# SECTION TMS TRACTION MOTOR SYSTEM TMS

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#### < PRECAUTION >

# PRECAUTION PRECAUTIONS

## Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

#### WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see "SRS AIR BAG".
- Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

#### PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

#### WARNING:

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the 12V battery, and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation after 12V Battery Disconnect

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For vehicle with steering lock unit, if the 12V battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the 12V battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

#### OPERATION PROCEDURE

- Connect both 12V battery cables. NOTE: Supply power using jumper cables if 12V battery is discharged.
- 2. Turn the ignition switch to ACC position.
  - (At this time, the steering lock will be released.)
- 3. Disconnect both 12V battery cables. The steering lock will remain released with both 12V battery cables disconnected and the steering wheel can be turned.
- 4. Perform the necessary repair operation.
- 5. When the repair work is completed, re-connect both 12V battery cables. With the brake pedal released, turn the ignition switch from ACC position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
- Perform All DTC Reading using CONSULT and delete DTC. NOTE:

Multiple DTCs are detected when 12V battery cable is disconnected while ignition switch is in ACC position.

#### TMS-4

#### Precaution for Procedure without Cowl Top Cover

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.

## **High Voltage Precautions**

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#### DANGER:

Since hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.

#### WARNING:

- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- The removed service plug must always be carried in a pocket of the responsible worker or placed in the tool box during the procedure to prevent the plug from being connected by mistake.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Never allow workers other than the responsible person to touch the vehicle containing high voltage parts. To keep others from touching the high voltage parts, these parts must be covered with an insulating sheet except when using them.

#### CAUTION:

Never bring the vehicle into the READY status with the service plug removed unless otherwise instructed in the Service Manual. A malfunction may occur if this is not observed.

#### HIGH VOLTAGE HARNESS AND EQUIPMENT IDENTIFICATION

All the high voltage harnesses and connectors are orange. The Li-ion battery and other high voltage devices include an orange high voltage label. Never touch these harnesses and high voltage parts.

#### HANDLING OF HIGH VOLTAGE HARNESS AND TERMINALS

Immediately insulate disconnected high voltage connectors and terminals with insulating tape.

#### **REGULATIONS ON WORKERS WITH MEDICAL ELECTRONICS**

#### WARNING:

The vehicle contains parts that contain powerful magnets. If a person who is wearing a heart pacemaker or other medical device is close to these parts, the medical device may be affected by the magnets. Such persons must not perform work on the vehicle.

#### PROHIBITED ITEMS TO CARRY DURING THE WORK

Hybrid vehicles and electric vehicles contain parts with high voltage and intense magnetic force. Never carry metal products and magnetic recording media (e.g. cash card, prepaid card) to repair/inspect high voltage parts. If this is not observed, the metal products may create a risk of short circuit and the magnetic recording media may lose their magnetic recording.

POSTING A SIGN OF "DANGER! HIGH VOLTAGE AREA. KEEP OUT"

Indicate "HIGH VOLTAGE. DO NOT TOUCH" on the vehicle under repair/inspection to call attention to other workers.



- Check that EVSE is not connected.
   NOTE:
   If EVSE is connected, the air conditioning system may be automatically activated by the timer A/C function.
- 2. Turn the power switch OFF  $\rightarrow$  ON  $\rightarrow$  OFF. Get out of the vehicle. Close all doors (including back door).

2013 M Hybrid

## PRECAUTIONS

< P	RECAUTION >	
3.	Check that the charge status indicator lamp does not blink and wait for 5 minutes or more. <b>NOTE:</b>	А
	If the battery is removed within 5 minutes after the power switch is turned OFF, plural DTCs may be detected.	
4.	Remove 12V battery within 1 hour after turning the power switch OFF $\rightarrow$ ON $\rightarrow$ OFF. <b>NOTE:</b>	В
	<ul> <li>The 12V battery automatic charge control may start automatically even when the power switch is in OFF state.</li> </ul>	
	<ul> <li>Once the power switch is turned ON → OFF, the 12V battery automatic charge control does not start for approximately 1 hour.</li> <li>CAUTION:</li> </ul>	TMS
	• After all doors (including back door) are closed, if a door (including back door) is opened before	D
	<ul> <li>After turning the power switch OFF, if "Remote A/C" is activated by user operation, stop the air conditioner and start over from Step 1.</li> </ul>	E
Ge	ineral Precautions	
Tak the	e care when handling the traction motor inverter so that dust, dirt, and other substances do not enter into inside from the opening.	F
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## < PREPARATION >

# PREPARATION

## PREPARATION

## **Commercial Service Tools**

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Тоо	Iname	Description
Insulated gloves	JMCIA0149ZZ	Removing and installing high voltage components
Leather gloves	JPCIA0066ZZ	Protection of insulated gloves
Insulated safety shoes	JPCIA0011ZZ	Removing and installing high voltage components
Safety glasses / Face shield protection	JPCIA0012ZZ	Removing and installing high voltage components
Insulated helmet	JPCIA0013ZZ	Removing and installing high voltage components
Insulation resistance tester (Multi tester)	JPCIA0014ZZ	Measuring voltage and insulation resis- tance

## DESCRIPTION

# < SYSTEM DESCRIPTION > SYSTEM DESCRIPTION DESCRIPTION

## Description

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- The traction motor contains a compact, lightweight, high output, high efficiency "Interior Permanent Magnet Synchronous Motor (IPMSM)".
- The traction motor inverter is a device which converts DC power from the Li-ion battery to AC power, and drives the traction motor. Because the AC power frequency and voltage can be varied when the DC power is converted to AC power, it provides control performance with a high degree of freedom.

## Specifications (Traction Motor)

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Max torque	270 Nm	E
Max output	50 kW	
Max speed	7,200 rpm	
Cooling system	Water cooling type	

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## < SYSTEM DESCRIPTION >

## COMPONENT PARTS

## **Component Parts Location**

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A. Engine room

B. Transmission assembly

## COMPONENT DESCRIPTION

No.	Item	Function
1	НРСМ	<ul> <li>Transmits mainly the following signals to HPCM via HEV system CAN.</li> <li>Motor speed signal</li> <li>Motor torque limit signal</li> <li>Traction motor inverter status signal</li> <li>Receives mainly the following signal from HPCM via HEV system CAN.</li> <li>Drive command signal</li> <li>High voltage power supply status signal</li> <li>System cut off signal</li> <li>Vibration control switching signal</li> <li>Motor charge preparation request signal</li> <li>Motor discharge request signal</li> </ul>
2	Traction motor inverter	TMS-10, "Traction Motor Inverter"
3	Traction motor (This is included in transmission)	TMS-11, "Traction Motor"

## **Traction Motor Inverter**

INFOID:000000008140275

#### NOTE:

Control of the traction motor and control of HEV system CAN communications with other control modules is actually performed by the motor controller. However because the motor controller is installed inside the traction motor inverter, the motor controller is here referred to as the traction motor inverter.

• The traction motor inverter is composed of the motor controller, driver, smoothing condenser, current sensors, coolant temperature sensor, and power module.

## **COMPONENT PARTS**

< SYSTEM DESCRI	PTION >
-----------------	---------

•	The traction motor inverter controls the traction motor based on the drive command signal transmitted by HEV system CAN from the HPCM.	А
•	Traction motor inverter drives traction motor accurately based on resolver detection signal and current sen- sor detection signal	
•	The traction motor inverter performs charging judgment for the high voltage circuit and also discharges the voltage inside the circuit.	В
•	Traction motor inverter operates speed control according to command from HPCM. This control absorbs	
	instantaneously the speed difference between engine and transmission, and it allows driving with reduced shift shocks	тмз

 The traction motor inverter performs vibration control in order to improve accelerator response and provide good acceleration while driving.

#### MOTOR CONTROLLER

The motor controller receives the rotor rotation angle from the traction motor resolver and the traction motor current value from the current sensor, and creates the pulse signal for driving the IGBT.

#### DRIVER

The driver converts the pulse signal (12V) from the motor controller to a high voltage signal (300V) and drives the IGBT.

#### POWER MODULE

- The power module is composed of 6 power semiconductor IGBT (Insulated Gate Bipolar Transistor).
- An IGBT Is a semiconductor switch that is capable of switching ON/OFF at high speed.
- An IGBT uses the IGBT drive signal from the driver to perform switching, converting the Li-ion battery DC
   G
   power to AC power and supplying AC power to the traction motor.

#### SMOOTHING CONDENSER

- Smoothing condenser charges DC power from Li-ion battery.
- The smoothing condenser controls the voltage ripple which occurs as a result of IGBT switching.

#### CURRENT SENSORS

For U-phase and V-phase, 2 sensors each are allocated. Current sensor detects current supplied to traction motor and transmits current value feedback to motor controller. W-phase current is calculated from U-phase and V-phase values.

#### COOLANT TEMPERATURE SENSOR

Coolant temperature sensor detects coolant temperature in traction motor inverter.

#### DISCHARGE RESISTER

The discharge resistor discharges the high voltage in case the traction motor inverter is unable to discharge the remaining high voltage in the high voltage circuit due to a malfunction.

#### Traction Motor

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- The traction motor contains an "Interior Permanent Magnet Synchronous Motor (IPMSM)". A permanent magnet is embedded inside the rotor core, and the rotating magnetic field generated by the stator coil is M used to generate rotational torque.
- The traction motor is able to generate torque even when the vehicle is stopped, and outputs maximum drive torque when the vehicle starts moving in order to provide good initial acceleration.



#### TRACTION MOTOR RESOLVER

The traction motor resolver is located coaxially with the traction motor, and detects the rotor rotation angle. The rotation angle is sent to the motor controller.

#### < SYSTEM DESCRIPTION >

## High Voltage Warning Label

- High voltage warning label is affixed to upper surface (A) of traction motor inverter.
- Always affix the label to the original position when replacing a part.



#### < SYSTEM DESCRIPTION >

## STRUCTURE AND OPERATION

## Structural Drawing

MOTOR MECHANISM (DIAGRAM)

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When 3-phase AC current is applied to the stator coil, a rotating magnetic field is generated. This rotating magnetic field pulls on the permanent magnet inside the rotor core, generating rotational torque that is syn-

## STRUCTURE AND OPERATION

#### < SYSTEM DESCRIPTION >

chronized with the rotating magnetic field. The generated torque is approximately proportional to the current, and the rotating speed depends on the frequency of the 3-phase current.

• In order to generate optimal rotor rotation, judgments regarding the position (angle) of the permanent magnet within the rotor core and the timing of current application to the coil are necessary. For this purpose, the traction motor resolver and current sensor are used in order to continually detect the rotating position of the rotor and control the timing of current application to the coil.

## < SYSTEM DESCRIPTION >

## SYSTEM TRACTION MOTOR INVERTER

**TRACTION MOTOR INVERTER : System Description** 

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- The traction motor inverter controls the traction motor based on the drive command signal transmitted by HEV system CAN from the HPCM.
- Traction motor inverter converts DC power from Li-ion battery to AC power, and drives traction motor accurately based on resolver detection signal and current sensor detection signal.
- At deceleration, traction motor is used as generator. It converts kinetic energy generated by rotary motion of tires (AC power) to electric energy (DC power) and charges Li-ion battery.
- If malfunction is detected, the system enters fail-safe mode. Refer to <u>TMS-28, "Fail-Safe"</u>.

SYSTEM DIAGRAM



#### **INPUT/OUTPUT SIGNAL**

Transmits mainly the following signals to HPCM via HEV system CAN.     Motor speed signal     Motor torque limit signal     Traction motor inverter status signal     Traction motor inverter status signal     Receives mainly the following signal from HPCM via HEV system CAN.     P HPCM     High voltage power supply status signal     System cut off signal     Vibration control switching signal	Item	Signal name	
- Motor charge preparation request signal	НРСМ	<ul> <li>Transmits mainly the following signals to HPCM via HEV system CAN.</li> <li>Motor speed signal</li> <li>Motor torque limit signal</li> <li>Traction motor inverter status signal</li> <li>Receives mainly the following signal from HPCM via HEV system CAN.</li> <li>Drive comand signal</li> <li>High voltage power supply status signal</li> <li>System cut off signal</li> <li>Vibration control switching signal</li> <li>Motor charge preparation request signal</li> </ul>	P

## < SYSTEM DESCRIPTION >

# TRACTION MOTOR INVERTER : Fail-Safe

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DTC	Vehicle behavior
P0A02	Radiator fan Hi request is requested to HPCM (Radiator fan is always operated at Hi, regardless of engine coolant temperature and high voltage sys- tem coolant temperature.)
P0A03	Radiator fan Hi request is requested to HPCM (Radiator fan is always operated at Hi, regardless of engine coolant temperature and high voltage sys- tem coolant temperature.)
P0A1B	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P0A3F	Stops drive control of traction motor
P0A40	Stops drive control of traction motor
P0A78	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P0A8D	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P0BE5	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P0BE6	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P0BE9	Stops drive control of traction motor, and requires system main relay OFF to HPCM
POBEA	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P0C17	Either of following status is observed • Does not to READY • Stops drive control of traction motor
P0C4E	Does not to READY
P0C79	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P31A5	Stops drive control of traction motor
P31A6	
P31A8	Stops drive control of traction motor
P31A9	
P3240	Stops drive control of traction motor
P3241	Stops drive control of traction motor
P3242	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P3243	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P3244	_
P3245	_
P3246	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P3247	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P3248	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P3249	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P324A	Does not to READY
P324B	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P324C	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P324D	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P324E	—
P324F	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P3250	—
P3251	_
U0100	—
U0101	Stops drive control of traction motor

#### < SYSTEM DESCRIPTION >

DTC	Vehicle behavior	Δ
U0111	_	A
U0293	Stops drive control of traction motor	
U1000	Stops drive control of traction motor	В
U1002	Stops drive control of traction motor	

## **TRACTION MOTOR INVERTER : Protection Control**

Traction motor inverter, when its status is as shown in the following table, enters a protective control state in order to protect the system. It automatically returns to the normal state when safety is ensured.

Condition	Control	Normal return condition	
IGBT high temperatures seen when traction motor speed is extremely low	IGBT switching frequency is reduced. <b>NOTE:</b> Traction motor electromagnetic noise increases.	<ul><li>IGBT temperature drops</li><li>Traction motor speed increases</li></ul>	
IGBT is overheated	Traction motor output torque is limited according to the IGBT temperature.	IGBT temperature drops	

## MOTOR POWER CONTROL

## MOTOR POWER CONTROL : System Description

The traction motor inverter applies AC power to the traction motor according to the drive command signal calculated by HPCM in order to generate drive force.

#### MOTOR POWER CONTROL : Operating Principle

## FLOW OF ENERGY (DRIVE BY MOTOR)



MOTOR REGENERATION CONTROL : System Description

**REGENERATIVE BRAKE ELECTRIC GENERATION** 

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Revision: 2013 March

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#### < SYSTEM DESCRIPTION >

During deceleration, the traction motor inverter drives the traction motor to function as a generator based on the signal sent via HEV system CAN from the HPCM, converting the kinetic torque generated by rotation of the tires into electrical energy. The converted electrical energy charges the Li-ion battery.

The regenerative torque that is generated when the traction motor is driven as a generator can be used as braking force, acting similar to engine braking and reducing the burden on the service brakes.

#### ENGINE ELECTRIC GENERATION

While the vehicle is driven by traction force from engine, traction motor inverter converts the engine drive force into electric energy. Converted electric energy is charged into Li-ion battery.

## MOTOR REGENERATION CONTROL : Operating Principle

INFOID:000000008140286

#### REGENERATIVE BRAKE ELECTRIC GENERATION

Flow of Energy



(1)		(2)		(3)		(4)
The kinetic energy generat- ed by rotation of the tires operates the traction motor as a generator.	⇒	Rotation of the traction mo- tor generates AC power.	⇒	The traction motor inverter (IGBT) switches in order to convert the AC power from the traction motor to DC power.	⇒	The DC power regenerat- ed by the traction motor in- verter is used to charge the Li-ion battery.

## ENGINE ELECTRIC GENERATION

Flow of Energy



## < SYSTEM DESCRIPTION >

(1)		(2)		(3)		(4)	٨
Traction motor is operated as a generator, according to kinetic energy generated by engine traction force.	⇒	Rotation of the traction mo- tor generates AC power.	⇒	The traction motor inverter (IGBT) switches in order to convert the AC power from the traction motor to DC power.	⇒	The DC power regenerat- ed by the traction motor in- verter is used to charge the Li-ion battery.	B

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## **ON BOARD DIAGNOSTIC (OBD) SYSTEM**

#### < SYSTEM DESCRIPTION >

## ON BOARD DIAGNOSTIC (OBD) SYSTEM

#### Diagnosis Description

This system is an on board diagnostic system that records exhaust emission-related diagnostic information and detects a sensors/actuator-related malfunction. A malfunction is indicated by the malfunction indicator lamp (MIL) and stored in ECU memory as a DTC. The diagnostic information can be obtained with the diagnostic tool (GST: Generic Scan Tool).

## GST (Generic Scan Tool)

INFOID:000000008140288

INFOID:000000008140287

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control module equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to <u>GI-57</u>, <u>"Description"</u>.

#### NOTE:

Service \$0A is not applied for regions where it is not mandated.

< SYSTEM DESCRIPTION >

## DIAGNOSIS SYSTEM (TRACTION MOTOR INVERTER) DIAGNOSIS DESCRIPTION

#### **DIAGNOSIS DESCRIPTION : System Description**

- This is an on-board trouble diagnosis system which automatically detects malfunction. Detected malfunction is memorized in control module as DTC. Diagnosis information can be confirmed using CONSULT.
- When malfunction is detected, traction motor inverter memorizes DTC and freeze frame data. In these diagnoses, some illuminate MIL and some do not. Refer to <u>TMS-31</u>, "<u>DTC Index</u>".

## **DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data**

#### NOTE:

"Start the engine and turn OFF the ignition switch after warm-up." This is defined as 1 trip.

- DTC (P0A02, P0BE5, U0293, etc.) is specified by SAE J2012/ISO 15031-6.
- Traction motor inverter memorizes DTC and freeze frame data when malfunction is detected.
- Traction motor inverter can memorize plural DTCs but only 1 set of freeze frame data.
- Freeze frame data is prioritized.

Priority	DTC	
1	Other than following items.	
2	P0A02, P0A03, P0A8D, P0C17, P0C4E, P3247, P3248, P3249, P324A, P324B, P324C, P324E, P3250, P3251, U1000, U1002	0

- For example, when a priority 1 DTC is detected on another trip after a priority 2 DTC is detected and freeze frame data is recorded, freeze frame data is updated to the priority 1 DTC data, at the time it is detected. Freeze frame data is not updated and freeze frame data firstly memorized remains, when a same priority DTC is detected.
- The procedure to erase DTC from traction motor inverter memory is described in "How to Erase DTC". Refer to <u>TMS-22</u>, "CONSULT Function".

## DIAGNOSIS DESCRIPTION : Counter System

- DTC and freeze frame data are displayed until 40 trips of "Driving Pattern A" are satisfied without detecting the same malfunction. DTC and freeze frame data are erased when 40 trips are satisfied.
- The illuminated MIL can be turned off by driving 3 trips with "Driving Pattern B" under condition that the concerned DTC is not detected (malfunction is absent).

#### COUNTER SYSTEM LIST

Item	Driving pattern	Trip	L
DTC and Freeze frame data (Clear)	A	40	
MIL (OFF)	В	3	Ν

## **DIAGNOSIS DESCRIPTION : Driving Pattern**

## DESCRIPTION

ECM recognizes each driving pattern; it transmits signals to each control module when the driving is complete. Each control module erases permanent DTC based on those signals.

#### DRIVING PATTERN A

Driving pattern A is the driving pattern that provides warm-up.

In specific, count-up is performed when all of the following conditions are satisfied.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature rises by 20°C (32°F) or more after starting the engine.
- Engine coolant temperature reaches 70°C (158°F) or more.
- The ignition switch is turned from ON to OFF.

#### NOTE:

- If the same malfunction is detected regardless of the driving pattern, reset the A counter.
- When the above is satisfied without detecting the same malfunction, count up the A counter.
- When MIL goes off due to the malfunction and the A counter reaches 40, the DTC is erased.

## **TMS-21**

OID:000000008140291	

IN

1

Н

А

В

D

INFOID:00000008140289

INFOID-000000008140290

INFOID:000000008140292

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Ρ

#### < SYSTEM DESCRIPTION >

#### DRIVING PATTERN B

Driving pattern B is the driving pattern that performs all diagnoses once.

In specific, count-up is performed when all of the following conditions are satisfied.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature reaches 70°C (158°F) or more.
- Vehicle speed of 70 120 km/h (44 75 MPH) is maintained for 60 seconds or more under the control of closed loop.
- Vehicle speed of 30 60 km/h (19 37 MPH) is maintained for 10 seconds or more under the control of closed loop.
- After experiencing the closed loop control with the hybrid system started (READY or engine started), vehicle speed of 4 km/h (2 MPH) or less and the status without stepping on the accelerator pedal are maintained for 12 seconds or more.
- The state of driving at 10 km/h (7 MPH) or more reaches 10 minutes or more in total.
- The status with the hybrid system started (READY or engine started) is maintained for 22 minutes or more.
- The ignition switch is turned from ON to OFF.

#### NOTE:

- If the same malfunction is detected regardless of the driving pattern, reset the B counter.
- When the above is satisfied without detecting the same malfunction, count up the B counter.
- When the B counter reaches 3 without malfunction, MIL goes off.

## DIAGNOSIS DESCRIPTION : Permanent Diagnostic Trouble Code (Permanent DTC)

INFOID:000000008140293

Permanent DTC is defined in SAE J1979/ISO 15031-5 Service \$0A.

Control module stores a DTC issuing a command of turning on MIL as a permanent DTC and keeps storing the DTC as a permanent DTC until control module judges that there is no presence of malfunction.

Permanent DTCs cannot be erased by using the erase function of CONSULT or Generic Scan Tool (GST) and by disconnecting the 12V battery to shut off power to control module. This prevents a vehicle from passing the use inspection without repairing a malfunctioning part.

When not passing the use inspection due to more than one permanent DTC, permanent DTCs should be erased, referring to this manual.

#### NOTE:

- The important items in state emission inspection are that MIL is not ON, SRT test items are set, and permanent DTCs are not included.
- Permanent DTCs do not apply for regions that permanent DTCs are not regulated by law.

#### PERMANENT DTC SET TIMING

The setting timing of permanent DTC is stored in control module with the lighting of MIL when a DTC is confirmed.

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:000000008140294

When traction motor inverter detects a DTC which affects exhaust gas, it transmits malfunction indicator lamp (MIL) signal to HPCM via CAN communication.

For malfunction indicator lamp (MIL) description, refer to <u>EC-52</u>, "DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)".

#### **CONSULT** Function

INFOID:000000008140295

#### APPLICATION ITEM

Item	Function
All DTC Reading	Display all DTCs or diagnostic items that all ECUs are recording and judging.
Self Diagnostic Results	Retrieve DTC from ECU and display diagnostic items.
Data Monitor	Monitor the input/output signal of the control unit in real time.
CAN Diagnosis	This mode displays a network diagnosis result about CAN by diagram.
CAN Diagnosis Support Monitor	It monitors the status of CAN communication.
ECU Identification	Display the ECU identification number (part number etc.) of the selected system.

#### SELF DIAGNOSTIC RESULTS

## **TMS-22**

#### < SYSTEM DESCRIPTION >

Display Item List Refer to <u>TMS-31, "DTC Index"</u> .			А			
How to Read DTC DTC is displayed on "Self Diagnostic results" of CONSULT. When DTC is currently detected, "CRNT" is displayed. If "PAST" is displayed, it shows a malfunction occurred in the past.The trip number of drive without malfunction of concerned DTC can be confirmed with "IGN counter" inside "FFD".						
How to Erase DTC			TMS			
<ul> <li>NOTE:</li> <li>If the ignition switch is kept ON after repair operation, operate the ignition switch to OFF. Operate the ignition switch to ON again after waiting at least 10 seconds.</li> <li>1. Touch "MOTOR CONTROL" of CONSULT.</li> <li>2. Touch "Self Diagnostic Result".</li> <li>3. Touch "Frase" (DTC memorized in electric traction motor inverter is erased.)</li> </ul>						
IGN Counter						
<ul><li>The IGN counter is displayed in "F after normal recovery of DTC.</li><li>If malfunction (DTC) is currently</li><li>After normal recovery, every time</li></ul>	FD" and th detected, "( e "Driving co	The number of times of satisfied "Driving condition A" is displayed D" is displayed. Condition A" is satisfied, the display value increases from $1 \rightarrow 2 \rightarrow 2$	F			
<ul> <li>338 → 39</li> <li>When the number reaches to 40 NOTE:</li> <li>The counter display of "40" can</li> </ul>	, DTC is era	ased.	G			
FREEZE FRAME DATA (FFD) The following vehicle status is reco	orded when	DTC is detected and is displayed on CONSULT.	Н			
FREEZE FRAME DATA (FFD) The following vehicle status is reco Monitored item (Unit) DTC	orded when	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory	H			
FREEZE FRAME DATA (FFD) The following vehicle status is reco Monitored item (Unit) DTC CALCULATE LOAD VALUE	orded when (%) (°C or °F)	DTC is detected and is displayed on CONSULT.          Remarks         Displays the DTC which caused freeze frame data memory         Displays the calculation load value of engine from ECM via CAN communication	H I J			
FREEZE FRAME DATA (FFD) The following vehicle status is reco Monitored item (Unit) DTC CALCULATE LOAD VALUE ENG COOLANT TEMP	(%) (°C or °F) (°C or °F)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication	H I J			
FREEZE FRAME DATA (FFD) The following vehicle status is reco Monitored item (Unit) DTC CALCULATE LOAD VALUE ENG COOLANT TEMP ENGINE SPEED	(%) (°C or °F) (°C or °F) (rpm)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication	H I J			
FREEZE FRAME DATA (FFD)         The following vehicle status is record         Monitored item (Unit)         DTC         CALCULATE LOAD VALUE         ENG COOLANT TEMP         ENGINE SPEED         VEHICLE SPEED	(%) (°C or °F) (°C or °F) (rpm) (km/h or MPH)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication Displays the vehicle speed from ECM via CAN communication	H J K			
FREEZE FRAME DATA (FFD)         The following vehicle status is record         Monitored item (Unit)         DTC         CALCULATE LOAD VALUE         ENG COOLANT TEMP         ENGINE SPEED         VEHICLE SPEED         THROTTLE ABSOLUTE POSITION	(%) (°C or °F) (°C or °F) (°C or °F) (rpm) (km/h or MPH) (%)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication Displays the vehicle speed from ECM via CAN communication Displays the throttle position information from ECM via CAN communication	H J K			
FREEZE FRAME DATA (FFD)         The following vehicle status is record         Monitored item (Unit)         DTC         CALCULATE LOAD VALUE         ENG COOLANT TEMP         ENGINE SPEED         VEHICLE SPEED         THROTTLE ABSOLUTE POSITION         ENGINE RUN TIME	(%) (°C or °F) (°C or °F) (rpm) (km/h or MPH) (%) (sec)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication Displays the vehicle speed from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the elapsed time of after engine start from ECM via CAN communication	H J K L			
FREEZE FRAME DATA (FFD)         The following vehicle status is record         Monitored item (Unit)         DTC         CALCULATE LOAD VALUE         ENG COOLANT TEMP         ENGINE SPEED         VEHICLE SPEED         THROTTLE ABSOLUTE POSITION         ENGINE RUN TIME         12V POWER VOLTAGE	orded when           (%)           (°C or °F)           (°C or °F)           (rpm)           (km/h or MPH)           (%)           (sec)           (V)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication Displays the vehicle speed from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the elapsed time of after engine start from ECM via CAN communication Displays 12V battery power voltage input to traction motor inverter	H J K L			
FREEZE FRAME DATA (FFD)         The following vehicle status is record         Monitored item (Unit)         DTC         CALCULATE LOAD VALUE         ENG COOLANT TEMP         ENGINE SPEED         VEHICLE SPEED         THROTTLE ABSOLUTE POSITION         ENGINE RUN TIME         12V POWER VOLTAGE         THROTTLE ABSOLUTE POSITION B	(%)           (°C or °F)           (°C or °F)           (°C or °F)           (rpm)           (km/h or MPH)           (%)           (sec)           (V)           (%)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication Displays the vehicle speed from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the elapsed time of after engine start from ECM via CAN communication Displays the throttle power voltage input to traction motor inverter Displays the throttle position information from ECM via CAN communication	H J K L			
FREEZE FRAME DATA (FFD)         The following vehicle status is record         Monitored item (Unit)         DTC         CALCULATE LOAD VALUE         ENG COOLANT TEMP         ENGINE SPEED         VEHICLE SPEED         THROTTLE ABSOLUTE POSITION         ENGINE RUN TIME         12V POWER VOLTAGE         THROTTLE ABSOLUTE POSITION B         DETAIL DTC	orded when           (%)           (°C or °F)           (°C or °F)           (rpm)           (km/h or MPH)           (%)           (sec)           (V)           (%)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication Displays the vehicle speed from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the elapsed time of after engine start from ECM via CAN communication Displays 12V battery power voltage input to traction motor inverter Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the detailed diagnosis trouble code (DTC)	H J K L			
FREEZE FRAME DATA (FFD)         The following vehicle status is record         Monitored item (Unit)         DTC         CALCULATE LOAD VALUE         ENG COOLANT TEMP         ENGINE SPEED         VEHICLE SPEED         THROTTLE ABSOLUTE POSITION         ENGINE RUN TIME         12V POWER VOLTAGE         THROTTLE ABSOLUTE POSITION B         DETAIL DTC         TORQUE LIMIT RATE	(%)           (°C or °F)           (°C or °F)           (°C or °F)           (rpm)           (km/h or MPH)           (%)           (sec)           (V)           (%)	DTC is detected and is displayed on CONSULT. Remarks Displays the DTC which caused freeze frame data memory Displays the calculation load value of engine from ECM via CAN communica- tion Displays the engine coolant temperature from ECM via CAN communication Displays the engine speed from ECM via CAN communication Displays the vehicle speed from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the elapsed time of after engine start from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the throttle position information from ECM via CAN communication Displays the detailed diagnosis trouble code (DTC) Displays the output torque limit rate	H J K L M			

TORQUE LIMIT (LOWER)

MOTOR TEMPERATURE

RESOLVER OFFSET VALUE

MAX MOTOR TEMPERATURE

MIN MOTOR TEMPERATURE

No. OF MOTOR OVER HEAT

**INVERTER TEMPERATURE** 

standard value

(Nm)

(deg)

(°C or °F)

(°C or °F)

(°C or °F)

(°C or °F)

CAN

Displays the torque limitation (lower) signal value from HPCM via HEV system

Displays the resolver offset value from TCM via CAN communication

Displays the number of times that traction motor temperature exceeds the

Displays the temperature of traction motor

Displays the highest temperature of traction motor

Displays the lowest temperature of traction motor

Displays the inside temperature of traction motor inverter

0

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#### < SYSTEM DESCRIPTION >

Monitored item (Unit)		Remarks
MAX INV TEMPERATURE	(°C or °F)	Displays the highest temperature of traction motor inverter
MIN INV TEMPERATURE	(°C or °F)	Displays the lowest temperature of traction motor inverter
No. OF INV OVER HEAT		Displays the number of times that traction motor inverter temperature exceeds the standard value
HV WATER TEMP	(°C or °F)	Displays the inside coolant temperature of traction motor inverter
MAX WATER TEMP		Displays the highest inside coolant temperature of traction motor inverter
MIN WATER TEMP		Displays the lowest inside coolant temperature of traction motor inverter
No. OF WATER TEMP OVER HEAT		Displays the number of times that inside coolant temperature of traction motor inverter exceeds the standard value
INVERTER TEMPERATURE 5	(°C or °F)	Displays the inside temperature of traction motor inverter
MAX INV TEMPERATURE 5	(°C or °F)	Displays the highest temperature of traction motor inverter
No. OF INV OVER HEAT 5		Displays the number of times that traction motor inverter temperature exceeds the standard value
INVERTER TEMPERATURE 4	(°C or °F)	Displays the inside temperature of traction motor inverter
MAX INV TEMPERATURE 4	(°C or °F)	Displays the highest temperature of traction motor inverter
No. OF INV OVER HEAT 4		Displays the number of times that traction motor inverter temperature exceeds the standard value
INV INPUT HIGH VOLTAGE	(V)	Displays high voltage input to traction motor inverter
Li-ion BAT TOTAL VOLTAGE	(V)	Displays the Li-ion battery voltage from Li-ion battery controller via HEV system CAN
COMMAND TORQUE	(Nm)	Displays the torque command value from HPCM via HEV system CAN
COMMAND MOTOR SPEED	(rpm)	Displays the motor speed command value from HPCM via HEV system CAN
MOTOR SPEED	(rpm)	Displays the traction motor speed
COMMAND MTR d CURRENT	(A)	Displays the command value of current (d-axis) of traction motor
MOTOR d CURRENT	(A)	Displays the detected value of current (d-axis) of traction motor
COMMAND MTR q CURRENT	(A)	Displays the command value of current (q-axis) of traction motor
MOTOR q CURRENT	(A)	Displays the detected value of current (q-axis) of traction motor
COMMAND MTR d VOLTAGE	(V)	Displays the command value of voltage (d-axis) of traction motor
COMMAND MTR q VOLTAGE	(V)	Displays the command value of voltage (q-axis) of traction motor
COMMAND MTR d CURRENT	(A)	Displays the command value of current (d-axis) of traction motor
U PHASE CURRENT	(A)	Displays the U-phase current detected value
V PHASE CURRENT	(A)	Displays the V-phase current detected value
SEQUENCE MODE		Displays the sequence number in motor controller
RF CONTROL SIGNAL		Displays the radiator fun drive request status to HPCM via HEV system CAN
SLEEP REFUSE SIGNAL		Displays the sleep refuse status
MIL REQUEST		Displays the MIL request status to HPCM via HEV system CAN
FAIL-SAFE STATUS		Displays the fail safe status of traction motor inverter
DISCHARGE STATUS		Displays that high voltage circuit is under discharge
MOTOR CONTROL STATUS		Displays the set status of traction motor control
CHARGE JUDGE		Displays the charge status of high voltage circuit
CHARGE PERMIT		Displays the charge permission status
CONTROL MODE		Displays the torque control or speed control status of traction motor inverter
COAST JUDGEMENT		Displays the coast judgement status from HPCM via HEV system CAN
ENGINE START COLD		Displays the status of engine started at cold temperature from HPCM via HEV system CAN
TORQUE/REV CONTROL		Displays the command status of torque control or speed control from HPCM via HEV system CAN

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#### < SYSTEM DESCRIPTION >

Monitored item (Unit)	Remarks	0
CL1 CONDITION	Displays the clutch 1 condition from HPCM via HEV system CAN	А
EGVR OPERATION	Displays the EGVR control status from HPCM via HEV system CAN	
HIGH VOLTAGE SUPPLY	Displays the high voltage supply status from HPCM via HEV system CAN	В
START/STOP REQUEST	Displays the start/stop request status from HPCM via HEV system CAN	
CHARGE RELAY READY REQ	Displays the start request status of charge judgement of high voltage circuit from HPCM via HEV system CAN	TM
NEXT GEAR POSITION	Displays the next gear position from TCM via HEV system CAN	
PRESENT GEAR POSITION	Displays the present gear position from TCM via HEV system CAN	
PWM OFF REQUEST	Displays the pulse signal off request status from HPCM via HEV system CAN	D
SYSTEM CUT OFF COMPLETE	Displays the system cut off status from HPCM via HEV system CAN	
DISCHARGE REQUEST	Displays the discharge request status from HPCM via HEV system CAN	Е
VIBRATION CONT REQUEST	Displays the vibration control switching request status from HPCM via HEV system CAN	
DIAG PROHIBIT	Displays the CAN diagnosis inhibition status from HPCM via HEV system CAN	F
WAKE UP SLEEP COMMAND	Displays the wake up/sleep request status from HPCM via HEV system CAN	

## DATA MONITOR

Monitored item (Unit	)	Remarks
DIAGNOSIS STATUS A		Displays the number of DTC of emission related
DIAGNOSIS STATUS B UPPER		Displays the diagnosis support status of emission related
DIAGNOSIS STATUS B LOWER		Displays the diagnosis support status of emission related
DIAGNOSIS STATUS C		Displays the diagnosis support status of emission related
DIAGNOSIS STATUS D		Displays the diagnosis support status of emission related
CALCULATE LOAD VALUE	(°C or °F)	Displays the calculation load value of engine from ECM via CAN communica- tion
ENG COOLANT TEMP	(°C or °F)	Displays the engine coolant temperature from ECM via CAN communication
VEHICLE SPEED	(km/h or MPH)	Displays the vehicle speed from ECM via CAN communication
THROTTLE ABSOLUTE POS	(%)	Displays the throttle position information from ECM via CAN communication
NUMBER OF P-DTC		Displays the number of permanent DTC
EOBD/OBD II		Displays the OBD adaptation
RESERVE		_
MONITOR STATUS B UPPER		Displays the diagnosis support status of emission related
MONITOR STATUS B LOWER		Displays the diagnosis support status of emission related
MONITOR STATUS C		Displays the diagnosis support status of emission related
MONITOR STATUS D		Displays the diagnosis support status of emission related
THROTTLE ABSOLUTE POS B	(%)	Displays the throttle position information from ECM via CAN communication
MOTOR TEMPERATURE	(°C or °F)	Displays the temperature of traction motor
INVERTER TEMPERATURE	(°C or °F)	Displays the inside temperature of traction motor inverter
HV WATER TEMP	(°C or °F)	Displays the inside coolant temperature of traction motor inverter
INVERTER TEMPERATURE 4	(°C or °F)	Displays the inside temperature of traction motor inverter
ENGINE SPEED	(rpm)	Displays the engine speed from ECM via CAN communication
ENGINE RUN TIME	(sec)	Displays the elapsed time of after engine start from ECM via CAN communi- cation
DTC ON RUN DISTANCE	(km or mile)	Displays the running distance from detected DTC
12V POWER VOLTAGE	(V)	Displays 12V battery power voltage input to traction motor inverter

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#### < SYSTEM DESCRIPTION >

Monitored item (Unit)		Remarks
INV INPUT HIGH VOLTAGE	(V)	Displays high voltage input to traction motor inverter
COMMAND TORQUE	(Nm)	Displays the torque command value from VCM via HEV system CAN
COMMAND MOTOR SPEED	(rpm)	Displays the motor speed command value from HPCM via HEV system CAN
MOTOR SPEED	(rpm)	Displays the traction motor speed
SEQUENCE MODE		Displays the sequence number in motor controller
RF CONTROL SIGNAL		Displays the radiator fun drive request status to HPCM via HEV system CAN
TORQUE/REV CONT CHANGE		Displays the command status of torque control or speed control from HPCM via HEV system CAN

#### < ECU DIAGNOSIS INFORMATION >

# ECU DIAGNOSIS INFORMATION TRACTION MOTOR INVERTER

## **Reference Value**

#### VALUES ON DIAGNOSIS TOOL

Monitor item	Condition	Value / Status (Approx.)	IVI
DIAGNOSIS STATUS A	Ignition switch ON	0	
DIAGNOSIS STATUS B UPPER	Ignition switch ON	4	D
DIAGNOSIS STATUS B LOWER	Ignition switch ON	0	
DIAGNOSIS STATUS C	Ignition switch ON	0	_
DIAGNOSIS STATUS D	Ignition switch ON	0	
CALCULATE LOAD VALUE	_	_	
ENG COOLANT TEMP	After engine warm-up	70°C (158°F) or more	F
VEHICLE SPEED	While driving	The value changes along with driving.	
	Accelerator pedal released	0%	_
THROTTLE ADSOLUTE POS	Accelerator pedal fully depressed	100%	G
NUMBER OF P-DTC	_	-	
EOBD/OBD II	Ignition switch ON	7	Н
RESERVE	Ignition switch ON	0	
MONITOR STATUS B UPPER	Ignition switch ON	4	
MONITOR STATUS B LOWER	Ignition switch ON	0	
MONITOR STATUS C	Ignition switch ON	0	
MONITOR STATUS D	Ignition switch ON	0	.]
	Accelerator pedal released	0%	Ŭ
THRUTTLE ADSOLUTE POS B	Accelerator pedal fully depressed	100%	
MOTOR TEMPERATURE	Drive by Motor	The value changes along with driving.	Κ
INVERTER TEMPERATURE	Drive by Motor	The value changes along with driving.	
HV WATER TEMP	Drive by Motor	The value changes along with driving.	1
INVERTER TEMPERATURE 5	Drive by Motor	The value changes along with driving.	
ENGINE SPEED	Drive by Engine	The value changes along with accelera- tion/deceleration.	М
ENGINE RUN TIME	_	_	IVI
DTC ON RUN DISTANCE	_	_	
12V POWER VOLTAGE	Ignition switch ON	10 – 16 V	Ν
INV INPUT HIGH VOLTAGE	READY (stop the vehicle) and drive by motor	240 – 403 V	
COMMAND TORQUE	Drive by Motor	The value changes along with accelera- tion/deceleration.	0
COMMAND MOTOR SPEED	Drive by Motor	The value changes along with accelera- tion/deceleration.	
MOTOR SPEED	Drive by Motor	The value changes along with accelera- tion/deceleration.	Ρ
SEQUENCE MODE	READY (stop the vehicle)	11	
RF CONTROL SIGNAL	_	_	
TORQUE/REV CONT CHANGE	_	_	

#### **TERMINAL LAYOUT**

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#### < ECU DIAGNOSIS INFORMATION >



## PHYSICAL VALUES

Termi (Co	nal No. olor)	Description		Description Condition Val	
+	-	Signal name	Input/ Output		
1 (G)	3 (L)	Traction motor resolver signal (S1 – S3)	Input	Ignition switch OFF	28 – 52 Ω
5 (R)	7 (W)	Traction motor resolver signal (S2 – S4)	Input	Ignition switch OFF	23 – 43 Ω
9 (L)		HEV system CAN-H	Input/ Output	_	_
17 (G)	35 (R)	Traction motor resolver signal (R1 – R2)	Output	Ignition switch OFF	7 – 14 Ω
24 (L)	14 (P)	Traction Motor Tem- perature Sensor	Input	_	_
28 (G)	_	HEV system CAN-L	Input/ Output	_	_
31	Ground	Power supply (IGN)		Ignition switch ON	10 – 16 V
(Y)	Giouna		_	Ignition switch OFF	0 V
33 (W)		Connection detection	Input/ Output	_	_
41 (B)	Ground	GND	_	Always	0 V
42	Ground	Power supply (BAT)		Ignition switch ON	10 – 16 V
(P)	Ground		Suppiy (ВАТ) —		0 V
43 (B)	Ground	GND	_	Always	0 V
44	Ground	Power supply (BAT)		Ignition switch ON	10 – 16 V
(P)	Ground		_	Ignition switch OFF	0 V

## Fail-Safe

INFOID:000000008140297

DTC	Vehicle behavior
P0A02	Radiator fan Hi request is requested to HPCM (Radiator fan is always operated at Hi, regardless of engine coolant temperature and high voltage sys- tem coolant temperature.)
P0A03	Radiator fan Hi request is requested to HPCM (Radiator fan is always operated at Hi, regardless of engine coolant temperature and high voltage sys- tem coolant temperature.)
P0A1B	Stops drive control of traction motor, and requires system main relay OFF to HPCM
P0A3F	Stops drive control of traction motor

#### < ECU DIAGNOSIS INFORMATION >

DTC	Vehicle behavior	<b>-</b>
P0A40	Stops drive control of traction motor	— A
P0A78	Stops drive control of traction motor, and requires system main relay OFF to HPCM	_
P0A8D	Stops drive control of traction motor, and requires system main relay OFF to HPCM	B
P0BE5	Stops drive control of traction motor, and requires system main relay OFF to HPCM	_
P0BE6	Stops drive control of traction motor, and requires system main relay OFF to HPCM	_
P0BE9	Stops drive control of traction motor, and requires system main relay OFF to HPCM	TMS
POBEA	Stops drive control of traction motor, and requires system main relay OFF to HPCM	_
P0C17	Either of following status is observed • Does not to READY • Stops drive control of traction motor	D
P0C4E	Does not to READY	
P0C79	Stops drive control of traction motor, and requires system main relay OFF to HPCM	— C
P31A5	Stops drive control of traction motor	_
P31A6	_	F
P31A8	Stops drive control of traction motor	
P31A9	—	_
P3240	Stops drive control of traction motor	G
P3241	Stops drive control of traction motor	_
P3242	Stops drive control of traction motor, and requires system main relay OFF to HPCM	Н
P3243	Stops drive control of traction motor, and requires system main relay OFF to HPCM	
P3244	_	
P3245	_	
P3246	Stops drive control of traction motor, and requires system main relay OFF to HPCM	
P3247	Stops drive control of traction motor, and requires system main relay OFF to HPCM	J
P3248	Stops drive control of traction motor, and requires system main relay OFF to HPCM	
P3249	Stops drive control of traction motor, and requires system main relay OFF to HPCM	
P324A	Does not to READY	K
P324B	Stops drive control of traction motor, and requires system main relay OFF to HPCM	_
P324C	Stops drive control of traction motor, and requires system main relay OFF to HPCM	
P324D	Stops drive control of traction motor, and requires system main relay OFF to HPCM	
P324E	_	
P324F	Stops drive control of traction motor, and requires system main relay OFF to HPCM	M
P3250	—	
P3251	_	NI
U0100	_	— IN
U0101	Stops drive control of traction motor	_
U0111	_	0
U0293	Stops drive control of traction motor	_
U1000	Stops drive control of traction motor	_
U1002	Stops drive control of traction motor	P

## **Protection Control**

INFOID:000000008140298

Traction motor inverter, when its status is as shown in the following table, enters a protective control state in order to protect the system. It automatically returns to the normal state when safety is ensured.

#### < ECU DIAGNOSIS INFORMATION >

Condition	Control	Normal return condition
IGBT high temperatures seen when traction motor speed is extremely low	IGBT switching frequency is reduced. <b>NOTE:</b> Traction motor electromagnetic noise increases.	<ul><li>IGBT temperature drops</li><li>Traction motor speed increases</li></ul>
IGBT is overheated	Traction motor output torque is limited according to the IGBT temperature.	IGBT temperature drops

## **DTC Inspection Priority Chart**

INFOID:000000008140299

If some DTCs are displayed at the same time, perform inspections one by one based on the priority as per thefollowing list.

Priority		Detected items	Reference
1	P0A8D	14VOLT POWER VOLTAGE	<u>TMS-53</u>
	P0A3F	DRIVE MOTOR A POSITION SENSOR	<u>TMS-45</u>
	P0A40	DRIVE MOTOR A POSITION SENSOR	<u>TMS-48</u>
	P0C17	DRIVE MOTOR A POSITION SENSOR	<u>TMS-63</u>
	P0C4E	DRIVE MOTOR A POSITION SENSOR	<u>TMS-66</u>
	P0C79	DRIVE MOTOR A INVERTER VOLTAGE	<u>TMS-67</u>
	P31A5	CAN ERROR	<u>TMS-69</u>
	P31A6	CAN ERROR	<u>TMS-70</u>
	P31A8	CAN ERROR	<u>TMS-71</u>
	P31A9	CAN ERROR	<u>TMS-72</u>
	P3240	DRIVE MOTOR A INVERTER CRNT CONT	<u>TMS-73</u>
	P3241	DRIVE MOTOR A INVERTER CRNT CONT	<u>TMS-76</u>
	P3244	DRIVE MOTOR A INVERTER	<u>TMS-82</u>
2	P3246	DRIVE MOTOR A INVERTER VOLTAGE	<u>TMS-86</u>
	P324A	DRIVE MOTOR A INVERTER VOLTAGE	<u>TMS-94</u>
	P324B	DRIVE MOTOR A INVERTER VOLTAGE	<u>TMS-96</u>
	P324D	DRIVE MOTOR A INVERTER IGBT	<u>TMS-99</u>
	P324E	IGNITION SWITCH SIGNAL	<u>TMS-101</u>
	P3250	CAN ERROR	TMS-105
	P3251	CAN ERROR	<u>TMS-106</u>
	U0100	LOST COMMUNICATION ECM	TMS-107
	U0101	LOST COMMUNICATION TCM	<u>TMS-109</u>
	U0111	LOST COMMUNICATION LBC	<u>TMS-111</u>
	U0293	LOST COMMUNICATION HCM	TMS-113
	U1000	CAN COMMUNICATION CIRCUIT	<u>TMS-115</u>
	U1002	CAN ERROR	<u>TMS-116</u>

#### < ECU DIAGNOSIS INFORMATION >

Priority		Detected items	Reference	_	
	P0A02	MOTOR COOLANT TEMP SENSOR	<u>TMS-39</u>	A	
	P0A03	MOTOR COOLANT TEMP SENSOR	<u>TMS-41</u>	_	
	P0A1B	DRIVE MOTOR A CONTROL MODULE	<u>TMS-43</u>	В	
	P0A78	DRIVE MOTOR A INVERTER	<u>TMS-51</u>	_	
	P0BE5	D-MOTOR A PHASE U CURRENT SEN	<u>TMS-55</u>		
	P0BE6	D-MOTOR A PHASE U CURRENT SEN	<u>TMS-57</u>	TMS	
2	P0BE9	D-MOTOR A PHASE V CURRENT SEN	<u>TMS-59</u>	_	
3	POBEA	D-MOTOR A PHASE V CURRENT SEN	<u>TMS-61</u>	D	
	P3242	D-MOTOR A PHASE U CURRENT SEN	<u>TMS-78</u>		
	P3243	D-MOTOR A PHASE V CURRENT SEN	<u>TMS-80</u>	_	
	P3245	DRIVE MOTOR A INVERTER	<u>TMS-84</u>	E	
	P3247	DRIVE MOTOR A INVERTER	<u>TMS-88</u>		
	P3248	DRIVE MOTOR A INVERTER	<u>TMS-90</u>		
	P3249	DRIVE MOTOR A INVERTER	<u>TMS-92</u>	- F	
4	P324C	DRIVE MOTOR A INVERTER CURRENT	<u>TMS-98</u>	_	
4	P324F	DRIVE MOTOR A INVERTER IGBT	TMS-103	G	

## **DTC** Index

INFOID:000000008140300

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#### NOTE:

If some DTCs are displayed at the same time, perform inspections one by one based on the priority as per the following list. Refer to <u>TMS-30, "DTC Inspection Priority Chart"</u>.

DTC <sup>*</sup>	Items	*2	Permanent	Hybrid system	Deferreres	
CONSULT	(CONSULT screen terms)	MIL <sup>2</sup>	DTC group <sup>*3</sup>	warning lamp	Reference	
P0A02	MOTOR COOLANT TEMP SENSOR		—	_	<u>TMS-39</u>	J
P0A03	MOTOR COOLANT TEMP SENSOR		—	—	<u>TMS-41</u>	
P0A1B	DRIVE MOTOR A CONTROL MODULE	ON	В	ON	<u>TMS-43</u>	Κ
P0A3F	DRIVE MOTOR A POSITION SENSOR	ON	В	ON	<u>TMS-45</u>	
P0A40	DRIVE MOTOR A POSITION SENSOR	ON	В	ON	<u>TMS-48</u>	
P0A78	DRIVE MOTOR A INVERTER	ON	В	ON	<u>TMS-51</u>	L
P0A8D	14VOLT POWER VOLTAGE	—	—	ON	<u>TMS-53</u>	
P0BE5	D-MOTOR A PHASE U CURRENT SEN	ON	В	ON	<u>TMS-55</u>	M
P0BE6	D-MOTOR A PHASE U CURRENT SEN	ON	В	ON	<u>TMS-57</u>	
P0BE9	D-MOTOR A PHASE V CURRENT SEN	ON	В	ON	<u>TMS-59</u>	
P0BEA	D-MOTOR A PHASE V CURRENT SEN	ON	В	ON	<u>TMS-61</u>	Ν
P0C17	DRIVE MOTOR A POSITION SENSOR		—	ON	TMS-63	
P0C4E	DRIVE MOTOR A POSITION SENSOR		—	ON	<u>TMS-66</u>	0
P0C79	DRIVE MOTOR A INVERTER VOLTAGE	ON	В	ON	<u>TMS-67</u>	0
P31A5	CAN ERROR	ON	В	ON	<u>TMS-69</u>	
P31A6	CAN ERROR	ON	В	—	<u>TMS-70</u>	Ρ
P31A8	CAN ERROR	ON	В	Can illuminate	<u>TMS-71</u>	
P31A9	CAN ERROR	ON	В	—	<u>TMS-72</u>	
P3240	DRIVE MOTOR A INVERTER CRNT CONT	ON	В	ON	<u>TMS-73</u>	
P3241	DRIVE MOTOR A INVERTER CRNT CONT	ON	В	ON	<u>TMS-76</u>	
P3242	D-MOTOR A PHASE U CURRENT SEN	ON	В	ON	TMS-78	

#### < ECU DIAGNOSIS INFORMATION >

DTC*	Items	MIL <sup>*2</sup>	Permanent	Hybrid system	Reference
CONSULT	(CONSULT screen terms)		DTC group <sup>3</sup>	warning lamp	
P3243	D-MOTOR A PHASE V CURRENT SEN	ON	В	ON	<u>TMS-80</u>
P3244	DRIVE MOTOR A INVERTER	ON	В	—	<u>TMS-82</u>
P3245	DRIVE MOTOR A INVERTER	ON	В	_	<u>TMS-84</u>
P3246	DRIVE MOTOR A INVERTER VOLTAGE	ON	В	ON	<u>TMS-86</u>
P3247	DRIVE MOTOR A INVERTER	_	—	ON	<u>TMS-88</u>
P3248	DRIVE MOTOR A INVERTER	_	—	ON	<u>TMS-90</u>
P3249	DRIVE MOTOR A INVERTER	_	—	ON	<u>TMS-92</u>
P324A	DRIVE MOTOR A INVERTER VOLTAGE	_	—	ON	<u>TMS-94</u>
P324B	DRIVE MOTOR A INVERTER VOLTAGE	_	—	ON	<u>TMS-96</u>
P324C	DRIVE MOTOR A INVERTER CURRENT	_	—	ON	<u>TMS-98</u>
P324D	DRIVE MOTOR A INVERTER IGBT	ON	В	ON	<u>TMS-99</u>
P324E	IGNITION SWITCH SIGNAL		—	ON	TMS-101
P324F	DRIVE MOTOR A INVERTER IGBT	ON	В	ON	TMS-103
P3250	CAN ERROR	_	—	_	TMS-105
P3251	CAN ERROR	_	—	_	<u>TMS-106</u>
U0100	LOST COMMUNICATION ECM	ON	В	_	TMS-107
U0101	LOST COMMUNICATION TCM	ON	В	Can illuminate	TMS-109
U0111	LOST COMMUNICATION LBC	ON	В	—	<u>TMS-111</u>
U0293	LOST COMMUNICATION HCM	ON	В	Can illuminate	<u>TMS-113</u>
U1000	CAN COMMUNICATION CIRCUIT	—	—	ON	<u>TMS-115</u>
U1002	CAN ERROR	—	_	ON	<u>TMS-116</u>

\*1: These numbers are prescribed by SAE J2012/ISO 15031-6.

\*2: Refer to EC-52, "DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)".

\*3: Refer to TMS-38, "Description".

## Index of HPCM-detected DTC

INFOID:000000008140301

When a DTC in the following table is detected by traction motor inverter, HPCM also detects a DTC.

DTC	DTC of HPCM
P324A	P3176
P0A3F, P0A40, P0C17, P0C4E	P3177
P0A1B, P0A78	P3178
P0A1B, P324E	P3179
P0A1B, P0A3F, P0A40, P0A78, P0C17, P0C4E, P31A5, P31A8, P3240, P3241, P3247, U0101, U0293, U1000, U1002	P317A
P0A1B, P0A8D, P0BE5, P0BE6, P0BE9, P0BEA, P0C79, P3242, P3243, P3246, P3248, P3249, P324A, P324B, P324C, P324D, P324F	P317B

## WIRING DIAGRAM TRACTION MOTOR INVERTER

## Wiring Diagram

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INFOID:000000008140302

For connector terminal arrangements, harness layouts, and alphabets in a  $\bigcirc$  (option abbreviation; if not described in wiring diagram), refer to <u>GI-13, "Connector Information"</u>. TMS

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< BASIC INSPECTION >

BASIC INSPECTION
DIAGNOSIS AND REPAIR WORK FLOW

## Work Flow

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INFOID:000000008140303 В

1. OBTAIN INFORMATION ABOUT SYMPTOM

Refer to TMS-36. "Question sheet" and interview the customer to obtain the malfunction information (condi-TMS tions and environment when the malfunction occurred) as much as possible when the customer brings in the vehicle.

>> GO TO 2.	
2. СНЕСК ДТС	
1. Before checking the malfunction, check whether any DTC exists.	
<ol> <li>If DTC exists, perform the following operations.</li> <li>Record the DTC and freeze frame data. (Print out the data using CONSULT and affix them to the</li> </ol>	- Work
Order Sheet.)	,
- Erase DTCs.	
<ul> <li>Check the relationship between the cause that is clarified with DTC and the malfunction infor described by the customer</li> </ul>	mation
<ol> <li>Check the information of related service bulletins and others also.</li> </ol>	
Do malfunction information and DTC exist?	
Malfunction information and DTC exists. >>GO TO 3.	
Malfunction information exists, but no DTC. >>GO TO 4.	
<b>3</b>	
Check any malfunction described by a customer, except those with DTC on the vehicle.	
When a malfunction symptom is reproduced, the question sheet is effective. Refer to TMS-36, "Qu	Jestion
<u>sheet"</u> .	
Verify the relationship between the symptom and the conditions in which the malfunction described by the	ne cus-
Check the malfunction described by the customer on the vehicle.	
When a malfunction symptom is reproduced, the question sheet is effective. Refer to TMS-36, "Qu	uestion
sheet".	
Verify the relationship between the symptom and the conditions in which the malfunction described by the temper occurs	ie cus-
>> GO TO 7	
5. PERFORM "DTC CONFIRMATION PROCEDURE"	
Perform "DTC CONFIRMATION PROCEDURE" of the appropriate DTC to check if DTC is detected ag	
Refer to <u>TMS-30</u> , " <u>DTC Inspection Priority Chart</u> " when multiple DTCs are detected, and then determ	ine the
order for performing the diagnosis.	
NOTE: If no DTC is detected, refer to the freeze frame data	
Is any DTC detected?	
YES $\rightarrow$ GO TO 6.	
NO >> Check according to <u>GI-49, "Intermittent Incident"</u> .	

6.REPAIR OR REPLACE THE MALFUNCTIONING PARTS

## **DIAGNOSIS AND REPAIR WORK FLOW**

#### < BASIC INSPECTION >

Repair or replace the detected malfunctioning parts.

Reconnect parts or connector after repairing or replacing, and then erase DTC if necessary.

#### >> GO TO 7.

## 7.FINAL CHECK

Perform "DTC CONFIRMATION PROCEDURE" again to make sure that the repair is correctly performed. Check that malfunctions are not reproduced when obtaining the malfunction information from the customer, referring to the symptom inspection result in step 3 or 4.

Is DTC or malfunction symptom reproduced?

#### YES >> GO TO 2.

NO >> Before delivering the vehicle to the customer, make sure that DTC is erased.

#### Question sheet

#### DESCRIPTION

By understanding those conditions properly, a quick and exact diagnosis can be achieved.

In general, customers have their own criteria for a problem. Therefore, it is important to understand the symptom and status well enough by asking the customer about the concerns carefully. In order to systemize all the information for the diagnosis, prepare the question sheet referring to the question points.

KEY	POINTS	

INFOID:000000008140304

SEF907L

WHAT.....Vehicle & engine modelWHEN.....Date, FrequenciesWHERERoad conditionsHOW.....Operating conditions,<br/>Weather conditions,<br/>Symptoms

#### WORKSHEET SAMPLE

			Qu	estion Sheet			
Customer name	ame	Motor No.			Inverter No.		
MR/MS		Model & Year			Incident Date		
		VIN			Trans.		
		In Service Date			Mileage		km/mile
Symptoms		Does not start	□ Hybrid system warning lamp is on			Does not to READY	
		□ Water leak*	□ Noise*	□ Vibration*	□ Shock*	Gear noise*	
		□ Non driving*	Poor acceleration*     Poor torque*		□ Poor torque*	□ Radio noise*	
		□ Other*				*: If applied, ent	er in detail
		Detailed sympton	n				
		Onomatopoeia					
Frequency		□ All the time	□ Once	□ Sometimes (	times a day)	□ Other	
Weather conditions		□ Not affected					
	Weather	□ Fine	□ Clouding	□ Raining	□ Snowing	D Other (	)
	Temp.	□ Hot	□ Warm		Cold	□ Temp. (Approx. °F)	° <b>C</b> /
	Humidity	□ High	□ Middle	□ Low	□ Humidity (Appro	x. %)	
## DIAGNOSIS AND REPAIR WORK FLOW

### < BASIC INSPECTION >

		Q	uestion Sheet				
Road conditions	□ Not affected	□ In town	□ Freeway	□ Off road (Up / D	)own)	Deplorable road	/
	□ Flat road	□ While turning	(Right / Left)	🗆 Bump			
	□ Other						1
Shift position	□ Not affected						
	P position	□ R position	□ N position	D position	□ M mode		Т
Gear position	□ 1st	□ 2nd	□ 3rd	□ 4th	🗆 5th		
	□ 6th	□ 7th	□ All gear				
	□ Shift up (	$) \rightarrow ($ $)$		□ Shift down (	$) \rightarrow ( )$		l
Shift speed	□ Slowly	□ Usually	□ Speedy	□ Other			
Driving conditions	□ Not affected						
	Drive by engine	ne	Drive by mote	or	□ Idling		
	□ Ignition switch	$ON \rightarrow OFF$	□ Ignition switc	h OFF $\rightarrow$ ON	C READY	(stop the vehicle)	
	While cruis- ing	□ While decel- erating	□ Just before stopping	□ Just after stop- ping	D positio	n (stop the vehicle)	
	□ Other		□ Engine speed	d ( rpm)			
	□ Vehicle speed	d [ km/h (	MPH)]	□ Accelerator ped	lal ( / 8)		(
Moments when mal- function disappears	Disappears while driving		Disappears w	vhen stopped	Disappea ation	ars with select oper-	
	Disappears w	hen ignition switch	is OFF	Does not disapp	bear		
	□ Other						
Other							

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< BASIC INSPECTION >

## HOW TO ERASE PERMANENT DTC

### Description

INFOID:000000008140305

Permanent DTC can be erased by driving each driving pattern.

ECM recognizes each driving pattern; it transmits signals to each control module when the driving is complete. Each control module erases permanent DTC based on those signals. For details, refer to <u>EC-123</u>, "<u>Description</u>".

### < DTC/CIRCUIT DIAGNOSIS >

## DTC/CIRCUIT DIAGNOSIS P0A02 MOTOR COOLANT TEMP SENSOR

## DTC Logic

DTC DETECTION LOGIC

DTC	Trouble diagnos	sis name	Malfunction detected conditi	on	F	Possible causes	ΤM
P0A02	Motor Electronics Temperature Sens Low	Coolant sor Circuit	When coolant temperature value is	s too low	<ul> <li>Harness, (Each circ)</li> <li>Traction n</li> <li>Self shut</li> </ul>	connector, or fuse cuit is open or shorted.) notor inverter off relay	D
DTC CONF	IRMATION PRO	CEDUR	E				Е
1.PRECON	DITIONING						
If "DTC CON waitat least 1	IFIRMATION PRO	OCEDUR e conduct	E" has been previously condu ing the next test.	cted, alv	ways turn iç	nition switch OFF and	F
>> (	GO TO 2.						G
2.снеск с	DTC DETECTION	I					0
<ol> <li>Perform</li> <li>Start the</li> <li>Check D</li> </ol>	"INSPECTION M engine and wait DTC.	1ODE 5". for 10 se	Refer to <u>HBC-89, "Descriptior</u> conds or more.	<u>ו"</u> .			Η
<u>Is "P0A02" d</u>	etected?		Dre ee duwe "				1
NO >> I	INSPECTION EN	ID	Procedure.				I
Diagnosis	Procedure					INFOID:00000008140307	I
1.снеск т	RACTION MOTO	OR INVEF	TER HARNESS CONNECTO	DR			0
<ol> <li>Turn ign</li> <li>Check the</li> </ol>	ition switch OFF. ne connection cor	nditions o	the traction motor inverter ha	arness c	onnector.		Κ
Is the inspec	tion result norma	<u> ?</u>					
NO >> I	Repair or replace	damageo	l parts.				L
<b>2.</b> CHECK F	POWER CIRCUIT	-					
<ol> <li>Disconni</li> <li>Turn ign</li> <li>Check the CAUTION</li> </ol>	ect the traction m ition switch ON. ne voltage betwee N:	iotor invei en tractior	ter harness connector. n motor inverter vehicle side h	arness	connector t	erminals.	M
Never d	amage connecto	or termin	als.				IN
	Traction r	notor inverte	er vehicle side harness connector				$\cap$
 	onnector		Terminal			Voltage	0
00			+	_			

Is the inspection result normal?

E78

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.

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NO >> GO TO 3.

**3.** DETECTION OF MALFUNCTION ITEMS

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10 – 16 V

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В

INFOID:000000008140306

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## P0A02 MOTOR COOLANT TEMP SENSOR

#### < DTC/CIRCUIT DIAGNOSIS >

Check the following items:

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u>.
- NO >> Repair or replace damaged parts.

## **P0A03 MOTOR COOLANT TEMP SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

## P0A03 MOTOR COOLANT TEMP SENSOR

## **DTC** Logic

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В

INFOID:000000008140308

## DTC DETECTION LOGIC

DTC	Trouble diagno	sis name	Malfunction det	ected condition	Possible of	auses
P0A03	Motor Electronics Temperature Sen High	Coolant sor Circuit	When coolant temper	ature value is too high	<ul> <li>Harness, connecto (Each circuit is ope</li> <li>Traction motor inve</li> <li>Self shut off relay</li> </ul>	r, or fuse in or shorted.) arter
DTC CONF	IRMATION PRO	OCEDUR	E			
1.PRECON	DITIONING					-
If "DTC CON waitat least	IFIRMATION PRO	OCEDURE e conducti	" has been previoung the next test.	usly conducted, all	ways turn ignition s	witch OFF and
						F
>> •	GO TO 2.					
Z.CHECK	DTC DETECTION	1				G
<ol> <li>Perform</li> <li>Start the</li> </ol>	"INSPECTION N engine and wait	10DE 5". I for 10 sec	Refer to <u>HBC-89, "I</u> conds or more	Description".		0
3. Check D	TC.					
<u>Is "P0A03" d</u>	etected?					H
YES >>	Go to <u>TMS-41, "[</u> INSPECTION EN	<u>Diagnosis  </u> חו	Procedure".			
Diagnosis	Procedure					
	Tiocedure					INFOID:00000008140309
1.CHECK 1	RACTION MOTO	OR INVER	TER HARNESS C	ONNECTOR		J
1. Turn ign	ition switch OFF.	nditions of	the treation motor	invertor borness a	opportor	
Is the inspec	tion result norma			inverter namess c	onnector.	K
YES >>	GO TO 2.					
NO >>	Repair or replace	damaged	parts.			
2.CHECK F		Г				L
<ol> <li>Disconn</li> <li>Turn ign</li> <li>Check ti CAUTIC Never d</li> </ol>	ect the traction m ition switch ON. ne voltage betwee <b>N:</b> amage connecte	notor inver en traction <b>or termina</b>	ter harness connec motor inverter veh als.	tor. iicle side harness	connector terminal	<b>s</b> . M
	Traction	motor invorte	r vohielo sido bornesa	connector		N
	TacuOIT		Terr	ninal		Voltage
Co	onnector		+	_		0
			42	41		
	E78		44	43		10 – 16 V

Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>. NO >> GO TO 3.

## **3.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

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## **P0A03 MOTOR COOLANT TEMP SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery
- Is the inspection result normal?
- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

## **P0A1B DRIVE MOTOR A CONTROL MODULE**

### < DTC/CIRCUIT DIAGNOSIS >

## P0A1B DRIVE MOTOR A CONTROL MODULE

## **DTC** Logic

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INFOID:000000008140310

### DTC DETECTION LOGIC

	l rouble diagnosis name	Malfunction detected condition	Possible causes
P0A1B	Drive Motor "A" Control Module	A malfunction is detected in the traction motor inverter (motor controller)	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>
DTC CONFIR	MATION PROCEDURE		
1.PRECONDI	TIONING		
If "DTC CONFI waitat least 10	RMATION PROCEDURE" seconds before conductin	has been previously conducted, al g the next test.	ways turn ignition switch OFF and
>> G(	) TO 2		
2.CHECK DT	C DETECTION		
1. Perform "IN	NSPECTION MODE 5". R	efer to HBC-89, "Description".	
<ol> <li>Start the er</li> <li>Check DT(</li> </ol>	ngine and wait for 10 seco C.	nds or more.	
Is "P0A1B" det	ected?		
YES >> Go	to <u>TMS-43, "Diagnosis P</u>	rocedure".	
Diagnosis P	Procedure		INFOID:00000000814031
		ER HARNESS CONNECTOR	
1. Turn ignitic	on switch OFF.		
	connection conditions of t	he traction motor inverter harness of	connector.
2. Check the			
2. Check the Is the inspectio	n result normal?		
2. Check the <u>Is the inspectio</u> YES >> GC NO >> Re	<u>n result normal?</u> ) TO 2. pair or replace damaged p	parts.	
2. Check the <u>Is the inspectio</u> YES >> GC NO >> Re <b>2.</b> CHECK PO	<u>n result normal?</u> D TO 2. pair or replace damaged p WER CIRCUIT	parts.	
<ol> <li>Check the <u>Is the inspectio</u> YES &gt;&gt; GC NO &gt;&gt; Re <b>2.</b>CHECK PO 1. Disconnec 2. Turn ignitic 3. Check the CAUTION: Never dan</li> </ol>	on result normal? O TO 2. Epair or replace damaged p WER CIRCUIT t the traction motor inverte on switch ON. voltage between traction r mage connector terminal	barts. er harness connector. motor inverter vehicle side harness <b>s.</b>	connector terminals.
<ol> <li>Check the <u>Is the inspectio</u> YES &gt;&gt; GC NO &gt;&gt; Re <b>2.</b>CHECK PO 1. Disconnec 2. Turn ignitic 3. Check the CAUTION: Never dan</li> </ol>	n result normal? D TO 2. pair or replace damaged p WER CIRCUIT t the traction motor inverte on switch ON. voltage between traction r nage connector terminal	parts. er harness connector. motor inverter vehicle side harness <b>s.</b> vehicle side harness connector	connector terminals.
2. Check the <u>Is the inspectio</u> YES >> GC NO >> Re <b>2.</b> CHECK PO 1. Disconnec 2. Turn ignitic 3. Check the CAUTION: Never dan Conn	on result normal? D TO 2. epair or replace damaged p WER CIRCUIT t the traction motor inverted on switch ON. voltage between traction r mage connector terminal Traction motor inverter	parts. er harness connector. motor inverter vehicle side harness <b>s.</b> vehicle side harness connector Terminal	connector terminals.
2. Check the Is the inspectio YES >> GC NO >> Re 2.CHECK PO 1. Disconnec 2. Turn ignitic 3. Check the CAUTION: Never dan Conn	on result normal? D TO 2. epair or replace damaged p WER CIRCUIT t the traction motor inverted on switch ON. voltage between traction r mage connector terminal Traction motor inverter rector	oarts. er harness connector. motor inverter vehicle side harness <b>s.</b> vehicle side harness connector Terminal +	connector terminals.

Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation". NO >> GO TO 3.

## 3. DETECTION OF MALFUNCTION ITEMS

Check the following items:

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## P0A1B DRIVE MOTOR A CONTROL MODULE

#### < DTC/CIRCUIT DIAGNOSIS >

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery
- Is the inspection result normal?
- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

## **P0A3F DRIVE MOTOR A POSITION SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

## P0A3F DRIVE MOTOR A POSITION SENSOR

## DTC Logic

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INFOID:000000008140312

## DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detection	ted condition	Pos	ssible causes	
P0A3F	Drive Motor "A" Position Se sor Circuit	n- If there is an abnormalit tor resolver detection cir	/ in the traction mo- cuit	<ul> <li>Harness or (Each circuit</li> <li>Traction model</li> <li>Traction model</li> </ul>	connector it is open or shorted.) otor otor inverter	TM
DTC CONF	IRMATION PROCEDU	RE				
1.PRECON	IDITIONING					F
If "DTC CON waitat least	IFIRMATION PROCEDUI	E" has been previousl ting the next test.	y conducted, alwa	ays turn ignit	tion switch OFF and	
>>	GO TO 2.					F
2.снеск с	DTC DETECTION					
<ol> <li>Perform</li> <li>Start the</li> </ol>	"INSPECTION MODE 5" e engine and wait for 10 s	Refer to <u>HBC-89, "De</u> econds or more.	scription".			G
3. Check E	DTC.					Н
YES >>	Go to TMS-45, "Diagnosi	Procedure".				
NO >>	INSPECTION END					
Diagnosis	Procedure				INFOID:00000008140313	I
1.снеск с	CONNECTION CONDITIC	DN				J
<ol> <li>Turn ign</li> <li>Check the harness</li> </ol>	ition switch OFF. he connection conditions connector.	of the traction motor ir	verter harness c	onnector an	d the traction motor	K
Is the inspec	tion result normal?					IX.
YES >> NO >>	GO TO 2. Repair or replace damage	ed parts				
2.снеск т	RACTION MOTOR RES	OLVER CIRCUIT				L
<ol> <li>Disconn</li> <li>Check t ground.</li> </ol>	ect the traction motor inverses the resistance between the traction betw	erter harness connecto raction motor inverter	r. vehicle side ha	rness conne	ector terminals and	Μ
Never d	amage connector termi	nals.				Ν
Tracti	ion motor inverter vehicle side h	arness connector				
C	onnector	Terminal	Ground	I	Resistance	$\bigcirc$
		1				0
		3				_
	F78	5	Groupe	4	100 kQ or more	Ρ
	210	7	Giounu	1		

YES >> GO TO 3.

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## **P0A3F DRIVE MOTOR A POSITION SENSOR**

< DTC/CIRCUIT DIAGNOSIS >

#### NO >> Repair or replace damaged parts.

## 3. CHECK TRACTION MOTOR RESOLVER CIRCUIT

1. Disconnect the traction motor harness connector.

 Check the resistance between traction motor inverter vehicle side harness connector terminals and traction motor vehicle side harness connector terminals. CAUTION:

#### Never damage connector terminals.

Traction motor inverter vehicle side harness connector		Traction motor vehicle side harness connector		Posistance	
Connector	Terminal	Connector	Terminal	Resistance	
E78	1		4		
	3		3		
	5	<b>E</b> 77	1		
	7		2	1 22 01 1855	
	17		6		
	35		5		

 Check the harness for short.
 CAUTION: Never damage connector terminals.

Traction mo	Posistance		
Connector	Terr	Resistance	
		3	
		5	
	1	7	
		17	
		35	
	3	5	
		7	
E78		17	100 k $\Omega$ or more
		35	
		7	
	5	17	
	· · · · · · · · · · · · · · · · · · ·	35	
		17	
	1	35	
	17	35	

### Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace damaged parts.

**4.**CHECK TRACTION MOTOR RESOLVER

Check the traction motor resolver. Refer to <u>TMS-47, "Component Inspection (Traction Motor Resolver)"</u>. <u>Is the inspection result normal?</u>

YES >> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation".

NO >> Replace the transmission assembly due to malfunction in the traction motor resolver (traction motor). Refer to <u>TM-190</u>, "Removal and Installation".

## **P0A3F DRIVE MOTOR A POSITION SENSOR**

#### Component Inspection (Traction Motor Resolver) INFOID:000000008140314 1.CHECK TRACTION MOTOR RESOLVER Disconnect the traction motor connector. 1. 2. Check the resistance between traction motor connector terminals. Traction motor connector Resistance TMS Terminal 1 2 28 – 52 Ω 3 4 $23 - 43 \Omega$ 5 6 7 – 14 Ω Is the inspection result normal?

YES >> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

>> Replace the transmission assembly due to malfunction in the traction motor resolver (traction NO motor). Refer to TM-190, "Removal and Installation".

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## **P0A40 DRIVE MOTOR A POSITION SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

## P0A40 DRIVE MOTOR A POSITION SENSOR

### DTC Logic

INFOID:000000008140315

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P0A40	Drive Motor "A" Position Sen- sor Circuit Range/Perfor- mance	When traction motor resolver detection cir- cuit malfunctions	<ul> <li>Harness or connector (Each circuit is open or shorted.)</li> <li>Traction motor</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>

## DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

### >> GO TO 2.

### 2. CHECK DTC DETECTION

1. Turn ignition switch ON and wait for 10 seconds or more.

2. Check DTC.

### Is "P0A40" detected?

- YES >> Go to TMS-48, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000008140316

## 1. CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection conditions of the traction motor inverter harness connector and the traction motor harness connector.

#### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace damaged parts.

### 2. CHECK POWER CIRCUIT

- 1. Disconnect the traction motor inverter harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between traction motor inverter vehicle side harness connector terminals. CAUTION:

#### Never damage connector terminals.

Traction				
Connector	Terr	Voltage		
Connector	+	_		
E70	42	41	- 10 – 16 V	
E78	44	43		

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

**3.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

## **P0A40 DRIVE MOTOR A POSITION SENSOR**

#### < DTC/CIRCUIT DIAGNOSIS >

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- · Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery

#### Is the inspection result normal?

- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

## **4.**CHECK TRACTION MOTOR RESOLVER CIRCUIT

Check the resistance between traction motor inverter vehicle side harness connector terminals and ground. CAUTION:

#### Never damage connector terminals.

Traction motor inverter v	ehicle side harness connector	Ground	Posistanaa	-
Connector	Terminal	Ground	Resistance	F
	1			_
	3		100 k $\Omega$ or more	
E70	5	Ground		G
Ero	7	Giouna		
	17			F
	35			

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace damaged parts.

### 5. CHECK TRACTION MOTOR RESOLVER CIRCUIT

1. Disconnect the traction motor harness connector.

 Check the resistance between traction motor inverter vehicle side harness connector terminals and traction motor vehicle side harness connector terminals.

### CAUTION:

#### Never damage connector terminals.

Traction motor inverter vehicle side harness connector		Traction motor vehicle side harness connector		Desistance	L
Connector	Terminal	Connector	Terminal	Resistance	
	1		4	1 Ω or less	_
	3		3		IV
E70	5	<b>E</b> 77	1		
Elo	7	- F//	2		N
	17		6		
	35		5	1	
					-

3. Check the harness for short.

**CAUTION:** 

Never damage connector terminals.

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## P0A40 DRIVE MOTOR A POSITION SENSOR

### < DTC/CIRCUIT DIAGNOSIS >

Traction me	Posistopoo		
Connector	Terr	Resistance	
		3	
		5	
	1	7	
		17	
		35	
	3	5	
		7	
E78		17	100 k $\Omega$ or more
		35	
		7	
	5	17	
		35	
	7	17	
		35	
-	17	35	

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace damaged parts.

**6.**CHECK TRACTION MOTOR RESOLVER

Check the traction motor resolver. Refer to <u>TMS-50, "Component Inspection (Traction Motor Resolver)"</u>. Is the inspection result normal?

- YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.
- NO >> Replace the transmission assembly due to malfunction in the traction motor resolver (traction motor). Refer to <u>TM-190, "Removal and Installation"</u>.

## Component Inspection (Traction Motor Resolver)

1. CHECK TRACTION MOTOR RESOLVER

1. Disconnect the traction motor connector.

2. Check the resistance between traction motor connector terminals.

Traction mo	Posistanco	
Terr		
1	2	28 – 52 Ω
4	3	23 – 43 Ω
5	6	7 – 14 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace the transmission assembly due to malfunction in the traction motor resolver (traction motor). Refer to TM-190, "Removal and Installation".

INFOID:000000008140317

### **P0A78 DRIVE MOTOR A INVERTER**

### < DTC/CIRCUIT DIAGNOSIS >

## P0A78 DRIVE MOTOR A INVERTER

## DTC Logic

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INFOID:000000008140318

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction dete	cted condition	Possible causes	
P0A78	Drive Motor "A" Inverter Per- formance	A malfunction is detecte tor inverter (motor contr	ed in the traction mo- oller)	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>	TMS
DTC CONF	IRMATION PROCEDUF	RE			
1.PRECON	DITIONING				
If "DTC CON waitat least 1	FIRMATION PROCEDUR	E" has been previous ting the next test.	sly conducted, alw	vays turn ignition switch OFF and	L
					F
2 CHECK F					
1 Perform	"INSPECTION MODE 5"	Refer to HBC-89 "D	escription"		G
2. Start the	engine and wait for 10 se	conds or more.	<u>comption</u> .		
3. Check D	DTC.				Н
YES >> (	<u>Go to TMS-51. "Diagnosis</u>	Procedure".			
NO >>	INSPECTION END	<u></u>			
Diagnosis	Procedure			INFOID:00000008140315	)
1.снеск т	RACTION MOTOR INVER	RTER HARNESS CO	NNECTOR		J
1. Turn ign	ition switch OFF.				
2. Check the	tion result normal?	t the traction motor in	iverter narness co	onnector.	K
YES >> (	GO TO 2.				rx.
NO >>	Repair or replace damage	d parts.			
2.CHECK F	POWER CIRCUIT				L
<ol> <li>Disconn</li> <li>Turn ign</li> <li>Check the CAUTION Never description</li> </ol>	ect the traction motor inve ition switch ON. ne voltage between traction N: amage connector termin	rter harness connecton motor inverter vehic <b>als.</b>	or. cle side harness c	connector terminals.	Μ
	Traction motor invert	er vehicle side harness co	nnector		N
	ppportor	Termi	nal	Voltage	
		+	_		0
	E78	42	41	10 – 16 V	
	-	44	43		

Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>. NO >> GO TO 3.

## **3.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

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## **P0A78 DRIVE MOTOR A INVERTER**

#### < DTC/CIRCUIT DIAGNOSIS >

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery

#### Is the inspection result normal?

- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

### P0A8D 14VOLT POWER VOLTAGE

### < DTC/CIRCUIT DIAGNOSIS >

## P0A8D 14VOLT POWER VOLTAGE

## DTC Logic

INFOID:000000008140320

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### DTC DETECTION LOGIC

	l rouble diagnosis name	Malfunction detected condition	Possible causes
P0A8D	14 Volt Power Module System Voltage Low	If the 12V battery voltage is too low	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>
	IRMATION PROCEDURE		
.PRECOM	IDITIONING		
f "DTC CON vaitat least	VFIRMATION PROCEDURE" 10 seconds before conducting	has been previously conducted, alw g the next test.	ays turn ignition switch OFF and
>>	GO TO 2.		
2.CHECK	DTC DETECTION		
I. Turn igr	nition switch ON and wait for 1	0 seconds or more.	
s "P0A8D" (	detected?		
YES >>	Go to TMS-53, "Diagnosis Pr	ocedure".	
NO >>	INSPECTION END		
Diagnosis	Procedure		INFOID:0000000814032
1			
I.CHECK	I RACTION WOTOR INVERT	ER HARNESS CONNECTOR	
I. Turn igr	ition switch OFF.	ER HARNESS CONNECTOR	
I. Turn igr 2. Check t	ition switch OFF. he connection conditions of th	ER HARNESS CONNECTOR	nnector.
I. CHECK I. Turn igr 2. Check t <u>s the inspective</u> YES >>	ition switch OFF. he connection conditions of th ction result normal? GO TO 2	ER HARNESS CONNECTOR	nnector.
I. CHECK       . Turn igr       2. Check t <u>s the insper       YES       NO  </u>	ition switch OFF. he connection conditions of th <u>ction result normal?</u> GO TO 2. Repair or replace damaged p	ER HARNESS CONNECTOR	nnector.
I. CHECK I. Turn igr 2. Check t <u>s the insperies</u> YES >> NO >> 2.CHECK	ition switch OFF. he connection conditions of th <u>ction result normal?</u> GO TO 2. Repair or replace damaged p POWER CIRCUIT	ER HARNESS CONNECTOR	nnector.
I. CHECK I. Turn igr C. Check t S the inspective YES >> NO >> C.CHECK I C. Disconr D. Disconr C. Turn igr C. Check t CAUTIC	ition switch OFF. he connection conditions of th ction result normal? GO TO 2. Repair or replace damaged p POWER CIRCUIT nect the traction motor inverten hition switch ON. he voltage between traction m ON:	ER HARNESS CONNECTOR ne traction motor inverter harness co arts. r harness connector. notor inverter vehicle side harness c	nnector.
I. CHECK I. Turn igr C. Check t s the inspective YES >> NO >> C.CHECK I. Disconr C. Disconr C. Turn igr C. Check t CAUTIC Never C	ition switch OFF. he connection conditions of th ction result normal? GO TO 2. Repair or replace damaged p POWER CIRCUIT nect the traction motor inverten ition switch ON. he voltage between traction m ON: lamage connector terminals	ER HARNESS CONNECTOR ne traction motor inverter harness co arts. r harness connector. notor inverter vehicle side harness c	nnector.
I. CHECK I. Turn igr C. Check t s the inspective YES >> NO >> C.CHECK I I. Disconr C. Turn igr C. Check t CAUTIC Never C	ition switch OFF. he connection conditions of th ction result normal? GO TO 2. Repair or replace damaged p POWER CIRCUIT nect the traction motor inverter ition switch ON. he voltage between traction m ON: lamage connector terminals	ER HARNESS CONNECTOR ne traction motor inverter harness co arts. r harness connector. notor inverter vehicle side harness c s.	nnector.
I. CHECK I. Turn igr C. Check t S the inspective YES >> NO >> C.CHECK I Disconr Disconr CAUTIC Never C	ition switch OFF. he connection conditions of th ction result normal? GO TO 2. Repair or replace damaged p POWER CIRCUIT hect the traction motor inverter hition switch ON. he voltage between traction m DN: lamage connector terminals Traction motor inverter v	ER HARNESS CONNECTOR ne traction motor inverter harness co arts. r harness connector. notor inverter vehicle side harness c s. rehicle side harness connector Terminal	onnector terminals.
I. CHECK I. Turn igr 2. Check t s the insper YES >> NO >> 2. CHECK I 1. Disconr 2. Turn igr 3. Check t CAUTIC Never C	ition switch OFF. he connection conditions of the ction result normal? GO TO 2. Repair or replace damaged po POWER CIRCUIT he contraction motor inverter he voltage between traction mon N: lamage connector terminals Traction motor inverter volume onnector	ER HARNESS CONNECTOR Terminal	onnector terminals.
I. CHECK I. Turn igr C. Check t S the inspective YES >> NO >> C.CHECK I Disconr C. Turn igr C. Check t CAUTIC Never C	Intraction NUCTOR INVERTION         inition switch OFF.         he connection conditions of the connection conditions of the connection conditions of the connector replace damaged performed and the connector inverter intervention switch ON.         he voltage between traction motor inverter intervention         Image connector terminals         Traction motor inverter voltage         Image connector terminals         Traction motor inverter voltage	ER HARNESS CONNECTOR  The traction motor inverter harness con arts.  The harness connector.  The harness connector  Terminal  Terminal	onnector terminals.

NO >> GO TO 3.

## **3.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

 Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3

### **TMS-53**

## P0A8D 14VOLT POWER VOLTAGE

< DTC/CIRCUIT DIAGNOSIS >

- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u>.
- NO >> Repair or replace damaged parts.

## **P0BE5 D-MOTOR A PHASE U CURRENT SEN**

### < DTC/CIRCUIT DIAGNOSIS >

## P0BE5 D-MOTOR A PHASE U CURRENT SEN

## **DTC** Logic

INFOID:000000008140322

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P0BE5	Drive Motor "A" Phase U Cur- rent Sensor Circuit	When a difference is detected between val- ues of traction motor U-phase current sen- sor 1 and current sensor 2	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>
TC CONFIR	MATION PROCEDUR	E	
.PRECONDI	TIONING		
f "DTC CONFII vaitat least 10 s	RMATION PROCEDURI	E" has been previously conducted, all ing the next test.	ways turn ignition switch OFF and
>> GC 2.CHECK DT(	) TO 2. C DETECTION		
<ol> <li>Set the veh</li> <li>Drive the veh</li> <li>Fully open</li> <li>Stop the veh</li> <li>Check DTC</li> </ol>	hicle to READY. ehicle by motor. the accelerator and acc hicle.	elerate the vehicle to 60 km/h (37 MP	Н).
: "Oneck Dre s "P0BE5" dete	ected?		
YES >> Go NO >> INS	to <u>TMS-55, "Diagnosis</u> SPECTION END	Procedure".	
Diagnosis P	rocedure		INFOID:00000008140323
.CHECK TRA	ACTION MOTOR INVER	TER HARNESS CONNECTOR	
. Turn ignitio	n switch OFF. connection conditions of p result pormal?	the traction motor inverter harness c	onnector.
YES >> GC	) TO 2.		
NO >> Re CHECK PO	pair or replace damaged NER CIRCUIT	l parts.	
	the traction motor inver	ter harness connector	
<ol> <li>Disconnect</li> <li>Turn ignitio</li> <li>Check the control</li> <li>CAUTION:</li> </ol>	n switch ON. voltage between tractior	n motor inverter vehicle side harness	connector terminals.
Disconnect Turn ignitio Check the CAUTION: Never dam	n switch ON. voltage between tractior nage connector termina	n motor inverter vehicle side harness	connector terminals.
Disconnect Turn ignitio Check the CAUTION: Never dam	n switch ON. voltage between tractior nage connector termina Traction motor inverte	a motor inverter vehicle side harness als.	connector terminals.
Disconnect     Turn ignitio     Check the     CAUTION:     Never dam     Conne	n switch ON. voltage between tractior nage connector termina Traction motor inverte	a motor inverter vehicle side harness als. er vehicle side harness connector Terminal	connector terminals.
Disconnect     Turn ignitio     Check the     CAUTION:     Never dam     Conne	n switch ON. voltage between tractior nage connector termina Traction motor inverte	als.  er vehicle side harness connector  terminal  terminal	Connector terminals.

Is the inspection result normal?

>> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation". YES

NO >> GO TO 3.

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## **P0BE5 D-MOTOR A PHASE U CURRENT SEN**

#### < DTC/CIRCUIT DIAGNOSIS >

## **3.** DETECTION OF MALFUNCTION ITEMS

### Check the following items:

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery
- Is the inspection result normal?
- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

## **P0BE6 D-MOTOR A PHASE U CURRENT SEN**

### < DTC/CIRCUIT DIAGNOSIS >

## P0BE6 D-MOTOR A PHASE U CURRENT SEN

## DTC Logic

INFOID:000000008140324

### DTC DETECTION LOGIC

	Trouble diagnosis name	Malfunction detected condition	Possible causes
P0BE6	Drive Motor "A" Phase U Cur- rent Sensor Circuit Range/ Performance	If the value detected by the traction motor U- phase current sensor 1 is abnormal	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>
DTC CONFI	RMATION PROCEDUR	E	
1.PRECOND	DITIONING		
f "DTC CONF waitat least 10	FIRMATION PROCEDURI	E" has been previously conducted, alwaing the next test.	ays turn ignition switch OFF and
>> G	O TO 2.		
2.CHECK DT	<b>TC DETECTION</b>		
<ol> <li>Perform "</li> <li>Start the e</li> </ol>	INSPECTION MODE 5". engine and wait for 10 sec	Refer to <u>HBC-89, "Description"</u> . conds or more.	
s "P0BE6" de	U. etected?		
YES >> G	o to TMS-57, "Diagnosis	Procedure".	
NO >> IN	ISPECTION END		
Diagnosis I	Procedure		INFOID:00000008140325
<b>1.</b> CHECK TF	RACTION MOTOR INVER	TER HARNESS CONNECTOR	
. Turn ignit	ion switch OFF.		
<ol> <li>Check the s the inspecti</li> </ol>	e connection conditions of on result normal?	the traction motor inverter harness co	nnector.
YES >> G	0 TO 2.		
NO >> R	epair or replace damaged	l parts.	
CHECK PC	OWER CIRCUIT		
<ol> <li>Disconne</li> <li>Turn igniti</li> </ol>	ct the traction motor inver ion switch ON. e voltage between tractior <mark>\</mark> :	ter harness connector. n motor inverter vehicle side harness co <b>als.</b>	onnector terminals.
3. Check the CAUTION Never da	mage connector termin		
3. Check the CAUTION Never da	mage connector termin	er vehicle side harness connector	
3. Check the CAUTION Never da	mage connector termina Traction motor inverte	er vehicle side harness connector Terminal	Voltage
3. Check the CAUTION Never da	mage connector termina Traction motor inverte	er vehicle side harness connector Terminal + - 42 41	Voltage
Check the     CAUTION     Never da     Con	Traction motor inverter	er vehicle side harness connector Terminal + - 42 41 44 43	Voltage 10 – 16 V

Check the following items:

А

В

## P0BE6 D-MOTOR A PHASE U CURRENT SEN

#### < DTC/CIRCUIT DIAGNOSIS >

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery
- Is the inspection result normal?
- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

## **P0BE9 D-MOTOR A PHASE V CURRENT SEN**

### < DTC/CIRCUIT DIAGNOSIS >

## P0BE9 D-MOTOR A PHASE V CURRENT SEN

## DTC Logic

INFOID:000000008140326

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P0BE9	Drive Motor "A" Phase V Cur rent Sensor Circuit	When a difference is detected between va ues of traction motor V-phase current sen- sor 1 and current sensor 2	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>
DTC CONF	IRMATION PROCEDU	RE	
Always drive 1.PRECON	<mark>e vehicle at a safe spee</mark> DITIONING	d.	E
If "DTC CON waitat least 1	FIRMATION PROCEDUR	RE" has been previously conducted, a cting the next test.	Ilways turn ignition switch OFF and $_{\sf F}$
>> (	GO TO 2.		G
<ol> <li>Set the V</li> <li>Drive the</li> <li>Fully ope</li> <li>Stop the</li> </ol>	venicle to READY. e vehicle by motor. en the accelerator and ac vehicle.	celerate the vehicle to 60 km/h (37 N	<b>РН).</b>
5. Check D	TC.		1
YES >> (	Go to <u>TMS-59, "Diagnosis</u>	<u>s Procedure"</u> .	
NO >> I	NSPECTION END		J
	FIOCEDUIE		INFOID:00000008140327
		RTER HARNESS CONNECTOR	K
2. Check th	ne connection conditions	of the traction motor inverter harness	connector.
<u>Is the inspec</u> YES >> (	tion result normal?		L
NO >> I	Repair or replace damage	ed parts.	M
	POWER CIRCUIT	arter horness connector	
<ol> <li>Disconne</li> <li>Turn igni</li> <li>Check the CAUTIO</li> </ol>	ition switch ON. ne voltage between tractic N:	on motor inverter vehicle side harnes	s connector terminals.
Never d	amage connector termi	nals.	0
	Traction motor inve	ter vehicle side harness connector	
Co	nnector		Voltage P
		42 41	
	E78	44 43	10 – 16 V

Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.

NO >> GO TO 3.

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## **P0BE9 D-MOTOR A PHASE V CURRENT SEN**

#### < DTC/CIRCUIT DIAGNOSIS >

## **3.** DETECTION OF MALFUNCTION ITEMS

### Check the following items:

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery
- Is the inspection result normal?
- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

## **POBEA D-MOTOR A PHASE V CURRENT SEN**

### < DTC/CIRCUIT DIAGNOSIS >

## POBEA D-MOTOR A PHASE V CURRENT SEN

## **DTC** Logic

INFOID:000000008140328

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## DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
POBEA	Drive Motor "A" Phase V Cur- rent Sensor Circuit Range/ Performance	If the value detected by the traction motor V- phase current sensor 1 is abnormal	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>
	RMATION PROCEDUR	E	
waitat least 10	0 seconds before conduct	ing the next test.	ays turn ignition switch OFF and
~~ (-			
2.снеск d <sup>.</sup>	TC DETECTION		
1. Perform "	INSPECTION MODE 5".	Refer to HBC-89, "Description".	
<ol> <li>Start the 3. Check D<sup>-</sup></li> </ol>	engine and wait for 10 sec FC.	conds or more.	
<u>ls "P0BEA" de</u>	etected?		
YES >> G NO >> I	So to <u>TMS-61, "Diagnosis</u> NSPECTION END	Procedure".	
Diagnosis	Procedure		INFOID:00000008140329
1 OUEON T			
1 Turn ignit		TER HARNESS CONNECTOR	
2. Check the	e connection conditions of	the traction motor inverter harness cor	nnector.
Is the inspect	ion result normal?		
NO >> R	Repair or replace damaged	parts.	
2.CHECK P	OWER CIRCUIT		
<ol> <li>Disconne</li> <li>Turn ignit</li> </ol>	ct the traction motor inver ion switch ON	ter harness connector.	
3. Check the	e voltage between tractior	n motor inverter vehicle side harness co	nnector terminals.
Never da	N: Image connector termina	als.	
	Traction motor inverte	er vehicle side harness connector	
		Terminal	Voltage
Cor	inector	+ -	
I	E78	42 41	10 – 16 V
I.a. (b. a. 1) (1)		44 43	

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>. NO >> GO TO 3.

#### NO >> GO IO **>**

## **3.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

## **P0BEA D-MOTOR A PHASE V CURRENT SEN**

#### < DTC/CIRCUIT DIAGNOSIS >

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery
- Is the inspection result normal?
- YES >> Check intermittent incident. Refer to GI-49, "Intermittent Incident".
- NO >> Repair or replace damaged parts.

## **P0C17 DRIVE MOTOR A POSITION SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

## P0C17 DRIVE MOTOR A POSITION SENSOR

## DTC Logic

INFOID:000000008140330

### DTC DETECTION LOGIC

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DTC	Trouble diagnosis name	Malfunction detect	ted condition	Po	ssible causes	
P0C17	Drive Motor "A" Position Sen- sor Not Learned	When the initial position of solver is not determined	of traction motor re-	<ul> <li>Harness or (Each circu)</li> <li>Traction model</li> <li>Traction model</li> </ul>	r connector iit is open or shorted.) otor otor inverter	TM
DTC CONFI	RMATION PROCEDURE	-				D
1.PRECOND	DITIONING					_
If "DTC CONF	FIRMATION PROCEDURE	" has been previously	conducted, alwa	ays turn igni	ition switch OFF and	E
waitat least 10	) seconds before conductin	ng the next test.				
>> G						F
2.CHECK D	TC DETECTION					
1. Turn ignit	ion switch ON and wait for	10 seconds or more.				G
2. Check DT	FC.					
<u>Is "P0C17" de</u>	etected?	Procedure"				Н
NO >> IN	NSPECTION END	<u>locedule</u> .				
Diagnosis	Procedure				INFOID:000000008140331	I
1. СНЕСК СО	ONNECTION CONDITION					
1. Turn ignit	ion switch OFF.					J
2. Check the	e connection conditions of	the traction motor in	verter harness c	onnector an	nd the traction motor	
Is the inspecti	ion result normal?					K
YES >> G	O TO 2.					
2  out of  T	epair or replace damaged	parts.				I
	ACTION MOTOR RESUL					
2. Check th	e resistance between tra	er namess connector ction motor inverter	vehicle side ha	rness conn	ector terminals and	
ground.	4.					M
Never da	mage connector termina	ls.				
Tractia	n matar invartar vahiala aida harr					Ν

Traction motor inverter veh	Traction motor inverter vehicle side harness connector		Posistance	
Connector	Terminal	Giound	Resistance	
	1			0
	3	Ground	100 k $\Omega$ or more	
EZQ	5			D
E70	7	Ground		Г
	17			
	35			_

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace damaged parts.

< DTC/CIRCUIT DIAGNOSIS >

## $\overline{\mathbf{3.}}$ CHECK TRACTION MOTOR RESOLVER CIRCUIT

- 1. Disconnect the traction motor harness connector.
- 2. Check the resistance between traction motor inverter vehicle side harness connector terminals and traction motor vehicle side harness connector terminals.

## CAUTION:

### Never damage connector terminals.

Traction motor inverter veh	action motor inverter vehicle side harness connector Traction motor vehicle side harness connector		Posistanco	
Connector	Terminal	Connector	Terminal	Tresistance
	1		4	
E78	3	F77 -	3	
	5		1	
	7		2	1 22 01 1855
	17		6	
	35		5	

3. Check the harness for short. CAUTION:

#### Never damage connector terminals.

Traction mo	Posistanco			
Connector	Terminal			
		3		
		5		
	1	7		
		17		
		35		
	3	5		
		7		
E78		3	17	100 kΩ or more
		35		
		7		
	5	17	-	
		35		
	7	17	-	
	1	35		
	17	35		

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace damaged parts.

**4.**CHECK TRACTION MOTOR RESOLVER

Check the traction motor resolver. Refer to <u>TMS-64</u>, "Component Inspection (Traction Motor Resolver)". Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.

NO >> Replace the transmission assembly due to malfunction in the traction motor resolver (traction motor). Refer to <u>TM-190, "Removal and Installation"</u>.

### Component Inspection (Traction Motor Resolver)

INFOID:000000008140332

**1.**CHECK TRACTION MOTOR RESOLVER

## **P0C17 DRIVE MOTOR A POSITION SENSOR**

### < DTC/CIRCUIT DIAGNOSIS >

- 1. Disconnect the traction motor connector.
- Check the resistance between traction motor connector terminals. 2.

Traction motor connector		Desistance	
Terminal		Resistance	В
1	2	28 – 52 Ω	
4	3	23 – 43 Ω	
5	6	7 – 14 Ω	TIMS

#### Is the inspection result normal?

YES >> INSPECTION END

D NO >> Replace the transmission assembly due to malfunction in the traction motor resolver (traction motor). Refer to TM-190, "Removal and Installation".

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### **P0C4E DRIVE MOTOR A POSITION SENSOR**

< DTC/CIRCUIT DIAGNOSIS >

## P0C4E DRIVE MOTOR A POSITION SENSOR

## DTC Logic

INFOID:000000008140333

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P0C4E	Drive Motor "A" Position Exceed- ed Learning Limit	When traction motor resolver offset value received from TCM via HEV system CAN is not normal	<ul> <li>Harness or connector (Each circuit is open or shorted.)</li> <li>TCM</li> <li>Traction motor inverter</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

### 2. CHECK DTC DETECTION

1. Turn ignition switch ON and wait for 10 seconds or more.

2. Check DTC.

NO

### Is "P0C4E" detected?

- YES >> 1. Write down "RESOLVER OFFSET VALUE" of freeze frame data.
  - Go to <u>TMS-66, "Diagnosis Procedure"</u>.
     >> INSPECTION END

## Diagnosis Procedure

INFOID:000000008140334

### 1. CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection conditions of the traction motor inverter harness connector and the A/T assembly harness connector.

### Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace damaged parts.

### 2.CHECK TRACTION MOTOR RESOLVER OFFSET VALUE

- 1. Turn ignition switch ON.
- 2. Check "RESOLVER OFFSET VALUE" of the freeze frame data, that is recorded when DTC reproduction procedure is performed.

### Is "22.32 deg" displayed?

- YES >> Replace the transmission assembly due to malfunction in the TCM. Refer to <u>TM-190, "Removal</u> and Installation".
- NO >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.

## **P0C79 DRIVE MOTOR A INVERTER VOLTAGE**

### < DTC/CIRCUIT DIAGNOSIS >

## P0C79 DRIVE MOTOR A INVERTER VOLTAGE

## DTC Logic

INFOID:000000008140335

### DTC DETECTION LOGIC

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	-	6	
		2	

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DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes	
P0C79	Drive Motor "A" Inverter Voltage Too Hight	If the high voltage value is too high	<ul> <li>Traction motor inverter</li> <li>High voltage harness or connector</li> <li>Li-ion battery</li> <li>System main relay</li> <li>High voltage parts except for traction motor inverter</li> </ul>	D
DTC CONFI	RMATION PROCEDURE			F
1.PRECOND	DITIONING			
If "DTC CONF waitat least 10	FIRMATION PROCEDURE" I Diseconds before conducting	nas been previously conducted, al the next test.	ways turn ignition switch OFF and	F
>> G 2.CHECK D <sup></sup>	O TO 2. TC DETECTION			G
1. Set the ve 2. Check DT Is "P0C79" de YES >> G	ehicle to READY and wait for FC. <u>etected?</u> to to <u>TMS-67, "Diagnosis Pro</u>	10 seconds or more.		Η
NO >> IN	SPECTION END			
Diagnosis	Procedure		INFOID:00000008140336	
WARNING: • Because hy	/brid vehicles and electric	vehicles contain a high voltage	battery, there is the risk of elec-	J
tric shock, dled incorr andmainter	electric leakage, or simila rectly. Be sure to follow nance.	r accidents if the high voltage c the correct work procedures	omponent and vehicle are han- when performing inspection	K
<ul> <li>Be sure to inspection</li> <li>Be sure to inspection</li> </ul>	remove the service plug i or maintenance of high vo put the removed service pl	n order to shut off the high vol Itage system harnesses and par ug in your pocket and carry it w	tage circuits before performing 'ts. vith you so that another person-	L
<ul> <li>does not ac</li> <li>Be sure to before begi</li> <li>Clearly idea</li> </ul>	ccidentally connect it while wear insulating protective inning work on the high vo	e work is in progress. equipment consisting of glove, ltage system.	shoes and glasses/face shield-	M
touch the v ilar item to • Refer to <u>GI</u>	ehicle. When not working, prevent other persons from -31, "High Voltage Precauti	cover high voltage parts with an n contacting them. ons".	n insulating cover sheet or sim-	Ν
CAUTION: There is the p service plug doso in the S	oossibility of a malfunction is removed. Therefore do Service Manual.	occurring if the vehicle is chan not change the vehicle to REA	ged to READY status while the- DY status unless instructed to	0
1. СНЕСК СО	ONNECTION CONDITION			
<ol> <li>Turn ignit</li> <li>Check the</li> </ol>	ion switch OFF. e connection condition of the	traction motor inverter harness co	onnector.	Ρ

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace damaged parts.

2. CHECK DTC HIGH VOLTAGE SYSTEMS

## **P0C79 DRIVE MOTOR A INVERTER VOLTAGE**

< DTC/CIRCUIT DIAGNOSIS >

- 1. Turn ignition switch ON and wait 10 seconds or more.
- Check DTC of the high voltage systems. 2.

Were there any detected DTC related to a high voltage systems other than the traction motor inverter?

YES >> Check DTC detected item. >> GO TO 3.

NO

3. PRECONDITIONING

### WARNING:

Shut off high voltage circuit. Refer to GI-30, "How to Cut Off High Voltage".

Check voltage in high voltage circuit. (Check that condenser are discharged.)

- Remove trunk finisher front. Refer to INT-51, "Exploded View". 1.
- 2. Remove harness cover (1).

### **DANGER:**

Touching high voltage components without using the appropriate protective equipment will cause electrocution.





Measure voltage between high voltage harness terminals. 3.

#### Standard

: 5 V or less

### **DANGER:**

Touching high voltage components without using the appropriate protective equipment will cause electrocution.

**CAUTION:** For voltage measurements, use a tester which can measure to 500 V or higher.

>> GO TO 4.

CHECK CONNECTION CONDITION

Check the connection conditions of the traction motor inverter high voltage harness connector and the 3phase harness. Refer to TM-190, "Exploded View".

Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to TM-190, "Removal and Installation".

NO >> Repair or replace damaged parts.



## P31A5 CAN ERROR

## < DTC/CIRCUIT DIAGNOSIS >

## P31A5 CAN ERROR

## DTC Logic

DTC DETECTION LOGIC

#### NOTE:

If DTC P31A5 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes	TMS
P31A5	CAN communication data error	When traction motor inverter detected data er- ror of CAN communication.	<ul> <li>ECM</li> <li>Li-ion battery controller</li> <li>Traction motor inverter</li> <li>HPCM</li> </ul>	D
DTC CO	NFIRMATION PROCEDU	RE		Е
1.PREC	ONDITIONING			
If "DTC C waitat lea	ONFIRMATION PROCEDUF st 10 seconds before conduc	RE" has been previously conducted, al cting the next test.	ways turn ignition switch OFF and	F
: <b>2.</b> снес	>> GO TO 2. K DTC DETECTION			G
<ol> <li>Turn</li> <li>Perfo</li> <li>Chec</li> </ol>	ignition switch ON and wait f orm self-diagnosis. k DTC.	or 5 seconds or more.		Н
Is DTC de YES	<u>etected?</u> >> Go to <u>TMS-69, "Diagnosis</u> >> INSPECTION END	s Procedure".		I
Diagnos	sis Procedure		INFOID:00000008140338	
1.PFRF	ORM ALL DTC READING			J
1. Perfo 2. Chec	orm "All DTC Reading". k diagnosis results.			K
DTC	DTC detection control modul	le Malfunctioning part		L
	"ENGINE" only	• ECM • HPCM		
	"HV BATTERY" only	<ul><li>Li-ion battery controller</li><li>HPCM</li></ul>		M
	"MOTOR CONTROL" only	Traction motor inverter     HPCM		N
P31A5	"ENGINE"     "MOTOR CONTROL"			1.4
	<ul><li> "ENGINE"</li><li> "HV BATTERY"</li></ul>			0
	"MOTOR CONTROL"     "HV BATTERY"	НРСМ		D
	"ENGINE"     "HV BATTERY"			F

>> Replace malfunctioning part corresponding to the control module detecting DTC P31A5.

"MOTOR CONTROL"

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INFOID:000000008140337

# < DTC/CIRCUIT DIAGNOSIS >

## P31A6 CAN ERROR

### DTC Logic

### DTC DETECTION LOGIC

### NOTE:

If DTC P31A6 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P31A6	CAN communication data error	When traction motor inverter detected data error of CAN communication.	<ul><li>ECM</li><li>HPCM</li><li>Traction motor inverter</li></ul>

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Turn ignition switch ON and wait for 5 seconds or more.
- 2. Perform self-diagnosis.
- 3. Check DTC.

### Is DTC detected?

YES >> Go to <u>TMS-70, "Diagnosis Procedure"</u>. NO >> INSPECTION END

## Diagnosis Procedure

## **1.**PERFORM ALL DTC READING

- 1. Perform "All DTC Reading".
- 2. Check diagnosis results.

DTC	DTC detection control module	Malfunctioning part
	"MOTOR CONTROL" only	<ul><li>ECM</li><li>Traction motor inverter</li></ul>
P31A6	"EV/HEV" only	HPCM
	<ul><li> "MOTOR CONTROL"</li><li> "EV/HEV"</li></ul>	ECM

>> Replace malfunctioning part corresponding to the control module detecting DTC P31A6.

INFOID:000000008140339

INFOID:000000008140340

## **P31A8 CAN ERROR**

### < DTC/CIRCUIT DIAGNOSIS > P31A8 CAN ERROR

**DTC** Logic

## DTC DETECTION LOGIC

#### NOTE:

If DTC P31A8 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

	Trankla dia manaia na ma		Dessible serves	TMS
P31A8	CAN communication data error	When traction motor inverter detected data er- ror of CAN communication.	Possible causes     HPCM     TCM     Traction motor inverter	D
		RE		E
I.PREC	ONDITIONING			
If "DTC C	ONFIRMATION PROCEDUR	RE" has been previously conducted, alv	vays turn ignition switch OFF and	
waitat iea		ung the flext test.		F
:	>> GO TO 2.			
<b>2.</b> CHEC	K DTC DETECTION			G
1. Turn	ignition switch ON and wait for	or 5 seconds or more.		
2. Perfc	orm self-diagnosis.			Ц
	KDIC.			
YES :	So to TMS-71 "Diagnosis"	Procedure"		
NO :	>> INSPECTION END			
Diagno	sis Procedure		INFOID:00000008140342	
1				J
I.PERF	ORM ALL DTC READING			
1. Perfo	orm "All DTC Reading".			
2. 0100				K
DTC	DTC detection control modul	e Malfunctioning part		
	"MOTOR CONTROL" only	Traction motor inverter     TCM		L
P31A8	"EV/HEV" only	НРСМ		
	"MOTOR CONTROL"     "EV/HEV"	ТСМ		M
		· · · · · · · · · · · · · · · · · · ·		
	> Poplace malfunctioning or	art corresponding to the control module	datacting DTC D21A9	N

>> Replace malfunctioning part corresponding to the control module detecting DTC P31A8.

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INFOID:000000008140341

Revision: 2013 March

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# < DTC/CIRCUIT DIAGNOSIS >

## P31A9 CAN ERROR

### DTC Logic

### DTC DETECTION LOGIC

#### NOTE:

If DTC P31A9 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P31A9	CAN communication data error	When traction motor inverter detected data error of CAN communication.	<ul><li>HPCM</li><li>Traction motor inverter</li><li>Li-ion battery controller</li></ul>

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Turn ignition switch ON and wait for 5 seconds or more.
- 2. Perform self-diagnosis.
- 3. Check DTC.

### Is DTC detected?

YES >> Go to <u>TMS-72, "Diagnosis Procedure"</u>. NO >> INSPECTION END

### Diagnosis Procedure

## **1.**PERFORM ALL DTC READING

- 1. Perform "All DTC Reading".
- 2. Check diagnosis results.

DTC	DTC detection control module	Malfunctioning part
	"MOTOR CONTROL" only	<ul><li>Traction motor inverter</li><li>Li-ion battery controller</li></ul>
P31A9	"EV/HEV" only	<ul><li> HPCM</li><li> Li-ion battery controller</li></ul>
	<ul><li> "MOTOR CONTROL"</li><li> "EV/HEV"</li></ul>	Li-ion battery controller

>> Replace malfunctioning part corresponding to the control module detecting DTC P31A9.

INFOID:000000008140343

INFOID:000000008140344
## **P3240 DRIVE MOTOR A INVERTER CRNT CONT**

### < DTC/CIRCUIT DIAGNOSIS >

## P3240 DRIVE MOTOR A INVERTER CRNT CONT

## **DTC** Logic

INFOID:000000008140345

### DTC DETECTION LOGIC

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DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3240	Drive Motor "A" Inverter Per- formance/Motor Current Con- trol Error	If the traction motor inverter output voltage is ab- normal	<ul> <li>Traction motor inverter</li> <li>Traction motor</li> <li>High voltage harness or connector</li> <li>Li-ion battery</li> <li>High voltage parts except for traction motor inverter</li> </ul>
DTC CONI CAUTION: Always dri 1.PRECOI	FIRMATION PROCEDU ve vehicle at a safe spee NDITIONING	IRE ed.	
If "DTC CO waitat least	NFIRMATION PROCEDU 10 seconds before condu	RE" has been previously conducted, alwa cting the next test.	ys turn ignition switch OFF and
>> 2.снеск	GO TO 2. DTC DETECTION		
<ol> <li>Set the</li> <li>Drive the</li> <li>Fully op</li> <li>Stop the</li> <li>Check</li> </ol>	vehicle to READY. ne vehicle by motor. pen the accelerator and ac e vehicle. DTC.	ccelerate the vehicle to 60 km/h (37 MPH)	
<u>Is "P3240" (</u> YES >> NO >>	<u>detected?</u> Go to <u>TMS-73, "Diagnosi</u> INSPECTION END	<u>s Procedure"</u> .	
Diagnosi	s Procedure		INFOID:00000008140346
• Because tric shoc dled inco	hybrid vehicles and elec k, electric leakage, or si orrectly. Be sure to fo	ctric vehicles contain a high voltage ba milar accidents if the high voltage com llow the correct work procedures v	ttery, there is the risk of elec- ponent and vehicle are han- vhen performing inspection
Be sure to inspection	to remove the service plan or maintenance of hig	lug in order to shut off the high voltag h voltage system harnesses and parts.	e circuits before performing
<ul> <li>Be sure t does not</li> <li>Be sure t</li> </ul>	o put the removed servion accidentally connect it v o wear insulating protect	ce plug in your pocket and carry it with while work is in progress. tive equipment consisting of glove, sh	you so that another person- oes and glasses/face shield-
<ul> <li>before be • Clearly ic touch the ilar item f</li> <li>Pofor to f</li> </ul>	eginning work on the hig lentify the persons response vehicle. When not work to prevent other persons CL21. "High Voltage Pro-	h voltage system. onsible for high voltage work and ensu king, cover high voltage parts with an in s from contacting them. cautions"	re that other persons do not- nsulating cover sheet or sim-
CAUTION:		tion courring if the vehicle is charge	d to DEADY status while the

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while theservice plug is removed. Therefore do not change the vehicle to READY status unless instructed to doso in the Service Manual.

1. CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection condition of the traction motor inverter harness connector.

## P3240 DRIVE MOTOR A INVERTER CRNT CONT

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace damaged parts.

2. CHECK DTC HIGH VOLTAGE SYSTEMS

1. Turn ignition switch ON and wait for 10 seconds or more.

2. Check DTC of the high voltage systems.

Were there any detected DTC related to a high voltage systems other than the traction motor inverter?

YES >> Check DTC detected item.

NO >> GO TO 3.

3. PRECONDITIONING

### WARNING:

#### Shut off high voltage circuit. Refer to GI-30, "How to Cut Off High Voltage".

Check voltage in high voltage circuit. (Check that condenser are discharged.)

- Remove trunk finisher front. Refer to <u>INT-51, "Exploded View"</u>.
- 2. Remove harness cover (1).

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.





3. Measure voltage between high voltage harness terminals.

Standard

: 5 V or less

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.

#### CAUTION: For voltage measurements, use a tester which can measure to 500 V or higher.

>> GO TO 4.

**4.**CHECK CONNECTION CONDITION

Check the connection conditions of the traction motor inverter high voltage harness connector and the 3-phase harness. Refer to <u>TMS-120</u>, "Exploded View".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace damaged parts.

5.CHECK DISCONNECTION TRACTION MOTOR STATOR COIL

- 1. Disconnect the 3-phase harness from the traction motor inverter. Refer to <u>TMS-121</u>, "<u>Removal and Instal-</u> lation".
- 2. Check for an open circuit in the traction motor stator coil.



## **P3240 DRIVE MOTOR A INVERTER CRNT CONT**

### < DTC/CIRCUIT DIAGNOSIS >

Traction m	Traction motor inverter 3-phase harness connector			A
Connector	Ter	minal	- Resistance	
	54	55		
C16	55	56	1 $\Omega$ or less	В
	56	54		_
Is the inspection result norm	al?			TMS

YES >> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation".

NO >> Replace the transmission assembly due to malfunction in the traction motor. Refer to TM-190. "Removal and Installation"

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## **P3241 DRIVE MOTOR A INVERTER CRNT CONT**

### < DTC/CIRCUIT DIAGNOSIS >

## P3241 DRIVE MOTOR A INVERTER CRNT CONT

## DTC Logic

INFOID:000000008140347

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3241	Drive Motor "A" Inverter Performance/AC Error De- tection	If no current is being applied to 1 phase of the traction motor	<ul> <li>Traction motor inverter</li> <li>Traction motor</li> <li>High voltage harness or connector</li> </ul>

### DTC CONFIRMATION PROCEDURE

#### **CAUTION:**

### Always drive vehicle at a safe speed.

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

### >> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Set the vehicle to READY.
- 2. Drive the vehicle by motor.
- 3. Fully open the accelerator and accelerate the vehicle to 60 km/h (37 MPH).
- 4. Stop the vehicle.
- 5. Check DTC.

#### Is "P3241" detected?

- YES >> Go to TMS-76. "Diagnosis Procedure".
- NO >> INSPECTION END

### **Diagnosis** Procedure

INFOID:00000008140348

#### WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection andmaintenance.
- Be sure to remove the service plug in order to shut off the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- Be sure to put the removed service plug in your pocket and carry it with you so that another persondoes not accidentally connect it while work is in progress.
- Be sure to wear insulating protective equipment consisting of glove, shoes and glasses/face shieldbefore beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do nottouch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to GI-31, "High Voltage Precautions".

#### **CAUTION:**

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while theservice plug is removed. Therefore do not change the vehicle to READY status unless instructed to doso in the Service Manual.

1. CHECK CONNECTOR CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check the connection condition of the traction motor inverter harness connector.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace damaged parts.

## **P3241 DRIVE MOTOR A INVERTER CRNT CONT**

< DTC/CIRCUIT DIAGNOSIS >

## 2. PRECONDITIONING

#### WARNING:

Shut off high voltage circuit. Refer to GI-30, "How to Cut Off High Voltage".

- Check voltage in high voltage circuit. (Check that condenser are discharged.)
- Remove trunk finisher front. Refer to INT-51, "Exploded View". 1.
- 2. Remove harness cover (1).

### **DANGER:**

Touching high voltage components without using the appropriate protective equipment will cause electrocution.



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Measure voltage between high voltage harness terminals. 3.

#### Standard

: 5 V or less



Touching high voltage components without using the appropriate protective equipment will cause electrocution.



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CAUTION: For voltage measurements, use a tester which can measure to 500 V or higher.

>> GO TO 3.

3. CHECK CONNECTION CONDITION

Check the connection condition of the 3-phase harness. Refer to TMS-120, "Exploded View". Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace damaged parts.

4. CHECK DISCONNECTION TRACTION MOTOR STATOR COIL

1. Disconnect the 3-phase harness from the traction motor inverter. Refer to TMS-121, "Removal and Installation".

2. Check for an open circuit in the traction motor stator coil.

Traction	Posistanco	•		
Connector	Terminal		Resistance	0
	54	55		-
C16	55	56	1 $\Omega$ or less	
	56	54		P

Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation".

NO >> Replace the transmission assembly due to malfunction in the traction motor. Refer to TM-190. "Removal and Installation".

## **P3242 D-MOTOR A PHASE U CURRENT SEN**

### < DTC/CIRCUIT DIAGNOSIS >

## P3242 D-MOTOR A PHASE U CURRENT SEN

## DTC Logic

INFOID:000000008140349

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3242	Drive Motor "A" U Phase Cur- rent Sensor Circuit Perfor- mance Error	When detected value of traction motor U- phase sensor 2 is not normal	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Perform "INSPECTION MODE 5". Refer to <u>HBC-89, "Description"</u>.
- 2. Start the engine and wait for 10 seconds or more.
- 3. Check DTC.

#### Is "P3242" detected?

- YES >> Go to TMS-78, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000008140350

## 1. CHECK TRACTION MOTOR INVERTER HARNESS CONNECTOR

- 1. Turn ignition switch OFF.
- 2. Check the connection conditions of the traction motor inverter harness connector.

#### Is the inspection result normal?

YES >> GO TO 2.

- NO >> Repair or replace damaged parts.
- 2. CHECK POWER CIRCUIT
- 1. Disconnect the traction motor inverter harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between traction motor inverter vehicle side harness connector terminals. CAUTION:

#### Never damage connector terminals.

Traction			
Connector	Teri	Terminal	
Connector	+	_	
E78	42	41	10 – 16 V
L70	44	43	10 - 10 V

#### Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>. NO >> GO TO 3.

## **3.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

## **P3242 D-MOTOR A PHASE U CURRENT SEN**

### < DTC/CIRCUIT DIAGNOSIS >

<ul> <li>Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3</li> <li>Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery</li> <li>10A fuse (#71, Fuse and fusible link block No.3)</li> </ul>	А
<ul> <li>50A fusible link (#Y, Fuse and fusible link block No.3)</li> <li>Self shut off relay</li> <li>12V battery</li> </ul>	В
<u>Is the inspection result normal?</u> YES >> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u> .	TMS
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## **P3243 D-MOTOR A PHASE V CURRENT SEN**

### < DTC/CIRCUIT DIAGNOSIS >

## P3243 D-MOTOR A PHASE V CURRENT SEN

## DTC Logic

INFOID:000000008140351

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3243	Drive Motor "A" V Phase Cur- rent Sensor Circuit Perfor- mance Error	When detected value of traction motor V- phase sensor 2 is not normal	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Perform "INSPECTION MODE 5". Refer to <u>HBC-89, "Description"</u>.
- 2. Start the engine and wait for 10 seconds or more.
- 3. Check DTC.

#### Is "P3243" detected?

- YES >> Go to TMS-80, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000008140352

## 1. CHECK TRACTION MOTOR INVERTER HARNESS CONNECTOR

- 1. Turn ignition switch OFF.
- 2. Check the connection conditions of the traction motor inverter harness connector.

#### Is the inspection result normal?

YES >> GO TO 2.

- NO >> Repair or replace damaged parts.
- 2. CHECK POWER CIRCUIT
- 1. Disconnect the traction motor inverter harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between traction motor inverter vehicle side harness connector terminals.
   CAUTION:

#### Never damage connector terminals.

Traction			
Connector	Teri	Terminal	
Connector	+	_	
E78	42	41	10 – 16 V
L70	44	43	10 - 10 V

#### Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>. NO >> GO TO 3.

## **\mathbf{3}.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

## P3243 D-MOTOR A PHASE V CURRENT SEN

### < DTC/CIRCUIT DIAGNOSIS >

<ul> <li>Harness open circuit or short circuit between traction motor inverter vehicle side harness connector ternals and fuse and fusible link block No.3</li> <li>Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery</li> <li>104 fuse (#71 Fuse and fusible link block No.3)</li> </ul>	·mi- A
<ul> <li>50A fusible link (#Y, Fuse and fusible link block No.3)</li> <li>Self shut off relay</li> <li>12V battery</li> </ul>	В
<u>Is the inspection result normal?</u> YES >> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u> . NO >> Repair or replace damaged parts.	TMS
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### < DTC/CIRCUIT DIAGNOSIS >

## P3244 DRIVE MOTOR A INVERTER

## DTC Logic

INFOID:000000008140353

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3244	Drive Motor "A" Inverter Voltage Sensor Performance	If the value detected by the high voltage sensor is abnormal	<ul> <li>Traction motor inverter</li> <li>High voltage harness or connector</li> <li>Li-ion battery</li> <li>High voltage parts except for traction motor inverter</li> </ul>

## DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

2. CHECK DTC DETECTION

1. Set the vehicle to READY and wait for 10 seconds or more.

2. Check DTC.

Is "P3244" detected?

- YES >> Go to TMS-82, "Diagnosis Procedure".
- NO >> INSPECTION END

### **Diagnosis Procedure**

INFOID:000000008140354

### WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection andmaintenance.
- Be sure to remove the service plug in order to shut off the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- Be sure to put the removed service plug in your pocket and carry it with you so that another persondoes not accidentally connect it while work is in progress.
- Be sure to wear insulating protective equipment consisting of glove, shoes and glasses/face shieldbefore beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do nottouch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to GI-31, "High Voltage Precautions".

### CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while theservice plug is removed. Therefore do not change the vehicle to READY status unless instructed to doso in the Service Manual.

1. CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection condition of the traction motor inverter harness connector.
- Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace damaged parts.

**2.**CHECK DTC HIGH VOLTAGE SYSTEMS

1. Turn ignition switch ON and wait 10 seconds or more.

## **P3244 DRIVE MOTOR A INVERTER**

< DTC/CIRCUIT DIAGNOSIS >

2. Check DTC of the high voltage systems.

Were there any detected DTC related to a high voltage systems other than the traction motor inverter?

YES >> Check DTC detected item.

NO >> GO TO 3.

3. PRECONDITIONING

#### WARNING:

Shut off high voltage circuit. Refer to <u>GI-30, "How to Cut Off High Voltage"</u>.

- Check voltage in high voltage circuit. (Check that condenser are discharged.)
- 1. Remove trunk finisher front. Refer to <u>INT-51, "Exploded View"</u>.
- 2. Remove harness cover (1).

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.





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3. Measure voltage between high voltage harness terminals.

Standard

: 5 V or less

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.

**CAUTION:** For voltage measurements, use a tester which can measure to 500 V or higher.

### >> GO TO 4.

### **4.**CHECK CONNECTION CONDITION

Check the connection condition of the traction motor inverter high voltage harness connector. Refer to <u>TMS-120, "Exploded View"</u>.

Is the inspection result normal?

- YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.
- NO >> Repair or replace damaged parts.



### < DTC/CIRCUIT DIAGNOSIS >

## P3245 DRIVE MOTOR A INVERTER

## DTC Logic

INFOID:000000008140355

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3245	Drive Motor "A" Inverter Volt- ageSensor Circuit	If there is an abnormality in the high voltage sensor	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Perform "INSPECTION MODE 5". Refer to <u>HBC-89, "Description"</u>.
- 2. Start the engine and wait for 10 seconds or more.
- 3. Check DTC.

#### Is "P3245" detected?

- YES >> Go to TMS-84, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000008140356

## 1. CHECK TRACTION MOTOR INVERTER HARNESS CONNECTOR

- 1. Turn ignition switch OFF.
- 2. Check the connection conditions of the traction motor inverter harness connector.

#### Is the inspection result normal?

YES >> GO TO 2.

- NO >> Repair or replace damaged parts.
- 2. CHECK POWER CIRCUIT
- 1. Disconnect the traction motor inverter harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between traction motor inverter vehicle side harness connector terminals. CAUTION:

#### Never damage connector terminals.

Traction			
Connector	Terminal		Voltage
Connector	+	_	
E78	42	41	10 – 16 V
L70	44	43	10 - 10 V

#### Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>. NO >> GO TO 3.

## 3. DETECTION OF MALFUNCTION ITEMS

Check the following items:

## **P3245 DRIVE MOTOR A INVERTER**

< DTC/CIRCUIT DIAGNOSIS >	
<ul> <li>Harness open circuit or short circuit between traction motor inverter vehicle side harness connector term nals and fuse and fusible link block No.3</li> <li>Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery</li> <li>10A fuse (#71, Fuse and fusible link block No.3)</li> </ul>	i- A
<ul> <li>50A fusible link (#Y, Fuse and fusible link block No.3)</li> <li>Self shut off relay</li> <li>12V batterv</li> </ul>	В
Is the inspection result normal?	
YES >> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u> . NO >> Repair or replace damaged parts.	TMS
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## P3246 DRIVE MOTOR A INVERTER VOLTAGE

### < DTC/CIRCUIT DIAGNOSIS >

## P3246 DRIVE MOTOR A INVERTER VOLTAGE

## DTC Logic

INFOID:000000008140357

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3246	Drive Motor "A" Inverter Voltage Too Low	If the high voltage value is too low	<ul> <li>Traction motor inverter</li> <li>High voltage harness or connector</li> <li>Li-ion battery</li> <li>High voltage parts except for traction motor inverter</li> </ul>

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

2. CHECK DTC DETECTION

1. Set the vehicle to READY and wait for 10 seconds or more.

2. Check DTC.

Is "P3246" detected?

- YES >> Go to TMS-86, "Diagnosis Procedure".
- NO >> INSPECTION END

### **Diagnosis** Procedure

INFOID:000000008140358

### WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection andmaintenance.
- Be sure to remove the service plug in order to shut off the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- Be sure to put the removed service plug in your pocket and carry it with you so that another persondoes not accidentally connect it while work is in progress.
- Be sure to wear insulating protective equipment consisting of glove, shoes and glasses/face shieldbefore beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do nottouch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to <u>GI-31, "High Voltage Precautions"</u>.

### CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while theservice plug is removed. Therefore do not change the vehicle to READY status unless instructed to doso in the Service Manual.

1. CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection condition of the traction motor inverter harness connector.
- Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace damaged parts.

**2.**CHECK DTC HIGH VOLTAGE SYSTEMS

1. Turn ignition switch ON and wait 10 seconds or more.

## P3246 DRIVE MOTOR A INVERTER VOLTAGE

< DTC/CIRCUIT DIAGNOSIS >



Were there any detected DTC related to a high voltage systems other than the traction motor inverter?

YES >> Check DTC detected item.

NO >> GO TO 3.

3. PRECONDITIONING

#### WARNING:

Shut off high voltage circuit. Refer to GI-30, "How to Cut Off High Voltage".

- Check voltage in high voltage circuit. (Check that condenser are discharged.)
- 1. Remove trunk finisher front. Refer to <u>INT-51, "Exploded View"</u>.
- 2. Remove harness cover (1).

## DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.





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3. Measure voltage between high voltage harness terminals.

Standard

: 5 V or less

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.

**CAUTION:** For voltage measurements, use a tester which can measure to 500 V or higher.

### >> GO TO 4.

### **4.**CHECK CONNECTION CONDITION

Check the connection condition of the traction motor inverter high voltage harness connector. Refer to <u>TMS-120, "Exploded View"</u>.

Is the inspection result normal?

- YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.
- NO >> Repair or replace damaged parts.



### **P3247 DRIVE MOTOR A INVERTER**

### < DTC/CIRCUIT DIAGNOSIS >

## P3247 DRIVE MOTOR A INVERTER

## DTC Logic

INFOID:000000008140359

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3247	Drive Motor "A" Inverter Driver Power Supply	If the IGBT drive circuit power does not start up	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Perform "INSPECTION MODE 5". Refer to <u>HBC-89, "Description"</u>.
- 2. Start the engine and wait for 10 seconds or more.
- 3. Check DTC.

#### Is "P3247" detected?

- YES >> Go to TMS-88, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000008140360

## 1. CHECK TRACTION MOTOR INVERTER HARNESS CONNECTOR

- 1. Turn ignition switch OFF.
- 2. Check the connection conditions of the traction motor inverter harness connector.

#### Is the inspection result normal?

YES >> GO TO 2.

- NO >> Repair or replace damaged parts.
- 2. CHECK POWER CIRCUIT
- 1. Disconnect the traction motor inverter harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between traction motor inverter vehicle side harness connector terminals. CAUTION:

#### Never damage connector terminals.

Traction			
Connector	Terminal		Voltage
Connector	+	_	
E78	42	41	10 – 16 V
L70	44	43	10 - 10 V

#### Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>. NO >> GO TO 3.

## **\mathbf{3}.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

## **P3247 DRIVE MOTOR A INVERTER**

< DTC/CIRCUIT DIAGNOSIS >	
<ul> <li>Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3</li> <li>Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery</li> <li>10A fuse (#71, Fuse and fusible link block No.3)</li> <li>50A fusible link (#Y, Fuse and fusible link block No.3)</li> </ul>	A
<ul> <li>Self shut off relay</li> <li>12V battery</li> </ul>	В
Is the inspection result normal?	TMS
<ul> <li>YES &gt;&gt; Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u>.</li> <li>NO &gt;&gt; Repair or replace damaged parts.</li> </ul>	
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### < DTC/CIRCUIT DIAGNOSIS >

## P3248 DRIVE MOTOR A INVERTER

## DTC Logic

INFOID:00000008140361

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3248	Drive Motor "A" Inverter Driv- er Power Supply Perfor- mance	If there is overcurrent or overvoltage in the IGBT drive circuit power	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Perform "INSPECTION MODE 5". Refer to HBC-89, "Description".
- 2. Start the engine and wait for 10 seconds or more.
- 3. Check DTC.

#### Is "P3248" detected?

- >> Go to TMS-90, "Diagnosis Procedure". YES
- >> INSPECTION END NO

### Diagnosis Procedure

INFOID:00000008140362

## 1. CHECK TRACTION MOTOR INVERTER HARNESS CONNECTOR

- Turn ignition switch OFF. 1.
- Check the connection conditions of the traction motor inverter harness connector. 2.

#### Is the inspection result normal?

YES >> GO TO 2.

- NO >> Repair or replace damaged parts.
- 2. CHECK POWER CIRCUIT
- 1. Disconnect the traction motor inverter harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between traction motor inverter vehicle side harness connector terminals. CAUTION:

#### Never damage connector terminals.

Traction			
Connector	Terminal		Voltage
Connector	+	_	
E78	42	41	10 – 16 V
L70	44	43	10 - 10 V

#### Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation". NO >> GO TO 3.

## **\mathbf{3}.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

## **P3248 DRIVE MOTOR A INVERTER**

< DTC	/CIRCUIT DIAGNOSIS >	
<ul> <li>Harninals</li> <li>Harni</li> <li>10A f</li> </ul>	ess open circuit or short circuit between traction motor inverter vehicle side harness connector termi- and fuse and fusible link block No.3 ess open circuit or short circuit between fuse and fusible link block No.3 and 12V battery fuse (#71, Fuse and fusible link block No.3)	A
<ul> <li>50A f</li> <li>Self s</li> <li>12V l</li> </ul>	iusible link (#Y, Fuse and fusible link block No.3) shut off relay battery	В
le tha i	pspection result normal?	
YES NO	>> Check intermittent incident. Refer to GI-49, "Intermittent Incident". >> Repair or replace damaged parts.	TMS
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### P3249 DRIVE MOTOR A INVERTER

### < DTC/CIRCUIT DIAGNOSIS >

## P3249 DRIVE MOTOR A INVERTER

## DTC Logic

INFOID:000000008140363

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3249	Drive Motor "A" Inverter Driver Signal	If the IGBT drive current circuit voltage is too low	<ul> <li>Harness, connector, or fuse (Each circuit is open or shorted.)</li> <li>Traction motor inverter</li> <li>Self shut off relay</li> </ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

### 2. CHECK DTC DETECTION

- 1. Perform "INSPECTION MODE 5". Refer to <u>HBC-89, "Description"</u>.
- 2. Start the engine and wait for 10 seconds or more.
- 3. Check DTC.

### Is "P3249" detected?

- YES >> Go to TMS-92, "Diagnosis Procedure".
- NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000008140364

## 1. CHECK TRACTION MOTOR INVERTER HARNESS CONNECTOR

- 1. Turn ignition switch OFF.
- 2. Check the connection conditions of the traction motor inverter harness connector.

Is the inspection result normal?

YES >> GO TO 2.

- NO >> Repair or replace damaged parts.
- 2. CHECK POWER CIRCUIT
- 1. Disconnect the traction motor inverter harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between traction motor inverter vehicle side harness connector terminals. CAUTION:

### Never damage connector terminals.

Traction			
Connector	Terminal		Voltage
Connector	+	_	
E78	42	41	10 – 16 V
E70	44	43	10 - 10 V

#### Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.

NO >> GO TO 3.

### **3.** DETECTION OF MALFUNCTION ITEMS

Check the following items:

## **P3249 DRIVE MOTOR A INVERTER**

< DTC	/CIRCUIT DIAGNOSIS >	
<ul> <li>Harn nals</li> <li>Harn</li> <li>10A 1</li> </ul>	ess open circuit or short circuit between traction motor inverter vehicle side harness connector termi- and fuse and fusible link block No.3 ess open circuit or short circuit between fuse and fusible link block No.3 and 12V battery fuse (#71, Fuse and fusible link block No.3)	A
<ul> <li>50A f</li> <li>Self s</li> <li>12V l</li> </ul>	fusible link (#Y, Fuse and fusible link block No.3) shut off relay battery	В
le tha i	nspection result normal?	
YES NO	>> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u> . >> Repair or replace damaged parts.	TMS
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## P324A DRIVE MOTOR A INVERTER VOLTAGE

### < DTC/CIRCUIT DIAGNOSIS >

## P324A DRIVE MOTOR A INVERTER VOLTAGE

## DTC Logic

INFOID:000000008140365

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P324A	Drive Motor "A" Inverter Char- geError	If the high voltage circuit is not charged	<ul> <li>Traction motor inverter</li> <li>High voltage harness or connector</li> <li>Li-ion battery</li> <li>High voltage parts except for traction motor inverter</li> </ul>

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

2. CHECK DTC DETECTION

1. Set the vehicle to READY and wait for 10 seconds or more.

2. Check DTC.

Is "P324A" detected?

- YES >> Go to TMS-94, "Diagnosis Procedure".
- NO >> INSPECTION END

### **Diagnosis** Procedure

INFOID:000000008140366

### WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection andmaintenance.
- Be sure to remove the service plug in order to shut off the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- Be sure to put the removed service plug in your pocket and carry it with you so that another persondoes not accidentally connect it while work is in progress.
- Be sure to wear insulating protective equipment consisting of glove, shoes and glasses/face shieldbefore beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do nottouch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to GI-31, "High Voltage Precautions".

### CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while theservice plug is removed. Therefore do not change the vehicle to READY status unless instructed to doso in the Service Manual.

1. CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection condition of the traction motor inverter harness connector.
- Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace damaged parts.

**2.**CHECK DTC HIGH VOLTAGE SYSTEMS

1. Turn ignition switch ON and wait 10 seconds or more.

## P324A DRIVE MOTOR A INVERTER VOLTAGE

< DTC/CIRCUIT DIAGNOSIS >



Were there any detected DTC related to a high voltage systems other than the traction motor inverter?

YES >> Check DTC detected item.

NO >> GO TO 3.

3. PRECONDITIONING

#### WARNING:

Shut off high voltage circuit. Refer to <u>GI-30, "How to Cut Off High Voltage"</u>.

- Check voltage in high voltage circuit. (Check that condenser are discharged.)
- 1. Remove trunk finisher front. Refer to <u>INT-51, "Exploded View"</u>.
- 2. Remove harness cover (1).

## DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.





3. Measure voltage between high voltage harness terminals.

Standard

: 5 V or less

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.

**CAUTION:** For voltage measurements, use a tester which can measure to 500 V or higher.

### >> GO TO 4.

### **4.**CHECK CONNECTION CONDITION

Check the connection condition of the traction motor inverter high voltage harness connector. Refer to <u>TMS-120, "Exploded View"</u>.

Is the inspection result normal?

- YES >> Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.
- NO >> Repair or replace damaged parts.



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## **P324B DRIVE MOTOR A INVERTER VOLTAGE**

### < DTC/CIRCUIT DIAGNOSIS >

## P324B DRIVE MOTOR A INVERTER VOLTAGE

## DTC Logic

INFOID:000000008140367

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P324B	Drive Motor "A" Inverter Dis- charge Error	If the high voltage circuit is not discharged	<ul> <li>Traction motor inverter</li> <li>High voltage harness or connector</li> <li>Li-ion battery</li> <li>High voltage parts except for traction motor inverter</li> </ul>

### DTC CONFIRMATION PROCEDURE

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

2. CHECK DTC DETECTION

- 1. Set the vehicle to READY and wait for 10 seconds or more.
- 2. Turn ignition switch OFF and wait for 30 seconds or more.
- 3. Turn ignition switch ON.
- 4. Check DTC.
- Is "P324B" detected?
- YES >> Go to TMS-96, "Diagnosis Procedure".

NO >> INSPECTION END

### Diagnosis Procedure

INFOID:000000008140368

#### WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection andmaintenance.
- Be sure to remove the service plug in order to shut off the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- Be sure to put the removed service plug in your pocket and carry it with you so that another persondoes not accidentally connect it while work is in progress.
- Be sure to wear insulating protective equipment consisting of glove, shoes and glasses/face shieldbefore beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do nottouch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to <u>GI-31, "High Voltage Precautions"</u>.

#### **CAUTION:**

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while theservice plug is removed. Therefore do not change the vehicle to READY status unless instructed to doso in the Service Manual.

## **1**.CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection condition of the traction motor inverter harness connector.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace damaged parts.

## **P324B DRIVE MOTOR A INVERTER VOLTAGE**

< DTC/CIRCUIT DIAGNOSIS >



## **P324C DRIVE MOTOR A INVERTER CURRENT**

### < DTC/CIRCUIT DIAGNOSIS >

## P324C DRIVE MOTOR A INVERTER CURRENT

### Description

• As this DTC is activated at fail-safe, repair the DTC which has caused entry to fail-safe. Refer to <u>TMS-30</u>, <u>"DTC Inspection Priority Chart"</u>.

• When this DTC is detected individually, perform <u>TMS-98, "Diagnosis Procedure"</u>.

### DTC Logic

DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P324C	Drive Motor "A" Limp Form Current High	When current flows into 3-phase harness in fail safe mode	Traction motor inverter

### DTC CONFIRMATION PROCEDURE

#### **CAUTION:**

- "<u>TMS-98, "Diagnosis Procedure"</u>" must be performed before starting "DTC CONFIRMATION PROCE-DURE".
- Always drive vehicle at a safe speed.

### **1.**PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

### >> GO TO 2.

## 2. CHECK DTC DETECTION

- 1. Set the vehicle to READY and wait for 10 seconds or more.
- 2. Fully open the accelerator and drive the vehicle by motor.
- 3. Stop the vehicle.
- 4. Check DTC.

### Is "P324C" detected?

- YES >> Go to <u>TMS-98, "Diagnosis Procedure"</u>.
- NO >> INSPECTION END

### **Diagnosis** Procedure

## 1. CHECK CONNECTION CONDITION

- 1. Turn ignition switch OFF.
- 2. Check the connection condition of the traction motor inverter harness connector.

#### Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace damaged parts.
- **2.**CHECK DTC HIGH VOLTAGE SYSTEMS
- 1. Turn ignition switch ON and wait for 10 seconds or more.
- 2. Check DTC of the high voltage systems.

Were there any detected DTC related to a high voltage systems other than the traction motor inverter?

- YES >> Check DTC detected item.
- NO >> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation".

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INFOID:000000008140371

## **P324D DRIVE MOTOR A INVERTER IGBT**

### < DTC/CIRCUIT DIAGNOSIS >

## P324D DRIVE MOTOR A INVERTER IGBT

## **DTC** Logic

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INFOID:000000008140372

## DTC DETECTION LOGIC

				D
DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes	
P324D	Drive Motor "A" Inverter IGB- TOver Load (Over Current/ OverTemperature)	<ul> <li>If an over current has occurred in theIG- BT energizing current</li> <li>If IGBT temperature is too high</li> </ul>	<ul><li>Traction motor inverter</li><li>Traction motor</li><li>High voltage coolant system</li></ul>	TMS
DTC CONF CAUTION: Always driv	FIRMATION PROCEDURI	E		D
I.PRECON	NDITIONING			
If "DTC COI waitat least	NFIRMATION PROCEDURE	" has been previously conducted, alw ng the next test.	vays turn ignition switch OFF and	F
>> 2.снеск	GO TO 2. DTC DETECTION			G
<ol> <li>Set the</li> <li>Drive th</li> <li>Fully op</li> <li>Stop the</li> <li>Check I</li> </ol>	vehicle to READY. le vehicle by motor. len the accelerator and acce le vehicle. DTC.	elerate the vehicle to 60 km/h (37 MPI	Н).	Η
<u>ls "P324D" (</u> YES >> NO >>	<u>detected?</u> Go to <u>TMS-99, "Diagnosis F</u> INSPECTION END	Procedure".		Ι
Diagnosis	s Procedure		INF0ID:00000008140373	J
1.снеск	CONNECTION CONDITION	l		K.
1. Turn igr 2 Check t	nition switch OFF.	he traction motor inverter harness co	nnector	Γ
Is the inspective VES >>	ction result normal? GO TO 2.			L
		ING SYSTEM		
1. Turn sw	vitch ON and wait for 10 second	onds or more.		M
2. Perform	"Self Diagnostic Results" in	"EV/HEV".		
Is any DTC YES >>	detected? Check DTC detected item	Refer to HBC-71, "DTC Index"		Ν
NO >>	GO TO 3.			
3.CHECK	COOLANT WATER			0

Check the coolant level and check for coolant leakage. Refer to HCO-7. "Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace damaged parts.

**4.**CHECK COOLANT HOSE

Check for clogging of fluid paths and twisting of hoses in traction motor inverter and transmission assembly. Refer to HCO-5, "High Voltage Cooling System".

Is the inspection result normal?

Ρ

## P324D DRIVE MOTOR A INVERTER IGBT

#### < DTC/CIRCUIT DIAGNOSIS >

YES

- >> 1. Replace the traction motor inverter. Refer to <u>TMS-121, "Removal and Installation"</u>.
  - 2. If a malfunction still occurs after replacement of the traction motor inverter, replace transmission assembly. Refer to <u>TM-190, "Removal and Installation"</u>.
- NO >> Repair or replace damaged parts.

## **P324E IGNITION SWITCH SIGNAL**

### < DTC/CIRCUIT DIAGNOSIS >

## P324E IGNITION SWITCH SIGNAL

## **DTC** Logic

А

В

INFOID:000000008140374

## DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction dete	ected condition	Possible causes
P324E	Drive Motor "A" Inverter IGN switch signal	When voltage from por specified value or less	wer switch is the •	Harness or connector (Each circuit is open or shorted.) Traction motor inverter
DTC CONF	IRMATION PROCEDUR	RE		
1.PRECON	DITIONING			
If "DTC CON waitat least	FIRMATION PROCEDUR	E" has been previousl ing the next test.	y conducted, always	turn ignition switch OFF and
>>	GO TO 2.			
2.снеск с	DTC DETECTION			
1. Turn ign 2. Check D	ition switch ON and wait fo	r 10 seconds or more		
<u>Is "P324E" d</u>	etected?			
YES >> NO >>	Go to <u>TMS-101, "Diagnosi:</u> INSPECTION END	<u>s Procedure"</u> .		
Diagnosis	Procedure			INFOID:00000008140375
1.снеск с	CONNECTION CONDITIO	N		
1. Turn ign 2. Check th	ition switch OFF.	the traction motor inve	erter harness connec	tor.
Is the inspec YES >> NO >> 2.CHECK F	<u>tion result normal?</u> GO TO 2. Repair or replace damaged POWER CIRCUIT	d parts.		
<ol> <li>Turn ign</li> <li>Disconn</li> <li>Turn ign</li> <li>Check the</li> </ol>	ition switch OFF. ect the traction motor inver ition switch ON. ne voltage between tractior	rter harness connector n motor inverter vehicl	r. e side harness conn	ector terminal and ground.
Traction moto	r inverter vehicle side harness co nector	on- Ground	Condition	Voltage (Approx.)
Connec	tor Terminal		Turn ignition owitch	
	31	Ground		10 – 16 V
E78			Turn ignition switch (	DFF 0 V

 If inspection result is OK, replace the traction motor inverter. Refer to <u>TMS-121, "Removal</u> P and Installation".

NO >> GO TO 3.

## **3.**CHECK HARNESS BETWEEN TRACTION MOTOR INVERTER AND IPDM E/R

- 1. Turn ignition switch OFF.
- 2. Disconnect the IPDM E/R connector.
- 3. Check the resistance between traction motor inverter vehicle side harness connector terminal and IPDM E/R vehicle side harness connector terminal.

### TMS-101

## **P324E IGNITION SWITCH SIGNAL**

### < DTC/CIRCUIT DIAGNOSIS >

Traction motor inverter veh	icle side harness connector	IPDM E/R vehicle sid	Posistanco		
Connector	Terminal	Connector	Terminal	Resistance	
E78	31	E7	76	1 $\Omega$ or less	

4. Check the resistance between traction motor inverter vehicle side harness connector terminal and ground.

Traction motor inverter veh	icle side harness connector	Groupd	Posistanco	
Connector	Terminal	Glound	Resistance	
E78	31	Ground	100 kΩ or more	

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace damaged parts.

### **4.**DETECTION OF MALFUNCTION ITEMS

Check the following items:

• Harness open circuit or short circuit between IPDM E/R and ignition switch

10A fuse (#43, IPDM E/R)

• Ignition switch

• IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)

Is the inspection result normal?

YES >> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u>.

NO >> Repair or replace damaged parts.

## **P324F DRIVE MOTOR A INVERTER IGBT**

#### < DTC/CIRCUIT DIAGNOSIS >

## P324F DRIVE MOTOR A INVERTER IGBT

### Description

This DTC is detected simultaneously with "P0C79" or "P324D", firstly check either of DTC. Refer to <u>TMS-30</u>, <u>B</u><u>"DTC Inspection Priority Chart"</u>.

### DTC Logic

INFOID:000000008140377

INFOID:000000008140376

## TMS

## DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P324F	Drive Motor "A" Inverter IGB- TOver Current/Over Tempera- ture/Over Voltage	<ul> <li>If an over current has occurred in the IG- BTenergizing current</li> <li>If IGBT temperature is too high</li> <li>If there is over voltage in the high voltage</li> </ul>	<ul> <li>Traction motor inverter</li> <li>Traction motor</li> <li>High voltage coolant system</li> <li>System main relay</li> <li>Self shut off relay</li> <li>High voltage harness or connector</li> <li>Li-ion battery</li> <li>High voltage parts except for traction motor inverter</li> </ul>
DTC CONF	FIRMATION PROCEDURI	E	
1.PRECON	NDITIONING		
If "DTC COI waitat least >> 2 CHECK	NFIRMATION PROCEDURE 10 seconds before conductin GO TO 2.	" has been previously conducted, alwang the next test.	iys turn ignition switch OFF and
1 Perform		Refer to HBC-89 "Description"	
2. Start the	e engine and wait for 10 sec	onds or more.	
3. Check I	DTC.		
<u>YES</u> >>	<u>Go to TMS-103</u> "Diagnosis	Procedure"	
NO >>	INSPECTION END	<u> </u>	
Diagnosis	s Procedure		INFOID:00000008140376
1.снеск	"P0C79" AND "P324D"		
Firstly, chec "DTC Logic"	k "P0C79" or "P324D", acco <u>'</u> (P0C79), <u>TMS-99, "DTC Lo</u>	rding to " <u>TMS-30, "DTC Inspection Pr</u> ogic" (P324D).	iority Chart"". Refer to <u>TMS-67,</u>
>>	GO TO 2.		
2.снеск	TRACTION MOTOR INVER	TER HARNESS CONNECTOR	
1. Turn igr	nition switch OFF.	the treation motor inventor how and	
2. Check t	tion result normal?	the traction motor inverter harness cor	inector.
YES >>	GO TO 3.		
NO >>	Repair or replace damaged	parts.	
<b>З.</b> снеск	POWER CIRCUIT		
1. Disconr	nect the traction motor invert	er harness connector.	
2. Turn igr	nition switch ON.	an a tan ing ang atang sa kinda atala da	

3. Check the voltage between traction motor inverter vehicle side harness connector terminals. CAUTION:

## TMS-103

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## P324F DRIVE MOTOR A INVERTER IGBT

#### < DTC/CIRCUIT DIAGNOSIS >

#### Never damage connector terminals.

Traction			
Connector	Terminal		Voltage
Connector	+	-	
E79	42	41	10 – 16 V
L70	44	43	10-10 V

Is the inspection result normal?

YES >> Replace the traction motor inverter. Refer to TMS-121, "Removal and Installation".

NO >> GO TO 4.

## **4.**DETECTION OF MALFUNCTION ITEMS

Check the following items:

- Harness open circuit or short circuit between traction motor inverter vehicle side harness connector terminals and fuse and fusible link block No.3
- Harness open circuit or short circuit between fuse and fusible link block No.3 and 12V battery
- 10A fuse (#71, Fuse and fusible link block No.3)
- 50A fusible link (#Y, Fuse and fusible link block No.3)
- Self shut off relay
- 12V battery

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to <u>GI-49, "Intermittent Incident"</u>.
- NO >> Repair or replace damaged parts.

## P3250 CAN ERROR

# < DTC/CIRCUIT DIAGNOSIS > P3250 CAN ERROR

## DTC Logic

## DTC DETECTION LOGIC

#### NOTE:

If DTC P3250 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3250	CAN communication data error	When traction motor inverter detected data error of CAN communication.	<ul><li>HPCM</li><li>Traction motor inverter</li></ul>
DTC CON	<b>IFIRMATION PROCEDU</b>	IRE	
1.PRECC	NDITIONING		
lf "DTC CC waitat leas	DNFIRMATION PROCEDU t 10 seconds before condu	RE" has been previously conducted, alv acting the next test.	vays turn ignition switch OFF and
>	> GO TO 2.		
<b>2.</b> CHECK	<b>COTC DETECTION</b>		
1. Turn iç 2. Perfor	gnition switch ON and wait m self-diagnosis.	for 5 seconds or more.	
s. Check ls DTC dat	DIC.		
YES >	> Go to TMS-105. "Diagno	sis Procedure".	
NO >	> INSPECTION END		
Diagnos	is Procedure		INFOID:00000008140380
1 <b>DEDE</b>			
<ol> <li>Perfor</li> <li>Check</li> </ol>	m "All DTC Reading".		
DTC dete	ection control module and DTC	Malfunctioning part	
Only "MOT	OR CONTROL" detects P3250	Traction motor inverter	
<ul><li> "MOTOR</li><li> "HV BAT"</li></ul>	CONTROL" detects P3250 IERY" detects P33E0	НРСМ	
>	> Replace malfunctioning p	part corresponding to the control module	e detecting DTC.

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INFOID:000000008140379

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## < DTC/CIRCUIT DIAGNOSIS >

## P3251 CAN ERROR

## DTC Logic

## DTC DETECTION LOGIC

### NOTE:

If DTC P3251 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
P3251	CAN communication data error	When traction motor inverter detected data error of CAN communication.	<ul><li>ECM</li><li>Traction motor inverter</li></ul>

### DTC CONFIRMATION PROCEDURE

## 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and waitat least 10 seconds before conducting the next test.

>> GO TO 2.

## 2. CHECK DTC DETECTION

1. Turn ignition switch ON and wait for 5 seconds or more.

- 2. Perform self-diagnosis.
- 3. Check DTC.

### Is DTC detected?

- YES >> Go to TMS-106, "Diagnosis Procedure".
- NO >> INSPECTION END

## Diagnosis Procedure

## **1.**PERFORM ALL DTC READING

- 1. Perform "All DTC Reading".
- 2. Check diagnosis results.

DTC detection control module and DTC	Malfunctioning part
Only "MOTOR CONTROL" detects P3251	Traction motor inverter
<ul><li> "MOTOR CONTROL" detects P3251</li><li> "HV BATTERY" detects P33E1</li></ul>	ECM

>> Replace malfunctioning part corresponding to the control module detecting DTC.

INFOID:000000008140381

INFOID:000000008140382

## **U0100 LOST COMMUNICATION ECM**

### < DTC/CIRCUIT DIAGNOSIS >

## U0100 LOST COMMUNICATION ECM

## DTC Logic

INFOID:000000008140383

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DTC DETECTION LOGIC
```

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes	
U0100	Lost Communication With ECM	Traction motor inverter cannot receive a CAN communication signal from ECM for 2 sec- onds or more in a row	Harness or connectors (CAN communication line is open or- shorted)	TMS
		Traction motor inverter cannot receive a CAN communication signal from ECM for a short period of less than 2 seconds	Harness or connectors (Intermittent malfunction in the CAN- communication circuit)	D
DTC CO	NFIRMATION PROCEDU	RE		Е
1.PREC	ONDITIONING			
If "DTC C waitat leas	ONFIRMATION PROCEDUF st 10 seconds before conduc	RE" has been previously conducted, alv cting the next test.	vays turn ignition switch OFF and	F
>> GO TO 2. 2.CHECK DTC DETECTION				G
<ul> <li>With CONSULT</li> <li>Perform "INSPECTION MODE 5". Refer to <u>HBC-89, "Description"</u>.</li> <li>Start engine and wait at least 5 seconds.</li> </ul>				Н
4. Check DTC of "MOTOR CONTROL". Is the DTC U0100, U0101, U0111, or U0293 detected?				
NO-1 (DTC U0100, U0101, U0111, or U0293 is stored in "MOTOR CONTROL" at the time of receiving.)>> GO TO 3.				J
3.PERFORM CAN DIAGNOSIS				K
With Co	ONSULT			
<ol> <li>Perform "CAN Diagnosis".</li> <li>Check diagnosis results.</li> </ol>			L	
>	>> Go to <u>TMS-107, "Diagnos</u>	sis Procedure".		М
Diagnosis Procedure INFOLD-00000008140384				
• To perfe • To repa	<mark>l:</mark> orm diagnosis, observe <u>LA</u> ir harness, observe <u>LAN-2</u>	N-27, "Precautions for Trouble Diag 7, "Precautions for Harness Repair".	nosis".	Ν
1.INSPE	1.INSPECTION START			
Confirm the detected malfunction (result of "CAN Diagnosis"). <u>Is there any malfunction at present or a malfunction history?</u> YES >> Go to <u>LAN-19, "Trouble Diagnosis Flow Chart"</u> . NO >> GO TO 2.				Ρ
2.DETEC	CT THE ROOT CAUSE			

With CONSULT
 Check DTC of "MOTOR CONTROL".

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## **U0100 LOST COMMUNICATION ECM**

#### < DTC/CIRCUIT DIAGNOSIS >

Detected DTC	Root cause
DTC U0100, U0101, U0111, and U0293	<ul> <li>HEV system CAN line (Short circuit or traction motor inverter- branch line*)</li> <li>ECM</li> <li>HPCM</li> <li>TCM</li> <li>Li-ion battery controller</li> <li>Traction motor inverter</li> </ul>
DTC U0100	<ul><li>ECM branch line</li><li>ECM</li></ul>
DTC U0101	<ul><li>TCM branch line</li><li>TCM</li></ul>
DTC U0111	<ul><li>Li-ion battery controller branch line</li><li>Li-ion battery controller</li></ul>
DTC U0293	<ul><li>HPCM branch line</li><li>HPCM and battery junction box</li></ul>
DTC U0101, U0111, and U0293	Main line between traction motor inverter- and TCM
DTC U0111 and U0293	Main line between HPCM and TCM

#### NOTE:

\*: If "EV/HEV" detects DTC U0110, check the traction motor inverter branch line first.

>> Intermittent malfunction. Check malfunctioning parts, according to the intermittent Incident. Referto <u>GI-49</u>, "Intermittent Incident".
# **U0101 LOST COMMUNICATION TCM**

### < DTC/CIRCUIT DIAGNOSIS >

# U0101 LOST COMMUNICATION TCM

# DTC Logic

INFOID:000000008140385

### DTC DETECTION LOGIC

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DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes	
10101	Last Communication With TCM	Traction motor inverter cannot receive a CAN communication signal from TCM for 2 sec- onds or more in a row	Harness or connectors (CAN communication line is open or- shorted)	TM
00101	Lost Communication with TCIVI	Traction motor inverter cannot receive a CAN communication signal from TCM for a short period of less than 2 seconds	Harness or connectors (Intermittent malfunction in the CAN- communication circuit)	D
DTC CO	NFIRMATION PROCEDU	RE		Е
1.PREC	ONDITIONING			
If "DTC C	ONFIRMATION PROCEDUR	RE" has been previously conducted, alv	ways turn ignition switch OFF and	F
waitat lea	st 10 seconds before conduc	cting the next test.		
;	>> GO TO 2.			G
2.CHEC	K DTC DETECTION			G
(P)With C	ONSULT			
1. Perfo	orm "INSPECTION MODE 5"	. Refer to <u>HBC-89, "Description"</u> .		Π
3. Perfo	orm "All DTC Reading".	conus.		
4. Chec				
YES YES	<u>C 00100, 00101, 00111, or</u> >> GO TO 3	DU293 detected?		
NO-1 (D	TC U0100, U0101, U0111, o	r U0293 is stored in "MOTOR CONTR	OL" at the time of receiving.)>>	J
NO-2 (R	epaired after performing TM	S-109, "Diagnosis Procedure".)>>INSF	PECTION END	
3.PERF	ORM CAN DIAGNOSIS			Κ
With C	ONSULT			
1. Perfo	orm "CAN Diagnosis".			L
2. Onec	a diagnosis results.			
:	>> Go to <u>TMS-109, "Diagnos</u>	is Procedure".		NЛ
Diagnos	sis Procedure		INFOID:00000008140386	IVI
CAUTION	N:			
• To perf	orm diagnosis, observe LA	N-27, "Precautions for Trouble Diag	<u>inosis"</u> .	Ν
• To repa	air harness, observe <u>LAN-2</u>	7, "Precautions for Harness Repair"		
	CTION START			0
Is there a	ne delected mainunction (res	a malfunction history?		
YES :	> Go to <u>LAN-19, "Trou</u> ble D	iagnosis Flow Chart".		Ρ
NO :	>> GO TO 2.			
	CT THE ROOT CAUSE			

With CONSULT
 Check DTC of "MOTOR CONTROL".

# **U0101 LOST COMMUNICATION TCM**

### < DTC/CIRCUIT DIAGNOSIS >

Detected DTC	Root cause
DTC U0100, U0101, U0111, and U0293	<ul> <li>HEV system CAN line (Short circuit or traction motor inverter- branch line*)</li> <li>ECM</li> <li>HPCM</li> <li>TCM</li> <li>Li-ion battery controller</li> <li>Traction motor inverter</li> </ul>
DTC U0100	<ul><li>ECM branch line</li><li>ECM</li></ul>
DTC U0101	<ul><li>TCM branch line</li><li>TCM</li></ul>
DTC U0111	<ul><li>Li-ion battery controller branch line</li><li>Li-ion battery controller</li></ul>
DTC U0293	<ul><li>HPCM branch line</li><li>HPCM and battery junction box</li></ul>
DTC U0101, U0111, and U0293	Main line between traction motor inverter- and TCM
DTC U0111 and U0293	Main line between HPCM and TCM

### NOTE:

\*: If "EV/HEV" detects DTC U0110, check the traction motor inverter branch line first.

>> Intermittent malfunction. Check malfunctioning parts, according to the intermittent Incident. Referto <u>GI-49</u>, "Intermittent Incident".

# **U0111 LOST COMMUNICATION LBC**

### < DTC/CIRCUIT DIAGNOSIS >

# U0111 LOST COMMUNICATION LBC

# DTC Logic

INFOID:000000008140387

### DTC DETECTION LOGIC

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DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
	Lost Communication With Li-ion	Traction motor inverter cannot receive a CAN communication signal from Li-ion battery con- troller for 2 seconds or more in a row	Harness or connectors (CAN communication line is open or- shorted)
00111	Battery Controller	Traction motor inverter cannot receive a CAN communication signal from Li-ion battery con- troller for a short period of less than 2 seconds	Harness or connectors (Intermittent malfunction in the CAN- communication circuit)
DTC CO	NFIRMATION PROCEDU	RE	E
1.PREC	ONDITIONING		
If "DTC C waitat lea	ONFIRMATION PROCEDUF st 10 seconds before conduc	RE" has been previously conducted, alw cting the next test.	rays turn ignition switch OFF and
:	>> GO TO 2.		C
<b>2.</b> CHEC	K DTC DETECTION		
With C 1. Perfc 2. Start	ONSULT orm "INSPECTION MODE 5" engine and wait at least 5 se	. Refer to <u>HBC-89, "Description"</u> . econds.	ł
4. Chec	k DTC of "MOTOR CONTRO	DL".	
Is the DT	<u>C U0100, U0101, U0111, or </u>	U0293 detected?	
YES : NO-1 (D	>> GO TO 3. )TC U0100, U0101, U0111, o GO TO 3.	r U0293 is stored in "MOTOR CONTRO	DL" at the time of receiving.)>>
NO-2 (R	epaired after performing TM	<u>S-111, "Diagnosis Procedure"</u> .)>>INSPI	ECTION END
J.PERF	ORM CAN DIAGNOSIS		
(P)With C 1. Perfc 2. Chec	ONSULT orm "CAN Diagnosis". k diagnosis results.		I
:	>> Go to <u>TMS-111, "Diagnos</u>	is Procedure".	
Diagno	sis Procedure		INFOID:00000008140388
CAUTION • To perf • To repa	<mark>\:</mark> orm diagnosis, observe <u>LA</u> iir harness, observe <u>LAN-2</u>	N-27, "Precautions for Trouble Diagon 7, "Precautions for Harness Repair".	nosis".
1.INSPE	ECTION START		(
Confirm t	he detected malfunction (res	ult of "CAN Diagnosis").	
Is there a	ny malfunction at present or	a malfunction history?	
YES : NO :	>> Go to <u>LAN-19, "Trouble D</u> >> GO TO 2.	lagnosis Flow Chart".	ł
2.DETE	CT THE ROOT CAUSE		

With CONSULT
 Check DTC of "MOTOR CONTROL".

# **U0111 LOST COMMUNICATION LBC**

### < DTC/CIRCUIT DIAGNOSIS >

Detected DTC	Root cause
DTC U0100, U0101, U0111, and U0293	<ul> <li>HEV system CAN line (Short circuit or traction motor inverter- branch line*)</li> <li>ECM</li> <li>HPCM</li> <li>TCM</li> <li>Li-ion battery controller</li> <li>Traction motor inverter</li> </ul>
DTC U0100	ECM branch line     ECM
DTC U0101	TCM branch line     TCM
DTC U0111	<ul><li>Li-ion battery controller branch line</li><li>Li-ion battery controller</li></ul>
DTC U0293	<ul><li>HPCM branch line</li><li>HPCM and battery junction box</li></ul>
DTC U0101, U0111, and U0293	Main line between traction motor inverter- and TCM
DTC U0111 and U0293	Main line between HPCM and TCM

### NOTE:

\*: If "EV/HEV" detects DTC U0110, check the traction motor inverter branch line first.

>> Intermittent malfunction. Check malfunctioning parts, according to the intermittent Incident. Referto <u>GI-49</u>, "Intermittent Incident".

# **U0293 LOST COMMUNICATION HCM**

### < DTC/CIRCUIT DIAGNOSIS >

# **U0293 LOST COMMUNICATION HCM**

# DTC Logic

INFOID:000000008140389

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DTC DETECTION LOGIC
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DTC DET	FECTION LOGIC			В			
DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes				
	Last Communication With HPCM	Traction motor inverter cannot receive a CAN communication signal from HPCM for 2 seconds or more in a row	Harness or connectors (CAN communication line is open or- shorted)	TMS			
00293	D0293       Lost Communication with HPCM         Traction motor inverter cannot receive a CAN communication signal from HPCM for a short period of less than 2 seconds       Harness or connectors         (Intermittent malfunction in the CAN-period of less than 2 seconds       communication circuit)						
DTC CO	NFIRMATION PROCEDUR	RE		Е			
1.PREC	ONDITIONING						
If "DTC C waitat leas	ONFIRMATION PROCEDUR st 10 seconds before conduc	E" has been previously conducted, alv ting the next test.	vays turn ignition switch OFF and	F			
э 2.снес	>> GO TO 2. K DTC DETECTION			G			
With Control 1. Perfo	ONSULT rm "INSPECTION MODE 5". engine and wait at least 5 se	Refer to <u>HBC-89, "Description"</u> .		Н			
3. Perfo 4. Chec Is the DTC	rm "All DTC Reading". k DTC of "MOTOR CONTRO C U0100, U0101, U0111, or L	UL". J0293 detected?		I			
YES >> GO TO 3. NO-1 (DTC U0100, U0101, U0111, or U0293 is stored in "MOTOR CONTROL" at the time of receiving.)>> GO TO 3.							
NO-2 (R 3.PERF0	epaired after performing <u>TMS</u> DRM CAN DIAGNOSIS	S-113. "Diagnosis Procedure".)>>INSP	ECTION END	Κ			
With Control 1. Performation 2. Chec	ONSULT rm "CAN Diagnosis". k diagnosis results.			L			
>	>> Go to <u>TMS-113, "Diagnosi</u>	s Procedure".		M			
Diagnos	sis Procedure		INFOID:00000008140390				
• To perfe • To repa	<mark>l:</mark> orm diagnosis, observe <u>LA</u> ir harness, observe <u>LAN-27</u>	N-27, "Precautions for Trouble Diag 7, "Precautions for Harness Repair"	nosis".	Ν			
1.INSPECTION START							
Confirm th	ne detected malfunction (resu	ult of "CAN Diagnosis").					
<u>IS there al</u> YES	ny mairunction at present or a >> Go to LAN-19, "Trouble Di	a mairunction history? agnosis Flow Chart".		Р			
NO	>> GO TO 2.	<u></u>					
2.DETECT THE ROOT CAUSE							

With CONSULT
 Check DTC of "MOTOR CONTROL".

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# **U0293 LOST COMMUNICATION HCM**

### < DTC/CIRCUIT DIAGNOSIS >

Detected DTC	Root cause
DTC U0100, U0101, U0111, and U0293	<ul> <li>HEV system CAN line (Short circuit or traction motor inverter- branch line*)</li> <li>ECM</li> <li>HPCM</li> <li>TCM</li> <li>Li-ion battery controller</li> <li>Traction motor inverter</li> </ul>
DTC U0100	ECM branch line     ECM
DTC U0101	TCM branch line     TCM
DTC U0111	<ul><li>Li-ion battery controller branch line</li><li>Li-ion battery controller</li></ul>
DTC U0293	<ul><li>HPCM branch line</li><li>HPCM and battery junction box</li></ul>
DTC U0101, U0111, and U0293	Main line between traction motor inverter- and TCM
DTC U0111 and U0293	Main line between HPCM and TCM

### NOTE:

\*: If "EV/HEV" detects DTC U0110, check the traction motor inverter branch line first.

>> Intermittent malfunction. Check malfunctioning parts, according to the intermittent Incident. Referto <u>GI-49</u>, "Intermittent Incident".

### < DTC/CIRCUIT DIAGNOSIS >

# U1000 CAN COMM CIRCUIT

# Description

CAN (Controller Area Network) is a serial communication line for real-time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent malfunction detection ability.Many electronic control units are equipped onto a vehicle, and each control unit shares information and linkswith other control units during operation (not independently). In CAN communication, control units are connected with 2 communication lines (CAN-H line, CAN-L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

# DTC Logic

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
U1000	CAN communication line	If CAN communications signals continu- ously cannot be transmitted	Harness or connectors (CAN communication line is open or short- ed.)
DTC CONFIF	RMATION PROCEDUF	RE	
1.PRECOND	ITIONING		
If "DTC CONF wait at least 10	IRMATION PROCEDUR 0 seconds before conduc	E" has been previously conducted, cting the next test.	always turn ignition switch OFF and
>> G	O TO 2.		
<ol> <li>СНЕСК DT</li> </ol>	C DETECTION		
1. Turn igniti	on switch ON and wait fo	or 5 seconds or more.	
2. Check DT	C.		
YES >> G	o to TMS-115, "Diagnosis	s Procedure".	
NO >> IN	ISPECTION END		
Diagnosis I	Procedure		INFOID:00000008140393
For the diagno	osis procedure, refer to L	AN-19. "Trouble Diagnosis Flow Ch	art".

INFOID:000000008140391

INFOID:000000008140392

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# U1002 CAN ERROR

# < DTC/CIRCUIT DIAGNOSIS >

# U1002 CAN ERROR

# DTC Logic

INFOID:000000008140394

INFOID:000000008140395

### DTC DETECTION LOGIC

DTC	Trouble diagnosis name	Malfunction detected condition	Possible causes
U1002	CAN communication line	If CAN communications signals continu- ously cannot be transmitted	Harness or connectors (CAN communication line is open or short- ed.)

# DTC CONFIRMATION PROCEDURE

# 1.PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. CHECK DTC DETECTION

1. Turn ignition switch ON and wait for 5 seconds or more.

2. Check DTC.

Is "U1002" detected?

YES >> Go to <u>TMS-116</u>, "Diagnosis Procedure".

NO >> INSPECTION END

# Diagnosis Procedure

For the diagnosis procedure, refer to LAN-19. "Trouble Diagnosis Flow Chart".

### < DTC/CIRCUIT DIAGNOSIS >

# INSULATION RESISTANCE

### Component Inspection

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### WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection andmaintenance.
- Be sure to remove the service plug in order to shut off the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- Be sure to put the removed service plug in your pocket and carry it with you so that another person- D does not accidentally connect it while work is in progress.
- Be sure to wear insulating protective equipment consisting of glove, shoes and glasses/face shieldbefore beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do nottouch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to GI-31, "High Voltage Precautions".

### CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while theservice plug is removed. Therefore do not change the vehicle to READY status unless instructed to doso in the Service Manual.

**1.**PRECONDITIONING

### WARNING:

Shut off high voltage circuit. Refer to GI-30, "How to Cut Off High Voltage".

- Check voltage in high voltage circuit. (Check that condenser are discharged.)
- 1. Remove trunk finisher front. Refer to INT-51. "Exploded View".
- 2. Remove harness cover (1).

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.





3. Measure voltage between high voltage harness terminals.

#### Standard

: 5 V or less

### DANGER:

Touching high voltage components without using the appropriate protective equipment will cause electrocution.

# **CAUTION:** For voltage measurements, use a tester which can measure to 500 V or higher.

### >> GO TO 2.

2. CHECK TRACTION MOTOR INSULATION RESISTANCE



# **INSULATION RESISTANCE**

### < DTC/CIRCUIT DIAGNOSIS >

### WARNING:

Unlike the ordinary tester, the insulation resistance tester applies 500V when measuring. If used incorrectly, there is the danger of electric shock. If used in the vehicle 12V system, there is the danger of damage to electronic devices. Read the insulation resistance tester instruction manual carefully and be sure to work safely.

- 1. Disconnect the 3-phase harness from the traction motor inverter. Refer to <u>TMS-121, "Removal and Instal-</u> lation".
- 2. Use 500V range of insulation resistance tester to measure insulation resistance. Wait for 30 seconds until the value becomes stable.

# CAUTION:

Be sure to set the insulation resistance tester to 500V when performing this test. Using a setting higher than 500V can result in damage to the component being inspected.

Traction motor inverter 3-phase harness connector           Connector         Terminal		Ground	Resistance	
		Giouna		
	54			
C16	55	Transmission housing case	20 M $\Omega$ or more	
	56			

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace the transmission assembly due to malfunction in the traction motor. Refer to <u>TM-190.</u> <u>"Removal and Installation"</u>. < SYMPTOM DIAGNOSIS >

# SYMPTOM DIAGNOSIS ELECTROMAGNETIC NOISE IS AUDIBLE

# DESCRIPTION

Electromagnetic noise of traction motor may be noticeable while starting the vehicle on a steep slope (when output torque is large). This is a characteristic or control process of traction motor inverter, and it is not a mal-function.

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### < REMOVAL AND INSTALLATION >

# REMOVAL AND INSTALLATION TRACTION MOTOR INVERTER

# **Exploded View**

INFOID:000000008140398



- 1. Traction motor inverter
- 4. High voltage harness
- A. To traction motor
- B. To sub radiator
- C. O-ring
- : N·m (kg-m, in-lb)
- : N·m (kg-m, ft-lb)
- : Waterproof grease

- 2. 3-phase harness
- 5. High voltage warning label
- 3. Traction motor inverter bracket

### < REMOVAL AND INSTALLATION >

### Removal and Installation

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#### WARNING:

- · Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to shut off the high voltage circuits before performing TMS inspection or maintenance of high voltage system harnesses and parts.
- Be sure to put the removed service plug in your pocket and carry it with you so that another person does not accidentally connect it while work is in progress.
- Be sure to wear insulating protective equipment consisting of glove, shoes and glasses before beginning work on the high voltage system.
- · Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to <u>TMS-5</u>, "High Voltage Precautions".

#### **CAUTION:**

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the F service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

REMOVAL

### WARNING:

### Shut off high voltage circuit. Refer to GI-30, "How to Cut Off High Voltage".

- 1. Check voltage in high voltage circuit. (Check that condenser are discharged.)
- Remove trunk finisher front. Refer to INT-52, "TRUNK FINISHER FRONT : Removal and Installation". a.
- h Remove harness cover (1).

### **DANGER:**

Touching high voltage components without using the appropriate protective equipment will cause electrocution.



DANGER:

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Measure voltage between high voltage harness terminals. Touching high voltage components without using the appropriate protective equipment will cause electrocution.

#### Standard

#### : 5 V or less

#### CAUTION: For voltage measurements, use a tester which can measure to 500 V or higher.

- 2. Drain coolant from high voltage cooling system. Refer to HCO-7, "Draining and Refilling".
- Remove cowl top cover RH. Refer to EXT-21, "Removal and Installation".
- 4. Disconnect low voltage harness connector.
- Remove IPDM E/R and displace it to the engine side to obtain space for removing the traction motor 5. inverter. WARNING:

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### < REMOVAL AND INSTALLATION >



- 6. Remove three-phase harness and high voltage harness, according to the following instructions.
- a. Remove mounting bolts (1) on the sides of connector.



### WARNING:

To prevent electric shock hazards, be sure to wear protective gear.

b. Remove high voltage harness connector by loosening the center bolt (1) of high voltage harness connector while maintaining the connector in vertical position.



NOTE:

This bolt is fixed on the connector housing. **CAUTION:** 

### < REMOVAL AND INSTALLATION >

### Never pull high voltage harness connector by holding the wiring part.

7. Remove harness bracket.

### WARNING:



 Remove the high voltage harness fixing clip and displace high voltage harness to obtain space for removing the traction motor inverter.

### WARNING:

# To prevent electric shock hazards, be sure to wear protective gear.



9. Remove hose clump and disconnect water hose (1) from traction motor inverter.

### WARNING:

To prevent electric shock hazards, be sure to wear protective gear.



### CAUTION:

- Take care that coolant does not contact the high voltage harness connectors.
- To prevent performance degradation, if coolant contacts a high voltage harness connector, immediately dry the high voltage harness connector completely with an air blow gun.

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10. Remove mounting bolts (A), then remove traction motor inverter (1).



### WARNING:

**1** To prevent electric shock hazards, be sure to wear protective gear.



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### < REMOVAL AND INSTALLATION >

- Never hold the cooling bulge (A) when removing or carrying traction motor inverter.
- To carry traction motor inverter, remove it by holding bracket (B). If it is hard to hold bracket (B), hold high voltage harness connector (C).



### **INSTALLATION**

Note the following, and install in the reverse order of removal.

### WARNING:

To prevent electric shock hazards, be sure to wear protective gear.



### CAUTION:

Be sure to reinstall high voltage harness clips in their original positions. If a clip is damaged, replace it with a new clip before installing.

 If the traction motor inverter was replaced, first check that there is no dust or dirt on the surface of the traction motor inverter, then apply the new high voltage warning label at position (A), with the direction indicated by the arrow facing up.



### < REMOVAL AND INSTALLATION >

• To install high voltage harness connector, tighten the center bolt (1) of the connector while maintaining the connector in vertical position by hand to tighten bolts (2) on both sides.



 $\checkmark$  To prevent shock hazards, be sure to wear protective gear.



### Standard : Less than 0.1 $\Omega$

If the result deviates from the standard value, check for paint, oil, dirt, or other substance adhering to the bolts or conductive mounting parts. If such substances are found, clean the surrounding area and remove the foreign substances.

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