TOYOTA SERVICE BULLETIN

Group: 05 No.: 09 Date: Dec, 12

Prius NHW20

Correction to Repair Manual RM1076

Please ensure these pages are distributed to all relevant staff for their information; and a copy made available for future reference, with the above repair manual.

Section	Title	Paragraph
Please see the attached list on page 2.		

The revised pages listed above are attached.
(The corrected parts are indicated by arrows.)

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PREPARATION	HYBRID CONTROL SYSTEM	PREPARATION
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P112 HYBRID VEHICLE CONTROL	HYBRID CONTROL SYSTEM	SYSTEM DEIAGRAM
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P112 HYBRID VEHICLE CONTROL	HYBRID CONTROL SYSTEM	P0A78-279
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		P0A78-586
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P113 HYBRID VEHICLE CONTROL	HYBRID CONTROL SYSTEM	P0A94-550
		P0A94-551
		P0A94-553
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P112 HYBRID BATTERY CONTROL	HYBRID BATTERY SYSTEM	P0A7F
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HYBRID CONTROL SYSTEM	ELECTRIC VEHICLE CONVERTER	PRECAUTION
		COMPONENTS
		REMOVAL
		INSTALLATION
	POWER MODULE INTELLIGENT TRANSISTOR	PRECAUTION
		COMPONENTS
		REMOVAL
		INSTALLATION

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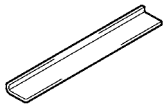
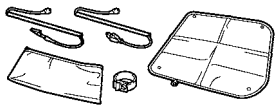
HYBRID CONTROL SYSTEM

PREPARATION

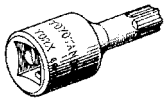
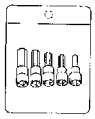
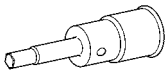
[Added]

023C8–01

SST

	09891–47010	Squeegee	POWER MODULE INTELLIGENT TRANSISTOR
	09890–47010	Desktop Anti–Static Mat Set	POWER MODULE INTELLIGENT TRANSISTOR

Recomended Tools

	09042–00010	Torx Socket T30	W/CONVERTER INVERTER ASSY ELECTRIC VEHICLE CONVERTER POWER MODULE INTELLIGENT TRANSISTOR
	09010–3C110	Set, Hexagon Socket Wrench	POWER MODULE INTELLIGENT TRANSISTOR
	(09013–6C100)	Socket Hexagon 5mm	POWER MODULE INTELLIGENT TRANSISTOR
	09053–1C200	Set,Hose Plug	ELECTRIC VEHICLE CONVERTER
	09053–1C210	Plug, Hose No.	ELECTRIC VEHICLE CONVERTER

[Added]

Equipment

Stopwatch	
Ohmmeter	
Radeator cap tester	
Thermometer	
Torque wrench	
Voltmeter	

SSM

Toyota Genuine Seal Packing 1282B, Three Bond 1282B or Equivalent	

[Added]

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031RX–01

TORQUE SPECIFICATION

Part Tightened		N·m	kgf·cm	ft·lbf
Inverter cover x W/ converter inverter assy	Bolt	11	112	8.1
	Security screw	11	112	8.1
MG 1 power cable x W/ converter inverter assy		8.0	82	71 in. lbf
MG 2 power cable x W/ converter inverter assy		8.0	82	71 in. lbf
W/ converter inverter assy x Body		21	214	16
Air compressor connector bracket x W/ converter inverter assy		8.0	82	71 in. lbf
Inverter bracket No. 1 x W/ converter inverter assy		25	255	18
Inverter bracket No. 2 x W/ converter inverter assy		25	255	18
Circuit bracket sensor No. 1 x W/ converter inverter assy		8.0	82	71 in. lbf
Battery currier bracket x Battery cover		28	286	21
Battery bracket reinforcement x Battery cover		28	286	21
Battery carrier panel No. 6 x Battery carrier sub–assy UPR		7.5	76	66 in. lbf
Frame wire x System main relay No. 2		5.6	57	50 in. lbf
Frame wire x System main relay No. 3		5.6	57	50 in. lbf
HV battery assy x Body		19	194	14
Battery cover x HV battery assy		8.0	82	71 in. lbf
Battery carrier sub–assy UPR x HV Battery		5.5	56	49 in. lbf
Main battery cable x Frame wire No. 2		5.4	55	48 in. lbf
Main battery cable x System main relay No. 2		5.6	57	50 in. lbf
Aluminium shield wire x Battery carrier sub–assy UPR		3.3	34	29 in. lbf
Main battery cable No. 2 x Frame wire No. 2		5.4	55	48 in. lbf
Main battery cable No. 2 x System main relay No. 3		5.6	57	50 in. lbf
Frame wire No. 2 x Battery pack		5.4	55	48 in. lbf
Battery plug x Wiring harness protector cover No. 1		5.4	55	48 in. lbf
Battery plug x Battery carrier sub–assy UPR		5.4	55	48 in. lbf
Junction block x Battery pack		5.4	55	48 in. lbf
System main relay No. 1 x Battery carrier sub–assy UPR	Bolt	3.4	35	30 in. lbf
	Nut	5.6	57	50 in. lbf
System main relay No. 2 x Battery carrier sub–assy UPR		3.4	35	30 in. lbf
System main relay No. 3 x Battery carrier sub–assy UPR		3.4	35	30 in. lbf
System main resistor x Battery carrier sub–assy UPR		3.4	35	30 in. lbf
Battery current sensor x Battery carrier sub–assy UPR		1.4	14	12 in. lbf
Battery ECU assy x Battery carrier sub–assy UPR		3.3	34	29 in. lbf
Frame wire x Under floor panel		9.0	92	80 in. lbf
Frame wire x Engine room relay block		9.0	92	80 in. lbf
Electric vehicle fuse x Service plug grip		5.4	55	48 in. lbf
Battery blower assy x Body		5.0	51	44 in. lbf
Hybrid vehicle control ECU x ECM		5.5	56	49 in. lbf
Water w/ motor & bracket pump assy x Body		7.0	71	62 in. lbf
Accelerator pedal rod assy x Frame		7.5	77	66 in. lbf
Front suspension crossmember sub–assy x Body	Bolt A	113	1,152	83
	Bolt B	157	1,601	116
Front wheel		103	1,050	76
Auxiliary battery negative terminal		6.0	61	53 in. lbf
IPM (for boosting) x Inverter case		5.0	51	44 in. *lbf
Boost converter terminal plate x IPM (for boosting)		8.0	82	71 in. *lbf
Boost converter terminal plate x Boost converter reactor assy		8.0	82	71 in. *lbf
IPM (for driving) x Inverter case		5.0	51	44 in. *lbf
Inverter bus–bar plate sub–assy (MG1) x IPM (for driving)		8.0	82	71 in. *lbf
Inverter bus–bar plate sub–assy (MG1) x Inverter case		8.0	82	71 in. *lbf
Inverter bus–bar plate sub–assy (MG2) x IPM (for driving)		8.0	82	71 in. *lbf

[Added]

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Part Tightened	N·m	kgf·cm	ft·lbf
Inverter bus–bar plate sub–assy (MG2) x Inverter case	8.0	82	71 in. *lbf
Hybrid vehicle capacitor sub–assy x Inverter case	8.0	82	71 in. *lbf
Hybrid vehicle capacitor sub–assy x Boost converter reactor assy	8.0	82	71 in. *lbf
Hybrid vehicle capacitor sub–assy x IPM (for boosting)	8.0	82	71 in. *lbf
Hybrid vehicle capacitor sub–assy x IPM (for driving)	8.0	82	71 in. *lbf
Hybrid vehicle capacitor sub–assy x Wire harness	8.0	82	71 in. *lbf
Electric vehicle converter assy x Inverter case	9.0	92	80 in. *lbf
No. 3 inverter bracket x W/ converter inverter assy	25	255	18
Inverter reserve tank sub–assy x W/ converter inverter assy	8.0	82	71 in. *lbf

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2102N–01

ELECTRIC VEHICLE CONVERTER PRECAUTION

1. PRECAUTION WHEN REMOVING/INSTALLING W/ CONVERTER INVERTER ASSY

CAUTION:

Be careful not to injure yourself on the edges of the with converter inverter assembly when performing work.

NOTICE:

Observe the following in order to prevent entry of foreign matter:

- **Do not allow any dust, foreign matter or water to enter the converter assembly.**
- **Do not use air tools in areas other than specified to prevent entry of dust.**
- **Prevent wind from blowing through the workshop to prevent entry of dust.**
- **Do not drop any bolts or tools into the with converter inverter assembly.**

NOTICE:

PRECAUTION WHEN HANDLING ELECTRONIC COMPONENTS

- **Do not touch any connector terminals, static electricity may be applied to the internal circuits.**
- **Do not drop electronic components such as circuit boards or subject them to impact.**
- **Keep the removed parts free from dust.**
- **Electronic components are very sensitive. Be sure to observe the handling instructions.**

NOTICE:

PRECAUTION WHEN SUSPENDING WORK

- **If suspending work, temporarily install the inverter cover to the inverter case to prevent entry of foreign matter.**

HINT:

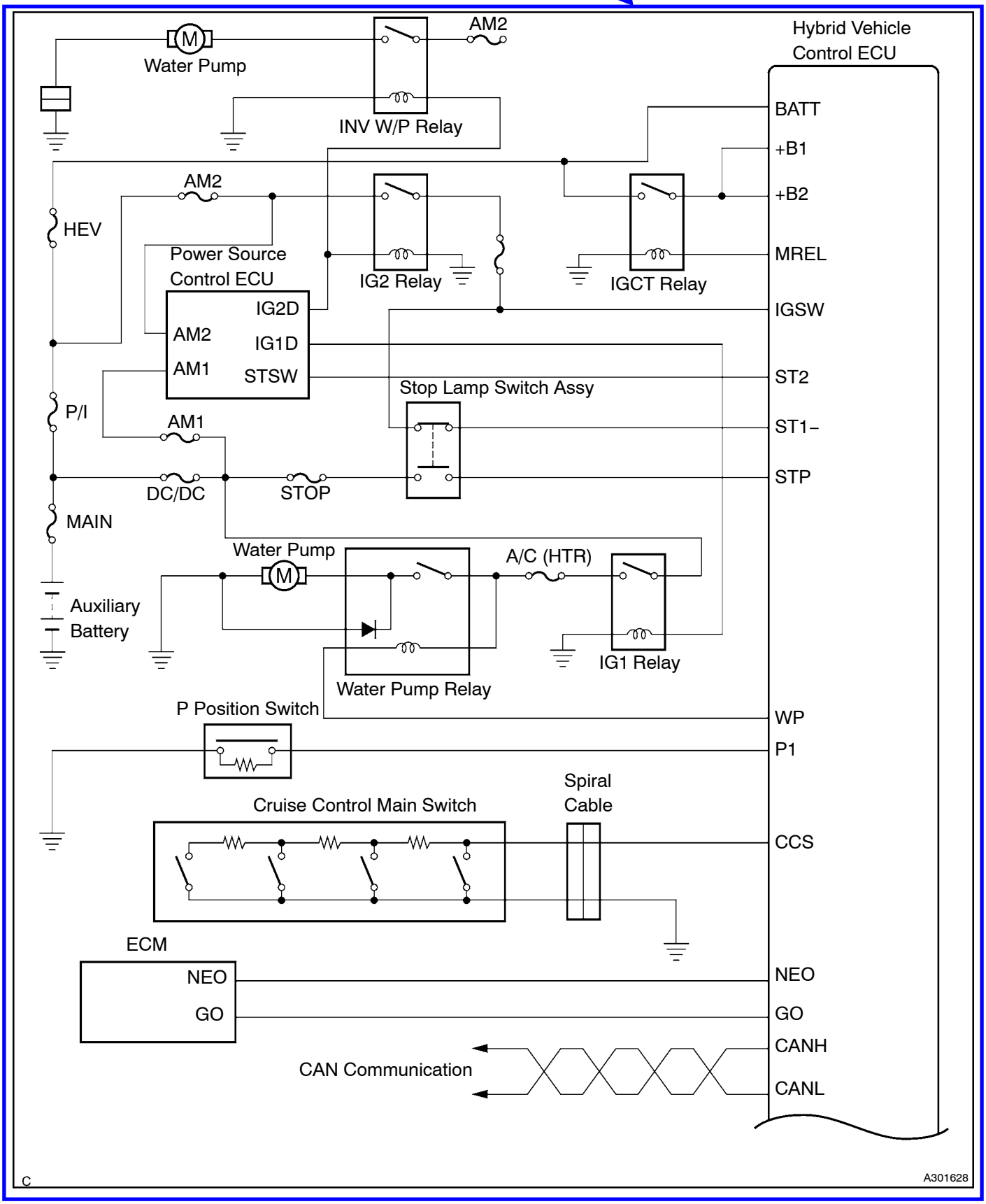
- Arrange the removed parts in the correct order so that they can be installed to the correct position and in the correct orientation.
- It is recommended to take pictures of parts before removing them to ensure correct installation.

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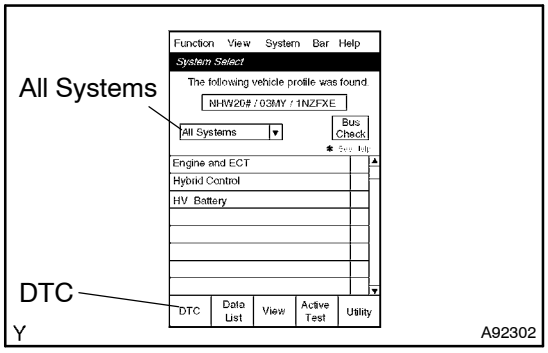
SYSTEM DIAGRAM

[Corrected]

05IH2–01

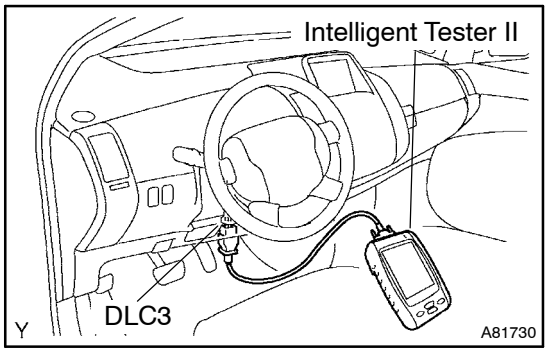


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(a) On the System Select screen, enter the following menus: All Systems / DTC.

(b) If DTCs are present, check the relevant systems.



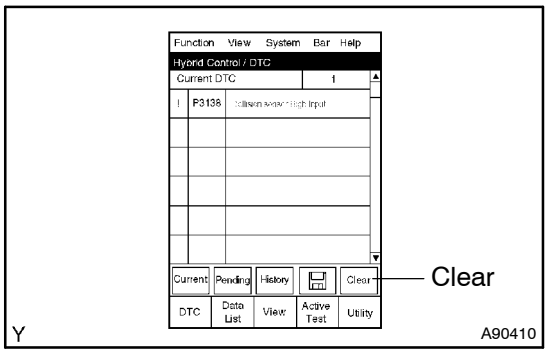
5. CLEAR DTC

(a) Connect the intelligent tester II to the DLC3.

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

(c) Turn the intelligent tester II ON.

(d) Check that the shift position is in the P position.



(e) Display the Hybrid Control / DTC screen and press the Clear key at the bottom right area of the screen.

NOTICE:

Clearing the DTCs will also clear the freeze frame data, information (see page 05–249) and operation history data (see page 05–253).

[Added]

6. DTC MALFUNCTION AREA TABLE

(a) When power module intelligent transistor set or electric vehicle converter assembly related DTCs are output, identify each malfunctioning area using the following DTC malfunctioning area table. If a multiple DTCs are output and the malfunctioning areas are not the same, replace the w/ converter inverter assembly.

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[Added]

DTC Malfunctioning Area Table

DTC No.	Malfunctioning Area Power module intelligent transistor setReference Range	Malfunctioning Area Electric vehicle converter assembly	Malfunctioning Area w/ converter inverter assembly
P0A08–264	—	○	
P0A09–265	—	○	—
P0A09–591	—	○	—
P0A10–263	—	○	—
P0A10–592	—	○	—
P3140–351	—	○	—
P0A60–288	○	—	—
P0A60–289	○	—	—
P0A60–290	○	—	—
P0A60–292	○	—	—
P0A60–294	○	—	—
P0A60–501	○	—	—
P0A63–296	○	—	—
P0A63–297	○	—	—
P0A63–298	○	—	—
P0A63–300	○	—	—
P0A63–302	○	—	—
P0A63–502	○	—	—
P0A72–326	○	—	—
P0A72–327	○	—	—
P0A72–328	○	—	—
P0A72–330	○	—	—
P0A72–333	○	—	—
P0A72–515	○	—	—
P0A75–334	○	—	—
P0A75–335	○	—	—
P0A75–336	○	—	—
P0A75–338	○	—	—
P0A75–341	○	—	—
P0A75–516	○	—	—
P0A78–266	○	—	—
P0A78–267	○	—	—
P0A78–272	○	—	—
P0A78–278	○	—	—
P0A78–279	○	—	—
P0A78–280	○	—	—
P0A78–282	○	—	—
P0A78–283	○	—	—
P0A78–284	○	—	—
P0A78–285	○	—	—
P0A78–286	○	—	—
P0A78–287	○	—	—
P0A78–304	○	—	—
P0A78–305	○	—	—
P0A78–306	○	—	—
P0A78–503	○	—	—
P0A78–504	○	—	—
P0A78–505	○	—	—
P0A78–506	○	—	—

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DTC No.	Malfunctioning Area Power module intelligent transistor setReference Range	Malfunctioning Area Electric vehicle converter assembly	Malfunctioning Area w/ converter inverter assembly
P0A78–507	○	—	—
P0A78–508	○	—	—
P0A78–510	○	—	—
P0A78–523	○	—	—
P0A78–586	○	—	—
P0A7A–309	○	—	—
P0A7A–321	○	—	—
P0A7A–322	○	—	—
P0A7A–323	○	—	—
P0A7A–324	○	—	—
P0A7A–325	○	—	—
P0A7A–342	○	—	—
P0A7A–343	○	—	—
P0A7A–344	○	—	—
P0A7A–517	○	—	—
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P0A7A–520	○	—	—
P0A7A–522	○	—	—
P0A90–509	○	—	—
P0A92–521	○	—	—
P0A93–346	—	—	○
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P0A94–587	○	—	—
P0A94–588	○	—	—
P0A94–589	○	—	—
P0A94–590	○	—	—
P3009–526	—	—	○
P3009–611	—	○	—

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DTC No.	Malfunctioning Area Power module intelligent transistor setReference Range	Malfunctioning Area Electric vehicle converter assembly	Malfunctioning Area w/ converter inverter assembly
P3009–612	—	—	○
P3009–613	○	—	—
P3009–614	—	—	○
P3211–276	○	—	—
P3211–277	○	—	—
P3212–275	○	—	—
P3213–274	○	—	—
P3004–131	—	—	○
P3004–132	—	—	○
P3221–314	○	—	—
P3221–315	○	—	—
P3222–313	○	—	—
P3223–312	○	—	—
P3226–562	○	—	—
P3226–563	○	—	—

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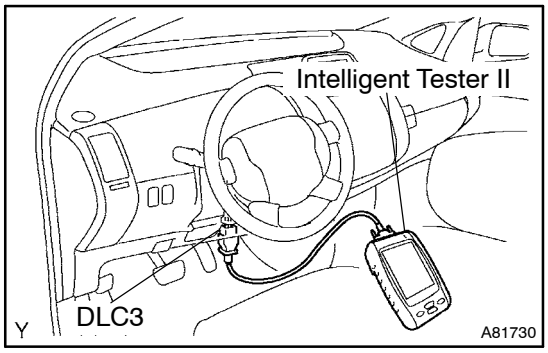
05IHC–01

OPERATION HISTORY DATA

1. OPERATION HISTORY DATA

HINT:

The operation history data records the special operations performed by the driver and the number of abnormal conditions that have been input into the HV control ECU.



(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the System Select screen, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) Select the menu to view the number of special operations or controls that have been effected.

HINT:

- Latest Operation (Latest Oper): Among the past occurrences, the number of special operations or controls that have been effected during the most recent 1 trip detection.
- Latest Trip (Latest Trip): The number of trips after the occurrence of Latest Operation.
- Operation before Latest (Bef Latst Oper): The number of occurrences 1 previously from Latest Operation.
- Trip before Latest (Bef Latst Trip): The number of trips after the occurrence of Operation before Latest.

Operation history data:

Intelligent Tester II Display (abbreviation)	Count Condition
Shift gear before READY (SHIFT BEF READY)	Selector lever moved when READY lamp blinking
N range control by busy shift (N RANGE CTRL 2) [Corrected]	N position control effected due to frequent shifting operation (shifted to N)
Step accelerator in N range (STEP ACCEL IN N)	Accelerator pedal depressed in N position
Auxiliary Battery Low (AUX. BATT LOW) [Corrected]	Auxiliary battery voltage below 9.5 V (Power switch cannot be turned on (READY))
HV ECU Intermittent problems (HV INTERMITTENT)	Instantaneous open at IGSW terminal of HV control ECU
MG2 (No1) temperature high (MG2 (NO1) TEMP HIGH) [Corrected]	Motor temperature climbed above 174°C (345°F) Motor output is limited. In addition to a motor malfunction, a cooling system malfunction or high engine load (at low vehicle speed) can be suspected.
MG2 (No2) temperature high (MG2 (NO2) TEMP HIGH)	Transaxle fluid temperature climbed above 162°C (324°F)
MG2 (motor) Inverter temperature high (MG2 INV TEMP HI) [Corrected]	Motor inverter temperature climbed above 111°C (232°F) Motor inverter output is limited. In addition to a motor inverter malfunction, a cooling system malfunction or high vehicle load (at low vehicle speed) can be suspected.

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Intelligent Tester II Display (abbreviation)	Count Condition
MG1 (generator) Inverter temperature high (MG1 INV TEMP HI) [Corrected]	Generator inverter temperature climbed above 111°C (232°F) Generator inverter output is limited. In addition to a generator inverter malfunction, a cooling system malfunction or high vehicle load (at low vehicle speed) can be suspected.
Main Battery low voltage (MAIN BATT LOW)	Battery state of charge dropped below 30% (The vehicle will not be able to be driven using EV drive mode and power will be reduced.)
Resister over heat (RESIST OVR HEAT)	Limit resistor forecast temperature climbed above 120°C (248°F) Since resistor is connected to SMRP (precharge system main relay), the resistor may overheat if the power switch is repeatedly turned on (READY) and off. The power switch temporarily cannot be turned on (READY), turn the power switch off and leave the vehicle as is for a while.
Coolant heating (COOLANT HEAT)	Inverter coolant forecast temperature climbed above 65°C (149°F) Output limit is set. Cooling system malfunction or high vehicle load (driven slowly) can be suspected.
Converter heating (CONVERTER HEAT)	Boost converter temperature climbed above 111°C (232°F) Boost converter output is limited. In addition to a boost converter malfunction, a cooling system malfunction or high vehicle load (at low vehicle speed) can be suspected.
Shift P in running (SHIFT P IN RUN)	Shifted to P while driving
Shift backward direction (BKWRD DIR SHIFT)	Shifted to R while moving forward or to D or B while moving in reverse
Prevention control of staying (PREVENT STAYING)	Engine speed stays in resonance frequency band

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05IHH–01

DATA LIST/ACTIVE TEST

1. DATA LIST

NOTICE:

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

HINT:

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

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the System Select screen, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) According to the display on the tester, read DATA LIST.

Intelligent Tester II Display (abbreviation)	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
Engine Coolant Temp (Coolant Temp)	Engine coolant temperature/ Min.: –40°C, Max.: 140°C	After warming up: 80 to 100°C (176 to 212°F)	• If the value is –40°C (–40°F): Open in sensor circuit • If the value is 140°C (284°F): Short in sensor circuit
Vehicle Spd (Vehicle Spd)	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	—
Engine Run Time (Eng Run Time)	Elapsed time after starting engine Min.: 0 s, Max.: 65,535 s	—	—
+B (+B)	Auxiliary battery voltage/ Min.: 0 V, Max.: 65.535 V	[Added] Constant: Auxiliary battery voltage ±3 V	The voltage will be between approximately 13 V and 15.5 V when the power switch is on (READY) and it will be approximately 12 V (same as the auxiliary battery voltage) when the power switch is on (IG). If the voltage becomes 11 V or lower when the power switch is on (READY), a DC/DC converter DTC will be stored. If the voltage becomes 9.5 V or lower, the power switch will not be able to be turned on (READY).
Accel Pedal Pos #1 (Accel Pos #1)	Accelerator pedal position sensor No. 1/ Min.: 0 %, Max.: 100 %	Accelerator pedal depressed: Changes with accelerator pedal pressure	—
Accel Pedal Pos #2 (Accel Pos #2)	Accelerator pedal position sensor No. 2/ Min.: 0 %, Max.: 100 %	Accelerator pedal depressed: Changes with accelerator pedal pressure	—
Ambient Temperature (Ambient Temp)	Ambient air temperature/ Min.: –40°C, Max.: 215°C	Power switch ON (IG): Same as ambient air temperature	—
Intake Air Temperature (Intake Air Temp)	Intake air temperature/ Min.: –40°C, Max.: 140°C	Constant: Same as ambient air temperature	—

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Intelligent Tester II Display (abbreviation)	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
DTC Clear Warm Up (DTC Clear Warm)	The number of times engine is warmed up after clearing DTCs/ Min.: 0, Max.: 255	CHK ENG OFF, engine coolant temperature increases from below 22°C (71.6°F) before starting the engine to above 70°C (158°F) after starting the engine: Increases once	—
DTC Clear Run Distance (DTC Clear Run)	Drive distance after clearing DTCs/ Min.: 0 km, Max.: 65,535 km	—	—
DTC Clear Min (DTC Clear Min)	Elapsed time after clearing DTCs/ Min.: 0 min, Max.: 65,535 min	—	—
MIL on Run Distance (MIL on Run Dist)	Drive distance after malfunction occurrence/ Min.: 0 km, Max.: 65,535 km	—	—
MIL on Engine Run Time (MIL On Eng Time)	Elapsed time after starting engine with CHK ENG ON/ Min.: 0 min, Max.: 65,535 min	—	—
MIL Status (MIL Status)	CHK ENG status/ ON or OFF	CHK ENG ON: ON	Constant ON: Repair in accordance with detected DTCs
Motor (MG2) Revolution (MG2 Rev)	MG2 revolution/ Min.: –16,383 rpm, Max.: 16,383 rpm	[Added] —	Motor (MG2) revolution speed changes in proportion to the vehicle speed. Motor (MG2) revolution speed is not affected by the accelerator opening angle, engine speed or generator (MG1) revolution speed.
Motor (MG2) Torq (MG2 Torq)	MG2 torque/ Min.: –500 Nm, Max.: 500 Nm	—	—
M (MG2) Trq Exec Val (MG2 Trq Exc Val)	MG2 torque execution value/ Min.: –512 Nm, Max.: 508 Nm	After full–load acceleration with READY lamp ON and engine stopped: Less than ±20 % of MG2 TORQ	— [Added]
Generator (MG1) Rev (MG1 Rev)	MG1 revolution/ Min.: –16,383 rpm, Max.: 16,383 rpm	—	Generator (MG1) revolution speed is set to obtain the target engine speed.
Generator (MG1) Torq (MG1 Torq)	MG1 torque/ Min.: –500 Nm, Max.: 500 Nm	—	—
G (MG1) Trq Exec Val (MG1 Trq Exc Val)	MG1 torque execution value/ Min.: –512 Nm, Max.: 508 Nm	1 second has elapsed after the engine was started automatically with READY lamp ON, engine stopped, A/C fan Hi, head lamp ON and the P position: Less than ±20 % of MG1 TORQ	—
Regenerative Brake Torq (Regen Exec Torq)	Regenerative brake execution torque/ Min.: 0 Nm, Max.: 186 Nm	—	— [Added]
Rqst Regen Brake Torq (Regen Rqst Torq)	Regenerative brake request torque/ Min.: 0 Nm, Max.: 186 Nm	Vehicle speed 30 km/h (19 mph) and master cylinder hydraulic pressure –200 Nm: Changes with brake pedal pressure	During regeneration, current flows from the motor (MG2) to charge the HV battery making the braking torque.
Inverter Temp–(MG1) (MG1 Invert Temp)	MG1 inverter temperature/ Min.: –50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is –50°C (–58°F): +B short in sensor circuit • If the value is 205°C (401°F): Open or GND short in sensor circuit

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Intelligent Tester II Display (abbreviation)	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
Inverter Temp–(MG2) (MG2 Invert Temp)	MG2 inverter temperature/ Min.: –50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is –50°C (–58°F): +B short in sensor circuit • If the value is 205°C (401°F): Open or GND short in sensor circuit
Motor Temp No2 (Motor2 Temp)	Transaxle fluid temperature/ Min.: –50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is –50°C (–58°F): Open or +B short in sensor circuit • If the value is 205°C (401°F): GND short in sensor circuit
Motor Temp No1 (Motor1 Temp)	MG2 motor temperature/ Min.: –50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 80°C (77 to 176°F)	• If the value is –50°C (–58°F): Open or +B short in sensor circuit • If the value is 205°C (401°F): GND short in sensor circuit
Converter Temperature (Converter Temp)	Boost converter temperature/ Min.: –50°C, Max.: 205°C	• Undisturbed for 1 day at 25°C (77°F): 25°C (77°F) • Street driving: 25 to 60°C (77 to 140°F)	• If the value is –50°C (–58°F): +B short in sensor circuit • If the value is 205°C (401°F): Open or GND short in sensor circuit
Accelerator Degree (Accelerator)	Accelerator pedal depressed angle/ Min.: 0 %, Max.: 100 %	Accelerator pedal depressed: Changes with accelerator pedal pressure	— [Added]
Request Power (Power Rqst)	Engine power output request value/ Min.: 0 W, Max.: 320,000 W	—	The HV control ECU sends a “Request Power” command to the ECM.
Target Engine Rev (Target Eng Spd)	Target engine speed/ Min.: 0 rpm, Max.: 8,000 rpm	—	The HV control ECU sends a “Target Engine Rev” command to the ECM.
Engine Spd (Engine Spd)	Engine speed/ Min.: 0 rpm, Max.: 8,000 rpm	Idling*: 950 to 1,050 rpm	—
Vehicle Spd (Vehicle Spd)	Resolver vehicle speed/ Min.: –256 km/h, Max.: 254 km/h	Driving at 40 km/h (25 mph): 40 km/h (25 mph)	— [Added]
Master Cylinder Ctrl Trq (Mcyl Ctrl Power)	Braking torque that is equivalent to the master cylinder hydraulic pressure/ Min.: –512 Nm, Max.: 508 Nm	Brake pedal depressed: Changes with brake pedal pressure	Total braking torque value: Master Cylinder Ctrl Trq = hydraulic brake control torque + regenerative brake torque
Status of Charge (SOC)	Battery state of charge/ Min.: 0 %, Max.: 100 %	Constant: 0 to 100 %	SOC is mainly calculated from the charging and discharging amperage.
WOUT Control Power (WOUT Ctrl Power)	Discharge control power value/ Min.: 0 W, Max.: 81,600 W	21,000 W or less	—
WIN Control Power (WIN Ctrl Power)	Charge control power value/ Min.: –40,800 W, Max.: 0 W	–25,000 W or more	—
Discharge Rqst to SOC (Dchg Rqst SOC)	Discharge request to adjust SOC/ Min.: –20,480 W, Max.: 20,320 W	• Uniform on–board charging: –4,400 W • Usually: 0 W	—
Power Resource VB (Pwr Resource VB)	HV battery voltage/ Min.: 0 V, Max.: 510 V	READY lamp ON and P position: 150 to 300 V	—
Power Resource IB (Pwr Resource IB)	HV battery current/ Min.: –256 A, Max.: 254 A	—	—
VL–Voltage before Raise (VL)	High voltage before it is boosted/ Min.: 0 V, Max.: 510 V	Power switch ON (READY): Practically the same as the HV battery voltage	• If the value is 0 V: Open or GND short in sensor circuit • If the value is 510 V: +B short in sensor circuit

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Intelligent Tester II Display (abbreviation)	Measurement Item/Range (Display)	Reference Range	Diagnostic Note
VH–Voltage after Raise (VH)	High voltage after it is boosted/ Min.: 0 V, Max.: 765 V	Engine revved up in P position: HV battery voltage to 500 V	• If the value is 0 V: Open or GND short in sensor circuit • If the value is 765 V: +B short in sensor circuit When cranking the engine, the maximum voltage (about 500 V) is observed.
Raising Pressure Ratio (Rais Pres Ratio)	Boost ratio/ Min.: 0 %, Max.: 100 %	The pre–boost voltage and the post–boost voltage are equal: 0 to 10 %	— [Added]
Drive Condition ID (Drive Condition)	Drive condition ID/ Min.: 0, Max.: 6	• Engine stopped: 0 • Engine about to be stopped: 1 • Engine about to be started: 2 • Engine operated or operating: 3 • Generating or loading movement: 4 • Revving up with P position: 6	—
Shift Sensor Main (M Shift Sensor)	Output voltage of the shift position sensor (main)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: 2.0 to 3.0 V • Shifting into R position: LHD: 4.0 to 4.8 V RHD: 0.2 to 1.0 V • Shifting into B or D position: LHD: 0.2 to 1.0 V RHD: 4.0 to 4.8 V	—
Shift Sensor Sub (S Shift Sensor)	Output voltage of the shift position sensor (sub)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: 2.0 to 3.0 V • Shifting into R position: LHD: 4.0 to 4.8 V RHD: 0.2 to 1.0 V • Shifting into B or D position: LHD: 0.2 to 1.0 V RHD: 4.0 to 4.8 V	—
Shift Sensor Select Main (Sm Shift Sensor)	Output voltage of the select position sensor (main)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: LHD: 0.5 to 2.0 V RHD: 3.0 to 4.85 V • Shifting into R, N or D position: LHD: 3.0 to 4.85 V RHD: 0.5 to 2.0 V	—
Shift Sensor Select Sub (Ss Shift Sensor)	Output voltage of the select position sensor (sub)/ Min.: 0 V, Max.: 5 V	• Selector lever in home position: LHD: 0.5 to 2.0 V RHD: 3.0 to 4.85 V • Shifting into R, N or D position: LHD: 3.0 to 4.85 V RHD: 0.5 to 2.0 V	—
Shift Sensor Shift Pos (Shift Position)	Shift position	P, R, N, D or B	—
A/C Consumption Pwr (A/C Consmpt Pwr)	A/C consumption power/ Min.: 0 kW, Max.: 5 kW	—	—
Driving Condition (Drive Condition)	Driving condition	• MG1 load: MG1 • MG2 load: MG2	—
Short Wave Highest Val (Short Wave High)	Waveform voltage in leak detection circuit in battery ECU/ Min.: 0 V, Max.: 5 V	READY lamp is left ON for 2 minutes, and the pre–boost voltage and the post–boost voltage are equal: 4 V or more	—
Type of ECU (ECU Type)	Type of ECU	HV ECU	—

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DTC	P0851/579	PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW

DTC	P0852/580	PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH

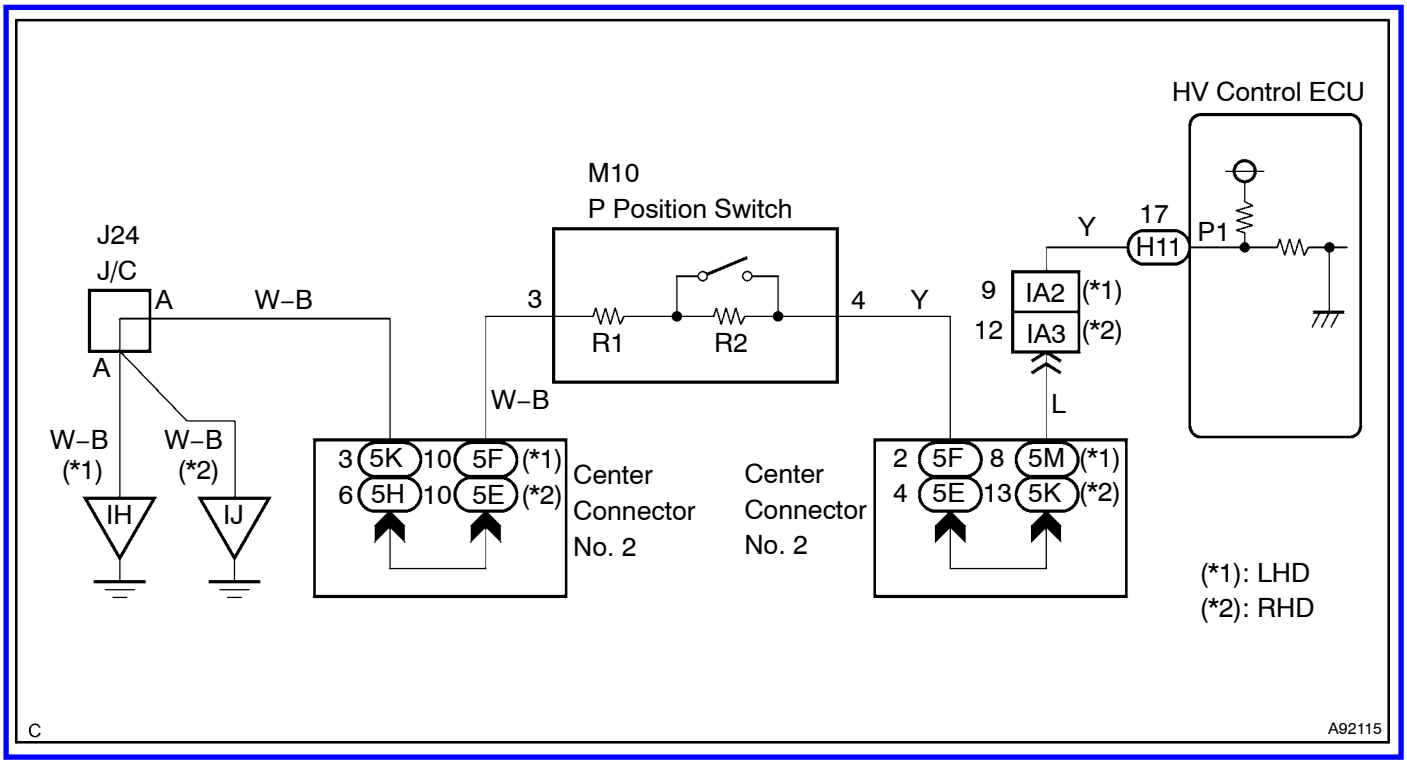
CIRCUIT DESCRIPTION

Instead of having a parking position as one of the positions of the conventional shift lever, a P position switch is provided independently in the upper area of the selector lever. The switch is based on a momentary type operation mode, in which the button does not lock mechanically.

The P position switch contains resistors R1 and R2. When the P position switch is not pressed, the switch provides a combined resistance of R1 and R2; and when the P position switch is pressed, the switch provides only the resistance of R1. The voltage at the P1 terminal of the HV control ECU varies with the changes in the resistance of the switch. The HV control ECU determines the P position switch operation intended by the driver according to this resistance signal.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0851	579	GND short in P position switch circuit	• Wire harness or connector • P position switch • HV control ECU
P0852	580	Open or +B short in P position switch circuit	• Wire harness or connector • P position switch • HV control ECU

WIRING DIAGRAM



[Corrected]

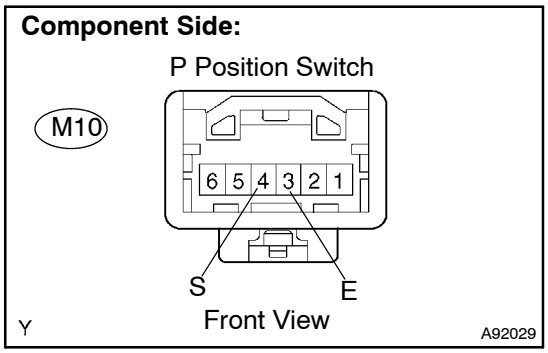
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[Added]

INSPECTION PROCEDURE

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Turn the power switch on (IG) and wait for 5 seconds or more.

1 INSPECT P POSITION SWITCH



(a) Remove the P position switch.
(b) Check the resistance between the terminals of the P position switch connector.

Standard:

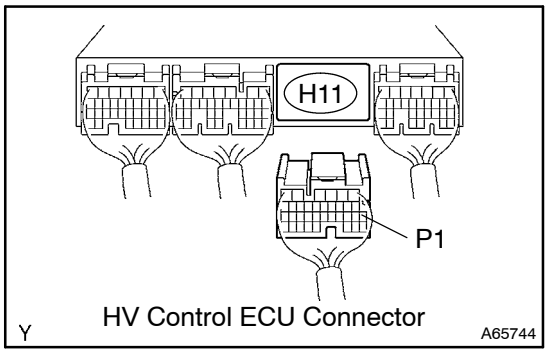
Symbols (Terminal No.)	Condition	Resistance
S (M10–4) – E (M10–3)	Keep switch pressed	680 Ω
S (M10–4) – E (M10–3)	Release switch	4,580 Ω

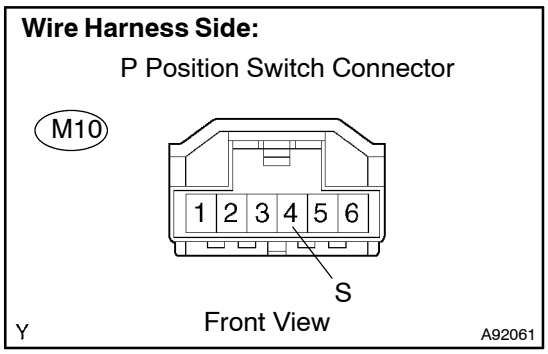
(c) Reinstall the P position switch.

NG → REPLACE P POSITION SWITCH

OK

2 CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – P POSITION SWITCH)





(a) Disconnect the H11 HV control ECU connector.
(b) Disconnect the M10 P position switch connector.
(c) Turn the power switch ON (IG).
(d) Measure the voltage between the terminal of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
P1 (H11–17) – Body ground	Below 1 V

(e) Turn the power switch OFF.
(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
P1 (H11–17) – S (M10–4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
P1 (H11–17) or S (M10–4) – Body ground	10 kΩ or higher

(g) Reconnect the P position switch connector.
(h) Reconnect the the HV control ECU connector.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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DTC	P0A08/264	DC/DC CONVERTER STATUS CIRCUIT

CIRCUIT DESCRIPTION

[Corrected]

This DTC is stored when the electric vehicle converter assembly stops due to a circuit malfunction or a fail–safe function and the auxiliary battery voltage is 11 V or less during READY ON. When the auxiliary battery voltage becomes low, the electric vehicle converter assembly sends a signal to the NODD terminal of the HV control ECU via the NODD signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A08	[Corrected] 264	Either of the following conditions below is detected • DC/DC converter internal circuit malfunction is detected • DC/DC converter enters fail–safe mode • Auxiliary battery voltage drops below 11 V	• Auxiliary battery • FL block • HV control ECU • Fuse (for 12 V electrical equipment) • Engine room R/B • Inverter cooling hose • Water w/ motor and bracket pump assy • Cooling fan motor • Cooling fan motor No.2 • Wire harness or connector • Electric vehicle converter assembly

Related Data List

DTC No.	INF Code	DTC Detection Condition
P0A08	264	• +B • Inverter Temp–(MG1)*1 • Inverter Temp–(MG2)*1 • Motor Temp No1*1 • Motor Temp No2*1 • Short Wave Highest Val

*1: When the inverter is overheating, the electric vehicle converter assembly has self–protection control that suspends the electric vehicle converter assembly control. As this time, this DTC may be stored.

HINT:

- When the NODD signal line is open, electric vehicle converter assembly control is prohibited and the auxiliary battery voltage will be approximately 12 V (or less).
- Regarding NODD signal circuit, when the transistor of the HV control ECU turns on, a signal is sent to the inverter to prohibit electric vehicle converter assembly control. Sends a malfunction signal to the hybrid vehicle control ECU when the inverter side transistor is on.

WIRING DIAGRAM

Refer to DTC P0A09 (INF 265) on page 05–311.

[Added]

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INSPECTION PROCEDURE

[Added]

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.
- After repair, clear the DTCs, turn the power switch off and wait for 30 seconds or more and perform the following procedure to confirm that the auxiliary battery low voltage indicated by this DTC has been repaired.

  (a)Wait for 2 minutes with park (P) selected, the power switch on (READY) and the following conditions met, then confirm that Data List item “+B” is between 13.0 and 15.0 V.

  (1)Headlight switch is in the HI position.

  (2)A/C blower fan switch is in the HI position.

  (3)Window defogger switch is turned on.

  (If charging cannot be made and the electrical load increases, +B voltage may not be steady and gradually drops.)
- By performing the following procedure, the electric vehicle converter assembly function can be checked.

  (a)Connect the AC/DC 400 A probe to the positive auxiliary battery cable.

  (1)Turn the power switch on (READY) and leave the vehicle as it is until the electric current flowing into the auxiliary battery becomes 10 A or less.

  (2)Turn the power switch on (READY) and the headlight switch and A/C blower fan switch in the HI position, and the window defogger turned on.

  (3)Confirm that the current drawn from the auxiliary battery is 0 A or lower and the auxiliary battery voltage is between 13.0 and 15.0 V.
- This DTC is stored when the power switch is on (READY) and the auxiliary battery voltage is 11 V or less. Therefore, this DTC may be also stored when a part other than the electric vehicle converter assembly is malfunctioning or depending on user operation.

Malfunction cases to store DTC P0A08–264

Malfunction Case	Remarks	Inspection Step
Fuse is blown. (MAIN, DCDC–S, DCDC)	–	7
The connector between the auxiliary battery and electric vehicle converter assembly is not connected securely.	–	2 to 4, 6, 9 to 11
High–voltage insulation between the inverter, MG1, MG2 and body ground is poor.	DTC P0AA6 may be stored if the ground voltage potential fluctuates due to a high–voltage insulation malfunction.	1
A signal connector of the HV control ECU or inverter is not connected securely.	–	8 to 11
The electric vehicle converter assembly is malfunctioning.	Inspect the electric vehicle converter assembly function.	13
Control is suspended due to overheating. (The inverter water pump is malfunctioning, the coolant is not sufficient, a hose is clogged, etc.)	When the inverter is overheating, the electric vehicle converter assembly has selfprotection control that suspends the electric vehicle converter assembly control. At that time, this DTC may be stored. The suspended electric vehicle converter assembly control will return to normal by clearing the DTCs and turning the power switch off.	13 to 18, 20

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- If this vehicle was used to jump start other vehicle with a discharged battery, a fuse may blow due to overcurrent or the electric vehicle converter assembly self–protection may be activated. Also, if this vehicle is jump started by a vehicle with a 24 V battery, the same malfunction may occur and this DTC may be stored. (The suspended electric vehicle converter assembly control will return to normal by clearing the DTCs and turning the power switch off.)
- Confirm that high electrical load equipment such as a high–capacitance audio device or electric kettle is used on vehicle. (A fuse of the auxiliary battery may be blown due to overcurrent.)
- If the electric vehicle converter assembly is malfunctioning, the auxiliary battery cannot be charged. Therefore, once the power switch is turned off, it may be impossible to turn it on (READY) again if the auxiliary battery is completely discharged. In this case, charge the auxiliary battery. Be careful that charging cannot be performed during the inspection.

1	CHECK FOR DTC

(a) Clear the DTC(s) (see page 05–246).
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the power switch ON (IG) and turn the intelligent tester II ON.
(d) Read DTC(s).

Result:

Result	Proceed to
One or more of following DTCs is output: P0AA1, P0AA2, P0AA4, P0AA5, P3000, P3004, P3009, P3110, P0A94, P0A93	A
P0A08 is output	B

[Corrected]

A → **Go to DIAGNOSTIC TROUBLE CODE CHART (See page 05–268)**

B

2	CHECK CABLE CONNECTION FROM AUXILIARY BATTERY TERMINAL

(a) Turn the power switch OFF.
(b) Check the auxiliary battery (12 V) cable connections at places listed below:

- The battery positive and negative terminals are not loosening.
- The body ground of the battery negative cable is not loosening.
- The FL block nut is not loosening.

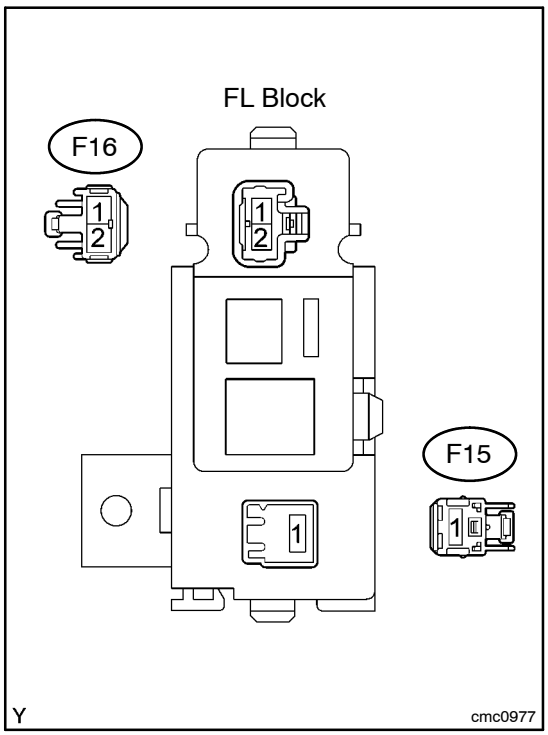
OK: They are not loosening.

NG → **CONNECT OR INSTALL SECURELY**

OK

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3	CHECK CONNECTION OF CONNECTORS (FL BLOCK)



(a) Check that the F15 and F16 connectors are securely connected to the FL block.
OK: Connectors are connected securely.

[Corrected]

NG → **CONNECT OR INSTALL SECURELY**

OK [Corrected]

4	CHECK CONNECTOR (FL BLOCK)

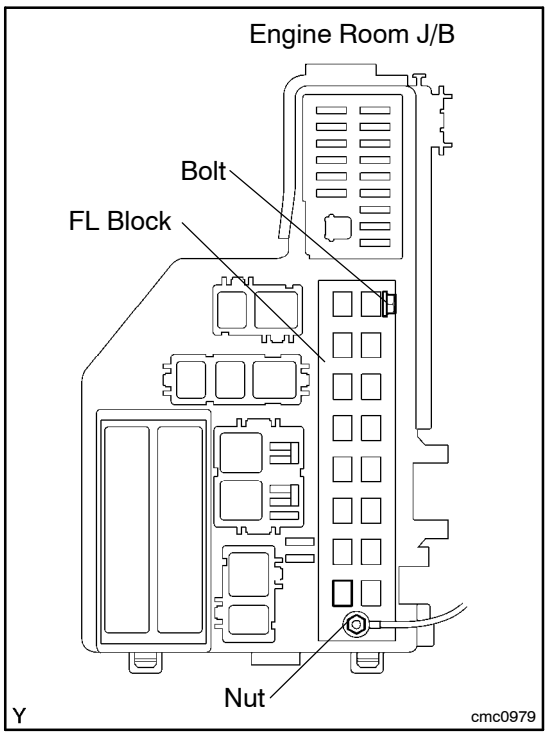
(a) Check that the F15 and F16 connector terminals do not have burnout.
OK: There is no burnout.

NG → **REPAIR OR REPLACE CONNECTOR**

OK

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7	CHECK FUSIBLE LINK



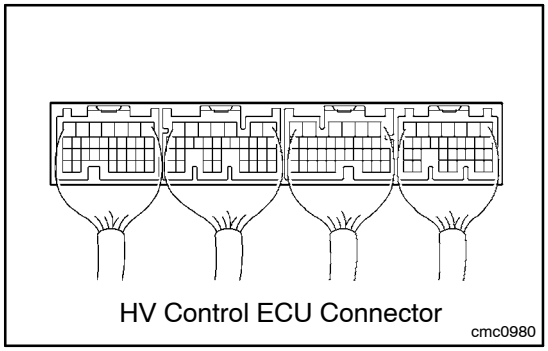
(a) Measure the resistance between the bolts and nut from the FL block.
Standard: Below 1 Ω

[Corrected]

NG → **Go to step 22**

OK

8	CHECK CONNECTION OF CONNECTORS (HV CONTROL ECU)



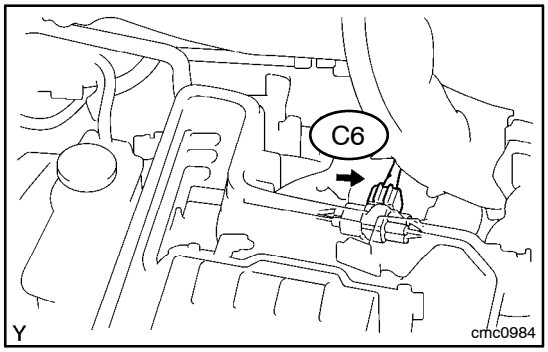
(a) Check the connection condition of all the connectors at the HV control ECU.
OK: Connectors are connected securely.

NG → **CONNECT SECURELY**

OK

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11	CHECK CONNECTOR (W/ CONVERTER INVERTER ASSY)



(a) Disconnect the C6 connector.
(b) Check that the C6 connector terminal does not have burnout.
OK: There is no burnout.

NG → **REPAIR OR REPLACE CONNECTOR**

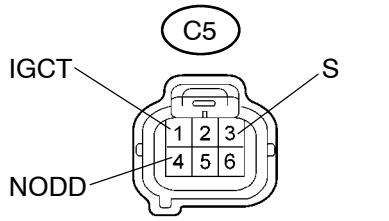
OK

[Corrected]

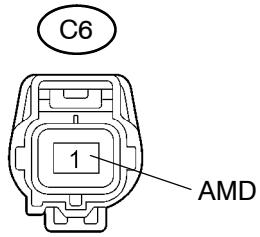
CONNECT SECURELY

12	CHECK WIRE HARNESS (W/ CONVERTER INVERTER ASSY – BATTERY AND BODY GROUND)

Wire Harness Side:



w/ Converter Inverter Assy



w/ Converter Inverter Assy

Y cmc0985

(a) Disconnect the C5 and C6 converter inverter connectors.
(b) Turn the power switch ON (IG).
(c) Measure the voltage of the wire harness side connectors.
Standard:

Tester connection	Condition	Specified condition
C5–3 (S) – Body ground	Always	Some as 12 V battery voltage
C5–4 (NODD) – Body ground	IG–OFF	120 to 140 kΩ
C6–1 (AMD) – Body ground	Always	Some as 12 V battery voltage
C5–1 (IGCT) – Body ground	Power switch ON (IG)	8 to 16 V

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

OK

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13 CHECK DC/DC CONVERTER FUNCTION

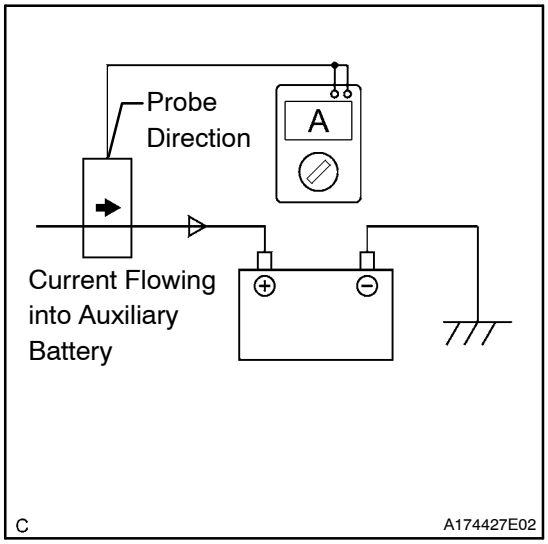
HINT:Measure the current flowing at the auxiliary battery instead.

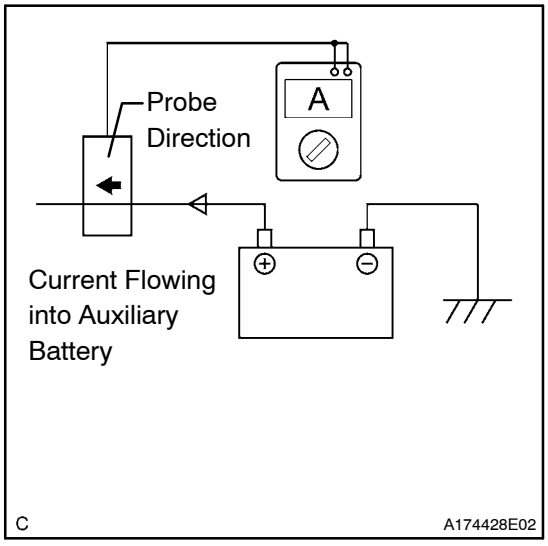
(a) Connect the AC/DC 400 A probe to the positive auxiliary battery line.

(b) Install the service plug grip.

(c) Turn the power switch on (READY) and leave the vehicle as it is until the electric current flowing into the auxiliary battery becomes 10 A or less.

(d) Measure the current flowing from the auxiliary battery with the power switch on (READY), the headlight position switch and blower motor switch in the HI position, and the rear window defogger turned on.





Standard Current

Item	Switch Condition	Specified Condition
Current flowing from auxiliary battery	Power switch on (READY) (The headlight position switch and blower motor switch are in the HI position, and the rear window defogger is turned on.)	0 A or less (no current from auxiliary battery)

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

Standard Voltage

Tester Connection	Switch Condition	Specified Condition
Auxiliary battery voltage	Power switch on (READY) (The headlight position switch and blower motor switch are in the HI position, and the rear window defogger is turned on.) 13 to 15 V	13 to 15 V

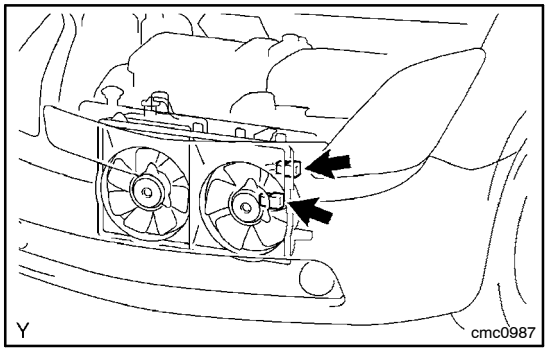
(f) Turn the power switch off.

NG → **Go to step 20**

OK

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18	CHECK CONNECTION CONDITION OF FAN ASSY W/MOTOR CONNECTOR (LOOSENESS AND POOR CONNECTION)



(a) Check the connection condition of the fan connectors.
OK: Connectors have been connected securely.

NG → **CONNECT SECURELY**

OK

19	INSPECT COOLING FAN MOTOR (See page 16–8)

NG → **REPLACE COOLING FAN MOTOR**

OK

[Corrected]

20	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A08–264 is output.	A
Only electric vehicle converter assembly related DTCs are output.	A
Power module intelligent transistor set or w/ converter inverter assembly related DTCs are also output.	B

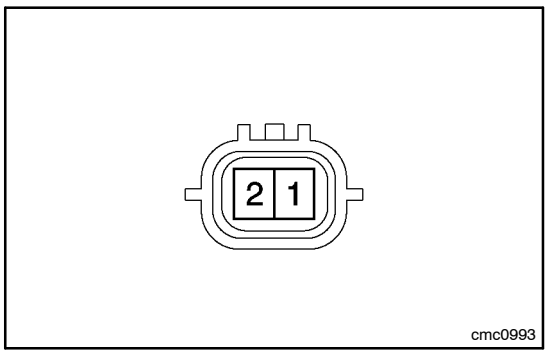
B → **REPLACE W/ CONVERTER INVERTER ASSY (See page 21–25)**

A

REPLACE ELECTRIC VEHICLE CONVERTER ASSEMBLY

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21	CHECK WATER W/MOTOR & BRACKET PUMP ASSY



(a) Remove the water w/ motor & bracket pump assy.
(b) Connect the battery positive terminal to terminal 2 and the battely negative terminal to terminal 1.
(c) Check that the pump motor operates properly.

NOTICE:

- **Do not connect the positive and negative poles of the battery to the wrong terminals.**
- **Complete the check within 10 seconds of connection.**

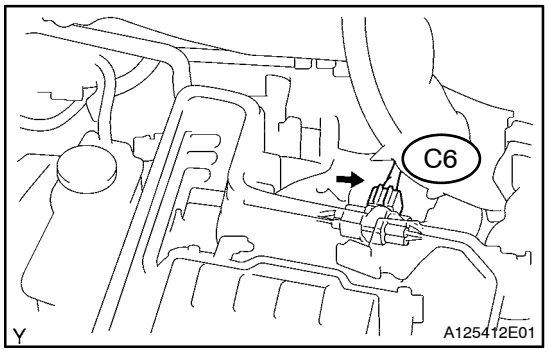
OK: Pump motor operates properly.

NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

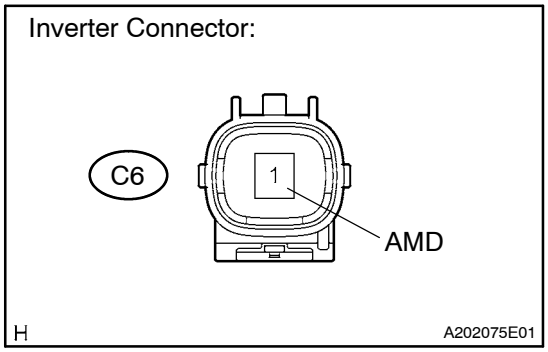
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (WATER W/MOTOR & BRACKET PUMP ASSY CIRCUIT)

22	CHECK W/ CONVERTER INVERTER ASSEMBLY (AMD TERMINAL)



(a) Disconnect the battery negative terminal.
(b) Disconnect the C6 connector.



(c) Measure the resistance between the C6 connector terminal of the w/converter inverter assembly and body ground.

Standard resistance

Tester Connection	Specified Condition
C6–1(AMD) – Body ground	10 kΩ or higher

(d) Connect the C6 connector.

NG → **Go to step 23**

OK

REPLACE FUSIBLE LINK BLOCK (DC/DC FUSE) AND REPAIR THE SHORT CIRCUITS

[Corrected]

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23	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A08–264 is output.	A
Only electric vehicle converter assembly related DTCs are output.	A
Power module intelligent transistor set or w/ converter inverter assembly related DTCs are also output.	B

B → **REPLACE W/ CONVERTER INVERTER ASSEY AND FUSIBLE LINK BLOCK (DC/ DC FUSE)**

A

REPLACE ELECTRIC VEHICLE CONVERTER ASSEMBLY AND FUSIBLE LINK BLOCK (DC/DC FUSE)

[Corrected]

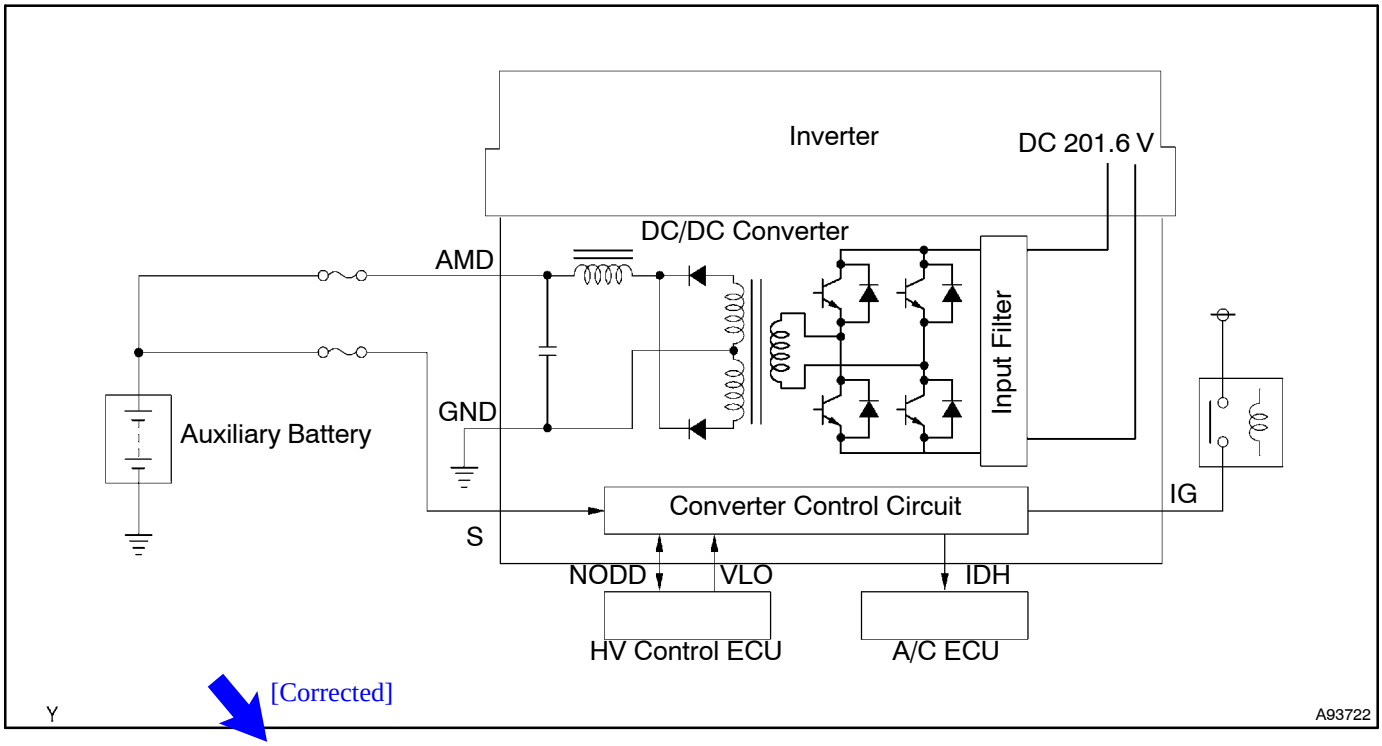
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DTC	P0A09/265	DC/DC CONVERTER STATUS CIRCUIT LOW INPUT

DTC	P0A10/263	DC/DC CONVERTER STATUS CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

The DC/DC converter converts the DC 201.6 V of the HV battery into DC 12 V in order to supply power to the vehicle's lighting, audio and ECU systems. In addition, it charges the auxiliary battery.
A transistor bridge circuit initially converts DC 201.6 V into alternating current, and a transformer lowers its voltage. Then, it is rectified and smoothed (into DC) and converted into DC 12 V.
The DC/DC converter controls the output voltage in order to keep a constant voltage at the terminals of the auxiliary battery.

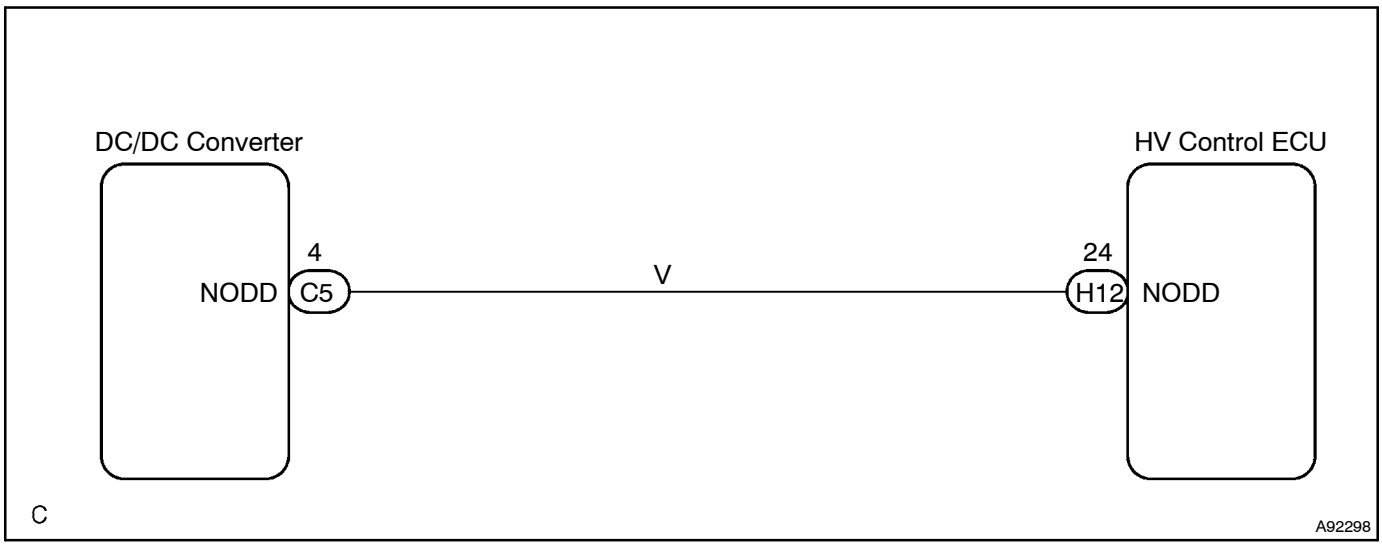


The HV control ECU sends a signal to prohibit the electric vehicle converter assembly via the NODD signal line when a malfunction is detected. The w/ converter inverter assembly sends a signal to inform the HV control ECU of the charging system condition. A signal is sent to warn the driver if the auxiliary battery voltage is less than 11 V.
If the vehicle is being driven with an inoperative electric vehicle converter assembly, the voltage of the auxiliary battery will drop, which will prevent the continued operation of the vehicle. Therefore, the HV control ECU monitors the operation of the electric vehicle converter assembly and alerts the driver if it detects a malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A09	265	Open or GND short in NODD signal circuit of electric vehicle converter assembly (1 trip detection logic)	• Wire harness or connector • HV control ECU • Electric vehicle converter assembly
P0A10	263 [Corrected]	+B short in NODD signal circuit of electric vehicle converter assembly (1 trip detection logic)	• Wire harness or connector • HV control ECU • Electric vehicle converter assembly

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WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

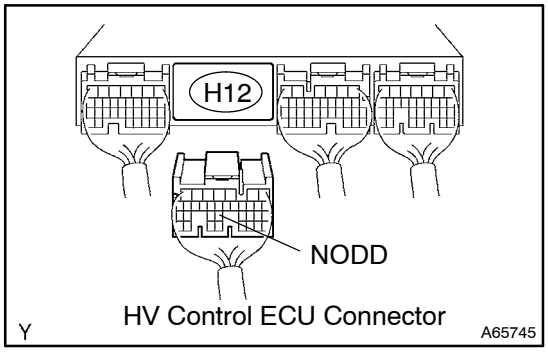
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 10 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.
- When the NODD signal line is open, electric vehicle converter assembly control is prohibited and the auxiliary battery voltage will be approximately 12 V (or less).
- When the transistor of the HV control ECU turns on, a signal is sent to the inverter to prohibit electric vehicle converter assembly control. The w/ converter inverter assembly sends a malfunction signal to the HV control ECU when the inverter side transistor is on.

[Added]

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1	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – DC/DC CONVERTER)



(a) Disconnect the H12 HV control ECU connector.
(b) Disconnect the C5 DC/DC converter connector.
(c) Turn the power switch ON (IG).
(d) Measure the voltage between the terminal of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
NODD (H12–24) – Body ground	Below 1 V

(e) Turn the power switch OFF.
(f) Check the resistance between the wire harness side connectors.

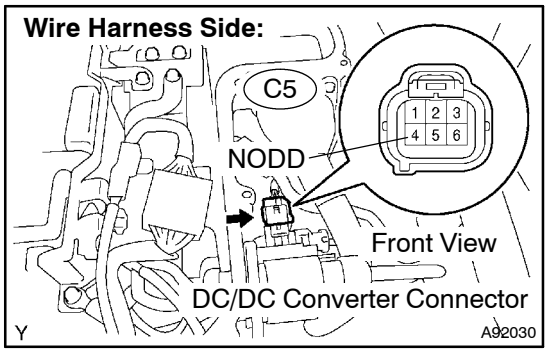
Standard (Check for open):

Tester Connection	Specified Condition
NODD (H12–24) – NODD (C5–4)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
NODD (H12–24) or NODD (C5–4) – Body ground	10 kΩ or higher

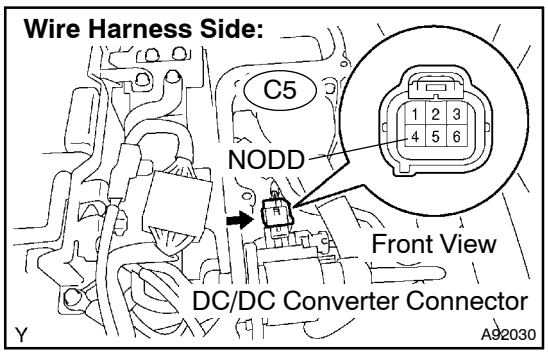
(g) Reconnect the DC/DC converter connector.
(h) Reconnect the HV control ECU connector.



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

OK

2	CHECK HYBRID VEHICLE CONTROL ECU (NODD)



(a) Disconnect the C5 converter inverter connector.
(b) Measure the resistance between the wire harness side connector.

Tester Connection	Condition	Specified Condition
C5–4 (NODD) – Body ground	IG–OFF	110 to 150kΩ

NG → **REPLACE HYBRID VEHICLE CONTROL ECU**

OK

[Corrected]

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3	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A09–265, P0A10–263 is output.	A
Only electric vehicle converter assembly set related DTCs are output.	A
Power module intelligent transistor set or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE ELECTRIC VEHICLE CONVERTER ASSEMBLY

[Corrected]

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DTC	P0A09/591	DC/DC CONVERTER STATUS CIRCUIT LOW INPUT

DTC	P0A10/592	DC/DC CONVERTER STATUS CIRCUIT HIGH INPUT

CIRCUIT DESCRIPTION

See the description of the DC/DC converter on page 05–310.

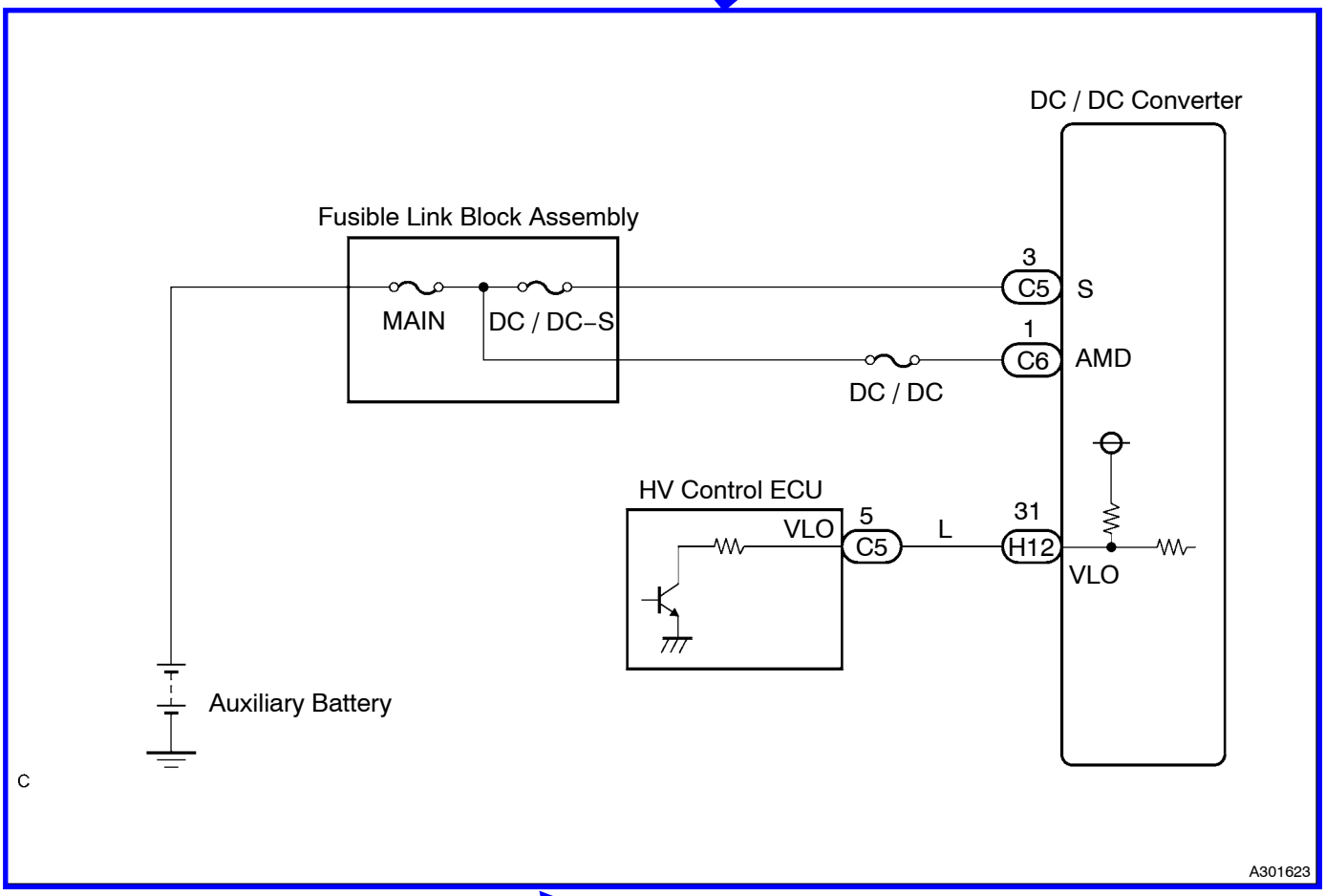
The HV control ECU sends the output voltage switch signal to the DC/DC converter via the VLO signal line in order to switch output voltage according to vehicle status.

If the vehicle is being driven with an inoperative DC/DC converter, the voltage of the auxiliary battery will drop, which will prevent the continued operation of the vehicle. Therefore, the HV control ECU monitors the operation of the DC/DC converter and alerts the driver if it detects malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A09	591	Open or GND short in VLO signal circuit of electric vehicle converter assembly (1 trip detection logic)	• Wire harness or connector • Electric vehicle converter assembly
P0A10	592	+B short in VLO signal circuit of electric vehicle converter assembly (1 trip detection logic)	• Wire harness or connector • Electric vehicle converter assembly

WIRING DIAGRAM

[Corrected]



[Corrected]

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INSPECTION PROCEDURE

[Added]

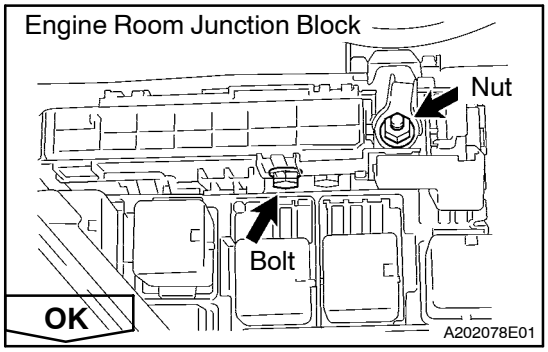
NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 10 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

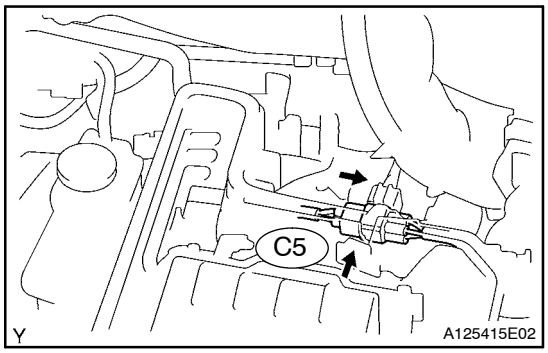
1	CHECK FUSIBLE LINK BLOCK (100A DC / DC)



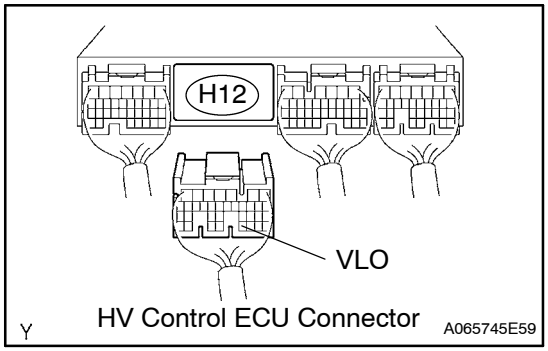
(a) Disconnect the battery negative terminal.
(b) Measure the resistance of the DC/DC fuse.
Standard resistance:
Below 1 Ω

NG	Go to step 4

2	CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU – DC / DC CONVERTER)



(a) Connect the battery negative terminal.
(b) Disconnect the H12 HV control ECU connector.
(c) Disconnect the C5 DC / DC converter connector.
(d) Turn the power switch ON (IG).



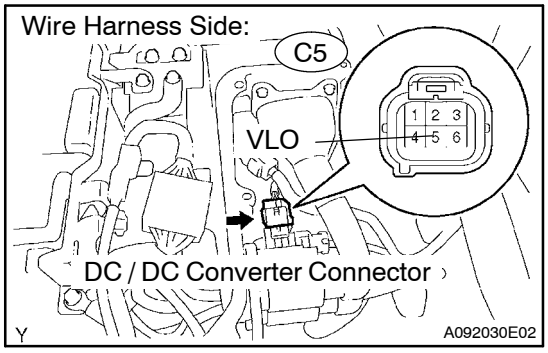
(e) Measure the voltage between the terminal of the HV control ECU connector and body ground.
Standard voltage

Tester Connection	Specified Condition
VLO (H12–31) – Body ground	Below 1 V

(f) Turn the power switch OFF.

[Corrected]

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(g) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
VLO (H12–31) – VLO (C5–5)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
VLO (H12–31) or VLO (C5–5) – Body ground	10 kΩ higher

(h) Reconnect the DC / DC converter connector.

(i) Reconnect the HV control ECU connector.

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

OK

3 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

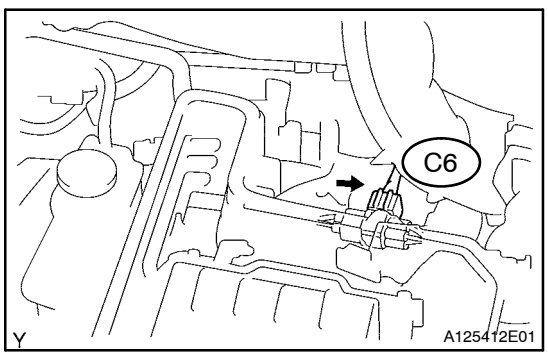
Result

Result	Proceed to
Only P0A09–591, P0A10–592 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

4 CHECK W/CONVERTER INVERTER ASSEMBLY (AMD TERMINAL)

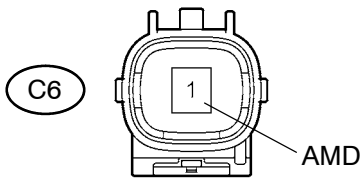


(a) Disconnect the battery negative terminal.

(b) Disconnect the C6 connector.

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Inverter Connector:



H A202075E01

(c) Measure the resistance between the C6 connector terminal of the w/converter inverter assembly and body ground.

Standard resistance

Tester Connection	Specified Condition
C6–1(AMD) – Body ground	10 kΩ or higher

(d) Connect the C6 connector.

NG → **Go to step 5**

OK

REPLACE FUSIBLE LINK BLOCK (DC/DC FUSE) AND REPAIR THE SHORT CIRCUITS

5 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A09–591, P0A10–592 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

B → **REPLACE W/CONVERTER INVERTER ASSY AND FUSIBLE LINK BLOCK (DC/ DC FUSE)**

A

REPLACE ELECTRIC VEHICLE CONVERTER ASSEMBLY AND FUSIBLE LINK BLOCK (DC/DCFUSE)

[Corrected]

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DTC	P0A0F/204	ENGINE FAILED TO START

DTC	P0A0F/205	ENGINE FAILED TO START

DTC	P0A0F/533	ENGINE FAILED TO START

DTC	P0A0F/534	ENGINE FAILED TO START

CIRCUIT DESCRIPTION

The HV control ECU performs the fail–safe control, when the ECM detects an error which will affect THS control.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A0F	204	Abnormal signal input from ECM (abnormal engine output) Actual engine torque is very low compared to the target torque. (1 trip detection logic)	• ECM • SFI system
P0A0F	205	Abnormal signal input from ECM (engine is unable to start) (1 trip detection logic)	• ECM • SFI system
P0A0F	533	Abnormal signal input from ECM (abnormal engine output by running out of fuel)	• ECM • SFI system
P0A0F	534	Abnormal signal input from ECM (engine is unable to start by running out of fuel)	• ECM • SFI system

Related Data List

DTC No.	INF Code	Data List
P0A0F	204	• Request Power • Engine Spd • Generator(MG1) Torq • Generator(MG1) Rev • Actual Engine Torque (SFI System)
P0A0F	205	
P0A0F	533	
P0A0F	534	

HINT:

- The HV control ECU stores DTC P0A0F–204, 205, 533 or 534 when it receives a DTC signal from the ECM indicating abnormal engine output or unable to start the engine by running out of fuel DTCs.
- If the engine cannot start, the vehicle is driven using EV drive mode. However, if the vehicle is continuously driven using only EV drive mode, the HV battery will be discharged and the vehicle will not be able to be driven.
- If any of these DTCs are output, it is required to repair the SFI system in accordance with the DTC or to add enough fuel.

Hybrid control system DTCs	SFI system related DTCs
P0A0F–204 (abnormal engine power)	P3190 (Poor Engine Power)
P0A0F–205 (engine starting malfunction)	P3191 (Engine does not Start)
P0A0F–533 (abnormal engine output or unable to start the engine by running out of fuel)	P3190 (Poor Engine Power) P3193 (Fuel Run Out)
P0A0F–533 (abnormal engine output or unable to start the engine by running out of fuel)	P3191 (Engine does not Start) P3193 (Fuel Run Out)

[Added]

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DTC	P0A0F/238	ENGINE FAILED TO START

CIRCUIT DESCRIPTION

The HV control ECU detects this DTC and effects fail–safe control if the engine or transaxle gear has seized up, or foreign objects have been caught in either of them. [Corrected]

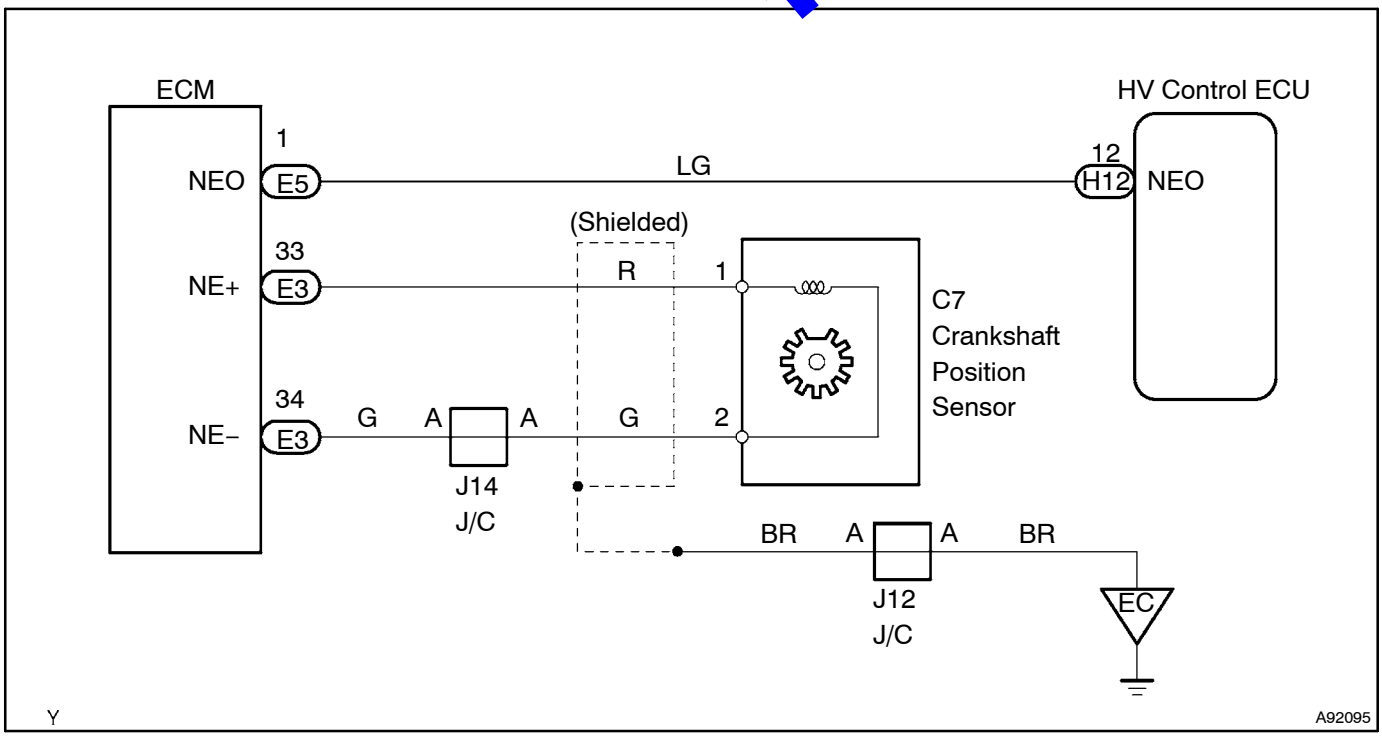
DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A0F	238	Engine does not start even though cranking it (transaxle input malfunction [engine system]) (1 trip detection logic)	• Engine assembly • HV transaxle assembly (shaft or gear) • Transmission input damper • Wire harness or connector • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P0A0F	238	• Engine Spd • Generator(MG1) Torq

WIRING DIAGRAM

[Added]



INSPECTION PROCEDURE

HINT:

- A seized engine, mechanical malfunction of the hybrid vehicle transaxle or an engine speed signal error can be suspected.
- If this DTC is output, the engine or gears in the transaxle may have seized or foreign objects have been caught in either of them. Therefore, check the engine oil, ATF and coolant levels.
- If this DTC is stored, it is necessary to clear the DTCs before turning the power switch on (READY).
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Depress the accelerator pedal by 1/2 or more opening angle while driving at 20 km/h (12 mph) or more. (3 seconds or more)

[Added]

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CIRCUIT DESCRIPTION

The HV control ECU performs self–checks to detect an internal operating malfunction in the ECU.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A1D	134 135 139 140 141 143 144 145 148 149 150 151 152 155 156 158 159 160 163 164 165 166 167 168 177 178 180 181 182 183 184 185 186 187 188 189 192 193 195 196 197 198 199 200 392 393 511 512 564 565 567 570 615	HV control ECU internal error (1 trip detection logic) [Added]	• HV control ECU

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INSPECTION PROCEDURE

[Added]

If any of the above information (INF) codes is present, replace the HV control ECU.

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Turn the power switch on (IG) and wait for 30 seconds or more.

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

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DTC	P0A2B/248	DRIVE MOTOR ”A” TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC	P0A2B/250	DRIVE MOTOR ”A” TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0A2C (INF 247) on page 05–336.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A2B	248	Motor temperature sensor No. 1 malfunction	• Hybrid vehicle motor
P0A2B	250	Motor temperature sensor No. 1 performance problem	• Hybrid vehicle motor

Related Data List

DTC No.	INF Code	DTC Detection Condition
P0A2B	248	• Motor Temp No1
P0A2B	250	• Motor Temp No1

INSPECTION PROCEDURE

If the information (INF) code 248 or 250 is present, replace the hybrid vehicle motor. [Added]

HINT:

The motor temperature sensor No. 1 is unavailable as an individual service part. Therefore, when replacing it, the hybrid vehicle motor must be replaced.

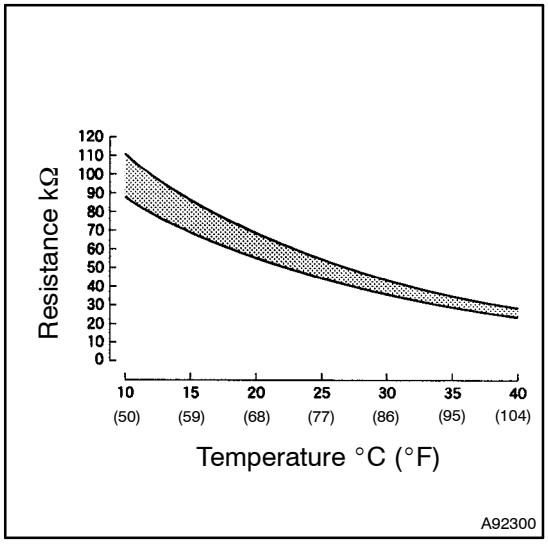
REPLACE HYBRID VEHICLE MOTOR ASSY

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DTC	P0A2C/247	DRIVE MOTOR "A" TEMPERATURE SENSOR CIRCUIT LOW

DTC	P0A2D/249	DRIVE MOTOR "A" TEMPERATURE SENSOR CIRCUIT HIGH

CIRCUIT DESCRIPTION



The resistance of the thermistor, which is enclosed in the motor temperature sensor No. 1, changes in accordance with the changes in the temperature of the motor. The lower the motor temperature, the higher the resistance of the thermistor. Conversely, the higher the temperature, the lower the resistance.
The motor temperature sensor No. 1 is connected to the HV control ECU. The power voltage of 5 V is supplied from the MMT terminal of the HV control ECU to the motor temperature sensor No. 1 via resistor R. Because resistor R and the motor temperature sensor No. 1 are connected in series, the resistance changes with the changes in temperature of the motor, which causes the MMT terminal voltage to also change.
Based on this signal, the HV control ECU limits the load in order to prevent the motor from overheating. Furthermore, the HV control ECU checks the motor temperature sensor No. 1 for a wiring malfunction and the sensor for malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A2C	247	GND short in motor temperature sensor No. 1 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU
P0A2D	249	Open or +B short in motor temperature sensor No. 1 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU

Related Data List

DTC No.	INF Code	DTC Detection Condition
P0A2C	247	• Motor Temp No1
P0A2D	249	• Motor Temp No1

HINT:
After confirming DTC P0A2C (INF 247) or P0A2D (INF 249), confirm Motor Temp No.1 in Powertrain / Hybrid Control / Data List using the intelligent tester II. [Added]

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

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DTC	P0A37/258	GENERATOR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0A38 (INF 257) on page 05–344.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A37	258	Motor temperature sensor No. 2 malfunction	• Hybrid vehicle motor

Related Data List

DTC No.	INF Code	DTC Detection Condition
P0A37	258	• Motor Temp No1

INSPECTION PROCEDURE

If the information (INF) code 258 is present, replace the hybrid vehicle motor.

[Added]

HINT:

The motor temperature sensor No. 2 is unavailable as an individual service part. Therefore, when replacing it, the hybrid vehicle motor must be replaced.

REPLACE HYBRID VEHICLE MOTOR ASSY

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DTC	P0A37/260	GENERATOR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0A38 (INF 257) on page 05–344.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A37	260	Motor temperature sensor No. 2 performance problem (1 trip detection logic)	• Hybrid vehicle motor • Transaxle fluid leakage • HV transaxle assembly • Water w/ motor & bracket pump assembly • Inverter cooling hose

Related Data List

DTC No.	INF Code	Data List
P0A37	260	• Motor Temp No2

INSPECTION PROCEDURE

[Added]

1	CHECK COOLANT HOSE

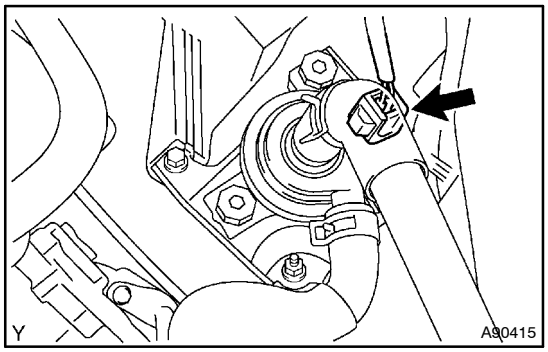
(a) Check that the hoses of the cooling system are not bent or clogged (see the cooling system on page 05–474).

OK: The hoses of the cooling system are not bent or clogged

NG → **CORRECT TO NORMAL CONDITION**

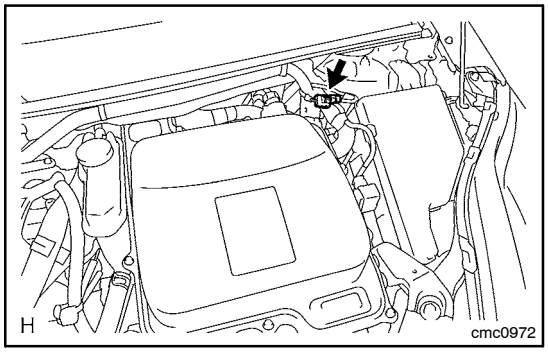
OK

2	CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP CONNECTOR AND SHORT CONNECTOR)



(a) Check the connection condition of the water pump connector.

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



(b) Check the connection condition of the short connector.

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

NG → **CONNECT SECURELY**

OK

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DTC	P0A38/257	GENERATOR TEMPERATURE SENSOR CIRCUIT LOW

DTC	P0A39/259	GENERATOR TEMPERATURE SENSOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The motor temperature sensor No. 2 detects the temperature of the transaxle fluid. The resistance of the thermistor installed in the motor temperature sensor No. 2 varies with the changes in the transaxle fluid temperature. The construction in the motor temperature sensor No. 2 and how it is connected to the HV control ECU are the same as those of the motor temperature sensor No. 1 (see the circuit description on page 05–336).

Based on the signal provided by the motor temperature sensor No. 2, the HV control ECU limits the load to prevent the motor from overheating. Furthermore, the HV control ECU checks the motor temperature sensor No. 2 for a wiring malfunction and the sensor for malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A38	257	GND short in motor temperature sensor No. 2 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU
P0A39	259	Open or +B short in motor temperature sensor No. 2 circuit	• Wire harness or connector • Hybrid vehicle motor • HV control ECU

Related Data List

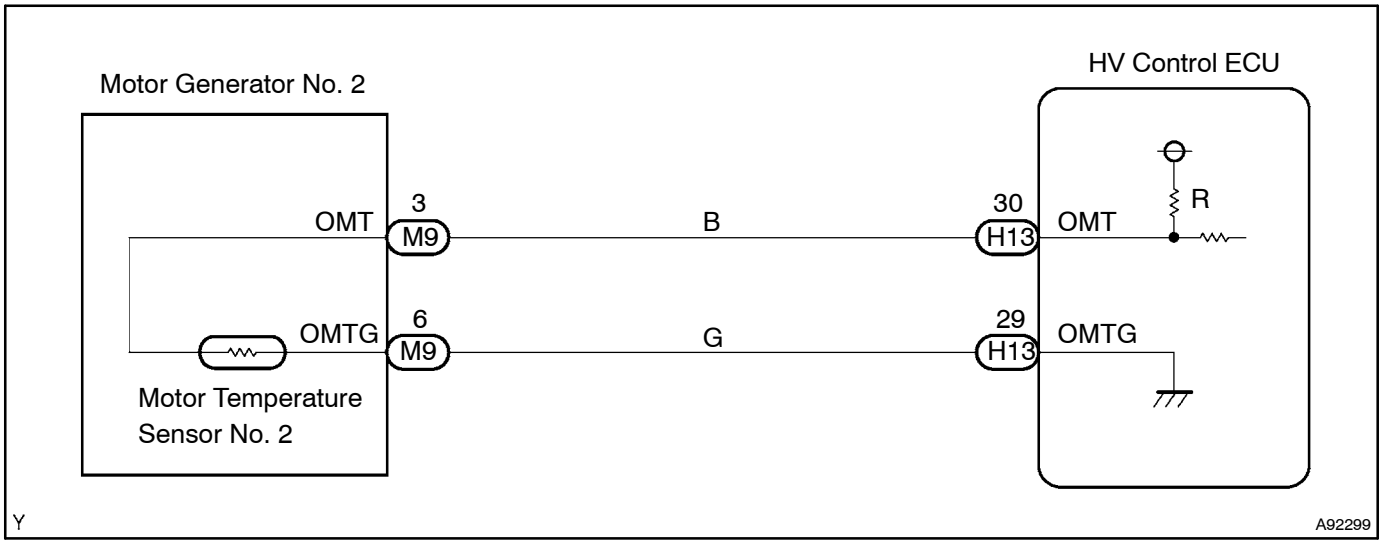
DTC No.	INF Code	DTC Detection Condition
P0A38	257	• Motor Temp No2
P0A39	259	• Motor Temp No2

HINT:

After confirming DTC P0A38 (INF 257) or P0A39 (INF 259), confirm Motor Temp No.2 in Powertrain / Hybrid Control / Data List using the intelligent tester II. [Added]

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

WIRING DIAGRAM



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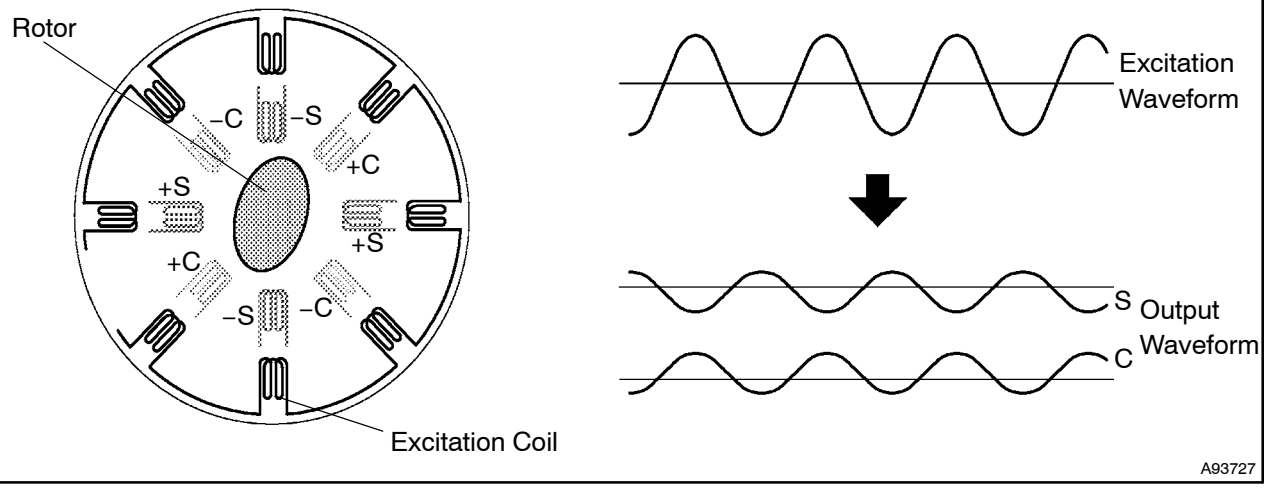
DTC	P0A3F/243	DRIVE MOTOR ”A” POSITION SENSOR CIRCUIT

DTC	P0A40/500	DRIVE MOTOR ”A” POSITION SENSOR CIRCUIT RANGE/PERFORMANCE

DTC	P0A41/245	DRIVE MOTOR ”A” POSITION SENSOR CIRCUIT LOW

CIRCUIT DESCRIPTION

The motor resolver is a type of sensor that detects the position of the magnetic poles, which are indispensable for ensuring the highly efficient control of the MG1 and MG2.
The stator of the resolver contains an excitation coil and two detection coils. Because the rotor has an oval shape, the gap between the stator and the rotor changes as the rotor turns. An alternating current with a predetermined frequency flows through the excitation coil, and detection coils S and C output alternating currents in accordance with the position of the sensor rotor.
The HV control ECU detects the absolute position of the rotor in accordance with the phases of detection coils S and C and the height of their waveform. Furthermore, the CPU calculates the amount of change in the position within a predetermined length of time, in order to use the resolver as a speed sensor.



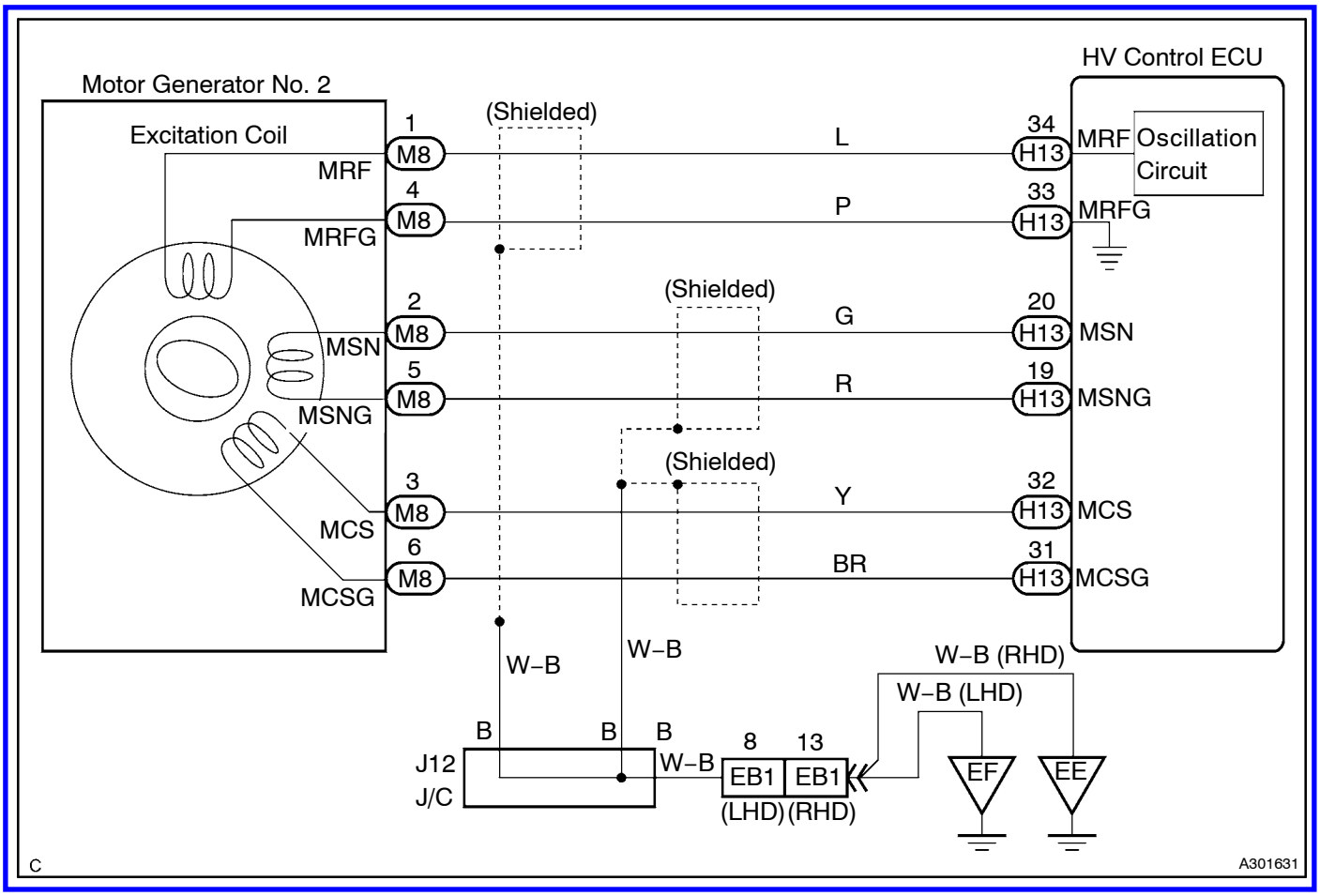
The HV control ECU monitors the output signals of the motor resolver and detects malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A3F	243	Interphase short in motor resolver circuit Detects a short circuit between signal lines of motor resolver phases. (1 trip detection logic)	• Wire harness or connector • Hybrid vehicle motor • HV control ECU
P0A40	500	Motor resolver output is out of normal range Detects that the motor resolver signal is out of the standard range. (1 trip detection logic)	• Wire harness or connector • Hybrid vehicle motor • HV control ECU
P0A41	245	Open or short in motor resolver circuit Detects that the motor resolver signal is out of the standard range. (1 trip detection logic)	• Wire harness or connector • Hybrid vehicle motor • HV control ECU

[Corrected]

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WIRING DIAGRAM



[Corrected]

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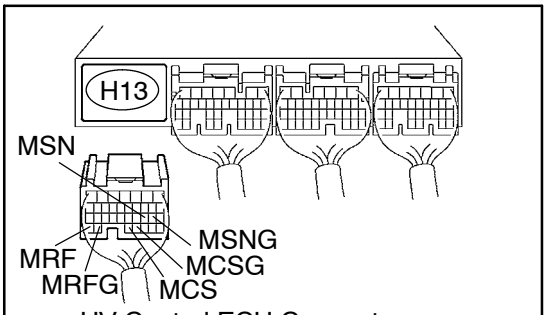
INSPECTION PROCEDURE

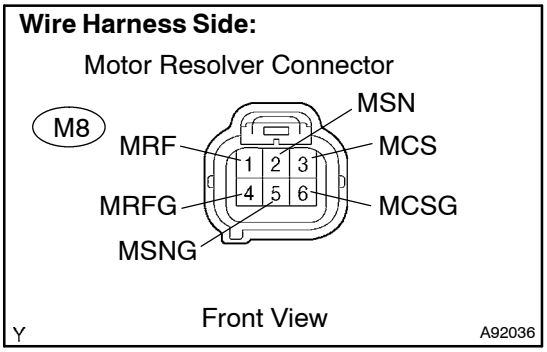
[Added]

HINT:

- If INF code 243 is stored and the malfunction cannot be reproduced, replace the hybrid vehicle motor (MG2) as the last step.
- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- If the resolver is malfunctioning, the vehicle may not drive smoothly.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
  (b) Turn the power switch on (READY) with park (P) selected and wait for 5 seconds or more.
  (c) Depress the accelerator pedal of the vehicle with the engine stopped and park (P) selected to start the engine.
  (d) Drive the vehicle forward with the shift lever in D for 5 m or more.
  (e) Drive the vehicle backward with the shift lever in R for 5 m or more.

1	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – MOTOR RESOLVER)





(a) Disconnect the H13 HV control ECU connector.
(b) Disconnect the M8 motor resolver connector.
(c) Turn the power switch ON (IG).
(d) Measure the voltage between the terminals of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
MRF (H13–34) – Body ground	Below 1 V
MRFG (H13–33) – Body ground	Below 1 V
MSN (H13–20) – Body ground	Below 1 V
MSNG (H13–19) – Body ground	Below 1 V
MCS (H13–32) – Body ground	Below 1 V
MCSG (H13–31) – Body ground	Below 1 V

(e) Turn the power switch OFF.
(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
MRF (H13–34) – MRF (M8–1)	Below 1 Ω
MRFG (H13–33) – MRFG (M8–4)	Below 1 Ω
MSN (H13–20) – MSN (M8–2)	Below 1 Ω
MSNG (H13–19) – MSNG (M8–5)	Below 1 Ω
MCS (H13–32) – MCS (M8–3)	Below 1 Ω
MCSG (H13–31) – MCSG (M8–6)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
MRF (H13–34) or MRF (M8–1) – Body ground	10 kΩ or higher
MRFG (H13–33) or MRFG (M8–4) – Body ground	10 kΩ or higher
MSN (H13–20) or MSN (M8–2) – Body ground	10 kΩ or higher
MSNG (H13–19) or MSNG (M8–5) – Body ground	10 kΩ or higher
MCS (H13–32) or MCS (M8–3) – Body ground	10 kΩ or higher
MCSG (H13–31) or MCSG (M8–6) – Body ground	10 kΩ or higher

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DTC	P0A4B/253	GENERATOR POSITION SENSOR CIRCUIT

DTC	P0A4C/513	GENERATOR POSITION SENSOR CIRCUIT RANGE/PERFORMANCE

DTC	P0A4D/255	GENERATOR POSITION SENSOR CIRCUIT LOW

CIRCUIT DESCRIPTION

The generator resolver detects the position of the magnetic poles, which are indispensable for ensuring the highly efficient control of the MG1 and MG2. The construction of the generator resolver and how it is connected to the HV control ECU are the same as those of the motor resolver (see the circuit description on page 05–349).

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A4B	253	Interphase short in generator resolver circuit Detects a short circuit between signal lines of generator resolver phases. (1 trip detection logic)	• Wire harness or connector • Hybrid vehicle generator • HV control ECU
P0A4C	513	Generator resolver output is out of normal range Detects that the generator resolver signal is out of the standard range. (1 trip detection logic)	• Wire harness or connector • Hybrid vehicle generator • HV control ECU
P0A4D	255	Open or short in generator resolver circuit Detects that the generator resolver signal is out of the standard range. (1 trip detection logic)	• Wire harness or connector • Hybrid vehicle generator • HV control ECU

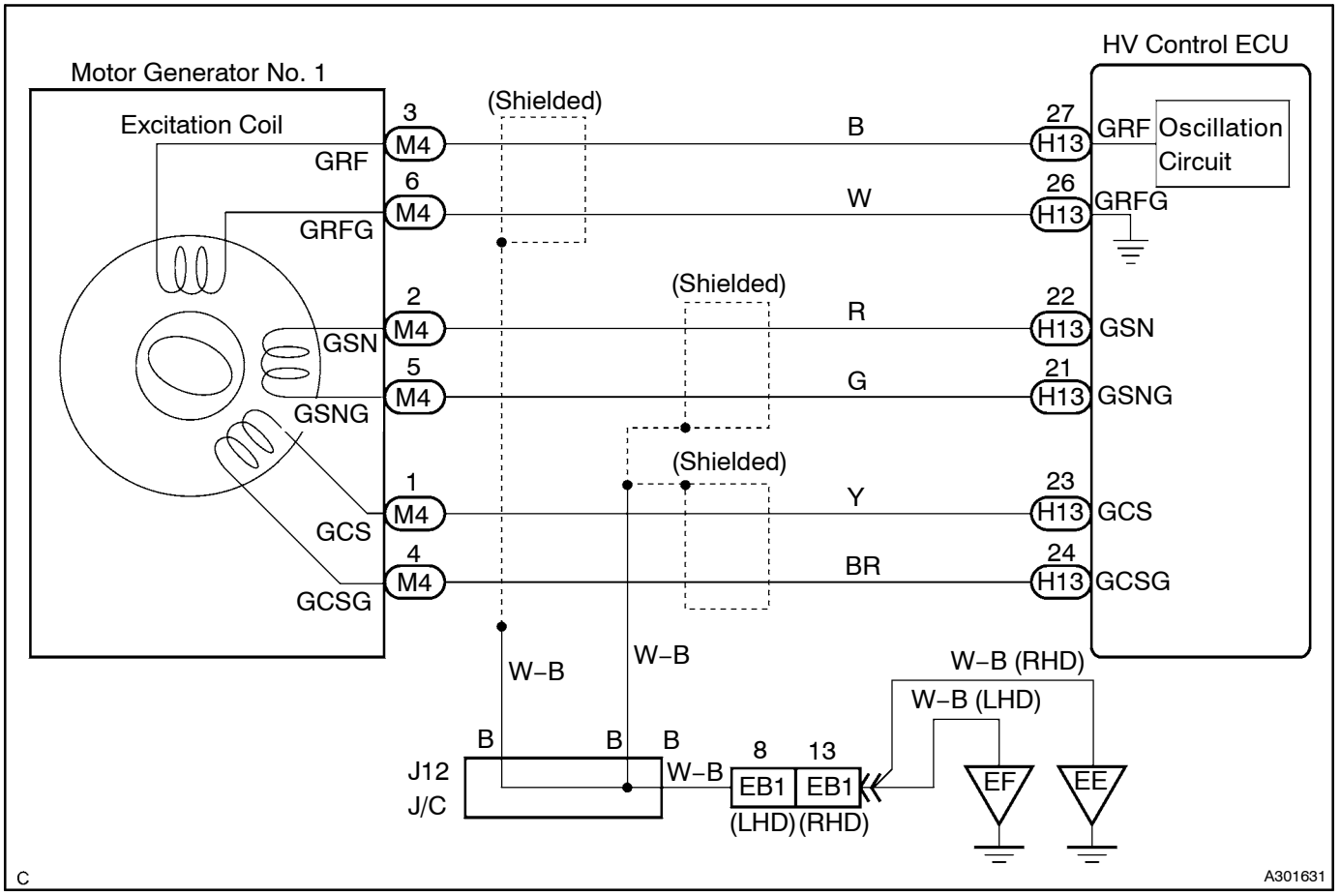


[Corrected]

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WIRING DIAGRAM

[Corrected]



INSPECTION PROCEDURE

HINT:

- If INF code 253 is stored and the malfunction cannot be reproduced, replace the hybrid vehicle generator (MG1) as the last step.
- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- If the resolver is malfunctioning, the vehicle may not drive smoothly.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
  (b)Turn the power switch on (READY) with park (P) selected and wait for 5 seconds or more.
  (c)Depress the accelerator pedal of the vehicle with the engine stopped and park (P) selected to start the engine.
  (d)Drive the vehicle forward with the shift lever in D for 5 m or more.
  (e)Drive the vehicle backward with the shift lever in R for 5 m or more.

[Added]

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DTC	P0A51/174	DRIVE MOTOR ”A” CURRENT SENSOR CIRCUIT

CIRCUIT DESCRIPTION

The HV control ECU performs self–checks to detect an internal operating malfunction in the ECU.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A51	174	HV control ECU internal error (1 trip detection logic)	• HV control ECU

[Corrected]

INSPECTION PROCEDURE

If the information (INF) code is present, replace the HV control ECU.

[Added]

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Turn the power switch on (IG) and wait for 30 seconds or more.

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

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CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

The motor inverter current sensors detect the amperage that flows through the V and W phase cables between the inverter and MG1/MG2. The inverter transmits information that is necessary for effecting control, such as the amperage and voltage, to the HV control ECU.

The HV control ECU monitors the inverter current sensors to detect a malfunction in the sensor system. Thus, this does not intend detecting a malfunction in the high voltage system.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A60	288	Phase V current sub sensor of motor inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A60	289	Open in phase V current sub sensor circuit of motor inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A60	290	Phase V current main sensor of motor inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A60	292	Open in phase V current main sensor circuit of motor inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A60	294	Phase V current main and sub sensors of motor inverter current sensor performance problem*1 Detects an abnormal condition when the difference between the output of the phase V main sensor and phase V sub sensor is larger than the standard. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A60	501	Phase V current main and sub sensors of motor inverter current sensor offset malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A63	296	Phase W current sub sensor of motor inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A63	297	Open in phase W current sub sensor circuit of motor inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A63	298	Phase W current main sensor of motor inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A63	300	Open in phase W current main sensor circuit of motor inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A63	302	Phase W current main and sub sensors of motor inverter current sensor performance problem*1Detects an abnormal condition when the difference between the output of the phase W main sensor and phase W sub sensor is larger than the standard. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A63	502	Phase W current main and sub sensors of motor inverter current sensor offset malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

*1: Stores a DTC when the current sensor signal is out of the normal range.

[Corrected]

[Added]

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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

[Added]

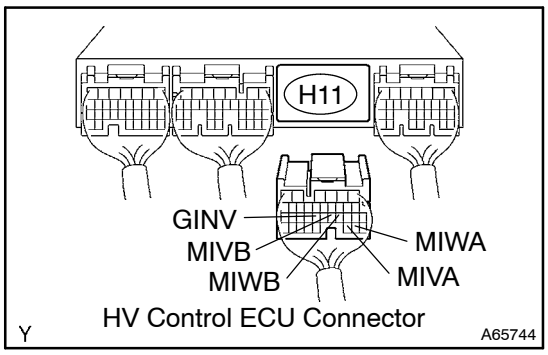
NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
  (b)Turn the power switch on (READY) with park (P) selected and wait for 5 seconds or more.
  (c)Move the shift lever to N and wait for 5 seconds or more.
  (d)Depress the accelerator pedal of the vehicle with the engine stopped and park (P) selected to start the engine.
  (e)Drive the vehicle forward with the shift lever in D for 5 m or more.
  (f) Drive the vehicle backward with the shift lever in R for 5 m or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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



CAUTION:

Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

NOTICE:

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

(c) Disconnect the H11 HV control ECU connector.

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

(e) Disconnect the I10 inverter connector.

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

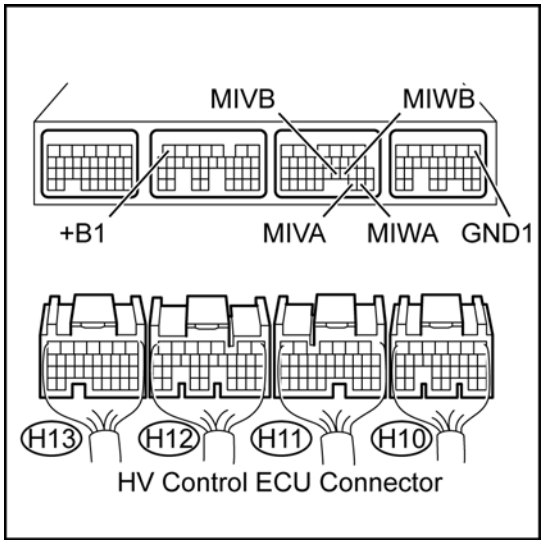
HINT:

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

(g) Measure the voltage between the terminals of the HV control ECU connector and body ground.

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2 INSPECT HYBRID VEHICLE CONTROL ECU



(a) Disconnect the negative auxiliary battery terminal.
(b) Disconnect the H10, H11, H12 and H13 HV control ECU connectors.
(c) Measure the resistance according to the value(s) in the table below.

Standard resistance:

Tester Connection	Specified Condition
MIVA (H11–30) – +B1 (H12–7)	12 to 16 kΩ
MIVA (H11–30) – GND1 (H10–1)	9 to 13 kΩ
MIVB (H11–21) – +B1 (H12–7)	27 to 33 kΩ
MIVB (H11–21) – GND1 (H10–1)	25 to 31 kΩ
MIWA (H11–29) – +B1 (H12–7)	12 to 16 kΩ
MIWA (H11–29) – GND1 (H10–1)	9 to 13 kΩ
MIWB (H11–20) – +B1 (H12–7)	27 to 33 kΩ
MIWB (H11–20) – GND1 (H10–1)	25 to 31 kΩ

(d) Reconnect the HV control ECU connector.
(e) Reconnect the negative auxiliary battery terminal.

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

OK

[Corrected]

3 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only DTC P0A60–288, P0A60–289, P0A60–290, P0A60–292, P0A60–294, P0A60–501, P0A63–296, P0A63–297, P0A63–298, P0A63–300, P0A63–302, P0A63–502 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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CIRCUIT DESCRIPTION

Refer to DTC P0A60 (INF 288) on page 05–357.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A72	326	Phase V current sub sensor of generator inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A72	327	Open in phase V current sub sensor circuit of generator inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A72	328	Phase V current main sensor of generator inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A72	330	Open in phase V current main sensor circuit of generator inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A72	333	Phase V current main and sub sensors of generator inverter current sensor performance problem*1 Detects an abnormal condition when the difference between the output of the phase V main sensor and phase V sub sensor is larger than the standard. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A72	515	Phase V current main and sub sensors of generator inverter current sensor offset malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A75	334	Phase W current sub sensor of generator inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A75	335	Open in phase W current sub sensor circuit of generator inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A75	336	Phase W current main sensor of generator inverter current sensor malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A75	338	Open in phase W current main sensor circuit of generator inverter current sensor*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A75	341	Phase W current main and sub sensors of generator inverter current sensor performance problem*1 Detects an abnormal condition when the difference between the output of the phase W main sensor and phase W sub sensor is larger than the standard. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A75	516	Phase W current main and sub sensors of generator inverter current sensor offset malfunction*1 (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

*1: Stores a DTC when the current sensor signal is out of the normal range.

[Corrected]

[Added]

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INSPECTION PROCEDURE

CAUTION:

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

  [Added]

  HINT:

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

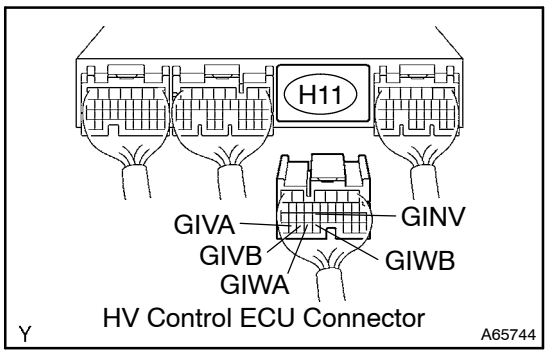
NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
  (b)Turn the power switch on (READY) with park (P) selected and wait for 5 seconds or more.
  (c)Move the shift lever to N and wait for 5 seconds or more.
  (d)Depress the accelerator pedal of the vehicle with the engine stopped and park (P) selected to start the engine.
  (e)Drive the vehicle forward with the shift lever in D for 5 m or more.
  (f) Drive the vehicle backward with the shift lever in R for 5 m or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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



CAUTION:

Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

NOTICE:

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

(c) Disconnect the H11 HV control ECU connector.

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

(e) Disconnect the I10 inverter connector.

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

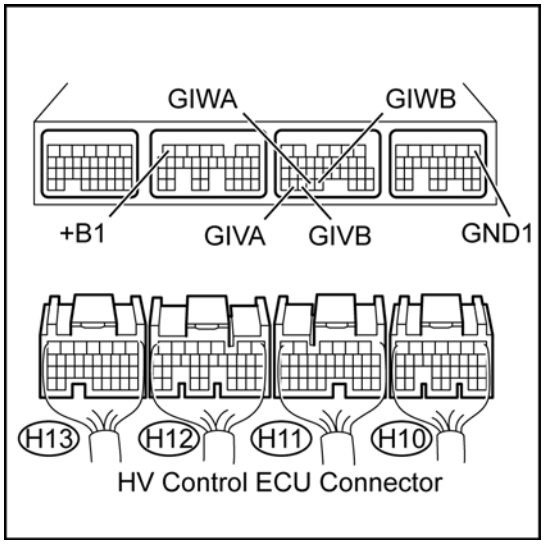
HINT:

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

(g) Measure the voltage between the terminals of the HV control ECU connector and body ground.

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2 INSPECT HYBRID VEHICLE CONTROL ECU



(a) Disconnect the negative auxiliary battery terminal.
(b) Disconnect the H10, H11, H12 and H13 HV control ECU connectors.
(c) Measure the resistance according to the value(s) in the table below.

Standard resistance:

Tester Connection	Specified Condition
GIVA (H11–34) – +B1 (H12–7)	14 to 18 kΩ
GIVA (H11–34) – GND1 (H10–1)	12 to 16 kΩ
GIVB (H11–33) – +B1 (H12–7)	27 to 34 kΩ
GIVB (H11–33) – GND1 (H10–1)	24 to 31 kΩ
GIWA (H11–32) – +B1 (H12–7)	14 to 18 kΩ
GIWA (H11–32) – GND1 (H10–1)	12 to 16 kΩ
GIWB (H11–31) – +B1 (H12–7)	27 to 34 kΩ
GIWB (H11–31) – GND1 (H10–1)	24 to 31 kΩ

(d) Reconnect the HV control ECU connector.
(e) Reconnect the negative auxiliary battery terminal.

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

OK

[Corrected]

3 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

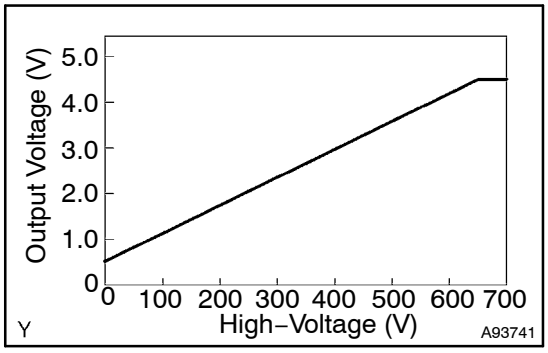
Result	Proceed to
Only DTC P0A72–326, P0A72–327, P0A72–328, P0A72–330, P0A72–333, P0A72–515, P0A75–334, P0A75–335, P0A75–336, P0A75–338, P0A75–341, P0A75–516 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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The HV control ECU uses a voltage sensor, which has been built into the inverter, to detect the high voltage after it is boosted and for boost control.

The inverter voltage sensor outputs a voltage that varies between 0 and 5 V in accordance with the changes in the high voltage. The higher the high voltage, the higher the output voltage, and the lower the high voltage, the lower the output voltage.

The HV control ECU monitors the inverter voltage and detects malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	266	Open or GND short in inverter voltage (VH) sensor circuit Stores a DTC when the VH sensor signal is excessively low. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A78	267	+B short in inverter voltage (VH) sensor circuit Stores a DTC when the VH sensor signal is excessively high. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

Related Data List

DTC No.	INF Code	DTC Detection Condition
P0A78	264	• VH–Voltage after Boosting
P0A78	264	• VH–Voltage after Boosting

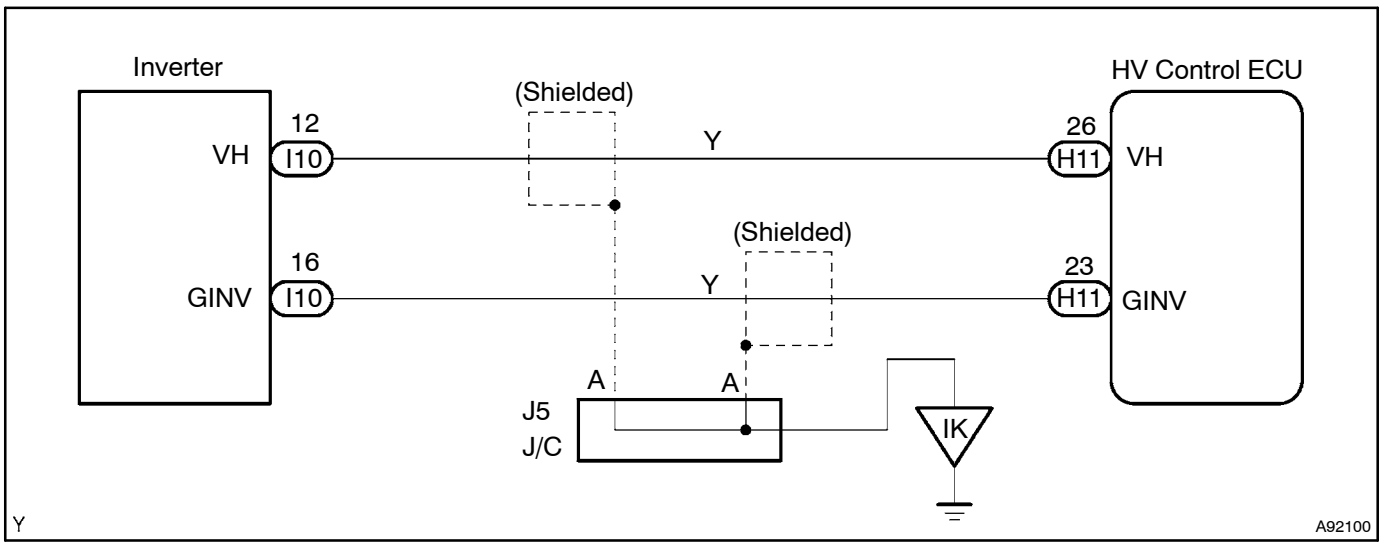
HINT:

After confirming DTC P0A78 (INF 266 or 267), confirm VH–Voltage after Raise in Powertrain / Hybrid Control / Data List using the intelligent tester II.

[Added]

Voltage Displayed	Malfunction
765 V	+B short circuit
0 V	Open or GND short circuit

WIRING DIAGRAM



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

[Added]

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

Result: DTC P0A1D is output

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	READ VALUE OF INTELLIGENT TESTER II(VH–VOLTAGE AFTER RAISE)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) Read the VH–Voltage after Raise value on the intelligent tester II.

Result:

Voltage Displayed	Proceed to
765 V	A
0 V	B
1 to 764 V	C

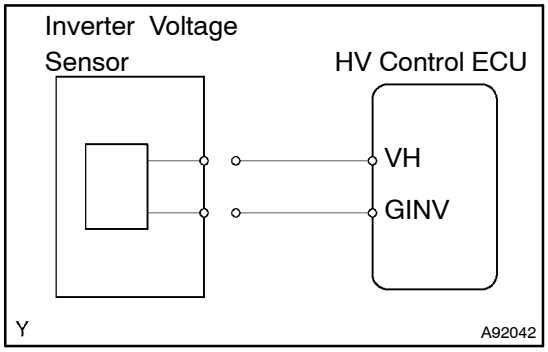
- If there is a +B short circuit, the intelligent tester II indicates 765 V.
- If there is an open or GND short circuit, the intelligent tester II indicates 0 V.

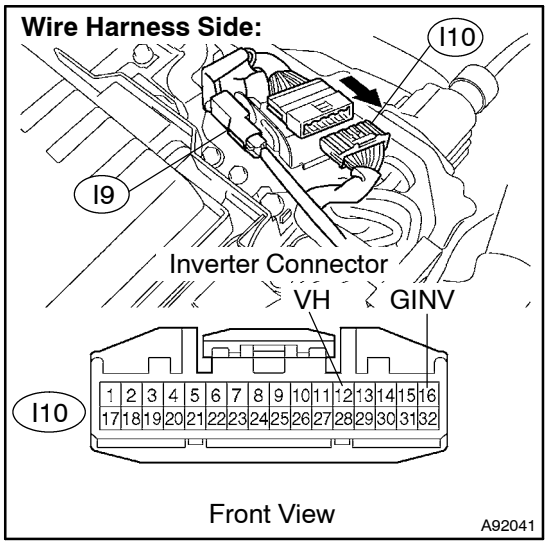
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B	Go to step 5
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05–232)

A

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





CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Disconnect the I10 inverter connector.
(e) Turn the power switch ON (IG).

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

(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(g) Read the VH–Voltage after Raise value on the intelligent tester II.
Standard: 0 V
(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

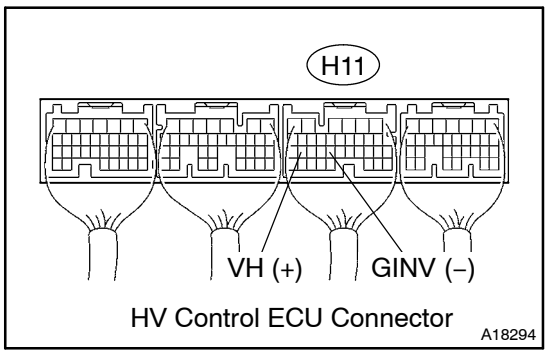
[Corrected]

OK	Go to step 7

NG [Corrected]

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6	INSPECT HYBRID VEHICLE CONTROL ECU(VH VOLTAGE)



HV Control ECU Connector
A18294

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

HINT:

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

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

Standard:

Tester Connection	Specified Condition
VH (H11–26) – GINV (H11–23)	1.6 to 3.8 V

NG → **Go to step 7**

[Corrected]

OK

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

7	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–266, P0A78–267 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/272	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

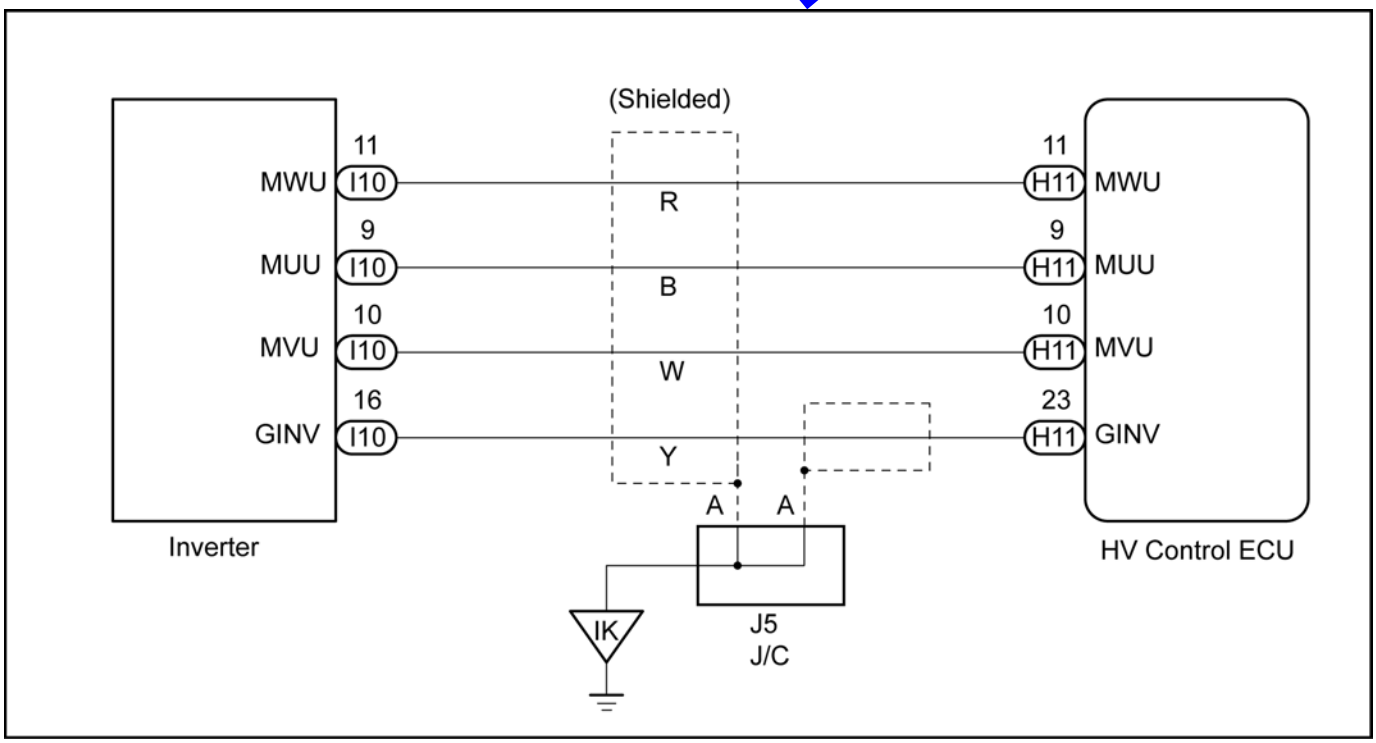
See the description of the inverter on page 05–365.

The inverter switches the power transistors ON and OFF in accordance with power transistor actuation signals received from the HV control ECU, in order to change the direction of the current that flows through the MG1/MG2. Also, the inverter regulates the duration of the switching time through PWM (Pulse Width Modulation) control, in order to control the voltage that is applied to the MG1/MG2.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	272	Abnormality in motor PWM circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

[Corrected]

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

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NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)After the vehicle is driven (required to use the motor) on urban roads at approximately 50 km/h (31 mph) or less for 5 minutes.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

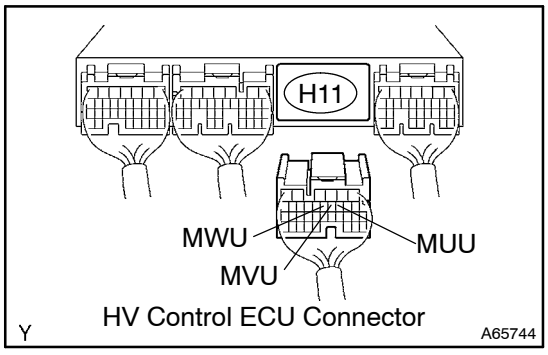
1	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A1D is output

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

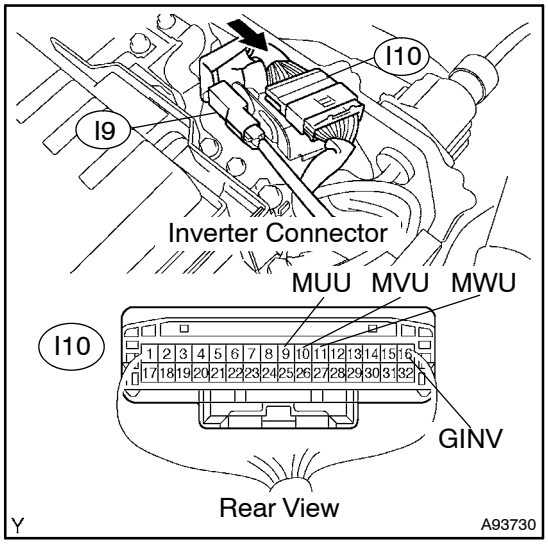
2	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – INVERTER)



CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(c) Disconnect the H11 HV control ECU connector.
(d) Remove the inverter cover (see page 21–25).
(e) Disconnect the I10 inverter connector.
(f) Check the resistance between the wire harness side connectors.
Standard (Check for open):

Tester Connection	Specified Condition
MUU (H11–9) – MUU (I10–9)	Below 1 Ω
MVU (H11–10) – MVU (I10–10)	Below 1 Ω
MWU (H11–11) – MWU (I10–11)	Below 1 Ω

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(i) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	12 to 16 V
MVU (I10–10) – GINV (I10–16)	12 to 16 V
MWU (I10–11) – GINV (I10–16)	12 to 16 V

(j) Turn the power switch OFF.
(k) Reinstall the inverter cover (see page 21–25).
(l) Reinstall the service plug grip (see page 21–120).

[Corrected]

OK → **Go to step 5**

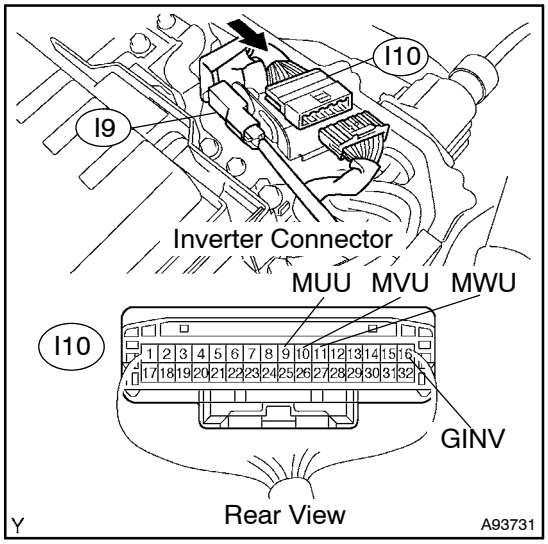
[Corrected]

NG

4	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.
(a) Connect the intelligent tester II to the DLC3.
(b) Clear the DTCs (see page05–246).
HINT:
Clear DTCs before inspection because the active test cannot be performed while DTCs are stored.
(c) Turn the power switch ON (IG).
(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Perform the Forcible Stop of Inverter Drive.
(g) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(h) Remove the inverter cover (see page 21–25).

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(i) Disconnect the I10 inverter connector.
(j) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.

Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	14 to 16 V
MVU (I10–10) – GINV (I10–16)	14 to 16 V
MWU (I10–11) – GINV (I10–16)	14 to 16 V

(k) Turn the power switch OFF.
(l) Reconnect the inverter connector.
(m) Reinstall the inverter cover (see page 21–25).
(n) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 5**

[Corrected]

OK

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

5 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–272 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/278	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/280	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

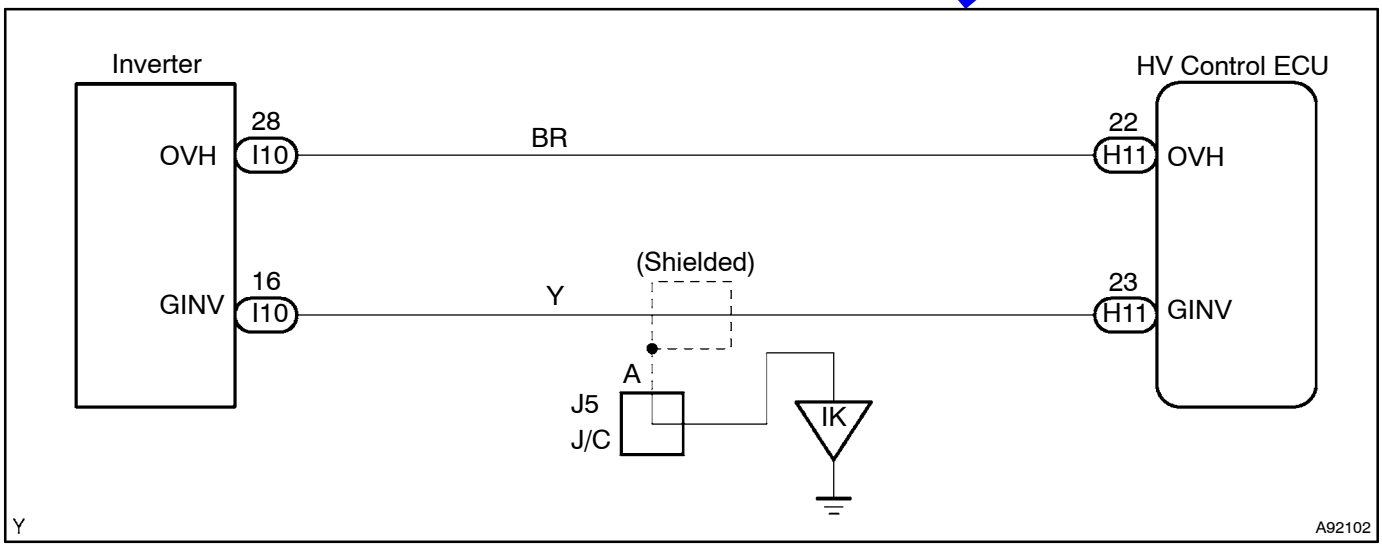
If the motor inverter detects a circuit malfunction or over–voltage, the inverter transmits this information to the OVH terminal of the HV control ECU via the motor inverter over–voltage signal line.

The HV control ECU monitors the motor inverter over–voltage signal line to detect the malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	278	+B short in motor inverter over–voltage (OVH) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A78	280	Open or GND short in motor inverter over–voltage (OVH) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM

[Corrected]



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

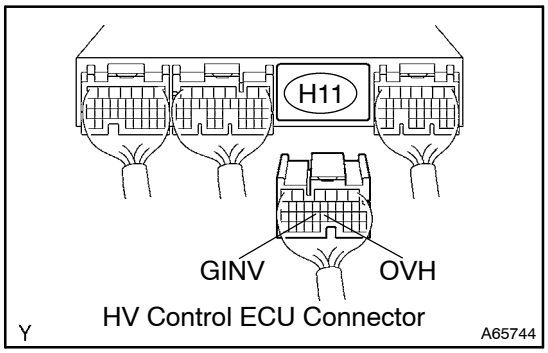
  At least 5 minutes is required to discharge the high–voltage condenser inside the inverter.

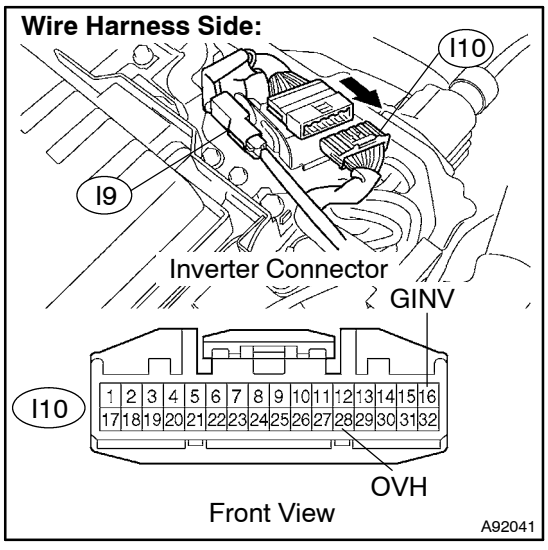
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NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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





CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(c) Disconnect the H11 HV control ECU connector.
(d) Remove the inverter cover (see page 21–25).
(e) Disconnect the I10 inverter connector.
(f) Turn the power switch ON (IG).
HINT:
DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.
(g) Measure the voltage between the terminals of the HV control ECU connector and body ground.
Standard:

Tester Connection	Specified Condition
OVH (H11–22) – Body ground	Below 1 V
GINV (H11–23) – Body ground	Below 1 V

(h) Turn the power switch OFF.
(i) Check the resistance between the wire harness side connectors.
Standard (Check for open):

Tester Connection	Specified Condition
OVH (H11–22) – OVH (I10–28)	Below 1 Ω
GINV (H11–23) – GINV (I10–16)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
OVH (H11–22) or OVH (I10–28) – Body ground	10 kΩ or higher
GINV (H11–23) or GINV (I10–16) – Body ground	10 kΩ or higher

(j) Reconnect the inverter connector.
(k) Reconnect the HV control ECU connector.
(l) Reinstall the inverter cover (see page 21–25).

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

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

OK

2 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A09–265, P0A10–263 is output.	A
Only electric vehicle converter assembly set related DTCs are output.	A
Power module intelligent transistor set or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/279	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/503	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/504	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

If the motor inverter detects a circuit malfunction or over–voltage, the inverter transmits this information to the OVH terminal of the HV control ECU via the motor inverter over–voltage signal line.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	279	Motor inverter over–voltage (OVH) signal detection (overvoltage by inverter assembly malfunction) When an overvoltage is detected after boosting.*1 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set
P0A78	503	Motor inverter over–voltage (OVH) signal detection (overvoltage by HV control ECU malfunction) When an overvoltage is detected after boosting.*2 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set
P0A78	504	Motor inverter over–voltage (OVH) signal detection (overvoltage by HV transaxle assembly malfunction) When an overvoltage is detected after boosting.*3 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set

HINT:

- *1: The power module intelligent transistor set may be suspected as a main cause of the malfunction.
- *2: The HV control ECU may be suspected as a main cause of the malfunction.
- *3: The hybrid vehicle transaxle assembly may be suspected as a main cause of the malfunction. In this case, the vehicle may not drive smoothly.
- Identify the malfunctioning part according to the “EXCLUSIVE INFO”.

Related Data List

DTC No.	INF Code	Data List
P0A78	279	• VH–Voltage after Boosting
P0A78	503	• VH–Voltage after Boosting
P0A78	504	• VH–Voltage after Boosting

[Added]

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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Depress the accelerator pedal of the vehicle with the engine stopped and park (P) selected to start the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	CONFIRM INFORMATION(EXCLUSIVE INFORMATION 3)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Select DTC P0A78 to display its freeze frame data.
(f) Select Detail Information beneath Detail Code which has INF code 279, 503, or 504, and press the ”Details” key.
(g) Read Exclusive Information 3.
Result: –32 to 32 (during driving without battery power)

HINT:

If the value is inside the range shown above, DTCs other than P0A78 (INF 279, 503 and 504) have been detected as well. Perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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4	CONFIRM INFORMATION(EXCLUSIVE INFORMATION 4)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

HINT:

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Select DTC P0A78 to display its freeze frame data.
(f) Select Detail Information beneath Detail Code which has INF code 279, 503, or 504, and press the ”Details” key.
(g) Read Exclusive Information 4.

Result:

Displayed in Exclusive Information 4	Proceed to
–127 to –120, –95 to –88, –63 to –56, –31 to –24, 1 to 8, 33 to 40, 65 to 72, 97 to 104	A
–119 to –112, –87 to –80, –55 to –48, –23 to –16, 9 to 16, 41 to 48, 73 to 80, 105 to 112	B
–111 to –104, –79 to –72, –47 to –40, –15 to –8, 17 to 24, 49 to 56, 81 to 88, 113 to 120	C
–103 to –96, –71 to –64, –39 to –32, –7 to 0, 25 to 32, 57 to 64, 89 to 96, 121 to 127	D

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

C → **Go to step 11**

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

[Corrected]

A

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8	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

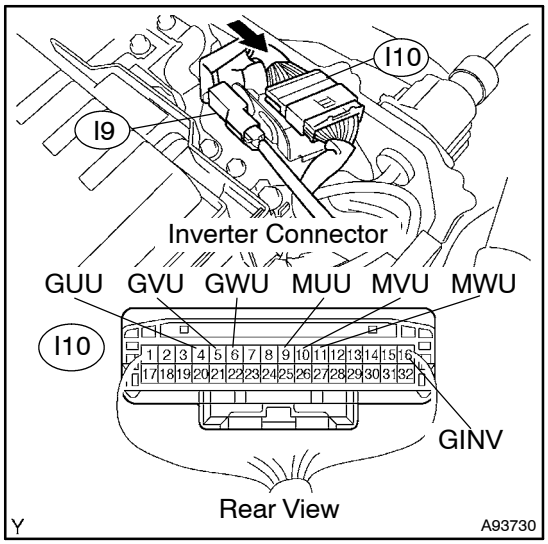
(a) Check that the service plug grip and inverter cover have been removed.
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the power switch ON (IG).

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

(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	12 to 16 V
MVU (I10–10) – GINV (I10–16)	12 to 16 V
MWU (I10–11) – GINV (I10–16)	12 to 16 V
GUU (I10–4) – GINV (I10–16)	12 to 16 V
GVU (I10–5) – GINV (I10–16)	12 to 16 V
GWU (I10–6) – GINV (I10–16)	12 to 16 V

(g) Turn the power switch OFF.



NG → **Go to step 10**

[Corrected]

OK

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9	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–279, 503, 504 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

B → **REPLACE HYBRID VEHICLE CONTROL ECU AND W/ CONVERTER INVERTER ASSY**

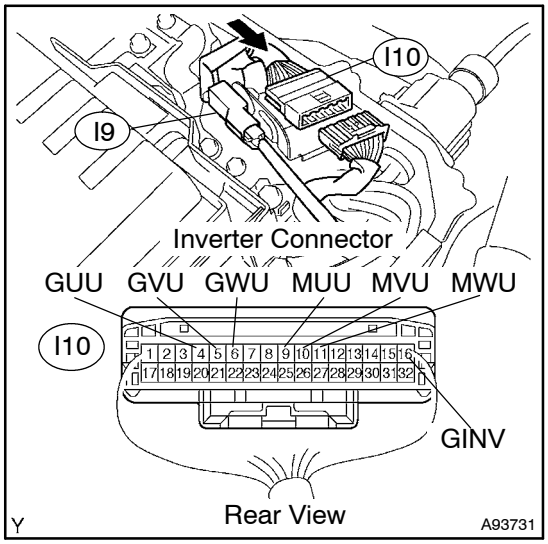
A

REPLACE HYBRID VEHICLE CONTROL ECU AND POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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10	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.
(b) Disconnect the I10 inverter connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the power switch ON (IG).

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

(e) Turn the intelligent tester II ON.
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(g) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	14 to 16 V
MVU (I10–10) – GINV (I10–16)	14 to 16 V
MWU (I10–11) – GINV (I10–16)	14 to 16 V
GUU (I10–4) – GINV (I10–16)	14 to 16 V
GVU (I10–5) – GINV (I10–16)	14 to 16 V
GWU (I10–6) – GINV (I10–16)	14 to 16 V

(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 11**

[Corrected]

OK

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

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11	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–279, 503, 504 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/282	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

If the motor inverter detects a circuit malfunction or over–voltage, the inverter transmits this information to the OVH terminal of the HV control ECU via the motor inverter over–voltage signal line.

[Corrected]

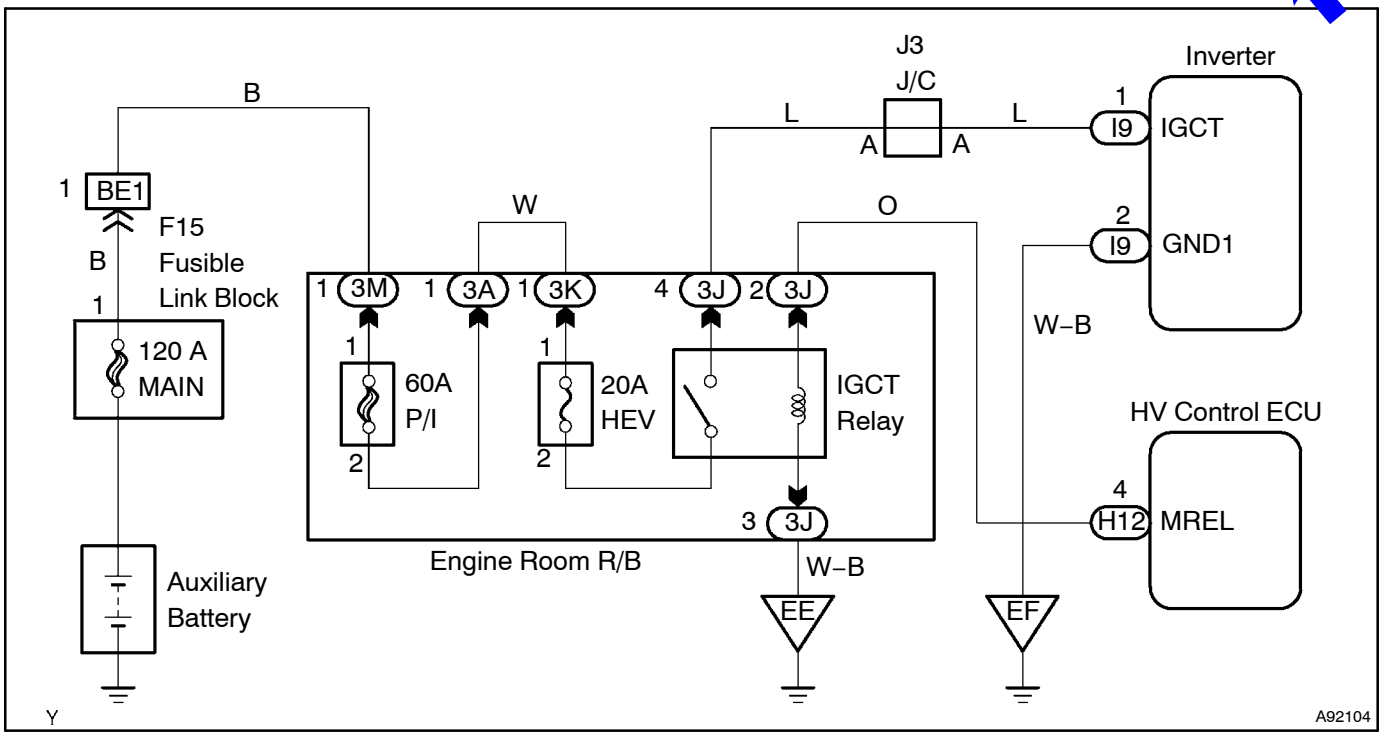
DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	282	Motor inverter over voltage (OVH) signal detection (circuit malfunction) (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A78	282	• VH–Voltage after Boosting

WIRING DIAGRAM

[Added]



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Depress the accelerator pedal of the vehicle with the engine stopped and park (P) selected to start the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

Result: DTC listed in table below is output

DTC No.	INF Code	Detection Item	See Page
P0A78	278 or 280	Drive Motor "A" Inverter performance	05–376

YES → **GO TO THE PAGE NUMBER SHOWN IN THE TABLE ABOVE**

NO

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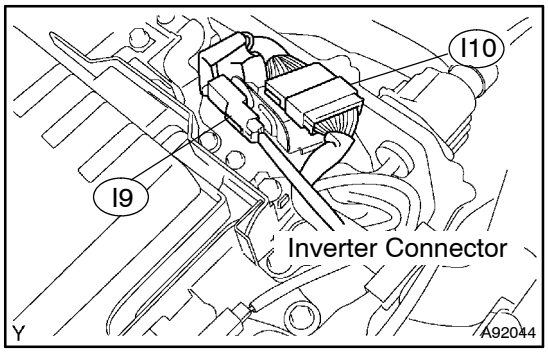
2	CHECK CONNECTION CONDITION OF INVERTER CONNECTOR(LOOSENESS AND POOR CONTACT)

CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Check the connection condition of the I9 and I10 inverter connectors.
OK: Connectors have been connected securely and there is no poor connection.
(e) Reinstall the inverter cover (see page 21–25).
(f) Reinstall the service plug grip (see page 21–120).



NG → **CONNECT SECURELY**

OK

3	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTCs P0A78 (INF 282, 286) and P0A7A (INF 324) (inverter circuit malfunction) are output

NO → **Go to step 5**

[Corrected]

YES

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–282 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/283	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/285	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

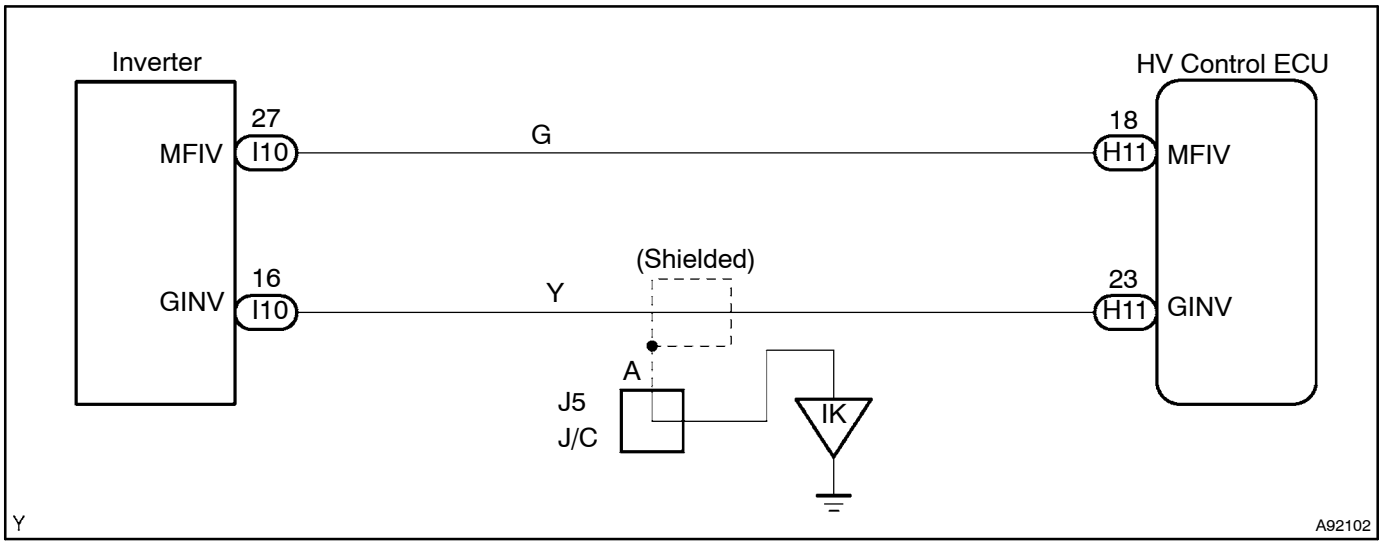
See the description of the inverter on page 05–365.

If the motor inverter has a circuit malfunction, internal short, or overheats, the inverter transmits this information to the MFIV terminal of the HV control ECU via the motor inverter fail signal line.

The HV control ECU monitors the motor inverter fail signal line and detects a malfunction. [Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	283	+B short in motor inverter fail (MFIV) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A78	285	Open or GND short in motor inverter fail (MFIV) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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2	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–283, 285 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Added]

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DTC	P0A78/284	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

If the motor inverter has a circuit malfunction, internal short, or overheats, the inverter transmits that information to the MFIV terminal of the HV control ECU via the motor inverter fail signal line.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	284	Motor inverter fail (MFIV) signal detection (inverter overheating) Motor inverter temperature is excessively high. (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • Power module intelligent transistor set

HINT:

Identify the malfunctioning part according to the “EXCLUSIVE INFO”.

Related Data List

DTC No.	INF Code	Data List
P0A78	284	• Vehicle Spd • Inverter Temp–(MG2)

WIRING DIAGRAM

Refer to DTC P0A78 (INF 279) on page 05–378.

[Added]

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

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NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) Perform a road test according to the Freeze Frame Data ”Vehicle Spd” for approximately 10 minutes.
  During the road test, check the Data List item “Inverter Temp–(MG2)” to prevent the motor inverter from overheating.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

DTC No.	Relevant Diagnosis
P0A1D	Hybrid Powertrain Control Module
P0A2B, P0A2C or P0A2D	Drive Motor ”A” Temperature Sensor Circuit System
P0A37, P0A38 or P0A39	Generator Temperature Sensor Circuit System
P0A3F, P0A40 or P0A41	Drive Motor ”A” Position Sensor Circuit System
P0A4B, P0A4C or P0A4D	Generator Position Sensor Circuit System
P0A60 or P0A63	Drive Motor ”A” Current Sensor Circuit System
P0A72 or P0A75	Generator Current Sensor Circuit System
P0A78	Drive Motor ”A” Inverter Performance
P0A7A	Generator Inverter Performance
P0A90	Drive Motor ”A” Performance
P0A92	Hybrid Generator Performance
P0A93	Inverter Cooling System Malfunction
P0A94	DC/DC Converter Malfunction
P0AA1, P0AA2, P0AA4 or P0AA5	System Main Relay Circuit System
P3000, P3004, P3009 or P3110	High Voltage System
P3211	Drive Motor ”A” Inverter Temperature Sensor Circuit System
P3221	Generator Inverter Temperature Sensor Circuit System
P3226	DC/DC Converter Temperature Sensor Circuit System

YES → **GO TO DTC CHART (See page 05–268). FIND A PAGE NUMBER TO PROCEED TO ITS DIAGNOSTIC TROUBLESHOOTING FLOWCHART**

NO

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11	CONFIRM INFORMATION(EXCLUSIVE INFORMATION 4)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

HINT:

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Select DTC P0A78 to display its freeze frame data.
(f) Select Detail Information beneath Detail Code which has INF code 284 and press the ”Details” key.
(g) Read Exclusive Information 4.

Result:

Displayed in Exclusive Information 4	Proceed to
–127 to –120, –95 to –88, –63 to –56, –31 to –24, 1 to 8, 33 to 40, 65 to 72, 97 to 104	A
–119 to –112, –87 to –80, –55 to –48, –23 to –16, 9 to 16, 41 to 48, 73 to 80, 105 to 112	B
–111 to –104, –79 to –72, –47 to –40, –15 to –8, 17 to 24, 49 to 56, 81 to 88, 113 to 120	C
–103 to –96, –71 to –64, –39 to –32, –7 to 0, 25 to 32, 57 to 64, 89 to 96, 121 to 127	D

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

C → **Go to step 16**

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

[Corrected]

A

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13	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

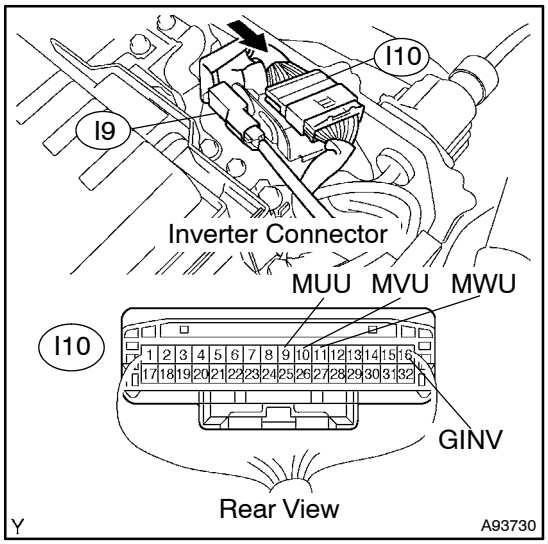
(a) Check that the service plug grip and inverter cover have been removed.
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the power switch ON (IG).

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

(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	12 to 16 V
MVU (I10–10) – GINV (I10–16)	12 to 16 V
MWU (I10–11) – GINV (I10–16)	12 to 16 V

(g) Turn the power switch OFF.



OK → **Go to step 16**

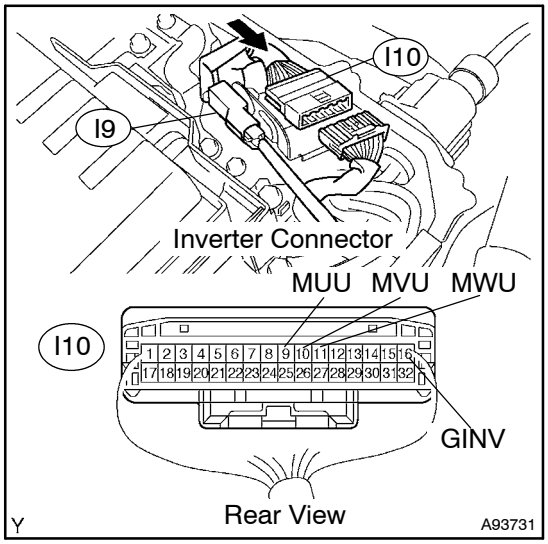
[Corrected]

NG

[Corrected]

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14	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.
(b) Disconnect the I10 inverter connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the power switch ON (IG).

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

(e) Turn the intelligent tester II ON.
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(g) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	14 to 16 V
MVU (I10–10) – GINV (I10–16)	14 to 16 V
MWU (I10–11) – GINV (I10–16)	14 to 16 V

(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 16**

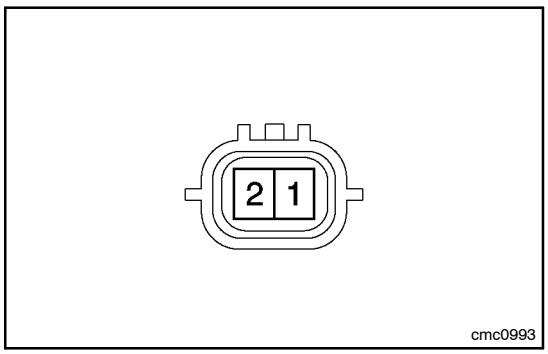
[Corrected]

OK

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

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15	CHECK WATER W/MOTOR & BRACKET PUMP ASSY



(a) Remove the water w/ motor & bracket pump assy.
(b) Connect the battery positive terminal to terminal 2 and the battely negative terminal to terminal 1.
(c) Check that the pump motor operates properly.

NOTICE:

- **Do not connect the positive and negative poles of the battery to the wrong terminals.**
- **Complete the check within 10 seconds of connection.**

OK: Pump motor operates properly.

NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (WATER W/MOTOR & BRACKET PUMP ASSY CIRCUIT)

16	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–286 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/286	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.
If the motor inverter has a circuit malfunction, internal short, or overheats, the inverter transmits that information to the MFIV terminal of the HV control ECU via the motor inverter fail signal line.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	286	Motor inverter fail (MFIV) signal detection (circuit malfunction) (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM

Refer to DTC P0A78 (INF 282) on page 05–387.

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 10 seconds or more.
  (b) Perform a road test according to the Freeze Frame Data “Vehicle Spd” for approximately 10 minutes.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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3	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
HINT:
DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTCs P0A78 (INF 282, 286) and P0A7A (INF 324) (inverter circuit malfunction) are output

NO → **Go to step 5**

[Corrected]

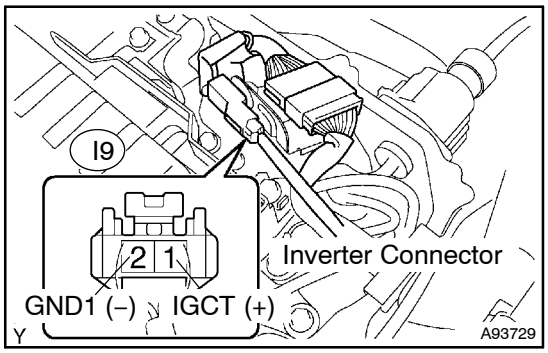
YES

4	INSPECT W/CONVERTER INVERTER ASSY(IGCT VOLTAGE)

CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(c) Remove the inverter cover (see page 21–25).
(d) Turn the power switch ON (IG).
HINT:
DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.
(e) Measure the voltage between the terminals of the inverter connector.
Standard:

Tester Connection	Specified Condition
IGCT (I9–1) – GND1 (I9–2)	8 V or more

(f) Turn the power switch OFF.
(g) Reinstall the inverter cover (see page 21–25).
(h) Reinstall the service plug grip (see page 21–120).



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

OK

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–286 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/287	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/505	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/506	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

[Added]

If the motor inverter has a circuit malfunction, internal short, or overheats, the inverter transmits that information to the MFIV terminal of the HV control ECU via the motor inverter fail signal line.

This DTC is stored when overheating, overcurrent or a circuit malfunction is detected for the motor inverter.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	287	Motor inverter fail (MFIV) signal detection (over current by inverter assembly malfunction)*1 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • Power module intelligent transistor set
P0A78	[Corrected] 505	Motor inverter fail (MFIV) signal detection (over current by HV control ECU malfunction)*2 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • Power module intelligent transistor set
P0A78	506	Motor inverter fail (MFIV) signal detection (over current by HV transaxle assembly malfunction)*3 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • HV control ECU • Power module intelligent transistor set

HINT:

- *1: The power module intelligent transistor set may be suspected as a main cause of the malfunction.
- *2: The HV control ECU may be suspected as a main cause of the malfunction.
- *3: The hybrid vehicle transaxle assembly may be suspected as a main cause of the malfunction. In this case, the vehicle may not drive smoothly.
- Identify the malfunctioning part according to the “EXCLUSIVE INFO”.

WIRING DIAGRAM

[Added]

Refer to DTC P0A78 (INF 279) on page 05–378.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

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[Added]

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 10 seconds or more.
  (b) Perform a road test according to the Freeze Frame Data ”Vehicle Spd” for approximately 10 minutes.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

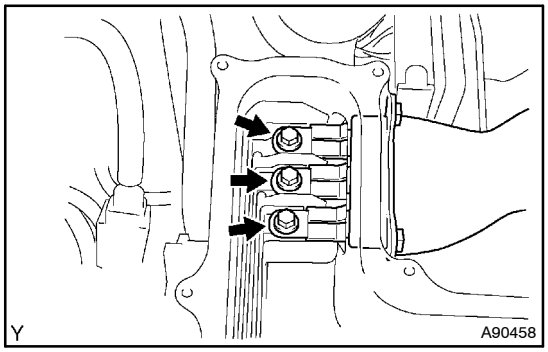
DTC No.	Relevant Diagnosis
P0A1D	Hybrid Powertrain Control Module
P0A2B, P0A2C or P0A2D	Drive Motor “A” Temperature Sensor Circuit System
P0A3F, P0A40 or P0A41	Drive Motor “A” Position Sensor Circuit System
P0A60 or P0A63	Drive Motor “A” Current Sensor Circuit System
P0A78 (Except for 284, 287, 505, 506, 279, 503 and 504)	Drive Motor “A” Inverter Performance
P0A90 (Except for 239, 240, 241, 242, 251, 602, 604 and 605)	Drive Motor “A” Performance
P0A93	Inverter Cooling System Malfunction
P0AA1, P0AA2, P0AA4 or P0AA5	System Main Relay Circuit System
P3000 (Except for 388 and 389), P3004 or P3009	High Voltage System
P3211	Drive Motor “A” Inverter Temperature Sensor Circuit System
P3226	DC/DC Converter Temperature Sensor Circuit System

YES → **GO TO DTC CHART (See page 05–268). FIND A PAGE NUMBER TO PROCEED TO ITS DIAGNOSTIC TROUBLESHOOTING FLOWCHART**

NO

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4	CHECK HYBRID VEHICLE MOTOR ASSY



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.
(b) Check if the three–phase alternating current cable installation bolts on the hybrid vehicle motor are tightened to the specified torque.
Standard: 8.0 N·m (82 kgf·cm 71in.·lbf)
(c) Reinstall the inverter cover (see page 21–25).
(d) Reinstall the service plug grip (see page 21–120).

NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

5	CONFIRM INFORMATION(EXCLUSIVE INFORMATION 4)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Select DTC P0A78 to display its freeze frame data.
(f) Select Detail Information beneath Detail Code which has INF code 287, 505, or 506 and press the ”Details” key.
(g) Read Exclusive Information 4.
Result:

Displayed in Exclusive Information 4	Proceed to
–127 to –120, –95 to –88, –63 to –56, –31 to –24, 1 to 8, 33 to 40, 65 to 72, 97 to 104	A
–119 to –112, –87 to –80, –55 to –48, –23 to –16, 9 to 16, 41 to 48, 73 to 80, 105 to 112	B
–111 to –104, –79 to –72, –47 to –40, –15 to –8, 17 to 24, 49 to 56, 81 to 88, 113 to 120	C
–103 to –96, –71 to –64, –39 to –32, –7 to 0, 25 to 32, 57 to 64, 89 to 96, 121 to 127	D

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

C → **Go to step 10**

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

[Corrected]

A

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7	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

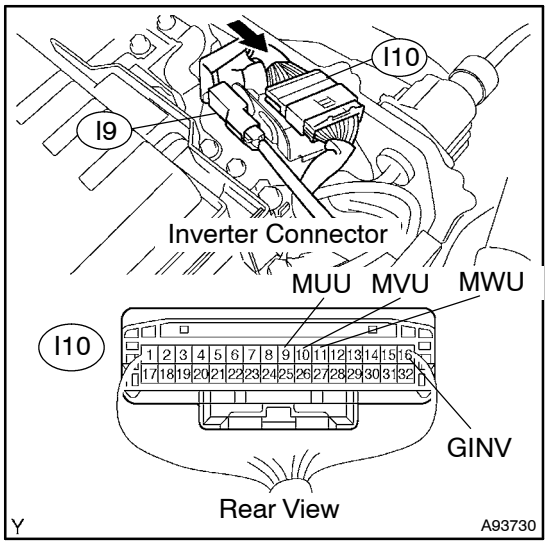
(a) Check that the service plug grip and inverter cover have been removed.
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the power switch ON (IG).

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

(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	12 to 16 V
MVU (I10–10) – GINV (I10–16)	12 to 16 V
MWU (I10–11) – GINV (I10–16)	12 to 16 V

(g) Turn the power switch OFF.



OK → **Go to step 10**

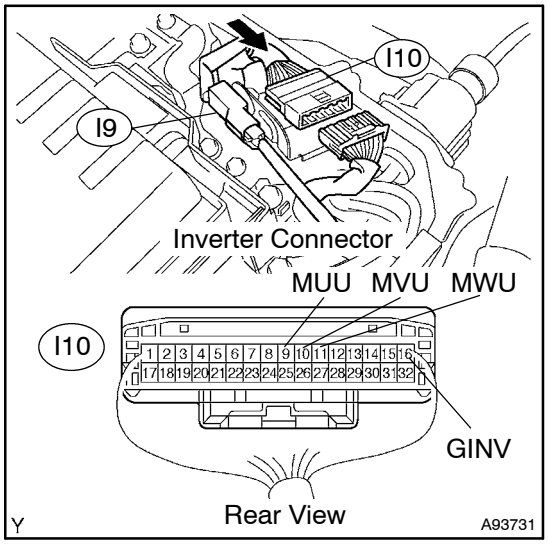
[Corrected]

NG

[Corrected]

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8	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.
(b) Disconnect the I10 inverter connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the power switch ON (IG).

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

(e) Turn the intelligent tester II ON.
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(g) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	14 to 16 V
MVU (I10–10) – GINV (I10–16)	14 to 16 V
MWU (I10–11) – GINV (I10–16)	14 to 16 V

(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 10**

[Corrected]

OK

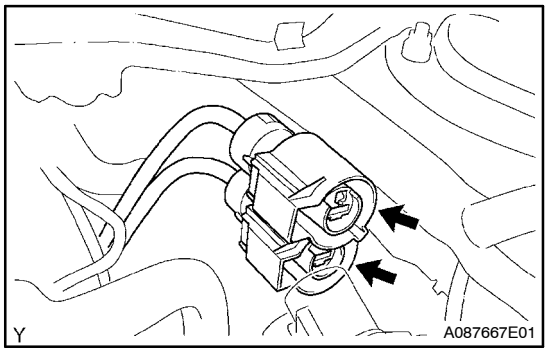
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9	INSPECT W/ CONVERTER INVERTER ASSY

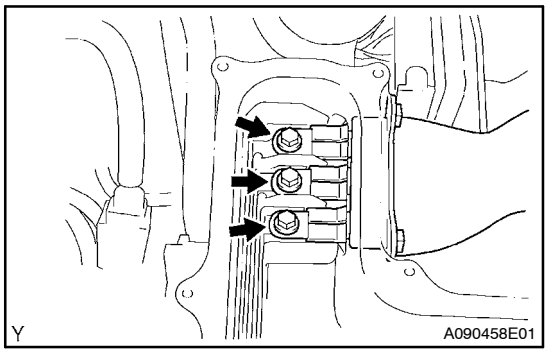
CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.

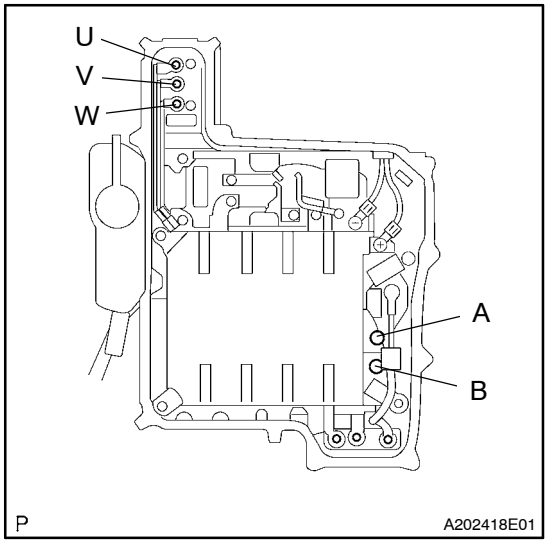
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause a malfunction. Therefore, never turn the power switch ON (READY) in this state.



(b) Disconnect the frame wire from the inverter.



(c) Disconnect the three–phase alternating current cable for the hybrid vehicle motor from the inverter.



(d) Measure the resistance between the three–phase alternating current cable terminals and the inverter terminals labeled A and B in the illustration.

HINT:
Each measurement needs to be performed 2 times. The polarity of the tester probes needs to be switched for the second measurement.

Standard resistance

Tester Connection	Specified Condition
U ← → A	Changes between below 1 kΩ and 1MΩ or higher when the polarity of the tester probes is switched.
V ← → A	
W ← → A	
U ← → B	
V ← → B	
W ← → B	

[Corrected]

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HINT:
This measurement is an inspection of the diodes in the inverter.

(e) Reconnect the three–phase alternating current cable for the hybrid vehicle motor.
(f) Reinstall the inverter cover (see page 21–25).
(g) Reconnect the frame wire from the inverter.
(h) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 10**

OK

REPLACE HYBRID VEHICLE CONTROL ECU

10 CHECK DTC OUTPUT

(a) Check that the service plug grip and inverter cover have been removed.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table(See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–287, 505, 506 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

B → **REPLACE W/ CONVERTER INVERTER ASSEY (See page 21–25)**

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/304	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/305	DRIVE MOTOR ”A” INVERTER PERFORMANCE

DTC	P0A78/507	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

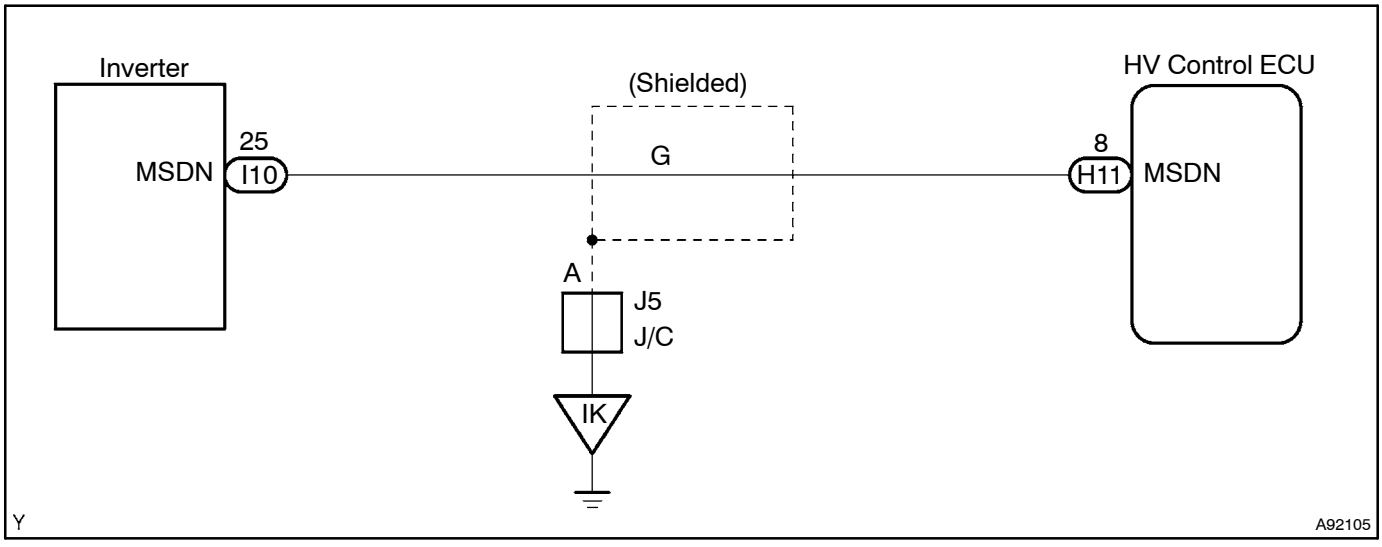
Upon receiving a motor gate shutdown signal from the HV control ECU, the inverter forcefully stops the operation of the MG2 by turning OFF the power transistors that are actuating the MG2.

The HV control ECU monitors the motor gate shutdown signal line and detects malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	304	Open or +B short in motor gate shutdown (MSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • Hybrid vehicle control ECU
P0A78	305	GND short in motor gate shutdown (MSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • Hybrid vehicle control ECU
P0A78	507	Open in motor gate shutdown (MSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • Hybrid vehicle control ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

CAUTION:

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

HINT:

[Added]

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

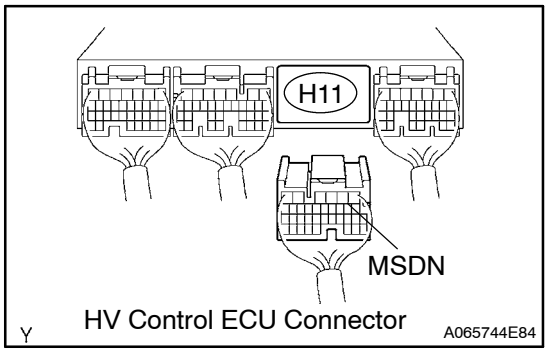
NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
  This DTC will not be stored if any inverter system related DTCs are stored.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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



(a) Disconnect the H11 HV control ECU connector.
(b) Measure the voltage between the terminal of the HV control ECU connector and body ground.

Standard voltage

Tester Connection	Specified Condition
MSDN (H11–8) – Body ground	Below 1 V

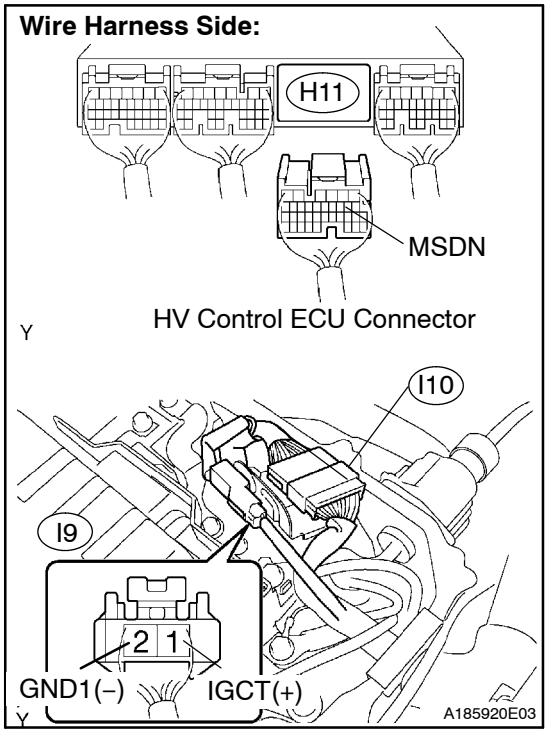
NG → **Go to step 4**

OK

[Corrected]

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
MSDN (H11–8) – GND1 (I9–2)	3.4 to 4.0 kΩ

NOTICE:
When measuring the resistance, wait until the value is stable before reading the tester.

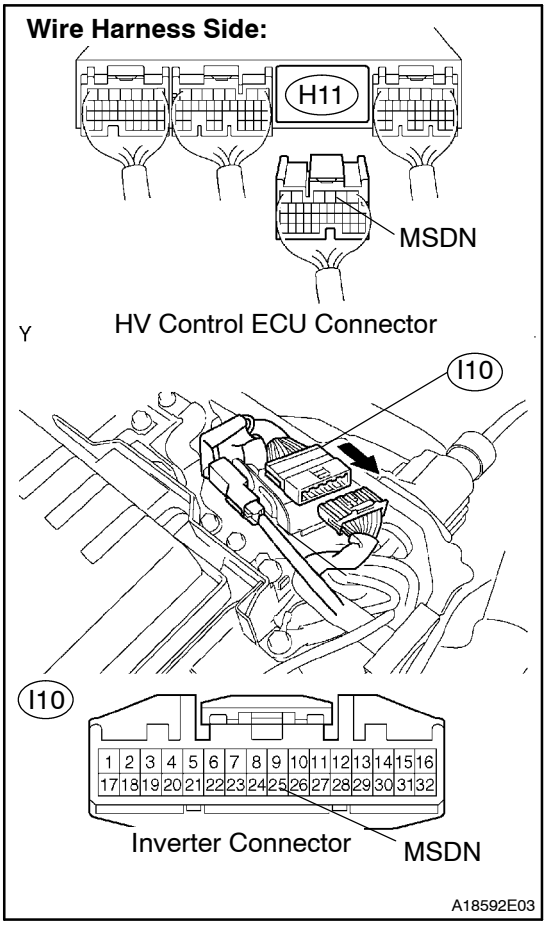
OK → **REPLACE HYBRID VEHICLE CONTROL ECU**

NG

[Corrected]

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



(a) Disconnect the I10 inverter connector.

(b) Measure the resistance between the wire harness side connectors and body ground.

Standard resistance (Check for open)

Tester Connection	Specified Condition
MSDN (H11–8) – MSDN (I10–25)	Below 1Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
MSDN (H11–8) or MSDN (I10–25) – Body ground	10 kΩ or higher

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

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

OK → **Go to step 5**

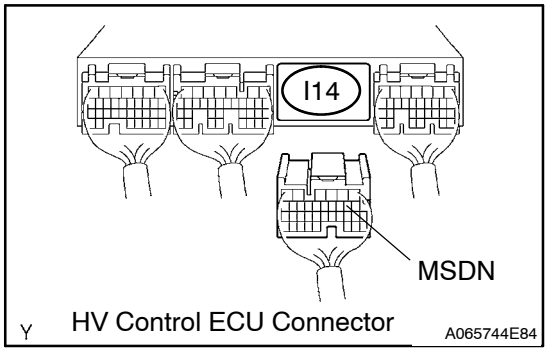
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

[Corrected]

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

HINT:
DTCs for the interlock switch system are output when the power switch is turned ON (READY) while the service plug grip and inverter cover are removed.

Standard voltage

Tester Connection	Specified Condition
MSDN (H11–8) – Body ground	Below 1 V

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

OK

[Corrected]

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–304, 305, 507 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/306	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

The HV control ECU controls MG2 torque in accordance with the driving condition.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	306	Failure in monitoring MG2 torque performance Difference between the motor torque request value sent by the HV control ECU and actual motor torque is large. (1 trip detection logic)	• Hybrid vehicle motor • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A78	306	• Motor (MG2) Torq • M(MG2) Trq Exec Val • Vehicle Spd

INSPECTION PROCEDURE

[Added]

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) Perform a road test according to the Freeze Frame Data “Vehicle Spd” for approximately 10 minutes.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

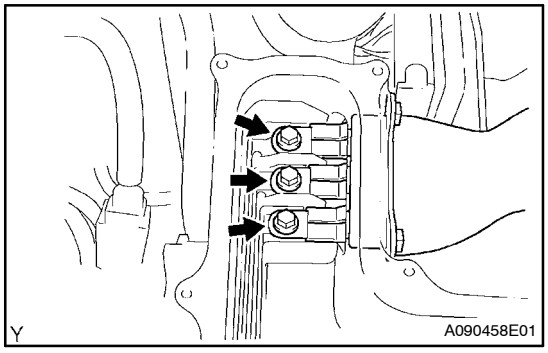
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A78 (INF 306) and other DTCs are output

HINT:
If any other codes besides P0A78 (INF 306) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	CHECK HYBRID VEHICLE MOTOR ASSEMBLY



CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(c) Remove the inverter cover (see page 21–25).
(d) Check if the three–phase alternating current cable installation bolts on the hybrid vehicle motor are tightened to the specified torque.
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

[Added]

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NG → **REPLACE HYBRID VEHICLE MOTOR ASSY**

OK

4 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–306 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/508	DRIVE MOTOR "A" INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.
Upon receiving a motor gate shutdown signal from the HV control ECU, the inverter forcefully stops the operation of the MG2 by turning OFF the power transistors that are actuating the MG2.
The HV control ECU monitors the motor gate shutdown signal and detects malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	508	Motor gate shutdown (MSDN) signal malfunction Either of the following conditions is met: • Although a motor inverter gate shutdown signal has been sent, the motor inverter gate is not shut down. • Although a motor inverter gate shutdown signal has not been sent, the motor inverter gate is shut down.	• Wire harness or connector • HV control ECU • Power module intelligent transistor set

[Corrected]

WIRING DIAGRAM

Refer to DTC P0A78 (INF 304) on page 05–410.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 10 seconds or more.
  (b) Turn the power switch on (READY) and wait for 10 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

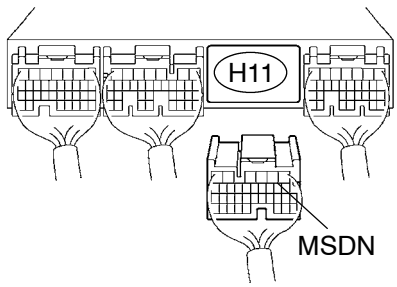
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A78 (INF 508) and other DTCs are output

HINT:
If any other codes besides P0A78 (INF 508) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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



(a) Disconnect the H11 HV control ECU connector.
(b) Measure the voltage between the terminal of the HV control ECU connector and body ground.
Standard voltage

Tester Connection	Specified Condition
MSDN (H11–8) – Body ground	Below 1 V

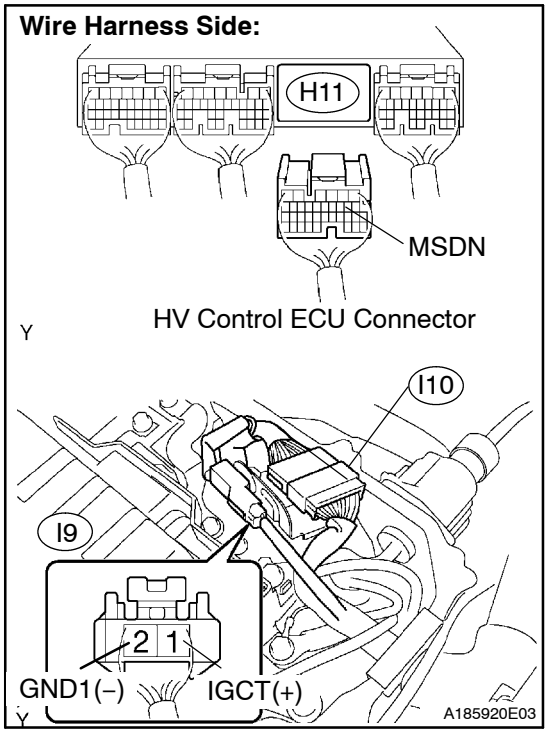
NG → **Go to step 4**

OK

[Corrected]

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
MSDN (H11–8) – GND1 (I9–2)	3.4 to 4.0 kΩ

NOTICE:
When measuring the resistance, wait until the value is stable before reading the tester.

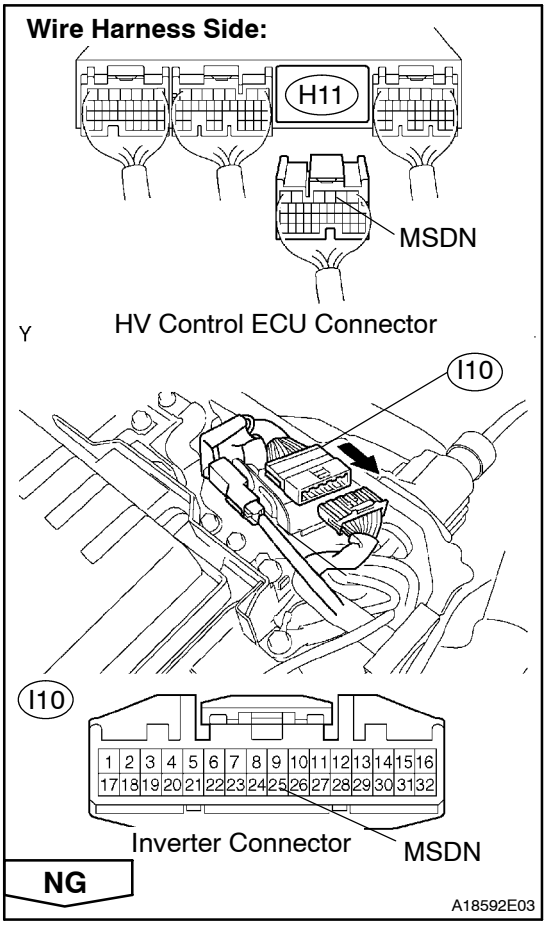
OK → **REPLACE HYBRID VEHICLE CONTROL ECU**

NG

[Corrected]

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



(a) Disconnect the I10 inverter connector.
(b) Measure the resistance between the wire harness side connectors and body ground.

Standard resistance (Check for open)

Tester Connection	Specified Condition
MSDN (H11–8) – MSDN (I10–25)	Below 1Ω

Standard resistance (Check for short)

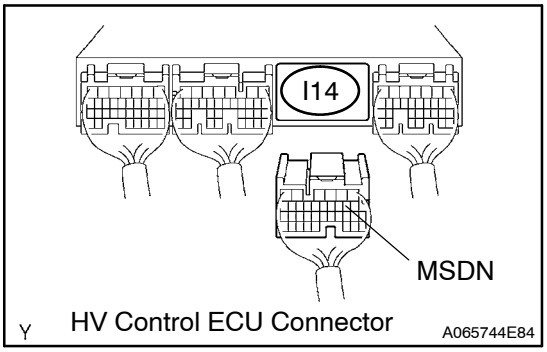
Tester Connection	Specified Condition
MSDN (H11–8) or MSDN (I10–25) – Body ground	10 kΩ or higher

(c) Reinstall the inverter cover (see page 21–25).
(d) Reinstall the service plug grip (see page 21–120).

OK	Go to step 5

REPAIR OR REPLACE HARNESS OR CONNECTOR

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



CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(c) Remove the inverter cover (see page 21–25).
(d) Measure the resistance between the wire harness side connectors.

[Correcte

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HINT:
DTCs for the interlock switch system are output when the power switch is turned ON (READY) while the service plug grip and inverter cover are removed.

Standard voltage

Tester Connection	Specified Condition
MSDN (H11–8) – Body ground	Below 1 V

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

OK

6 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–508 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A78/510	DRIVE MOTOR "A" INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

Upon receiving a motor gate shutdown signal from the HV control ECU, the inverter forcefully stops the operation of the MG2 by turning OFF the power transistors that are actuating the MG2.

The HV control ECU monitors the motor inverter gate and detects malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	510	Motor inverter gate malfunction Although a shutdown signal has been sent to the motor inverter, current flows in the motor. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A78	510	• MG2 Gate Status • M(MG2) Trq Exec Val

WIRING DIAGRAM

Refer to DTC P0A78 (INF 304) on page 05–410.

[Added]

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
  (b)While driving the vehicle at a speed between 30 and 50 km/h (19 and 32 mph), move the shift lever to N and stop the vehicle.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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2	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–510 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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DTC	P0A78/523	DRIVE MOTOR "A" INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0A78 (INF 266) on page 05–365.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	523	Inverter voltage (VH) sensor offset malfunction	• System main relay • Power module intelligent transistor set

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

[Added]

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

Result: DTC P0A78 (INF 523) and other DTCs are output

HINT:

If any other codes besides P0A78 (INF 523) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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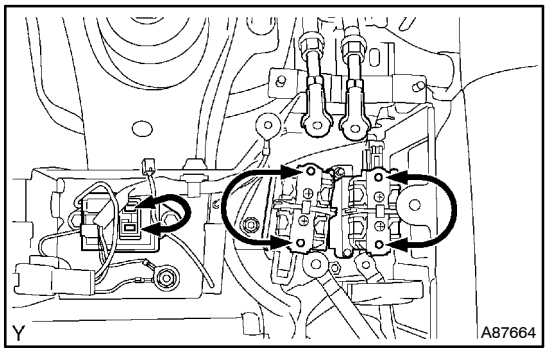
2	CHECK SYSTEM MAIN RELAYS FOR STICKING

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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



(c) Disconnect all the high–voltage terminals of the system main relays.

(d) Check the resistance at the switch side of the system main relays.
Standard: 10 kΩ or higher

(e) Connect the high–voltage terminals of the system main relays.

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

NG → **REPLACE STUCK SYSTEM MAIN RELAY**

OK

3	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:
- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–523 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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DTC	P0A78/586	DRIVE MOTOR ”A” INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0A78 (INF 266) on page 05–365.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	586	Inverter voltage (VH) sensor performance problem Difference between “VH–Voltage after Boosting” and “VL–Voltage before Boosting” is large and difference between “VH–Voltage after Boosting” and “Battery Voltage VB” is large. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A78	586	• Boost Raite • VL–Voltage before Boosting • VH–Voltage after Boosting • Power Resource VB

WIRING DIAGRAM

Refer to DTC P0A78 (INF 266) on page 05–365.

[Added]

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

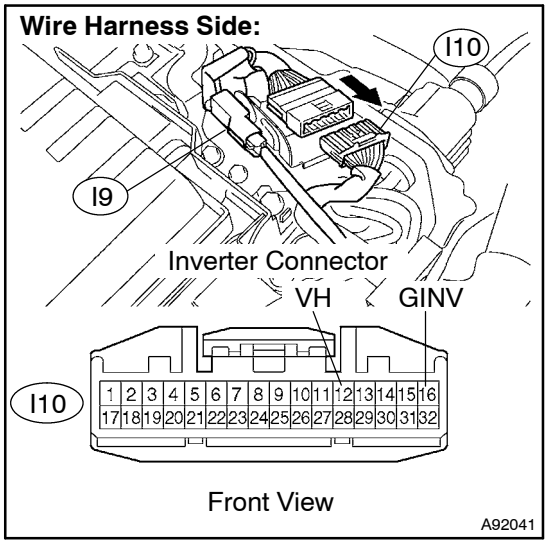
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- When the accelerator pedal is not depressed with the power switch on (READY) and park (P) selected, if “VH–Voltage after Boosting” and the “Power Resource VB” is approximately same after repair, the condition is judged as normal.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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Standard:

Tester Connection	Specified Condition
VH (H11–26) – Body ground	Below 1 V
GINV (H11–23) – Body ground	Below 1 V

(h) Turn the power switch OFF.

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

Standard (Check for open):

Tester Connection	Specified Condition
VH (H11–26) – VH (I10–12)	Below 1 Ω
GINV (H11–23) – GINV (I10–16)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VH (H11–26) or VH (I10–12) – Body ground	10 kΩ or higher
GINV (H11–23) or GINV (I10–16) – Body ground	10 kΩ or higher

(j) Reconnect the inverter connector.

(k) Reconnect the HV control ECU connector.

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

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

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

[Corrected]

OK

3 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A78–586 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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DTC	P0A7A/309	GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

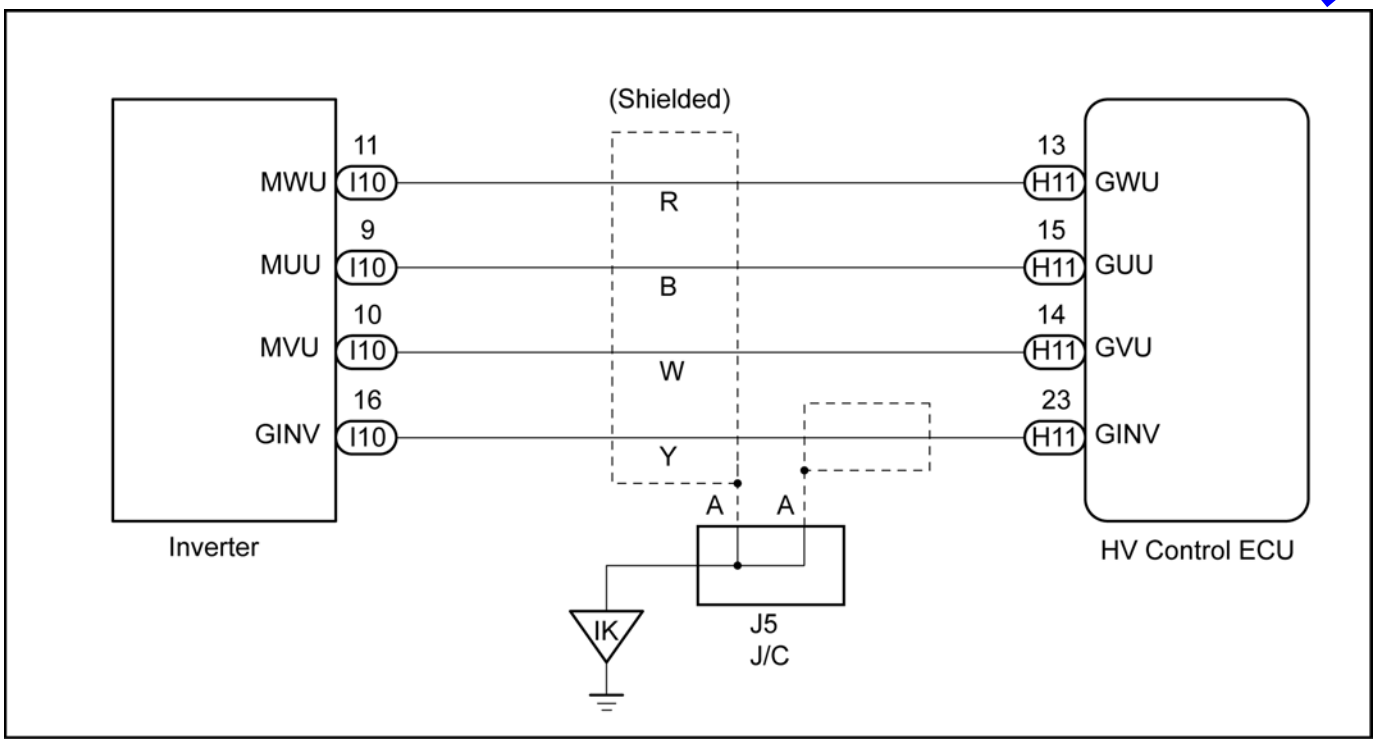
Refer to DTC P0A78 (INF 272) on page 05–373.

Stores a DTC when the duty command signal of the switching transistor (3–phase) in the inverter and current status signal of the drive circuit do not match.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	309	Abnormality in generator PWM circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

WIRING DIAGRAM

[Corrected]



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

[Added]

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY), depress the accelerator pedal with park (P) selected to start the engine and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

Result: DTC P0A1D is output

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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3	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Connect the intelligent tester II to the DLC3.
(b) Clear the DTCs (see page 05–246).

HINT:
Clear DTCs before inspection because the active test cannot be performed while DTCs are stored.

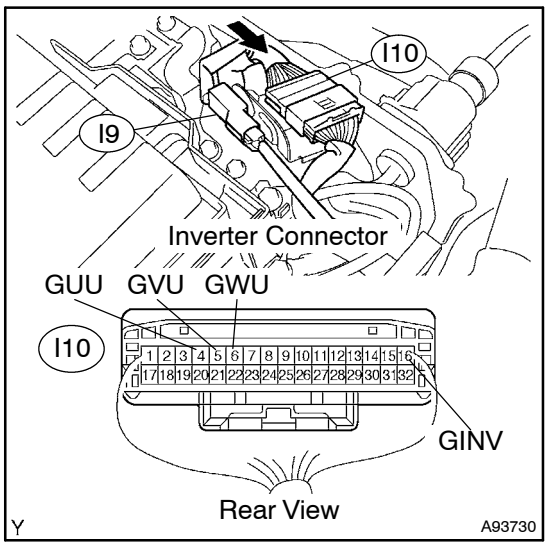
(c) Turn the power switch ON (IG).
(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Perform the Forcible Stop of Inverter Drive.
(g) Remove the service plug grip (see page 21–120).

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

(h) Remove the inverter cover (see page 21–25).
(i) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
GUU (I10–4) – GINV (I10–16)	12 to 16 V
GVU (I10–5) – GINV (I10–16)	12 to 16 V
GWU (I10–6) – GINV (I10–16)	12 to 16 V

(j) Turn the power switch OFF.
(k) Reinstall the inverter cover (see page 21–25).
(l) Reinstall the service plug grip (see page 21–120).



OK → **Go to step 5**

[Corrected]

NG

[Corrected]

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4	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Connect the intelligent tester II to the DLC3.
(b) Clear the DTCs (see page05–246).

HINT:
Clear DTCs before inspection because the active test cannot be performed while DTCs are stored.

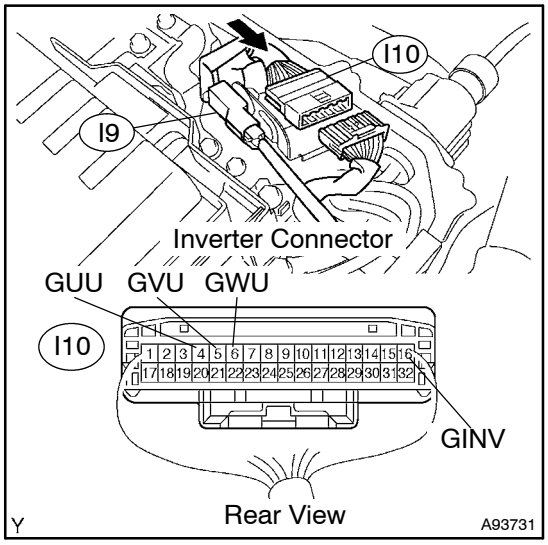
(c) Turn the power switch ON (IG).
(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Perform the Forcible Stop of Inverter Drive.
(g) Remove the service plug grip (see page 21–120).

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

(h) Remove the inverter cover (see page 21–25).
(i) Disconnect the I10 inverter connector.
(j) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
GUU (I10–4) – GINV (I10–16)	14 to 16 V
GVU (I10–5) – GINV (I10–16)	14 to 16 V
GWU (I10–6) – GINV (I10–16)	14 to 16 V

(k) Turn the power switch OFF.
(l) Reconnect the inverter connector.
(m) Reinstall the inverter cover (see page 21–25).
(n) Reinstall the service plug grip (see page 21–120).



NG → **Go to step 5**

[Corrected]

OK

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

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–309 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A7A/321	GENERATOR INVERTER PERFORMANCE

DTC	P0A7A/323	GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

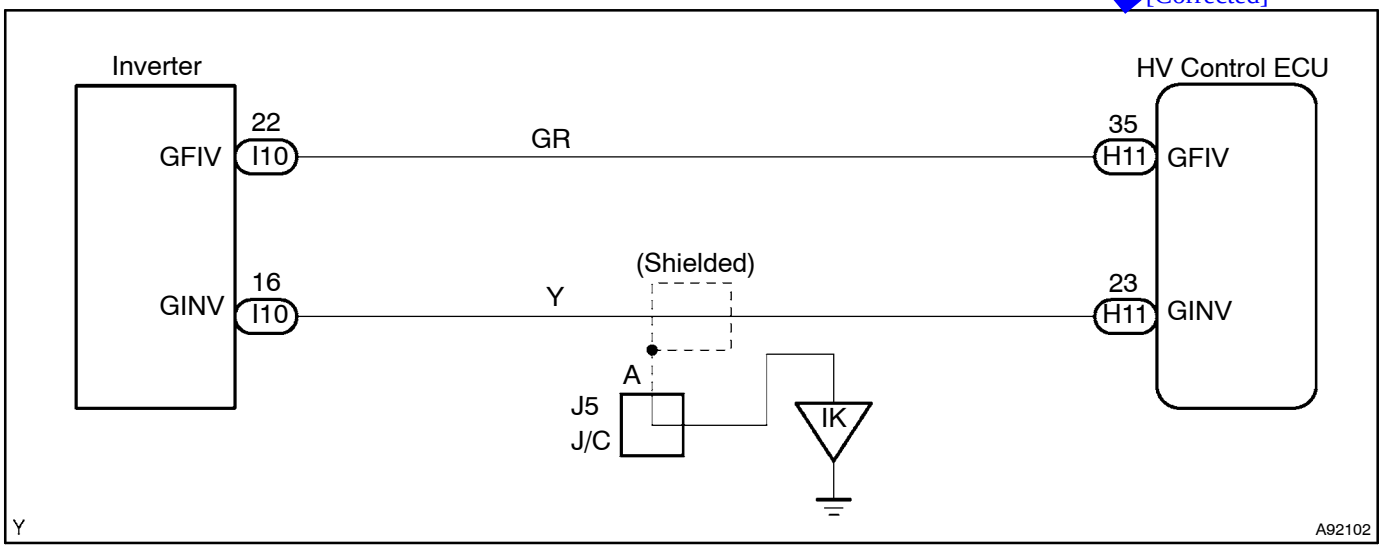
If the generator inverter has a circuit malfunction, internal short, or overheats, the inverter transmits that information to the GFIV terminal of the HV control ECU via the generator inverter fail signal line.

The HV control ECU monitors the generator inverter fail signal line and detects malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	321	+B short in generator inverter fail (GFIV) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A7A	323	Open or GND short in generator inverter fail (GFIV) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM

[Corrected]



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

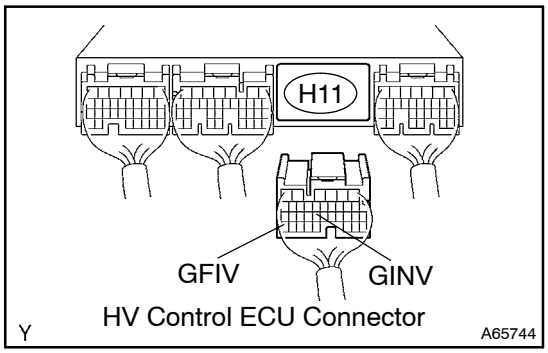
[Added]

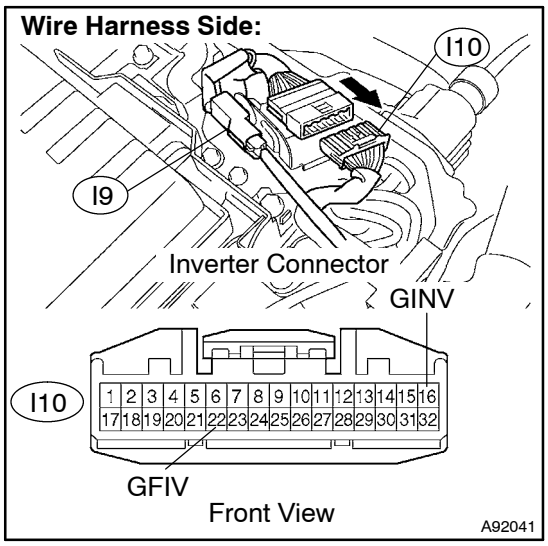
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HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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





CAUTION:

Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

NOTICE:

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

(c) Disconnect the H11 HV control ECU connector.

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

(e) Disconnect the I10 inverter connector.

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

HINT:

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

(g) Measure the voltage between the terminals of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
GFIV (H11–35) – Body ground	Below 1 V
GINV (H11–23) – Body ground	Below 1 V

(h) Turn the power switch OFF.

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

Standard (Check for open):

Tester Connection	Specified Condition
GFIV (H11–35) – GFIV (I10–22)	Below 1 Ω
GINV (H11–23) – GINV (I10–16)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
GFIV (H11–35) or GFIV (I10–22) – Body ground	10 kΩ or higher
GINV (H11–23) or GINV (I10–16) – Body ground	10 kΩ or higher

(j) Reconnect the inverter connector.

(k) Reconnect the HV control ECU connector.

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

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

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

[Corrected]

OK

2 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–321, 323 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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DTC P0A7A/322 GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.
If the generator inverter has a circuit malfunction, internal short, or overheats, the inverter transmits that information to the GFIV terminal of HV control ECU via the generator inverter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	[Corrected] 322	Generator inverter fail (GFIV) signal detection (inverter overheating) Generator inverter temperature is excessively high.	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • Engine assembly • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set

HINT:

- Other than the w/ converter inverter assembly, the HV control ECU or hybrid vehicle transaxle assembly may be the cause of the malfunction.
- Identify the malfunctioning part according to the “EXCLUSIVE INFO”.

Related Data List

DTC No.	INF Code	Data List
P0A7A	322	• Inverter Temp–(MG1)

WIRING DIAGRAM

[Added]

Refer to DTC P0A78 (INF 279) on page 05–378.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

[Added]

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HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) Drive the vehicle for approximately 10 minutes mainly using the engine.
  During the road test, check the Data List item “Inverter Temp–(MG1)” to prevent the motor inverter from overheating.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1 READ OUTPUT DTC(HYBRID CONTROL)

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

DTC No.	Relevant Diagnosis
P0A1D	Hybrid Powertrain Control Module
P0A2B, P0A2C or P0A2D	Drive Motor ”A” Temperature Sensor Circuit System
P0A37, P0A38 or P0A39	Generator Temperature Sensor Circuit System
P0A3F, P0A40 or P0A41	Drive Motor ”A” Position Sensor Circuit System
P0A4B, P0A4C or P0A4D	Generator Position Sensor Circuit System
P0A60 or P0A63	Drive Motor ”A” Current Sensor Circuit System
P0A72 or P0A75	Generator Current Sensor Circuit System
P0A78	Drive Motor ”A” Inverter Performance
P0A7A	Generator Inverter Performance
P0A90	Drive Motor ”A” Performance
P0A92	Hybrid Generator Performance
P0A93	Inverter Cooling System Malfunction
P0A94	DC/DC Converter Malfunction
P0AA1, P0AA2, P0AA4 or P0AA5	System Main Relay Circuit System
P3000, P3004, P3009 or P3110	High Voltage System
P3211	Drive Motor ”A” Inverter Temperature Sensor Circuit System
P3221	Generator Inverter Temperature Sensor Circuit System
P3226	DC/DC Converter Temperature Sensor Circuit System

YES → **GO TO DTC CHART (See page 05–268). FIND A PAGE NUMBER TO PROCEED TO ITS DIAGNOSTIC TROUBLESHOOTING FLOWCHART**

NO

2 CHECK QUANTITY OF HV COOLANT

(a) Check that there is a sufficient amount of coolant for the inverter.
OK: There is a sufficient amount of coolant for the inverter

NG → **ADD HV COOLANT (See page 22–4)**

OK

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NG	REPLACE HYBRID VEHICLE GENERATOR ASSY

OK

13	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Reinstall the inverter cover (see page 21–25).
(b) Reinstall the service plug grip (see page 21–120).
(c) Connect the intelligent tester II to the DLC3.
(d) Clear the DTCs (see page 05–246).

HINT:
Clear DTCs before inspection because the active test cannot be performed while DTCs are stored.

(e) Turn the power switch ON (IG).
(f) Turn the intelligent tester II ON.
(g) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(h) Perform the Forcible Stop of Inverter Drive.
(i) Remove the service plug grip (see page 21–120).

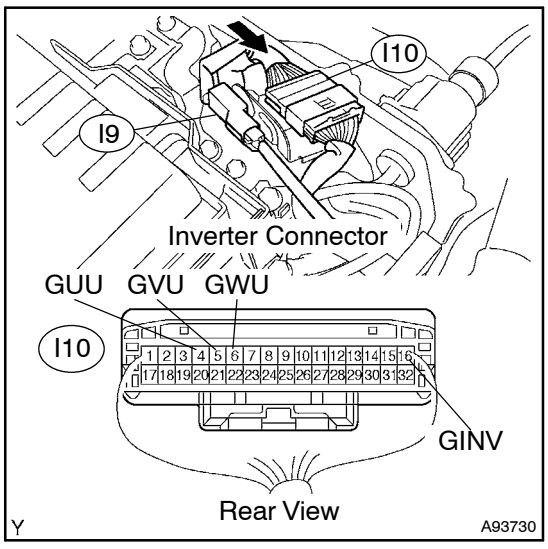
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(j) Remove the inverter cover (see page 21–25).
(k) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.

Standard:

Tester Connection	Specified Condition
GUU (I10–4) – GINV (I10–16)	12 to 16 V
GVU (I10–5) – GINV (I10–16)	12 to 16 V
GWU (I10–6) – GINV (I10–16)	12 to 16 V

(l) Turn the power switch OFF.
(m) Reinstall the inverter cover (see page 21–25).
(n) Reinstall the service plug grip (see page 21–120).



OK	Go to step 15

[Corrected]

NG

[Corrected]

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14	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Connect the intelligent tester II to the DLC3.
(b) Clear the DTCs (see page05–246).

HINT:
Clear DTCs before inspection because the active test cannot be performed while DTCs are stored.

(c) Turn the power switch ON (IG).
(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Perform the Forcible Stop of Inverter Drive.
(g) Remove the service plug grip (see page 21–120).

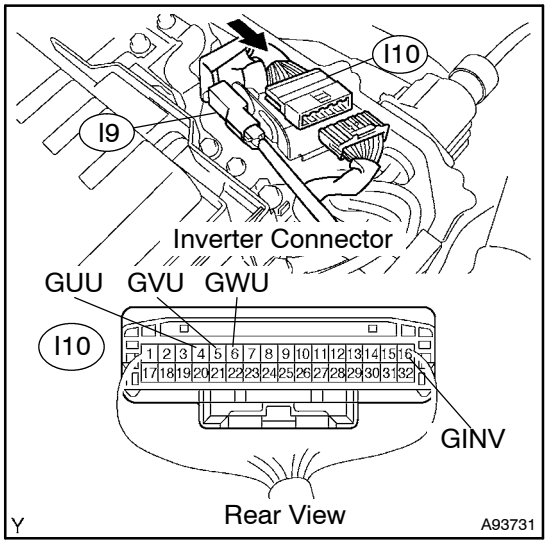
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(h) Remove the inverter cover (see page 21–25).
(i) Disconnect the I10 inverter connector.
(j) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.

Standard:

Tester Connection	Specified Condition
GUU (I10–4) – GINV (I10–16)	14 to 16 V
GVU (I10–5) – GINV (I10–16)	14 to 16 V
GWU (I10–6) – GINV (I10–16)	14 to 16 V

(k) Turn the power switch OFF.
(l) Reconnect the inverter connector.
(m) Reinstall the inverter cover (see page 21–25).
(n) Reinstall the service plug grip (see page 21–120).



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

[Corrected]

NG

[Corrected]

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15	CHECK CRANKSHAFT PULLEY REVOLUTION (P POSITION)

(a) Push the P position switch and turn the power switch OFF.
(b) Jack up the vehicle.
(c) Manually turn the crankshaft pulley to check if the crankshaft rotates.
OK: The crankshaft rotates

[Corrected]

OK	Go to step 18

[Corrected]

NG

16	CHECK CRANKSHAFT PULLEY REVOLUTION (N POSITION)

(a) Turn the power switch ON (IG).
(b) Depress the brake pedal, move the selector lever to the N position.

CAUTION:
Make sure that the inspection is performed with the power switch ON (IG).
If the power switch is ON (READY), the engine may start if P or D is accidentally selected.

(c) Jack up the vehicle.
(d) Manually turn the crankshaft pulley to check if the crankshaft rotates.
OK: The crankshaft rotates

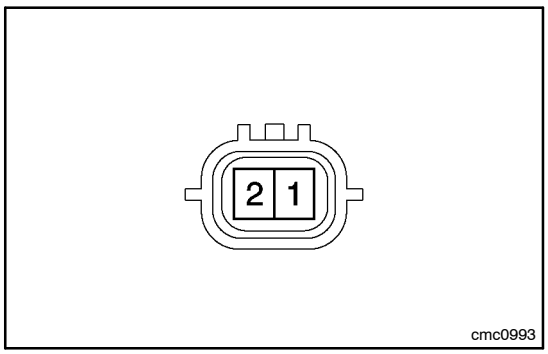
OK	REPAIR OR REPLACE ENGINE ASSY

OK

REPAIR OR REPLACE HYBRID VEHICLE TRANSAXLE ASSY (See page 22–11)

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17	CHECK WATER W/MOTOR & BRACKET PUMP ASSY



(a) Remove the water w/ motor & bracket pump assy.
(b) Connect the battery positive terminal to terminal 2 and the battely negative terminal to terminal 1.
(c) Check that the pump motor operates properly.

NOTICE:

- **Do not connect the positive and negative poles of the battery to the wrong terminals.**
- **Complete the check within 10 seconds of connection.**

OK: Pump motor operates properly.

NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (WATER W/MOTOR & BRACKET PUMP ASSY CIRCUIT)

18	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–322 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC P0A7A/324 GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.
If the generator inverter has a circuit malfunction, internal short, or overheats, the inverter transmits that information to the GFIV terminal of HV control ECU via generator inverter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	324	Generator inverter fail (GFIV) signal detection (circuit malfunction) (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM

[Corrected]

Refer to DTC P0A78 (INF 282) on page 05–387.

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) Drive the vehicle for approximately 10 minutes mainly using the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

[Added]

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

DTC No.	INF Code	Detection Item	See Page
P0A7A	321 or 323	Generator Inverter Performance	05–426

YES → **GO TO THE PAGE NUMBER SHOWN IN THE TABLE ABOVE**

NO

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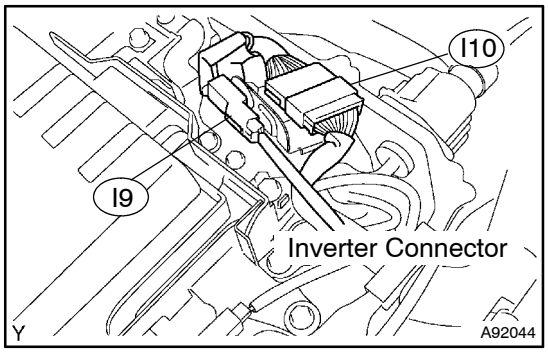
2	CHECK CONNECTION CONDITION OF INVERTER CONNECTOR(LOOSENESS AND POOR CONTACT)

CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Check the connection condition of the I9 and I10 inverter connectors.
OK: Connectors have been connected securely and there is no poor connection.
(e) Reinstall the inverter cover (see page 21–25).
(f) Reinstall the service plug grip (see page 21–120).



NG → **CONNECT SECURELY**

OK

3	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTCs P0A78 (INF 282, 286) and P0A7A (INF 324) (inverter circuit malfunction) are output

NO → **Go to step 5** [Corrected]

YES

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–324 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A7A/325	GENERATOR INVERTER PERFORMANCE

DTC	P0A7A/517	GENERATOR INVERTER PERFORMANCE

DTC	P0A7A/518	GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

If the generator inverter has a circuit malfunction, internal short, or overheats, the inverter transmits that information to the GFIV terminal of HV control ECU via the generator inverter fail signal line.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	325	Generator inverter fail (GFIV) signal detection (over current by inverter assembly malfunction)*1 (1 trip detection logic)	• Wire harness or connector • Engine assembly • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set
P0A7A	517	Generator inverter fail (GFIV) signal detection (over current by HV control ECU malfunction)*2 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • Engine assembly • Power module intelligent transistor set
P0A7A	518	Generator inverter fail (GFIV) signal detection (over current by HV transaxle assembly malfunction)*3 (1 trip detection logic)	• Wire harness or connector • Engine assembly • HV transaxle assembly • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set

HINT:

- *1: The power module intelligent transistor set may be suspected as a main cause of the malfunction.
- *2: The HV control ECU may be suspected as a main cause of the malfunction.
- *3: The hybrid vehicle transaxle assembly may be suspected as a main cause of the malfunction. In this case, the vehicle may not drive smoothly.
- Identify the malfunctioning part according to the “EXCLUSIVE INFO”.

WIRING DIAGRAM

[Added]

Refer to DTC P0A78 (INF 279) on page 05–378.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

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[Added]

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) Drive the vehicle for approximately 10 minutes mainly using the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

DTC No.	Relevant Diagnosis
P0A1D	Hybrid Powertrain Control Module
P0A37, P0A38 or P0A39	Generator Temperature Sensor Circuit System
P0A4B, P0A4C or P0A4D	Generator Position Sensor Circuit System
P0A72 or P0A75	Generator Current Sensor Circuit System
P0A7A (Except for 322, 325, 517 and 518)	Generator Inverter Performance
P0A92 (Except for 261, 606 and 607)	Hybrid Generator Performance
P0A93	Inverter Cooling System Malfunction
P0AA1, P0AA2, P0AA4 or P0AA5	System Main Relay Circuit System
P3000 (Except for 388 and 389), P3004 or P3009	High Voltage System
P3221	Generator Inverter Temperature Sensor Circuit System
P3226	DC/DC Converter Temperature Sensor Circuit System

YES → **GO TO DTC CHART (See page 05–268). FIND A PAGE NUMBER TO PROCEED TO ITS DIAGNOSTIC TROUBLESHOOTING FLOWCHART**

NO

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NG → REPLACE HYBRID VEHICLE GENERATOR ASSY

OK

7	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Reinstall the inverter cover (see page 21–25).
(b) Reinstall the service plug grip (see page 21–120).
(c) Connect the intelligent tester II to the DLC3.
(d) Clear the DTCs (see page 05–246).

HINT:
Clear DTCs before inspection because the active test cannot be performed while DTCs are stored.

(e) Turn the power switch ON (IG).
(f) Turn the intelligent tester II ON.
(g) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(h) Perform the Forcible Stop of Inverter Drive.
(i) Remove the service plug grip (see page 21–120).

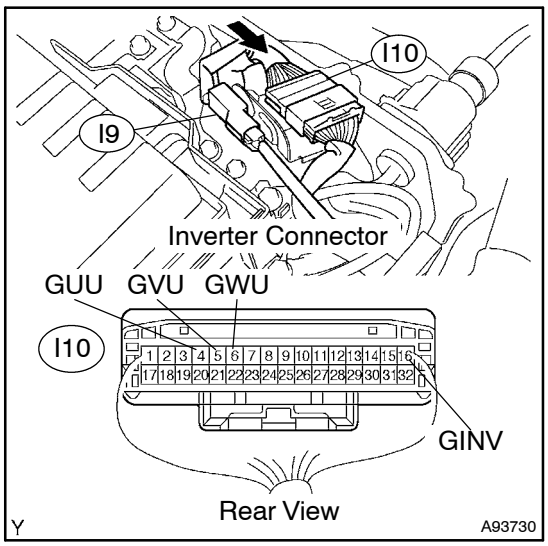
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(j) Remove the inverter cover (see page 21–25).
(k) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.

Standard:

Tester Connection	Specified Condition
GUU (I10–4) – GINV (I10–16)	12 to 16 V
GVU (I10–5) – GINV (I10–16)	12 to 16 V
GWU (I10–6) – GINV (I10–16)	12 to 16 V

(l) Turn the power switch OFF.
(m) Reinstall the inverter cover (see page 21–25).
(n) Reinstall the service plug grip (see page 21–120).



OK → Go to step 13 [Corrected]

NG [Corrected]

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8	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Connect the intelligent tester II to the DLC3.
(b) Clear the DTCs (see page05–246).

HINT:
Clear DTCs before inspection because the active test cannot be performed while DTCs are stored.

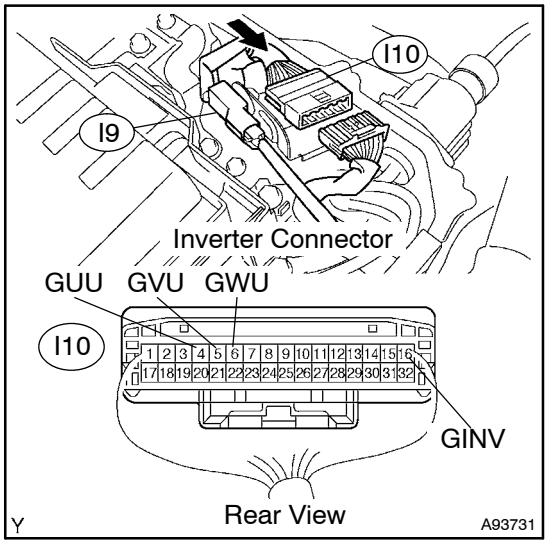
(c) Turn the power switch ON (IG).
(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Perform the Forcible Stop of Inverter Drive.
(g) Remove the service plug grip (see page 21–120).

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

(h) Remove the inverter cover (see page 21–25).
(i) Disconnect the I10 inverter connector.
(j) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
GUU (I10–4) – GINV (I10–16)	14 to 16 V
GVU (I10–5) – GINV (I10–16)	14 to 16 V
GWU (I10–6) – GINV (I10–16)	14 to 16 V

(k) Turn the power switch OFF.
(l) Reconnect the inverter connector.
(m) Reinstall the inverter cover (see page 21–25).
(n) Reinstall the service plug grip (see page 21–120).



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

[Corrected]

NG

[Corrected]

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9	CHECK CRANKSHAFT PULLEY REVOLUTION (P POSITION)

(a) Push the P position switch and turn the power switch OFF.
(b) Jack up the vehicle.
(c) Manually turn the crankshaft pulley to check if the crankshaft rotates.
OK: The crankshaft rotates

OK → **Go to step 15** [Corrected]

NG

10	CHECK CRANKSHAFT PULLEY REVOLUTION (N POSITION)

(a) Turn the power switch ON (IG).
(b) Depress the brake pedal, move the selector lever to the N position.

CAUTION:
Make sure that the inspection is performed with the power switch ON (IG).
If the power switch is ON (READY), the engine may start if P or D is accidentally selected.

(c) Jack up the vehicle.
(d) Manually turn the crankshaft pulley to check if the crankshaft rotates.
OK: The crankshaft rotates

NG → **Go to step 12** [Corrected]

OK

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11	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–325, 517, 518 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

B → **REPAIR OR REPLACE W/ CONVERTER INVERTER ASSY AND HYBRID VEHICLE TRANSAXLE ASSY**

A →

REPAIR OR REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET AND HYBRID VEHICLE TRANSAXLE ASSY

12	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–325, 517, 518 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

B → **REPAIR OR REPLACE W/ CONVERTER INVERTER ASSY AND ENGINE ASSY**

A →

REPAIR OR REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET AND ENGINE

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13	CHECK CRANKSHAFT PULLEY REVOLUTION (P POSITION)

(a) Push the P position switch and turn the power switch OFF.
(b) Jack up the vehicle.
(c) Manually turn the crankshaft pulley to check if the crankshaft rotates.
OK: The crankshaft rotates

OK	Go to step 15

NG

14	CHECK CRANKSHAFT PULLEY REVOLUTION (N POSITION)

(a) Turn the power switch ON (IG).
(b) Depress the brake pedal, move the selector lever to the N position.

CAUTION:
Make sure that the inspection is performed with the power switch on (IG).
If the power switch is on (READY), the engine may start if P or D is accidentally selected.

(c) Jack up the vehicle.
(d) Manually turn the crankshaft pulley to check if the crankshaft rotates.
OK: The crankshaft rotates

NG	REPAIR OR REPLACE ENGINE ASSY

OK

REPAIR OR REPLACE HYBRID VEHICLE TRANSAXLE ASSY

[Corrected]

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15	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–325, 517, 518 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A7A/342	GENERATOR INVERTER PERFORMANCE

DTC	P0A7A/343	GENERATOR INVERTER PERFORMANCE

DTC	P0A7A/519	GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

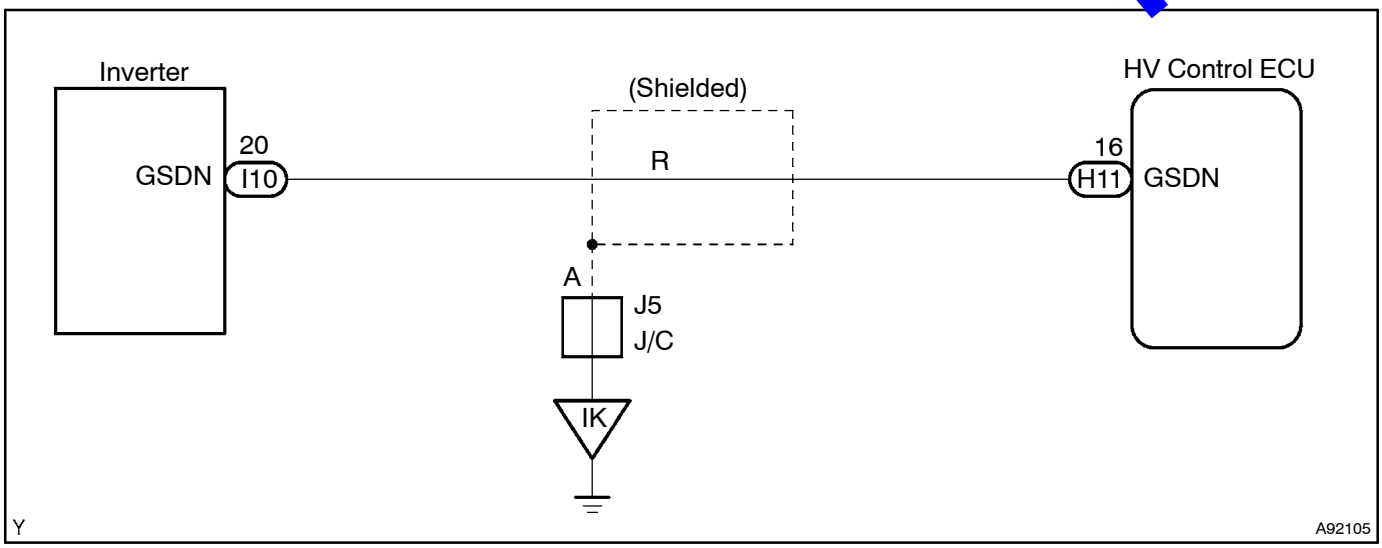
Upon receiving a generator gate shutdown signal from the HV control ECU, the inverter forcefully stops the operation of the MG1 by turning OFF the power transistors that are actuating the MG1.

The HV control ECU monitors the generator gate shutdown signal line and detects malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	342	Open or +B short in generator gate shutdown (GSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A7A	343	GND short in generator gate shutdown (GSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A7A	519	Open in generator gate shutdown (GSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM

[Corrected]



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

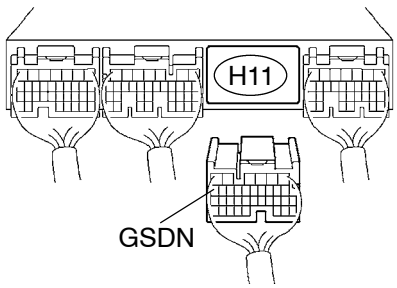
NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
  This DTC will not be stored if any inverter system related DTCs are stored.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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



(a) Disconnect the H11 HV control ECU connector.
(b) Measure the voltage between the terminal of the HV control ECU connector and body ground.

Standard: voltage

Tester Connection	Specified Condition
GSDN (H11–16) – Body ground	Below 1 V

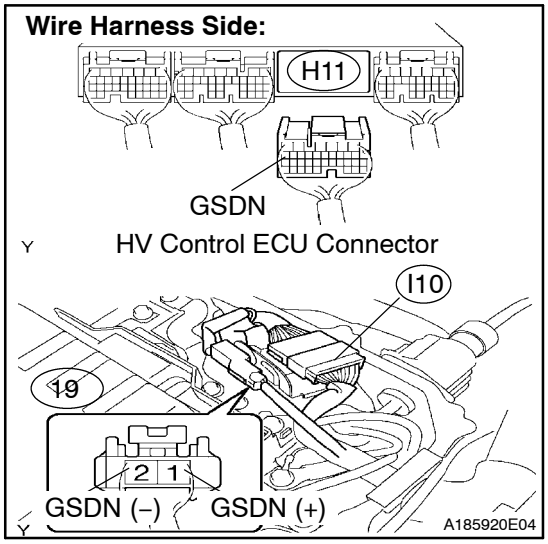
NG → **Go to step 4**

OK

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
GSDN (H11–16) – GND1 (I9–2)	3.4 to 4.0 kΩ

NOTICE:
When measuring the resistance, wait until the value is stable before reading the tester.

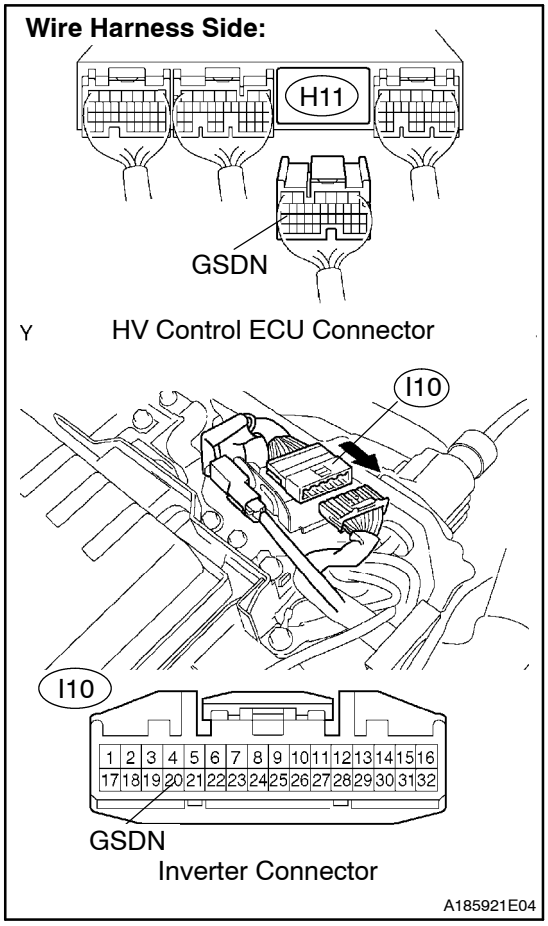
OK → **REPLACE HYBRID VEHICLE CONTROL ECU**

NG

[Corrected]

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



(a) Disconnect the I10 inverter connector.

(b) Measure the resistance between the wire harness side connectors and body ground.

Standard: resistance (Check for open)

Tester Connection	Specified Condition
GSDN (H11–16) – GSDN (I10–20)	Below 1 Ω

Standard: resistance (Check for open)

Tester Connection	Specified Condition
GSDN (H11–16) or GSDN (I10–20) – Body ground	10 kΩ or higher

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

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

OK	Go to step 5

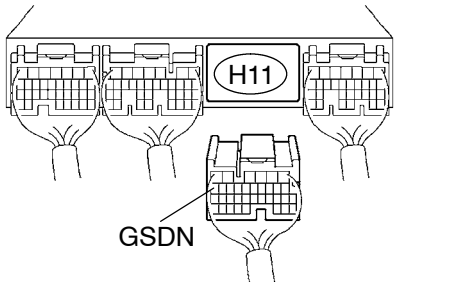
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

[Corrected]

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

HINT:
DTCs for the interlock switch system are output when the power switch is turned ON (READY) while the service plug grip and inverter cover are removed.

Standard: voltage

Tester Connection	Specified Condition
GSDN (H11–16) – Body ground	Below 1 V

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

OK

[Corrected]

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–342, 343, 519 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC P0A7A/344 GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

The HV control ECU controls MG1 torque in accordance with the driving condition.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	344	Failure in monitoring MG1 torque performance Difference between the generator torque request value sent by the HV control ECU and actual generator torque is large. (1 trip detection logic)	• Hybrid vehicle generator • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A7A	344	• Generator(MG1) Torq • G(MG1) Trq Exec Val

INSPECTION PROCEDURE

[Added]

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) Drive the vehicle for approximately 10 minutes mainly using the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

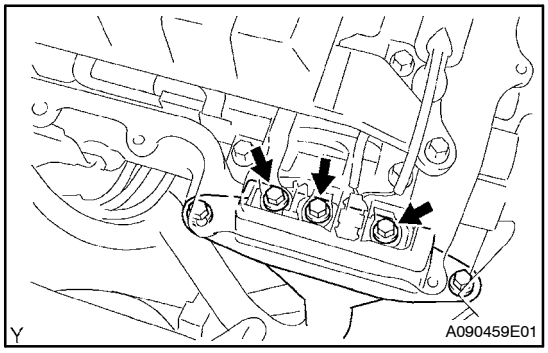
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A7A (INF 344) and other DTCs are output

HINT:
If any other codes besides P0A7A (INF 344) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	CHECK HYBRID VEHICLE GENERATOR ASSY



CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction.
Therefore, never turn the power switch ON (READY) in this state.
(c) Remove the inverter cover (see page 21–25).
(d) Check if the three–phase alternating current cable installation bolts on the hybrid vehicle generator are tightened to the specified torque.
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

[Corrected]

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NG → **REPLACE HYBRID VEHICLE GENERATOR ASSY**

OK

4	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–344 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Added]

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DTC	P0A7A/520	GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.

Upon receiving a generator gate shutdown signal from the HV control ECU, the inverter forcefully stops the operation of the MG1 by turning OFF the power transistors that are actuating the MG1.

The HV control ECU monitors the generator gate shutdown signal and detects malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	520	Generator gate shutdown (GSDN) signal malfunction Either of the following conditions is met: • Although a generator shutdown signal has been sent to the w/ converter inverter assembly, the generator gate is not shut down. • Although a generator shutdown signal has not been sent to the w/ converter inverter assembly, the generator gate is shut down.	• Wire harness or connector • HV control ECU • Power module intelligent transistor set

WIRING DIAGRAM

Refer to DTC P0A7A (INF 342) on page 05–446.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 10 seconds or more.
  (b) Turn the power switch on (READY) and wait for 10 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

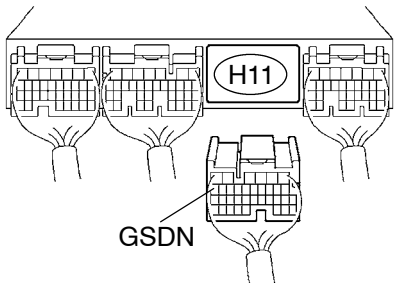
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A7A (INF 520) and other DTCs are output

HINT:
If any other codes besides P0A7A (INF 520) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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



(a) Disconnect the H11 HV control ECU connector.
(b) Measure the voltage between the terminal of the HV control ECU connector and body ground.
Standard: voltage

Tester Connection	Specified Condition
GSDN (H11–16) – Body ground	Below 1 V

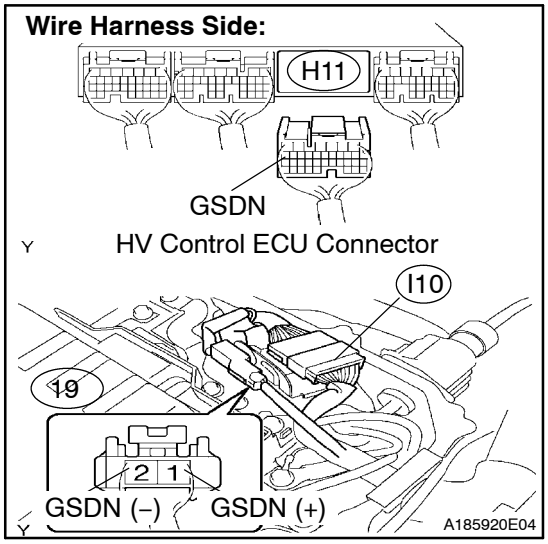
NG → **Go to step 4**

OK

[Corrected]

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
GSDN (H11–16) – GND1 (I9–2)	3.4 to 4.0 kΩ

NOTICE:
When measuring the resistance, wait until the value is stable before reading the tester.

OK → **REPLACE HYBRID VEHICLE CONTROL ECU**

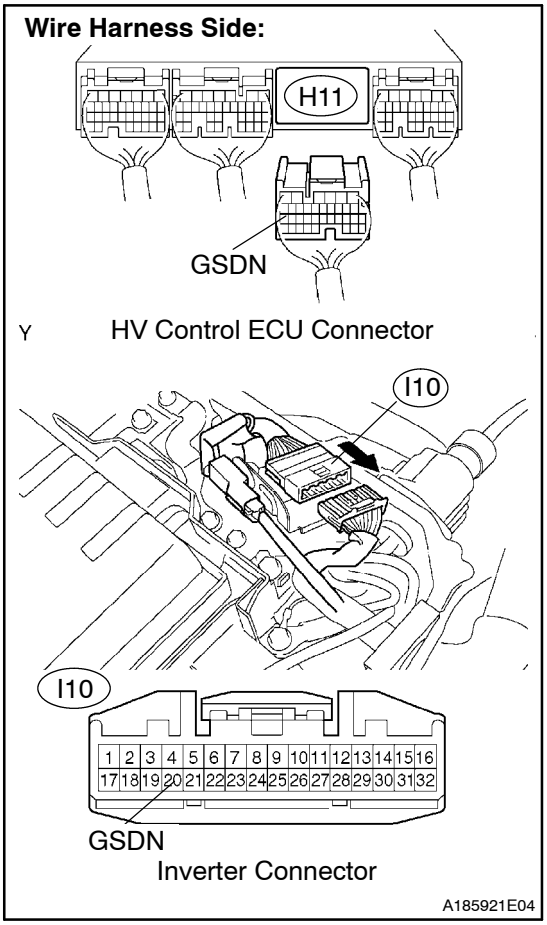
NG

[Corrected]

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[Corrected]

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



(a) Disconnect the I10 inverter connector.

(b) Measure the resistance between the wire harness side connectors and body ground.

Standard: resistance (Check for open)

Tester Connection	Specified Condition
GSDN (H11–16) – GSDN (I10–20)	Below 1 Ω

Standard: resistance (Check for open)

Tester Connection	Specified Condition
GSDN (H11–16) or GSDN (I10–20) – Body ground	10 kΩ or higher

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

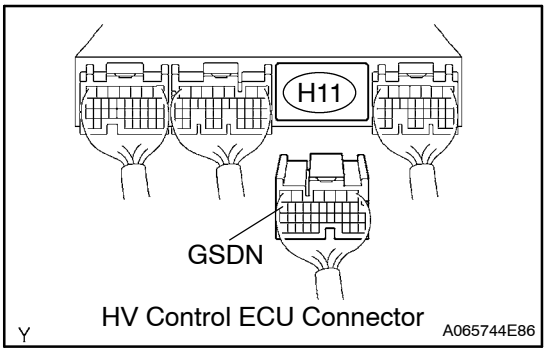
(d) Reinstall the service plug grip (see page 21–120).

OK	Go to step 5

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

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HINT:
DTCs for the interlock switch system are output when the power switch is turned ON (READY) while the service plug grip and inverter cover are removed.

Standard: voltage

Tester Connection	Specified Condition
GSDN (H11–16) – Body ground	Below 1 V

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

OK

6 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–520 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC P0A7A/522 GENERATOR INVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the inverter on page 05–365.
Upon receiving a generator gate shutdown signal from the HV control ECU, the inverter forcefully stops the operation of the MG1 by turning OFF the power transistors that are actuating the MG1.
The HV control ECU monitors the generator inverter gate and detects malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A7A	522	Generator inverter gate malfunction Although a generator shutdown signal has been sent to the w/ converter inverter assembly, current flows in the generator. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A7A	522	• Inverter Temp–(MG1) • G(MG1) Trq Exec Val

WIRING DIAGRAM

Refer to DTC P0A7A (INF 342) on page 05–446.

[Added]

INSPECTION PROCEDURE

CAUTION:

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

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) While driving (EV driving) the vehicle at a speed between 30 and 50 km/h (19 and 32 mph), move the shift lever to N and stop the vehicle.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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2	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A7A–522 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

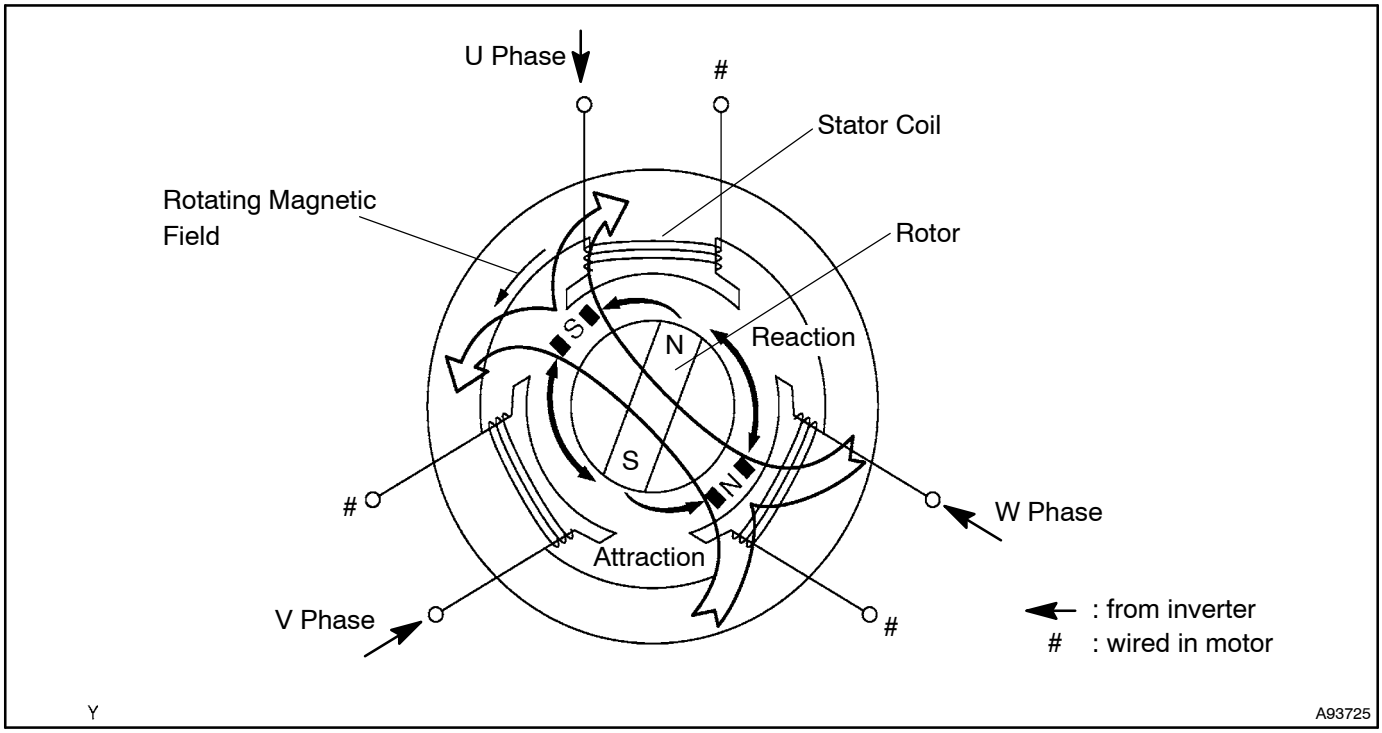
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DTC	P0A90/251	DRIVE MOTOR "A" PERFORMANCE

CIRCUIT DESCRIPTION

When three–phase alternating current flows through the three–phase windings of the stator coil, a rotating magnetic field is generated in the motor. The system controls the rotating magnetic field in accordance with the rotating position and speed of the rotor. As a result, the permanent magnets provided on the rotor are pulled in the rotating direction, which cause the generation of torque.

The generated torque is practically proportionate to the amount of current. Therefore, the system controls the speed of the motor by regulating the frequency of the alternating current. Furthermore, the system properly controls the rotating magnetic field and the angle of the rotor magnets in order to generate high torque in an efficient manner, even at high speeds.



[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A90	251	MG2 magnetic force deterioration or same phase short circuit Magnetic force of the motor decreases or a coil short circuit does not return to normal. (1 trip detection logic)	• Hybrid vehicle motor

Related Freeze Frame Data

DTC No.	INF Code	Freeze Frame Data
P0A90	251	• Inv–Temp (MG2) Max

[Added]

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INSPECTION PROCEDURE

[Added]

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Drive the vehicle until the cumulative traveling time driving at vehicle speed of 40 km/h or more is a few minutes. (not required to keep driving at 40 km/h or more).

1	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTCs except P0A90 (INF 251) and P0A78 (INF 287, 505, 506) are output

HINT:
If any other codes besides P0A90 (INF 251) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	REPRODUCTION TEST

(a) Connect the intelligent tester II to the DLC3.
(b) Test–drive the vehicle at a speed of 25 mph (40 km/h) for approximately 1 minute.
(c) Select the following menu items: Powertrain / Hybrid Control / DTC.
(d) Read output DTC.
Result

DTC output	Proceed to
P0A78–306 or P0A90–509 is output	A
P0A90–251 is output or no DTC is output	B

A → **GO TO RELEVANT DTC CHART (See page 05–268)**

B

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DTC	P0A90/509	DRIVE MOTOR "A" PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the MG1/MG2 on page 05–463.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A90	509	MG2 system malfunction (If current does not flow as commanded, the motor high voltage system may be malfunctioning.)	• Hybrid vehicle motor • Power module intelligent transistor set

HINT:
Suspected malfunctioning parts:
- Open circuit in the motor coil or motor cable
- Insecure connection of the motor cable connector
- w/ converter inverter assembly output line malfunction

[Added]

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- If a malfunction occurs after disconnecting and connecting the motor cable, check the cable connection.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Start the vehicle from a stop and drive the vehicle until the vehicle speed reaches approximately 10 km/h (6 mph). Repeat this procedure a few times.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

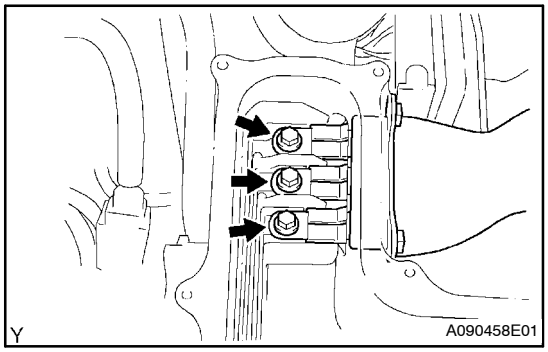
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A90 (INF 509) and other DTCs are output

HINT:
If any other codes besides P0A90 (INF 509) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	CHECK HYBRID VEHICLE MOTOR ASSY



CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction.
Therefore, never turn the power switch ON (READY) in this state.
(c) Remove the inverter cover (see page 21–25).
(d) Check if the three–phase alternating current cable installation bolts on the hybrid vehicle motor are tightened to the specified torque.
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

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NG → **REPLACE HYBRID VEHICLE MOTOR ASSY**

OK

4 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A90–509 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC P0A92/261 HYBRID GENERATOR PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the MG1/MG2 on page 05–463.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A92	261	MG1 magnetic force deterioration or same phase short circuit Magnetic force of the generator decreases or a coil short circuit does not return to normal. (1 trip detection logic)	• Hybrid vehicle generator

INSPECTION PROCEDURE

[Added]

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Drive the vehicle until the cumulative traveling time using the engine is a few minutes (not required to keep driving using the engine).

1 READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC except P0A92 (INF 261) and P0A7A (INF 325, 517, 518) are output

HINT:
If any other codes besides P0A92 (INF 261) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2 REPRODUCTION TEST

(a) Connect the intelligent tester II to the DLC3.
(b) Leave the vehicle for 1 minute with the engine ON (with the Generator rotating)
(c) Select the following menu items: Powertrain / Hybrid Control / DTC.
(d) Read output DTCs.
Result

DTC output	Proceed to
P0A7A–344 or P0A92–521 is output	A
P0A92–261 is output or no DTC is output	B

A → **GO TO RELEVANT DTC CHART (See page 05–268)**

B

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DTC	P0A92/521	HYBRID GENERATOR PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the MG1/MG2 on page 05–463.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A92	521	MG1 system malfunction (If current does not flow as commanded, the generator high voltage system may be malfunctioning.) (1 trip detection logic)	• Hybrid vehicle generator • Power module intelligent transistor set

HINT:
Suspected malfunctioning parts:
- Open circuit in the generator coil or generator cable
- Insecure connection of the generator cable connector
- w/ converter inverter assembly output line malfunction

[Added]

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) with park (P) selected.
  (b) With the engine stopped, depress the accelerator pedal and start the engine.
  (c) Release the accelerator pedal immediately.
  If the accelerator pedal is depressed continuously, the engine speed increases and this DTC cannot be detected.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A92 (INF 521) and other DTCs are output

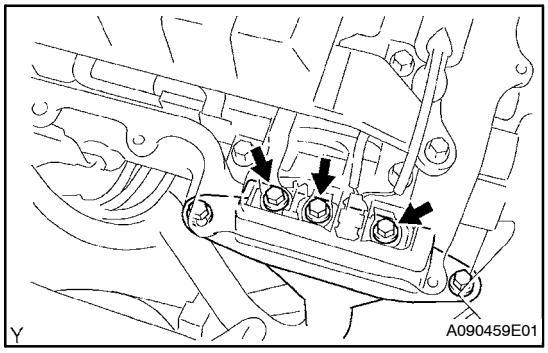
HINT:
If any other codes besides P0A92 (INF 521) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	CHECK HYBRID VEHICLE GENERATOR ASSY

CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction.
Therefore, never turn the power switch ON (READY) in this state.
(c) Remove the inverter cover (see page 21–25).
(d) Check if the three–phase alternating current cable installation bolts on the hybrid vehicle generator are tightened to the specified torque.
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)



NG → **TIGHTEN THEM TO SPECIFIED TORQUE**

OK

[Corrected]

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NG → **REPLACE HYBRID VEHICLE GENERATOR ASSY**

OK

4 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A92–521 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

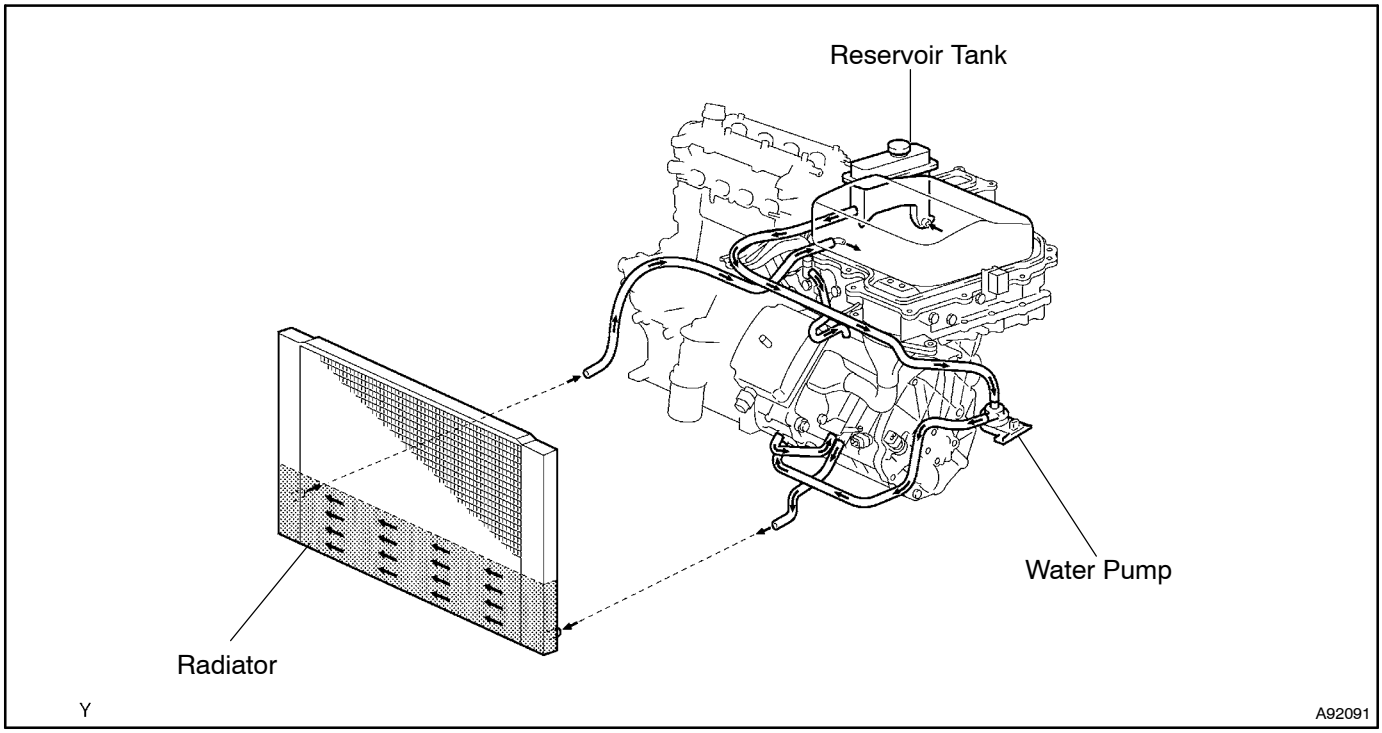
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DTC	P0A93/346	INVERTER COOLING SYSTEM PERFORMANCE

DTC	P0A93/347	INVERTER COOLING SYSTEM PERFORMANCE

CIRCUIT DESCRIPTION

The inverter converts the high–voltage direct current of the HV battery into the alternating current for the MG1 and the MG2. The inverter generates heat during the conversion process, and this heat could damage the inverter if a cooling system is unavailable. Therefore, similar to the MG1 and the MG2, the inverter is cooled by a dedicated cooling system, which consists of an electric water pump, cooling fan, and radiator. This cooling system is independent of the engine cooling system.



The HV control ECU monitors the electric water pump, cooling fan and cooling system, and detects malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A93	346	Inverter cooling system malfunction (water pump system malfunction) Inverter coolant temperature increases and the temperature of any w/ converter inverter assembly related parts increases. (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly
P0A93	347	Inverter cooling system malfunction (electric cooling fan system malfunction) Both inverter coolant temperature and engine coolant temperatures increase and the temperature of any inverter related parts increases. (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • w/ converter inverter assembly

[Corrected]

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Related Data List

DTC No.	INF Code	Data List
P0A93	346	• Inverter Temp–(MG1) • Inverter Temp–(MG2) • Converter Temperature • Engine Coolant Temp
P0A93	347	

INSPECTION PROCEDURE

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Perform a road test according to the freeze frame data “Vehicle Spd” for approximately 15 minutes.
During the road test, check Data List items “Inverter Temp–(MG1)”, “Inverter Temp–(MG2)”, “Converter Temperature” and “Engine Coolant Temp” to prevent them from overheating.

1 CHECK VEHICLE CONDITION

(a) Make sure that the front side of the radiator grille is not blocked with anything.
(b) Ask the customer if the front side of the radiator grille was blocked with anything.

Result

Result	Proceed to
Not blocked.	A
Is/was blocked.	B

HINT:
If the radiator grille is blocked, the inverter coolant temperature will increase and this DTC may be stored.

B → **IF EQUIPPED, EXPLAIN TO CUSTOMER THAT OPTIONAL COMPONENTS WILL BE REMOVED**

A

2 CHECK QUANTITY OF HV COOLANT [Added]

(a) Check that there is a sufficient amount of coolant for the inverter.
OK: There is a sufficient amount of coolant for the inverter

NG → **ADD HV COOLANT (See page 22–4)**

OK

3 CHECK COOLANT HOSE

(a) Check that the hoses of the cooling system are not bent or clogged (see the cooling system on page 05–474).
OK: The hoses of the cooling system are not bent or clogged

NG → **CORRECT TO NORMAL CONDITION**

OK

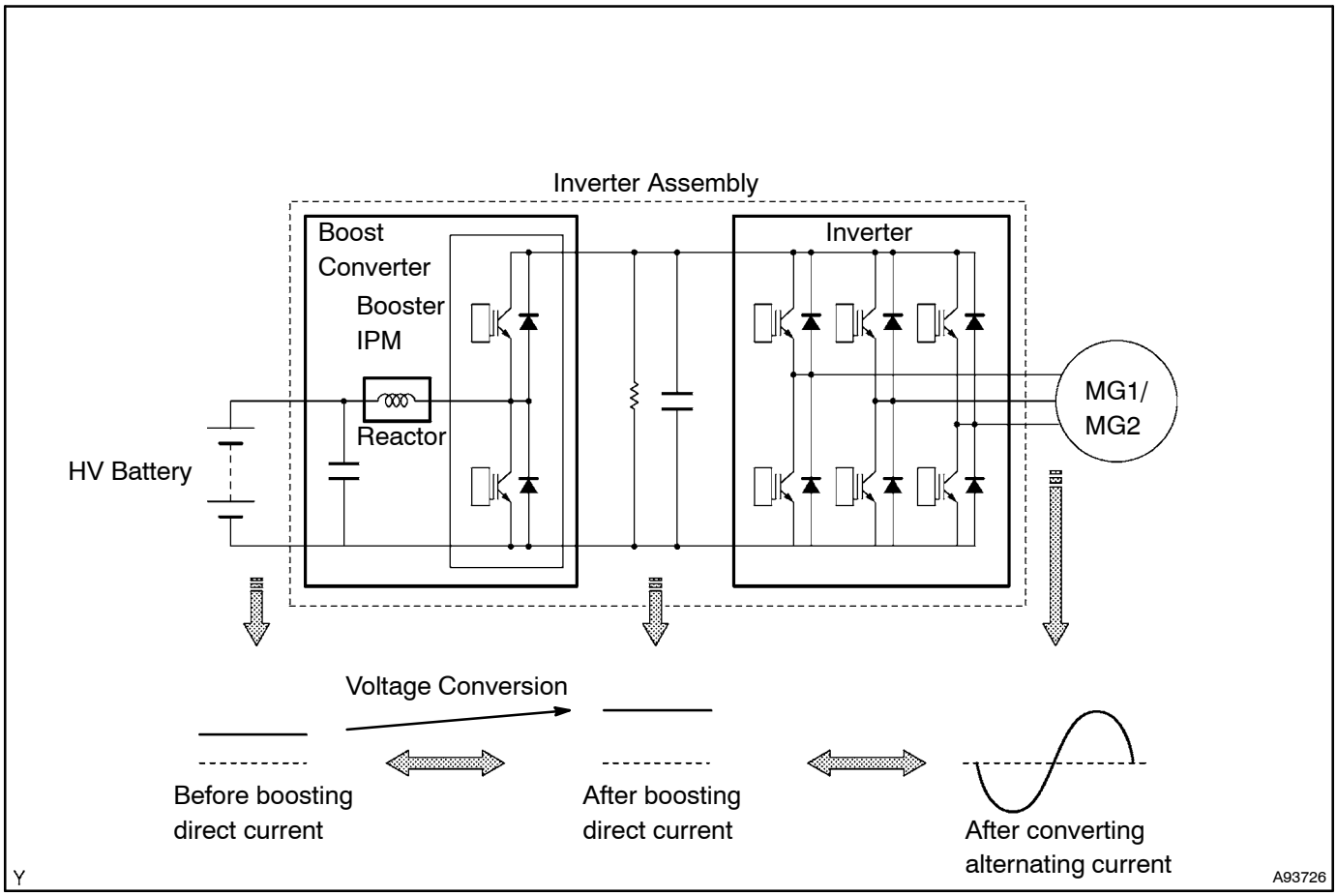
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DTC	P0A94/442	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

The boost converter contains a booster IPM (Intelligent Power Module), which includes an IGBT (Insulated Gate Bipolar Transistor) and a reactor. The HV control ECU actuates the IGBT, which controls the current in the reactor.

The boost converter boosts the high–voltage direct current rated at 201.6 V to an approximate direct current voltage of 500 V. The inverter converts the voltage that has been boosted by the boost converter into alternating current, which is used for driving the MG1/MG2. When the MG1/MG2 operates as a generator, the alternating current of approximately 500 V from the MG1/MG2 is converted into direct current by the inverter. Then, the boost converter drops this voltage to a direct current voltage rated at 201.6 V in order to charge the HV battery.



The HV control ECU uses a voltage sensor that is built into the boost converter to detect the high voltage (VL) before it is boosted. Also, it uses a voltage sensor that is built into the inverter to detect the high voltage (VH) after it has been boosted.

Based on the voltage before and after it has been boosted, the HV control ECU boosts it to a target voltage by controlling the operation of the boost converter.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	442	Abnormal voltage execution value Boosting cannot be performed as requested due to a boost converter system malfunction. (1 trip detection logic)	• Power module intelligent transistor set

HINT:
"VH–Voltage after Boosting" will be approximately 500 V during cranking.

[Added]

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[Added]

INSPECTION PROCEDURE

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY)
  (b) With the engine stopped and park (P) selected, depress the accelerator pedal and start the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A94 (INF 442) and other DTCs are output

HINT:
If any other codes besides P0A94 (INF 442) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

[Corrected]

NO

2	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**
  Result

Result	Proceed to
Only P0A94–442 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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DTC	P0A94/545	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/546	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.

If the boost converter detects a circuit malfunction or over–voltage, the boost converter transmits this information to the OVL terminal of the HV control ECU via the boost converter over–voltage signal line. [Corrected]

The HV control ECU monitors the boost converter over–voltage signal line and detects malfunction.

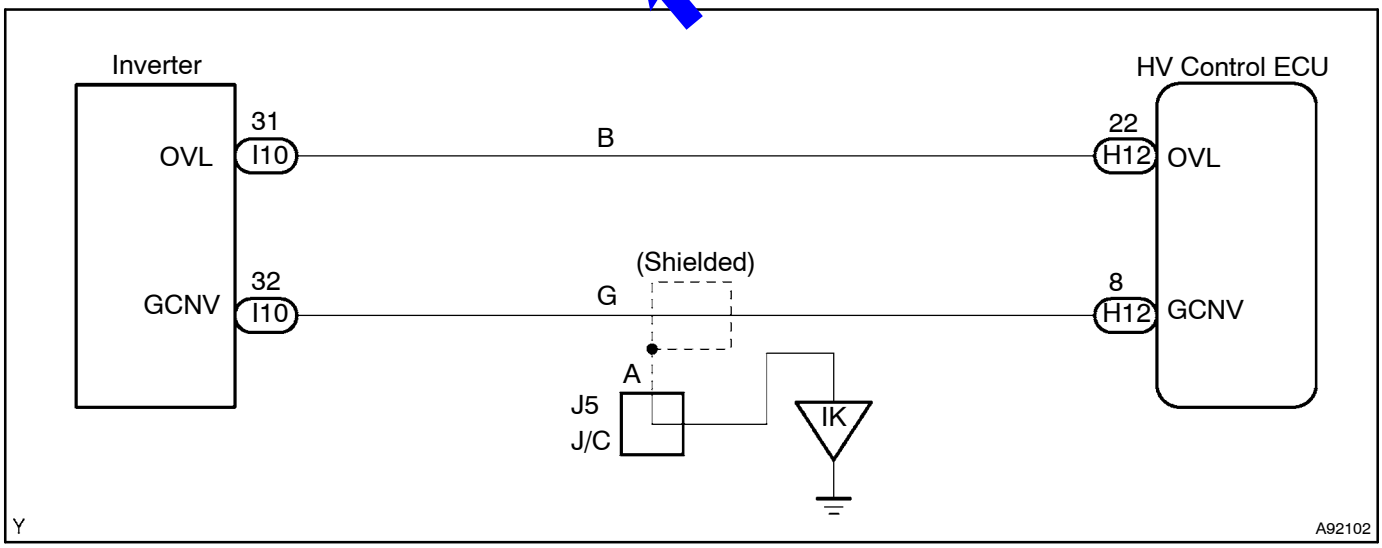
DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	545	Open or GND short in boost converter over–voltage (OVL) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A94	546	+B short in boost converter over–voltage (OVL) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A94	545	• VH–Voltage after Boosting
P0A94	546	

WIRING DIAGRAM

[Added]



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

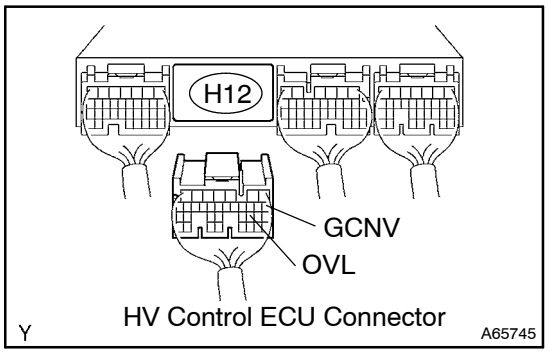
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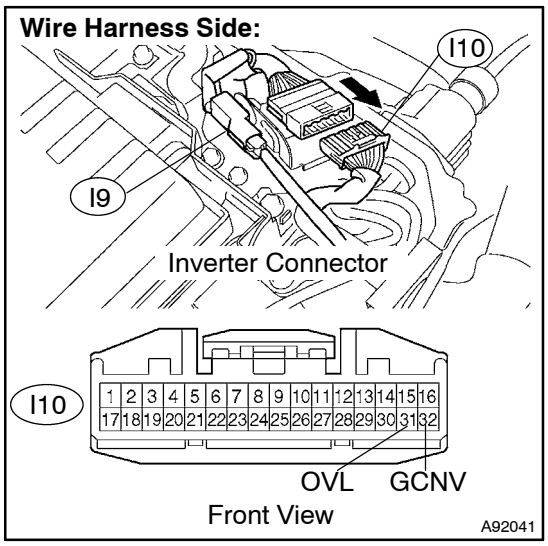
[Added]

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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





CAUTION:
Wear insulated gloves before performing the following operation.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.
(c) Disconnect the H12 HV control ECU connector.
(d) Remove the inverter cover (see page 21–25).
(e) Disconnect the I10 inverter connector.
(f) Turn the power switch ON (IG).
HINT:
DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.
(g) Measure the voltage between the terminals of the HV control ECU connector and body ground.
Standard:

Tester Connection	Specified Condition
OVL (H12–22) – Body ground	Below 1 V
GCNV (H12–8) – Body ground	Below 1 V

(h) Turn the power switch OFF.
(i) Check the resistance between the wire harness side connectors.
Standard (Check for open):

Tester Connection	Specified Condition
OVL (H12–22) – OVL (I10–31)	Below 1 Ω
GCNV (H12–8) – GCNV (I10–32)	Below 1 Ω

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Standard (Check for short):

Tester Connection	Specified Condition
OVL (H12–22) or OVL (I10–31) – Body ground	10 kΩ or higher
GCNV (H12–8) or GCNV (I10–32) – Body ground	10 kΩ or higher

(j) Reconnect the inverter connector.
(k) Reconnect the HV control ECU connector.
(l) Reinstall the inverter cover (see page 21–25).
(m) Reinstall the service plug grip (see page 21–120).

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

OK

2 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–545, 546 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A94/547	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/548	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/549	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of booster converter on page 05–477.

If the boost converter detects a circuit malfunction or over–voltage, the boost converter transmits that information to the OVL terminal of the HV control ECU via the boost converter over–voltage signal line. [Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	547	Boost converter over–voltage (OVL) signal detection (overvoltage by HV control ECU malfunction) “VL–Voltage before Boosting” overvoltage is detected.*1 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set
P0A94	548	Boost converter over–voltage (OVL) signal detection (overvoltage by inverter assembly malfunction) “VL–Voltage before Boosting” overvoltage is detected.*2 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set
P0A94	549	Boost converter over–voltage (OVL) signal detection (overvoltage by HV transaxle assembly malfunction) “VL–Voltage before Boosting” overvoltage is detected.*3 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set

HINT:

- *1: The HV control ECU may be suspected as a main cause of the malfunction.
- *2: The power module intelligent transistor set may be suspected as a main cause of the malfunction.
- *3: The hybrid vehicle transaxle assembly may be suspected as a main cause of the malfunction. In this case, the vehicle may not drive smoothly.

WIRING DIAGRAM

[Added]

Refer to DTC P0A78 (INF 279) on page 05–378.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

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[Added]

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) With the engine stopped and park (P) selected, depress the accelerator pedal and start the engine.
  Note: When the boosting request is not given, the ”VH–Voltage after Boosting” is approximately the same as the HV battery voltage.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	CONFIRM INFORMATION(EXCLUSIVE INFORMATION 3)

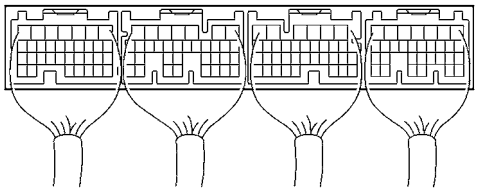
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Select DTC P0A94 to display its freeze frame data.
(f) Select Information beneath Detail Code which has INF code 547, 548, or 549 and press the ”Details” key.
(g) Read Exclusive Information 3.
Result: –32 to 32 (during driving without battery power)

HINT:
If the value is inside the range shown above, DTCs other than P0A78 (INF 547, 548 and 549) have been detected as well. Perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	CHECK CONNECTION CONDITION OF HYBRID VEHICLE CONTROL ECU CONNECTOR(LOOSENESS AND POOR CONTACT)


HV Control ECU Connector
A18294

(a) Check the connection condition of all the connectors at the HV control ECU.
OK: Connectors have been connected securely and there is no poor connection.

NG → **CONNECT SECURELY**

OK

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B	REPLACE HYBRID VEHICLE CONTROL ECU (See page 21–128)
C	Go to step 10
D	REPLACE HYBRID VEHICLE TRANSAXLE ASSY (See page 22–11)

[Corrected]

A

5	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

HINT:

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.

Result: DTCs listed in the table below are output

DTC No.	INF Code	Detection Item	See Page
P0A78	266	Drive Motor ”A” Inverter Performance	05–365
P0A94	558 or 560	DC/DC Converter Malfunction	05–513
P0A94	588	DC/DC Converter Malfunction	05–529
P0A94	589	DC/DC Converter Malfunction	05–531
P0AA2	227	Hybrid Battery Positive Contactor Circuit Stuck Open	05–540
P0AA5	229	Hybrid Battery Negative Contactor Circuit Stuck Open	05–544
P3000	125	Battery Control System Malfunction	05–553
P3004	131	HIgh Voltage Power Resource Malfunction	05–557

YES	GO TO THE PAGE NUMBER SHOWN IN THE TABLE ABOVE

NO

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8	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

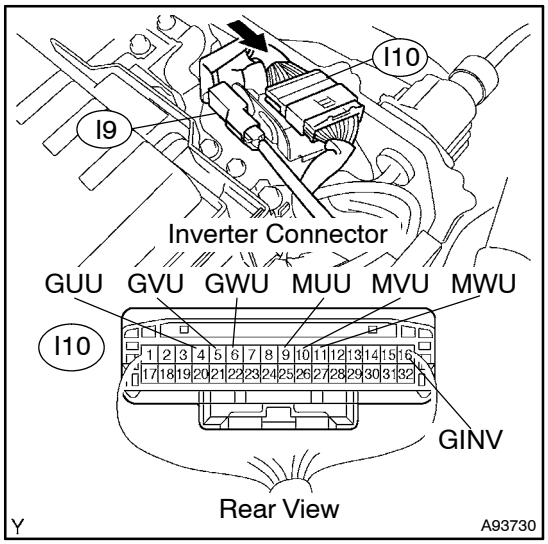
(a) Check that the service plug grip and inverter cover have been removed.
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the power switch ON (IG).

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

(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	12 to 16 V
MVU (I10–10) – GINV (I10–16)	12 to 16 V
MWU (I10–11) – GINV (I10–16)	12 to 16 V
GUU (I10–4) – GINV (I10–16)	12 to 16 V
GVU (I10–5) – GINV (I10–16)	12 to 16 V
GWU (I10–6) – GINV (I10–16)	12 to 16 V

(g) Turn the power switch OFF.



OK → **Go to step 11**

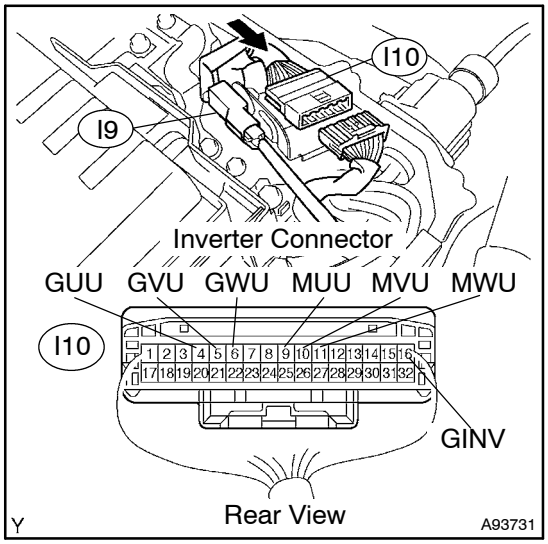
[Corrected]

NG

[Corrected]

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9	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.
(b) Disconnect the I10 inverter connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the power switch ON (IG).

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

(e) Turn the intelligent tester II ON.
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(g) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	14 to 16 V
MVU (I10–10) – GINV (I10–16)	14 to 16 V
MWU (I10–11) – GINV (I10–16)	14 to 16 V
GUU (I10–4) – GINV (I10–16)	14 to 16 V
GVU (I10–5) – GINV (I10–16)	14 to 16 V
GWU (I10–6) – GINV (I10–16)	14 to 16 V

(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 10**

[Corrected]

OK

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

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10	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–547, 548, 549 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

11	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–547, 548, 549 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

B → **REPLACE HYBRID VEHICLE CONTROL ECU AND W/ CONVERTER INVERTER ASSY**

A

REPLACE HYBRID VEHICLE CONTROL ECU AND POWER MODULE INTELLIGENT TRANSISTOR SET

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DTC	P0A94/550	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of boost converter on page 05–477.
If the boost converter detects a circuit malfunction or over–voltage, the boost converter transmits that information to the OVL terminal of the HV control ECU via the boost converter over–voltage signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	550	Boost converter over–voltage (OVL) signal detection (circuit malfunction) "VL–Voltage before Boosting" overvoltage or a circuit malfunction is detected. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

[Corrected]

WIRING DIAGRAM

Refer to DTC P0A78 (INF 282) on page 05–387.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) With the engine stopped and park (P) selected, depress the accelerator pedal and start the engine.
  Note: When the boosting request is not given, the "VH–Voltage after Boosting" is approximately the same as the HV battery voltage.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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3	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

HINT:

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.

Result: DTCs P0A78 (INF 282, 286) and P0A7A (INF 324) (inverter circuit malfunction) are output

NO → **Go To step 5** [Corrected]

YES

4	INSPECT W/CONVERTER INVERTER ASSY(IGCT VOLTAGE)

CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Turn the power switch ON (IG).

HINT:

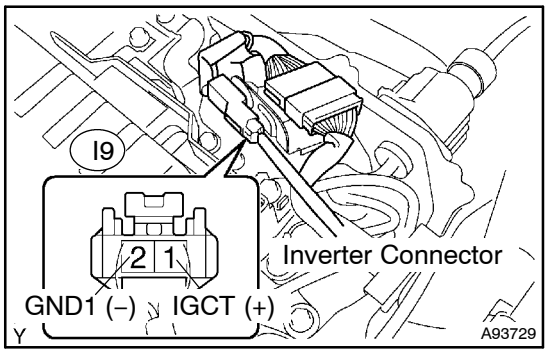
DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.

(e) Measure the voltage between the terminals of the inverter connector.

Standard:

Tester Connection	Specified Condition
IGCT (I9–1) – GND1 (I9–2)	8 V or more

(f) Turn the power switch OFF.
(g) Reinstall the inverter cover (see page 21–25).
(h) Reinstall the service plug grip (see page 21–120).



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

OK

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–550 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A94/551	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/552	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

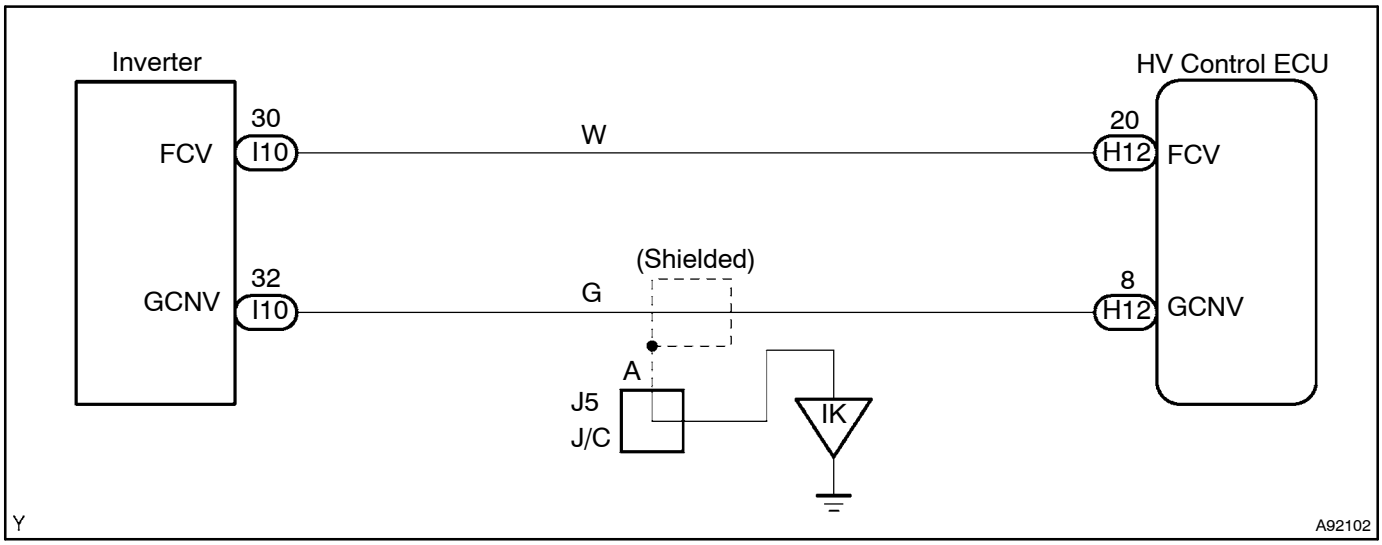
See the description of the boost converter on page 05–477.

If the boost converter has a circuit malfunction, or internal short, or overheats, the boost converter transmits this information to the FCV terminal of the HV control ECU via the boost converter fail signal line.

The HV control ECU monitors the boost converter fail signal line and detects malfunction. [Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	551	Open or GND short in boost converter fail (FCV) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A94	552	+B short in boost converter fail (FCV) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

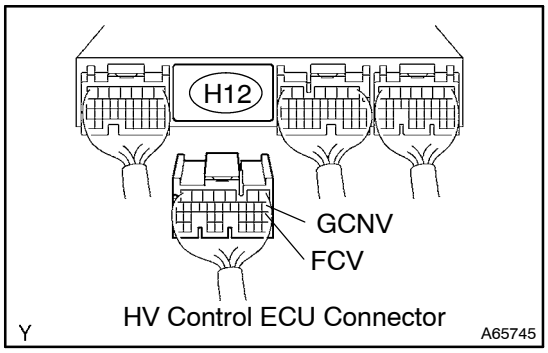
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

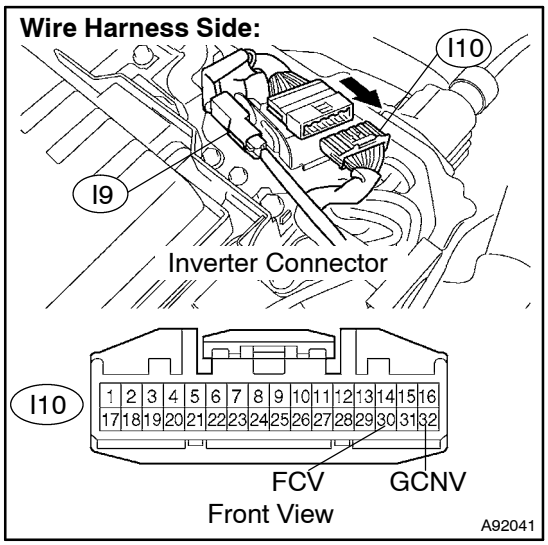
[Added]

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HINT:
If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

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





CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Disconnect the H12 HV control ECU connector.
(d) Remove the inverter cover (see page 21–25).
(e) Disconnect the I10 inverter connector.
(f) Turn the power switch ON (IG).

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

(g) Measure the voltage between the terminals of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
FCV (H12–20) – Body ground	Below 1 V
GCNV (H12–8) – Body ground	Below 1 V

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

Standard (Check for open):

Tester Connection	Specified Condition
FCV (H12–20) – FCV (I10–30)	Below 1 Ω
GCNV (H12–8) – GCNV (I10–32)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
FCV (H12–20) or FCV (I10–30) – Body ground	10 kΩ or higher
GCNV (H12–8) or GCNV (I10–32) – Body ground	10 kΩ or higher

(j) Reconnect the inverter connector.
(k) Reconnect the HV control ECU connector.
(l) Reinstall the inverter cover (see page 21–25).
(m) Reinstall the service plug grip (see page 21–120).

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

OK

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2	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–551, 552 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC P0A94/553 DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.
If the boost converter has a circuit malfunction, internal short, or overheats, the boost converter transmits that information to the FCV terminal of the HV control ECU via the boost converter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	[Corrected] 553	Boost converter fail (FCV) signal detection (boost converter overheating) Overheating or an internal short circuit of the boost converter is detected. (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A94	553	• Converter Temperature

WIRING DIAGRAM

Refer to DTC P0A78 (INF 279) on page 05–378. [Added]

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) With the engine stopped and park (P) selected, depress the accelerator pedal and start the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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11	CONFIRM INFORMATION(EXCLUSIVE INFORMATION 4)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

HINT:

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Select DTC P0A94 to display its freeze frame data.
(f) Select Detail Information (INF) beneath Detail Code which has INF code 553 and press the ”Details” key.
(g) Read Exclusive Information 4.

Result:

Displayed in Exclusive Information 4	Proceed to
–127 to –120, –95 to –88, –63 to –56, –31 to –24, 1 to 8, 33 to 40, 65 to 72, 97 to 104	A
–119 to –112, –87 to –80, –55 to –48, –23 to –16, 9 to 16, 41 to 48, 73 to 80, 105 to 112	B
–111 to –104, –79 to –72, –47 to –40, –15 to –8, 17 to 24, 49 to 56, 81 to 88, 113 to 120	C
–103 to –96, –71 to –64, –39 to –32, –7 to 0, 25 to 32, 57 to 64, 89 to 96, 121 to 127	D

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

C → **Go to step 17**

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

[Corrected]

A

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14	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

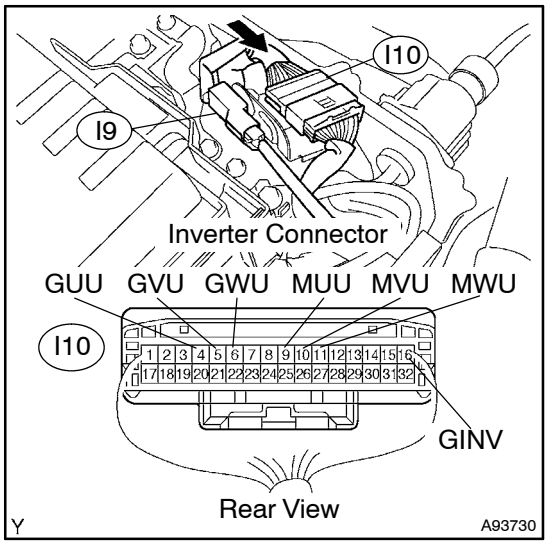
(a) Check that the service plug grip and inverter cover have been removed.
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the power switch ON (IG).

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

(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	12 to 16 V
MVU (I10–10) – GINV (I10–16)	12 to 16 V
MWU (I10–11) – GINV (I10–16)	12 to 16 V
GUU (I10–4) – GINV (I10–16)	12 to 16 V
GVU (I10–5) – GINV (I10–16)	12 to 16 V
GWU (I10–6) – GINV (I10–16)	12 to 16 V

(g) Turn the power switch OFF.



OK → **Go to step 17**

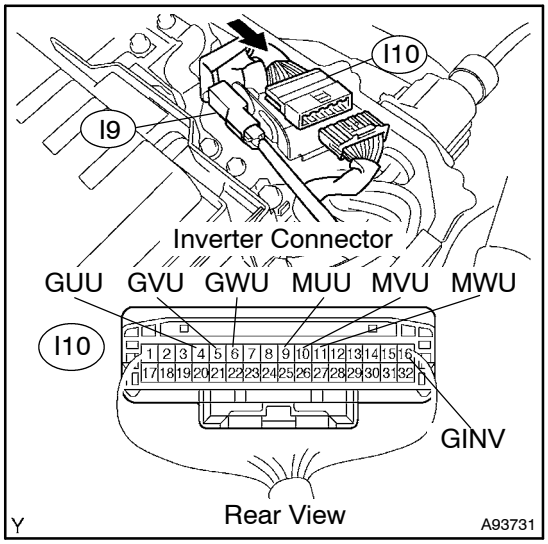
[Corrected]

NG

[Corrected]

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15	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.
(b) Disconnect the I10 inverter connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the power switch ON (IG).

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

(e) Turn the intelligent tester II ON.
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(g) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	14 to 16 V
MVU (I10–10) – GINV (I10–16)	14 to 16 V
MWU (I10–11) – GINV (I10–16)	14 to 16 V
GUU (I10–4) – GINV (I10–16)	14 to 16 V
GVU (I10–5) – GINV (I10–16)	14 to 16 V
GWU (I10–6) – GINV (I10–16)	14 to 16 V

(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 17**

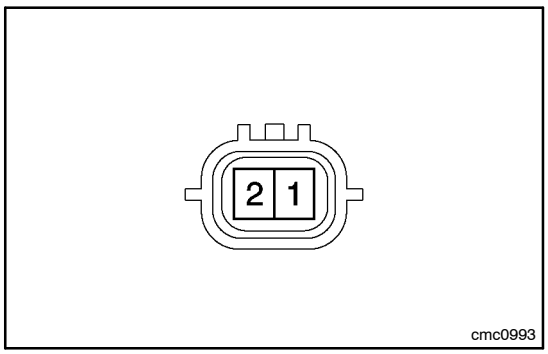
[Corrected]

OK

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

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16	CHECK WATER W/MOTOR & BRACKET PUMP ASSY



(a) Remove the water w/ motor & bracket pump assy.
(b) Connect the battery positive terminal to terminal 2 and the battely negative terminal to terminal 1.
(c) Check that the pump motor operates properly.

NOTICE:

- **Do not connect the positive and negative poles of the battery to the wrong terminals.**
- **Complete the check within 10 seconds of connection.**

OK: Pump motor operates properly.

NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (WATER W/MOTOR & BRACKET PUMP ASSY CIRCUIT)

17	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–553 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A94/554	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/555	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/556	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.

If the boost converter has a circuit malfunction, internal short, or overheats,the boost converter transmits that information to the FCV terminal of the HV control ECU via the boost converter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	554	Boost converter fail (FCV) signal detection (over current by HV control ECU malfunction) Internal short circuit or overheating of the boost converter is detected.*1 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set
P0A94	[Corrected] 555	Boost converter fail (FCV) signal detection (over current by inverter assembly malfunction) Internal short circuit or overheating of the boost converter is detected.*2 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set
P0A94	556	Boost converter fail (FCV) signal detection (over current by HV transaxle assembly malfunction) Internal short circuit or overheating of the boost converter is detected.*3 (1 trip detection logic)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • Power module intelligent transistor set

HINT:

- *1: The HV control ECU may be suspected as a main cause of the malfunction.
- *2: The power module intelligent transistor set may be suspected as a main cause of the malfunction.
- *3: The hybrid vehicle transaxle assembly may be suspected as a main cause of the malfunction. In this case, the vehicle may not drive smoothly.

WIRING DIAGRAM

[Added]

Refer to DTC P0A78 (INF 279) on page 05–378.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

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NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) With the engine stopped and park (P) selected, depress the accelerator pedal and start the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

DTC No.	Relevant Diagnosis
P0A1D	Hybrid Powertrain Control Module
P0A2B, P0A2C or P0A2D	Drive Motor "A" Temperature Sensor Circuit System
P0A37, P0A38 or P0A39	Generator Temperature Sensor Circuit System
P0A3F, P0A40 or P0A41	Drive Motor "A" Position Sensor Circuit System
P0A4B, P0A4C or P0A4D	Generator Position Sensor Circuit System
P0A60 or P0A63	Drive Motor "A" Current Sensor Circuit System
P0A72 or P0A75	Generator Current Sensor Circuit System
P0A78	Drive Motor "A" Inverter Performance
P0A7A	Generator Inverter Performance
P0A90	Drive Motor "A" Performance
P0A92	Hybrid Generator Performance
P0A93	Inverter Cooling System Malfunction
P0A94	DC/DC Converter Malfunction
P0AA1, P0AA2, P0AA4 or P0AA5	System Main Relay Circuit System
P3000, P3004, P3009 or P3110	High Voltage System
P3211	Drive Motor "A" Inverter Temperature Sensor Circuit System
P3221	Generator Inverter Temperature Sensor Circuit System
P3226	DC/DC Converter Temperature Sensor Circuit System

YES → **GO TO DTC CHART (See page 05–268). FIND A PAGE NUMBER TO PROCEED TO ITS DIAGNOSTIC TROUBLESHOOTING FLOWCHART**

NO

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4	CONFIRM INFORMATION(EXCLUSIVE INFORMATION 4)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

HINT:

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Select DTC P0A94 to display its freeze frame data.
(f) Select Detail Information beneath Detail Code which has INF code 554, 555, or 556 and press the ”Details” key.
(g) Read Exclusive Information 4.

Result:

Displayed in Exclusive Information 4	Proceed to
–127 to –120, –95 to –88, –63 to –56, –31 to –24, 1 to 8, 33 to 40, 65 to 72, 97 to 104	A
–119 to –112, –87 to –80, –55 to –48, –23 to –16, 9 to 16, 41 to 48, 73 to 80, 105 to 112	B
–111 to –104, –79 to –72, –47 to –40, –15 to –8, 17 to 24, 49 to 56, 81 to 88, 113 to 120	C
–103 to –96, –71 to –64, –39 to –32, –7 to 0, 25 to 32, 57 to 64, 89 to 96, 121 to 127	D

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

C → **GO to step 9**

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

[Corrected]

A

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7	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)

CAUTION:
Wear insulated gloves before performing the following operation.

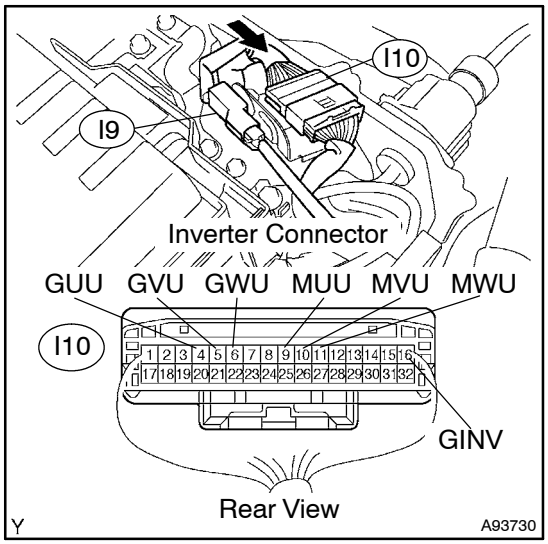
(a) Check that the service plug grip and inverter cover have been removed.
(b) Connect the intelligent tester II to the DLC3.
(c) Turn the power switch ON (IG).

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

(d) Turn the intelligent tester II ON.
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(f) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	12 to 16 V
MVU (I10–10) – GINV (I10–16)	12 to 16 V
MWU (I10–11) – GINV (I10–16)	12 to 16 V
GUU (I10–4) – GINV (I10–16)	12 to 16 V
GVU (I10–5) – GINV (I10–16)	12 to 16 V
GWU (I10–6) – GINV (I10–16)	12 to 16 V

(g) Turn the power switch OFF.



OK → **Go to step 9**

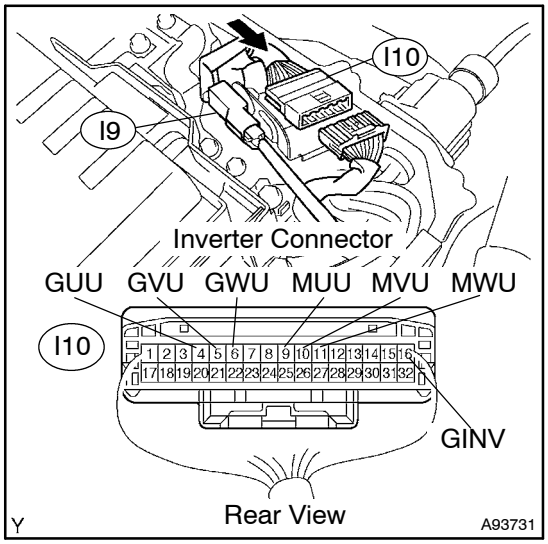
[Corrected]

NG

[Corrected]

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8	PERFORM ACTIVE TEST BY INTELLIGENT TESTER II(FORCIBLE STOP OF INVERTER DRIVE)



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip and inverter cover have been removed.
(b) Disconnect the I10 inverter connector.
(c) Connect the intelligent tester II to the DLC3.
(d) Turn the power switch ON (IG).

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

(e) Turn the intelligent tester II ON.
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.
(g) Measure the voltage between the terminals of the inverter connector while effecting Forcible Stop of Inverter Drive.
Standard:

Tester Connection	Specified Condition
MUU (I10–9) – GINV (I10–16)	14 to 16 V
MVU (I10–10) – GINV (I10–16)	14 to 16 V
MWU (I10–11) – GINV (I10–16)	14 to 16 V
GUU (I10–4) – GINV (I10–16)	14 to 16 V
GVU (I10–5) – GINV (I10–16)	14 to 16 V
GWU (I10–6) – GINV (I10–16)	14 to 16 V

(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 9**

[Corrected]

OK

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

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9	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–554, 555, 556 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC P0A94/557 DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of booster converter on page 05–477.
If the boost converter has a circuit malfunction, internal short, or overheats, the boost converter transmits that information to the FCV terminal of the HV control ECU via the boost converter fail signal line.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	557	Boost converter fail (FCV) signal detection (circuit malfunction) (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

[Corrected]

WIRING DIAGRAM

Refer to DTC P0A78 (INF 282) on page 05–387.

INSPECTION PROCEDURE

CAUTION:

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

[Added]

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 5 seconds or more.
  (b) With the engine stopped and park (P) selected, depress the accelerator pedal and start the engine.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ OUTPUT DTC(HYBRID CONTROL)

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

DTC No.	INF Code	Detection Item	See Page
P0A94	551 or 552	DC/DC Converter Malfunction	05–492

YES → **GO TO THE PAGE NUMBER SHOWN IN THE TABLE ABOVE**

NO

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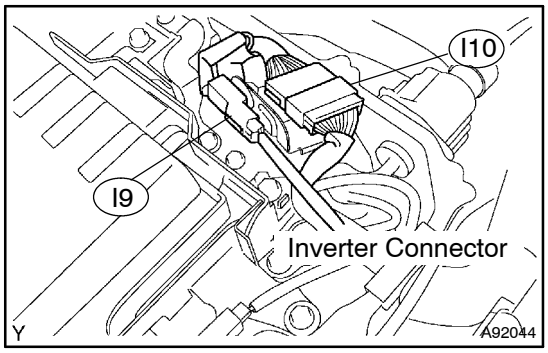
2	CHECK CONNECTION CONDITION OF INVERTER CONNECTOR(LOOSENESS AND POOR CONTACT)

CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Check the connection condition of the I9 and I10 inverter connectors.
OK: Connectors have been connected securely and there is no poor connection.
(e) Reinstall the inverter cover (see page 21–25).
(f) Reinstall the service plug grip (see page 21–120).



NG → **CONNECT SECURELY**

OK

3	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).

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

(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTCs P0A78 (INF 282, 286) and P0A7A (INF 324) (inverter circuit malfunction) are output

NO → **Go to step 5**

[Corrected]

YES

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5	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–557 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A94/558	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/559	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/560	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

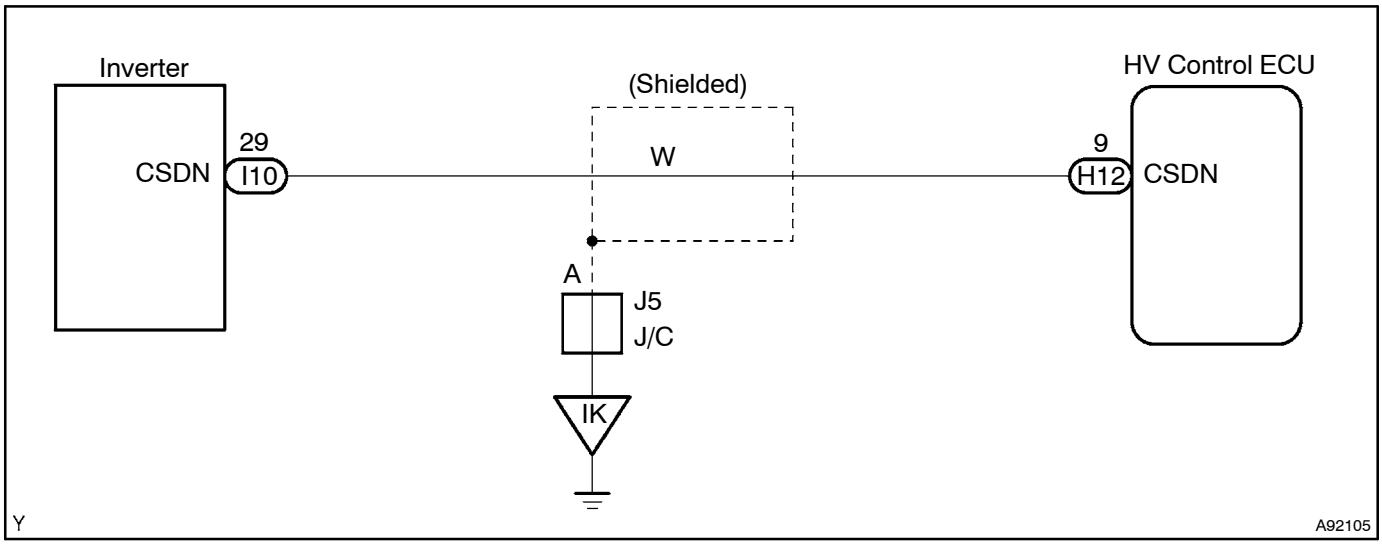
See the description of the boost converter on page 05–477.

Upon receiving a boost converter gate shutdown signal from the HV control ECU, the boost converter forcefully stops the operation of the boost converter by turning OFF the power transistors that are actuating the boost converter.

The HV control ECU monitors the boost converter gate shutdown signal line and detects malfunction. [Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	558	GND short in boost converter gate shutdown (CSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A94	559	Open or +B short in boost converter gate shutdown (CSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set
P0A94	560	Open in boost converter gate shutdown (CSDN) signal circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

WIRING DIAGRAM



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly

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

(a) Disconnect the H12 HV control ECU connector.

(b) Measure the voltage between the terminal of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
CSDN (H12–9) – Body ground	Below 1 V

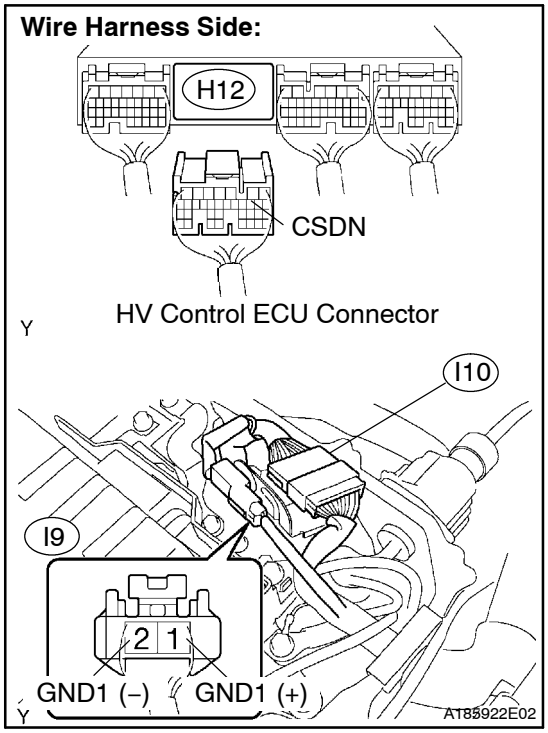
NG → **Go to step 4**

OK

[Corrected]

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
CSDN (H12–9) – GND1 (I9–2)	3.3 to 3.9 Ω

NOTICE:
When measuring the resistance, wait until the value is stable before reading the tester.

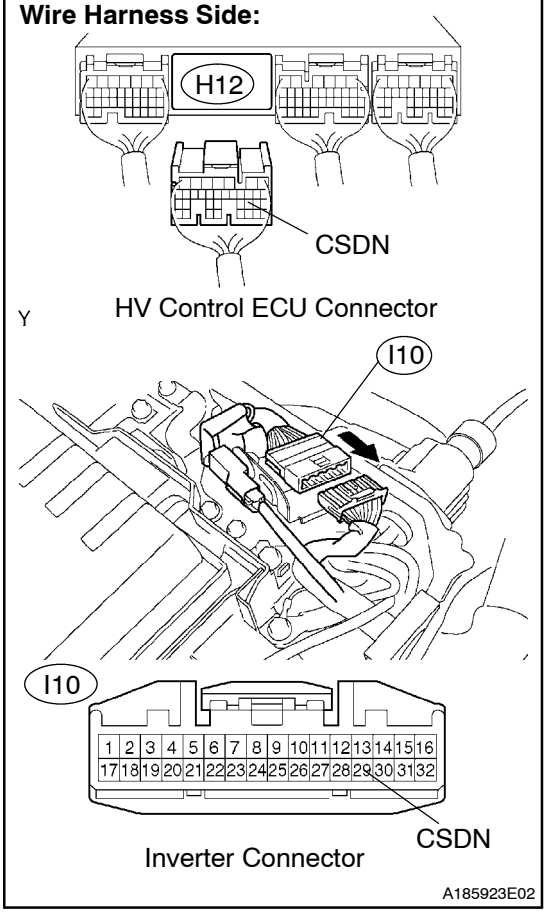
OK → **REPLACE HYBRID VEHICLE CONTROL ECU**

NG

[Corrected]

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



(a) Disconnect the I10 inverter connector.

(b) Measure the resistance between the wire harness side connectors and body ground.

Standard resistance (Check for open)

Tester Connection	Specified Condition
CSDN (H12–9) – CSDN (I10–29)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
CSDN (H12–9) or CSDN (I10–29) – Body ground	10 kΩ or higher

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

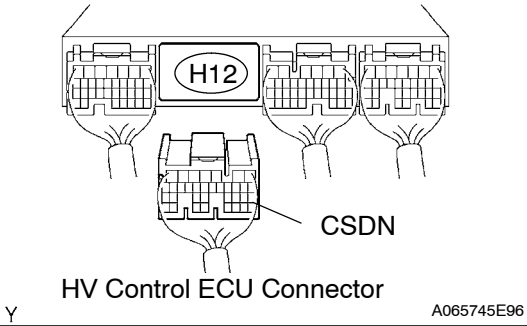
(d) Reinstall the service plug grip (see page 21–120).

OK → **Go to step 5**

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

[Corrected]

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(d) Measure the resistance between the wire harness side connectors.

HINT:

DTCs for the interlock switch system are output when the power switch is turned ON (READY) while the service plug grip and inverter cover are removed.

Standard voltage

Tester Connection	Specified Condition
CSDN (H12–9) – Body ground	Below 1 V

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

OK

5 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–558, 559, 560 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC P0A94/561 DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.
Upon receiving a boost converter gate shutdown signal from the HV control ECU, the boost converter forcefully stops the operation of the boost converter by turning OFF the power transistors that are actuating the boost converter.
The HV control ECU monitors the boost converter gate shutdown signal and detects malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	[Corrected] 561	Abnormal boost converter gate shutdown (CSDN) signal Either of the following conditions is met: • Although a boost converter gate shutdown signal has been sent, the boost converter gate is not shut down. • Although a boost converter gate shutdown signal has not been sent, the boost converter gate is shut down.	• Wire harness or connector • HV control ECU • Power module intelligent transistor set

WIRING DIAGRAM

Refer to DTC P0A94 (INF 558) on page 05–513.

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 10 seconds or more.
  (b) Turn the power switch on (READY) and wait for 10 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P0A94 (INF 561) and other DTCs are output

HINT:
If any other codes besides P0A94 (INF 561) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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

(a) Disconnect the H12 HV control ECU connector.
(b) Measure the voltage between the terminal of the HV control ECU connector and body ground.
Standard:

Tester Connection	Specified Condition
CSDN (H12–9) – Body ground	Below 1 V

NG → **Go to step 4**

OK

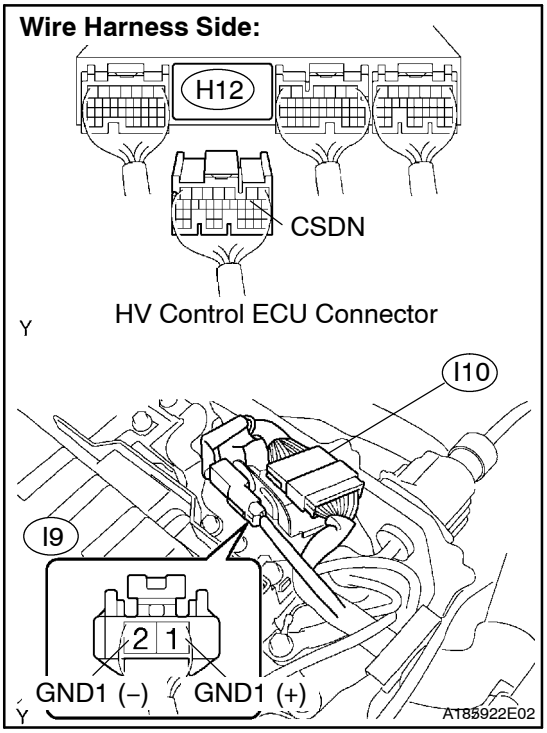


[Corrected]

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

Wire Harness Side:



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

(d) Measure the resistance between the wire harness side connectors.

Standard:

Tester Connection	Specified Condition
CSDN (H12–9) – GND1 (I9–2)	3.3 to 3.9 Ω

NOTICE:
When measuring the resistance, wait until the value is stable before reading the tester.

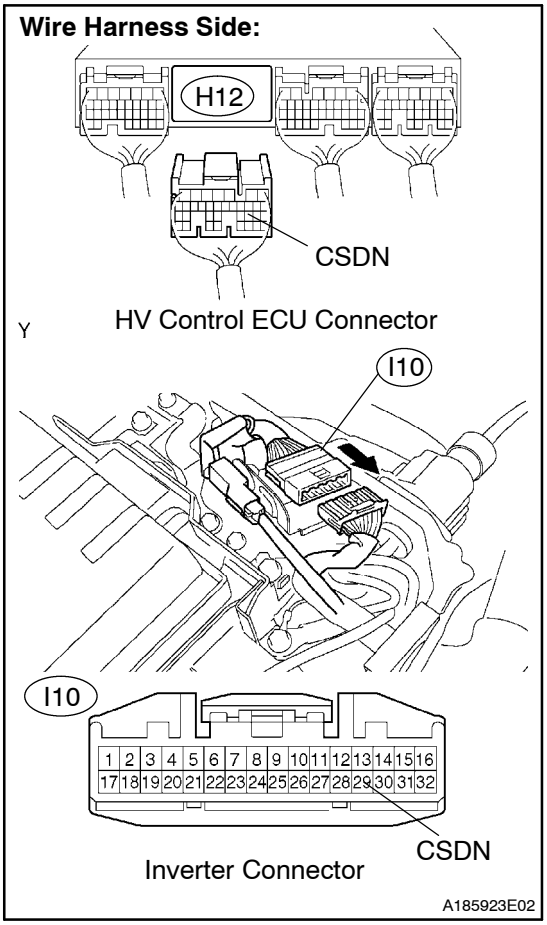
OK → **REPLACE HYBRID VEHICLE CONTROL ECU**

NG

[Corrected]

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



(a) Disconnect the I10 inverter connector.

(b) Measure the resistance between the wire harness side connectors and body ground.

Standard resistance (Check for open)

Tester Connection	Specified Condition
CSDN (H12–9) – CSDN (I10–29)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
CSDN (H12–9) or CSDN (I10–29) – Body ground	10 kΩ or higher

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

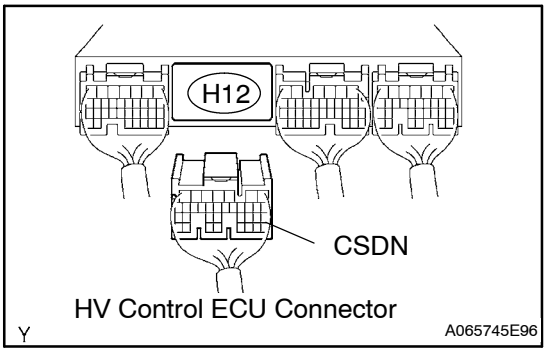
(d) Reinstall the service plug grip (see page 21–120).

OK	Go to step 5

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

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



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

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

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

[Corrected]

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(d) Measure the resistance between the wire harness side connectors.

HINT:

DTCs for the interlock switch system are output when the power switch is turned ON (READY) while the service plug grip and inverter cover are removed.

Standard voltage

Tester Connection	Specified Condition
CSDN (H12–9) – Body ground	Below 1 V

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

OK

6 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–561 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

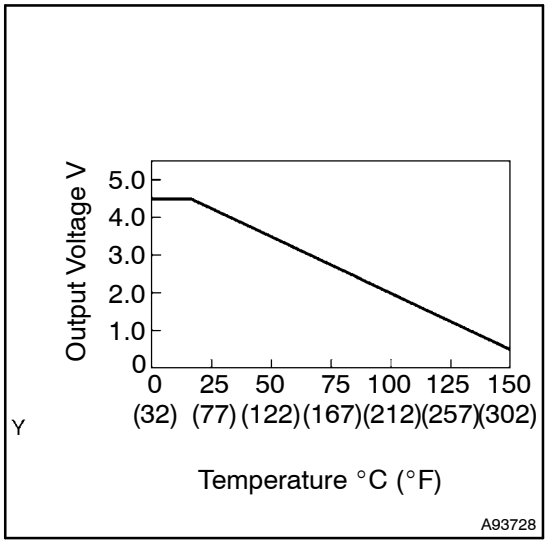
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DTC	P0A94/583	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/584	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.



The HV control ECU uses a temperature sensor, which is built into the boost converter, to detect the temperature of the boost converter.

The boost converter temperature sensor outputs a voltage, which varies between 0 and 5 V in accordance with the changes in the temperature. The higher the boost converter temperature, the lower the output voltage. Conversely, the lower the temperature, the higher the output voltage.

The HV control ECU limits the load based on the signals transmitted by the boost converter temperature sensor, in order to prevent the boost converter from overheating. Furthermore, the HV control ECU detects malfunction in the wiring of the boost converter temperature sensor, as well as in the sensor itself.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	583	Open or GND short in boost converter temperature sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A94	584	+B short in boost converter temperature sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P0A94	583	• Converter Temperature
P0A94	584	

[Added]

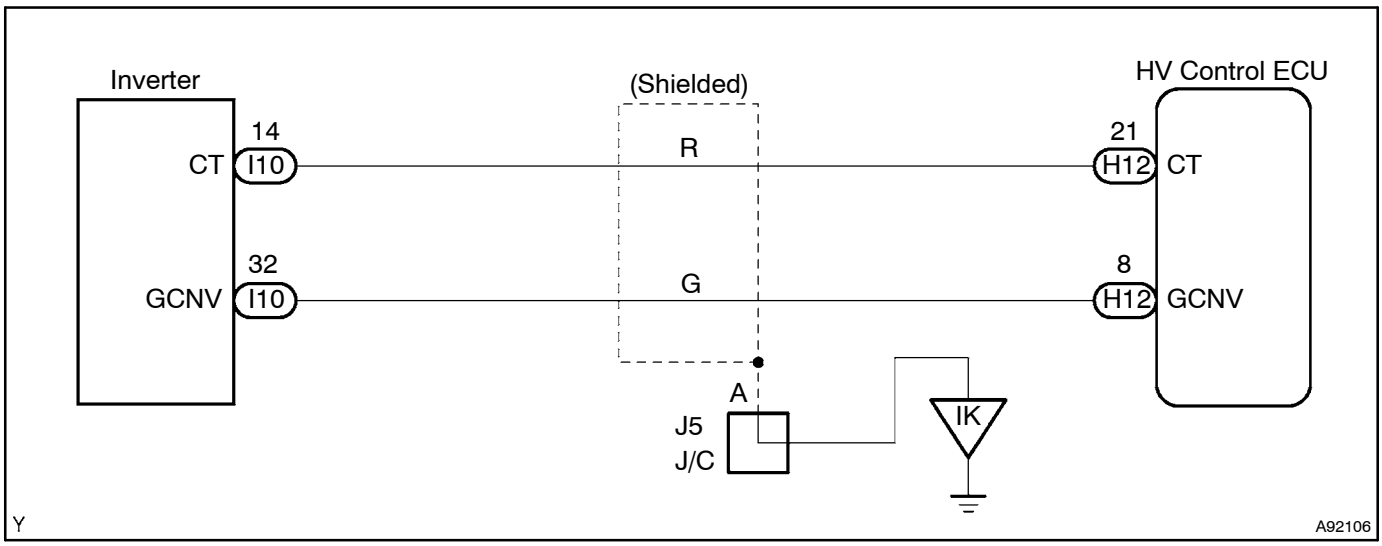
HINT:

After confirming DTC P0A94 (INF 583 or 584), confirm Converter Temperature in Powertrain / Hybrid Control / Data List using the intelligent tester II.

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

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WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

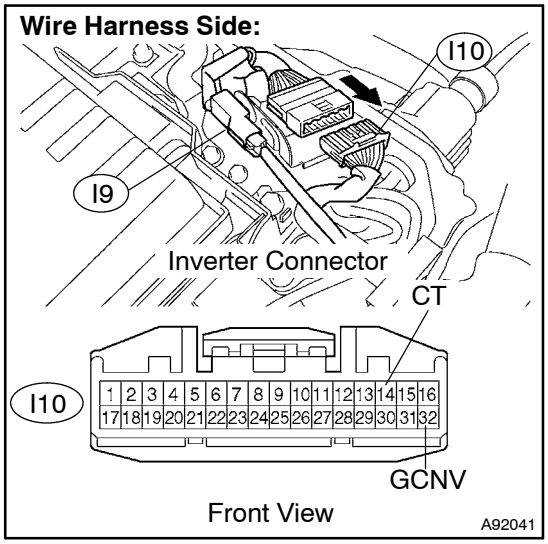
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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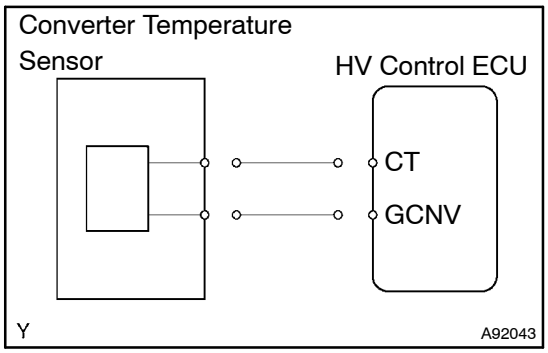
(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(g) Read the Converter Temperature value on the intelligent tester II.
Standard: 205°C (401°F)
(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see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

[Corrected]

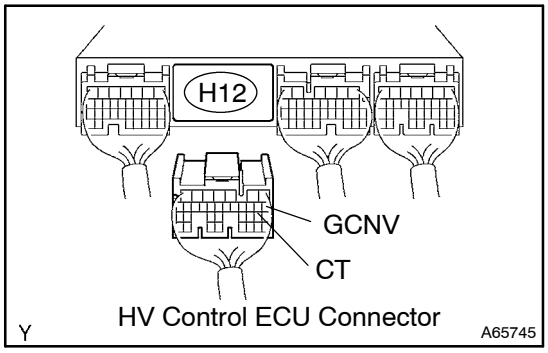
OK → **Go to step 6**

NG [Corrected]

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



(a) Disconnect the H12 HV control ECU connector.
(b) Turn the power switch ON (IG).
HINT:
DTCs for the interlock switch system are output when turning the power switch ON (IG) with both service plug grip and inverter cover removed.
(c) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(d) Read the Converter Temperature value on the intelligent tester II.
Standard: 205°C (401°F)
(e) Reconnect the HV control ECU connector.



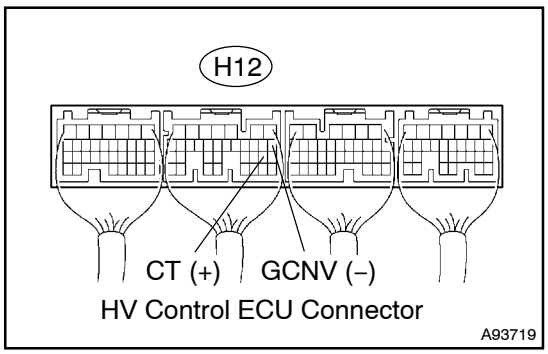
NG → **REPLACE HYBRID VEHICLE CONTROL ECU (See page 21–128)**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

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5	INSPECT HYBRID VEHICLE CONTROL ECU(CT VOLTAGE)



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

HINT:

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

(b) Measure the voltage between the terminals of the H12 HV control ECU connector.

Standard:

Tester Connection	Specified Condition
CT (H12–21) – GCNV (H12–8)	2.0 to 4.5 V

NG → **Go to step 6**

[Corrected]

OK

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

6	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–583, 584 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A94/585	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P0A94 (INF 589) on page 05–531.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	585	Boost converter voltage (VL) sensor performance problem Difference between “VL–Voltage before Boosting” and “Power Resource VB” is large and difference between “VL–Voltage before Boosting” and “VH–Voltage after Boosting” when the boosting request is not given. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set

Related Data List

DTC No.	INF Code	Data List
P0A94	585	• VL–Voltage before Boosting • VH–Voltage after Boosting • Power Resource VB • Boost Ratio

WIRING DIAGRAM

Refer to DTC P0A94 (INF 589) on page 05–531.

[Added]

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

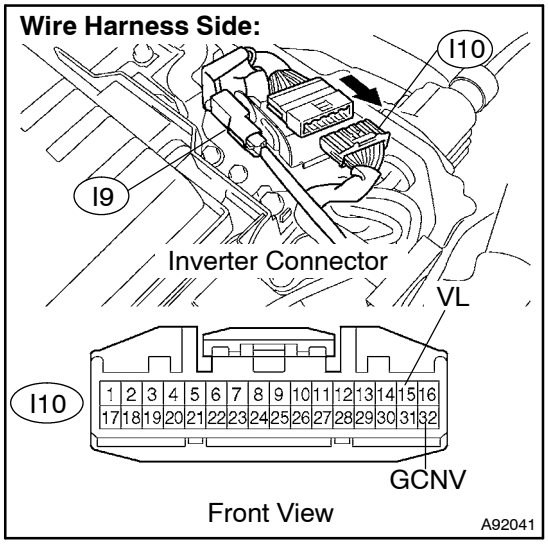
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- When the accelerator pedal is not depressed with the power switch on (READY) and park (P) selected, if “VH–Voltage after Boosting” and the “Power Resource VB” is approximately same after repair, the condition is judged as normal.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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(h) Turn the power switch OFF.

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

Standard (Check for open):

Tester Connection	Specified Condition
VL (H12–30) – VL (I10–15)	Below 1 Ω
GCNV (H12–8) – GCNV (I10–32)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VL (H12–30) or VL (I10–15) – Body ground	10 kΩ or higher
GCNV (H12–8) or GCNV (I10–32) – Body ground	10 kΩ or higher

(j) Reconnect the inverter connector.

(k) Reconnect the HV control ECU connector.

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

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

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

[Corrected]

OK

3 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–585 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

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DTC	P0A94/587	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.
The HV control ECU uses two voltage sensors, VL and VB, to detect voltage levels. The VL sensor that has been built into the boost converter is used to detect the high voltage before it is boosted. The VB sensor that has been built into the battery ECU is used to detect voltage of the HV battery.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	587	Difference between “VL–Voltage before Boosting” and “Power Resource VB” is large when the boosting request is given. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • Service plug grip • High voltage fuse • Battery ECU

Related Data List

DTC No.	INF Code	Data List
P0A94	587	• Power Resource VB • VL–Voltage before Boosting • VH–Voltage after Boosting • Boost Ratio

WIRING DIAGRAM

Refer to DTC P0A94 (INF 589) on page 05–531.

[Added]

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

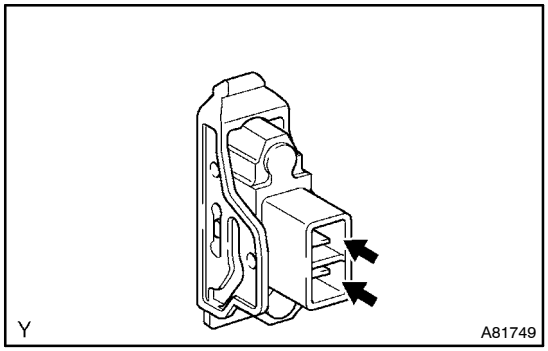
HINT:

- When the accelerator pedal is not depressed with the power switch on (READY) and park (P) selected, if “VL–Voltage before Boosting” and the ”Power Resource VB” is approximately same after repair, the condition is judged as normal.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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3	INSPECT SERVICE PLUG GRIP



CAUTION:
Wear insulated gloves before performing the following operation.

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

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

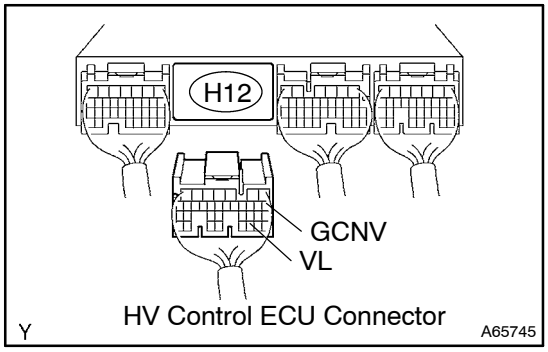
(c) Check the resistance between the terminals of the service plug grip.
Standard: Below 1 Ω
(d) Reinstall the service plug grip (see page 21–120).

NG → **Go to step 7**

[Corrected]

OK

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



CAUTION:
Wear insulated gloves before performing the following operation.

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

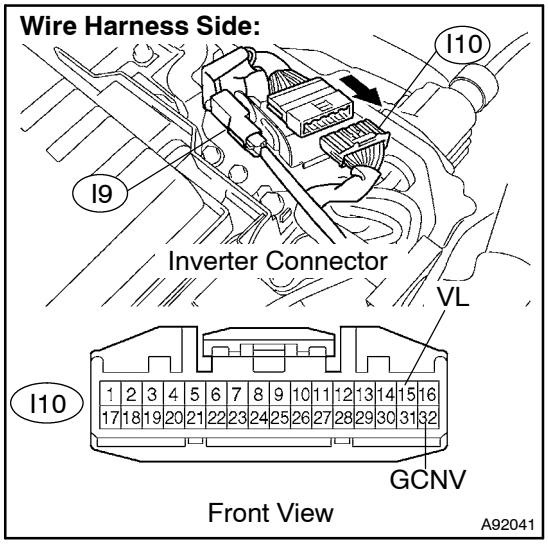
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(c) Disconnect the H12 HV control ECU connector.
(d) Remove the inverter cover (see page 21–25).
(e) Disconnect the I10 inverter connector.
(f) Turn the power switch ON (IG).

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

(g) Measure the voltage between the terminals of the HV control ECU connector and body ground.

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Standard:

Tester Connection	Specified Condition
VL (H12–30) – Body ground	Below 1 V
GCNV (H12–8) – Body ground	Below 1 V

(h) Turn the power switch OFF.

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

Standard (Check for open):

Tester Connection	Specified Condition
VL (H12–30) – VL (I10–15)	Below 1 Ω
GCNV (H12–8) – GCNV (I10–32)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VL (H12–30) or VL (I10–15) – Body ground	10 kΩ or higher
GCNV (H12–8) or GCNV (I10–32) – Body ground	10 kΩ or higher

(j) Reconnect the inverter connector.

(k) Reconnect the HV control ECU connector.

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

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

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

OK

5	CHECK OUTPUT DTC

(a) Proceed to A if only DTC P0A94 (INF 587) is output as a result of DTC reading in step 1.

(b) Proceed to B if DTCs P0A94 (INF 587) and P0A94 (INF 442) are output as a result of DTC reading in step 1.

B → **Go tp step 8** [Corrected]

A

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6	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

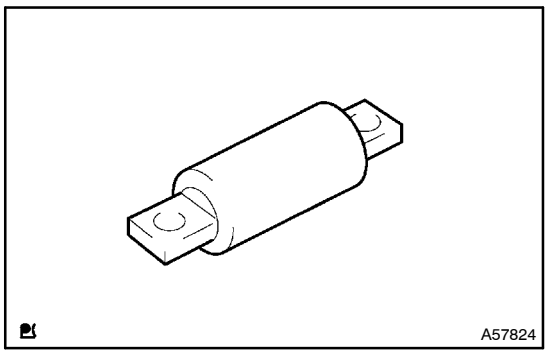
Result	Proceed to
Only P0A94–587 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

B → **REPLACE W/ CONVERTER INVERTER ASSY AND BATTERY ECU ASSY**

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET AND BATTERY ECU ASSY

7	INSPECT HIGH VOLTAGE FUSE



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Remove the high voltage fuse (see page 21–120).

HINT:

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

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

Standard: Below 1 Ω

(c) Reinstall the high voltage fuse (see page 21–120).

NG → **REPLACE HIGH VOLTAGE FUSE**

OK

REPLACE SERVICE PLUG GRIP

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8	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–587 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P0A94/588	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.

The boost converter switches the power transistors ON and OFF in accordance with the power transistor actuation signals received from the HV control ECU, in order to change the current that flows into the reactor. Also, the boost converter regulates the duration of the switching time through PWM (Pulse Width Modulation) control, in order to control the boosting voltage.

The HV control ECU monitors the boost converter PWM circuit and detects malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	588	Abnormality in boost converter PWM circuit Pulse of the monitor signal is not output when a duty command is output. (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P0A94	588	• VH–Voltage after Boosting

[Added]

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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

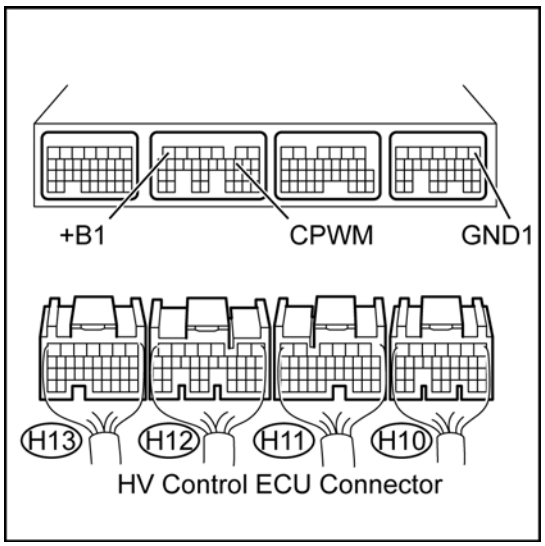
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Apply the parking brake and secure the wheels using chocks.
  (b) Turn the power switch on (READY).
  (c) While firmly depressing the brake pedal with drive (D) selected, depress and hold the accelerator pedal to operate the boost converter and wait for 5 seconds.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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2 INSPECT HYBRID VEHICLE CONTROL ECU



(a) Disconnect the negative auxiliary battery terminal.
(b) Disconnect the H10, H11, H12 and H13 HV control ECU connectors.
(c) Measure the resistance according to the value(s) in the table below.

Standard resistance:

Tester Connection	Specified Condition
CPWM (H12–10) – +B1 (H12–7)	40 to 75 kΩ
CPWM (H12–10) – GND1 (H10–1)	40 to 75 kΩ

(d) Reconnect the HV control ECU connector.
(e) Reconnect the negative auxiliary battery terminal.

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

OK

3 INSPECT W/CONVERTER INVERTER ASSY

CAUTION:
Wear insulated gloves before performing the following operation.

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

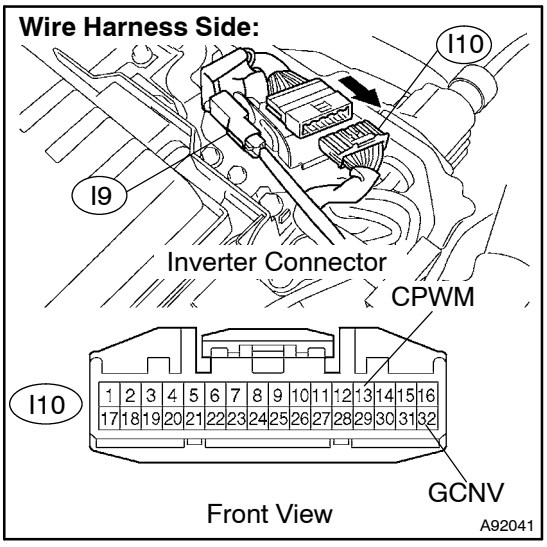
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

(c) Remove the inverter cover (see page 21–25).
(d) Disconnect the I10 inverter connector.
(e) Measure the resistance according to the value(s) in the table below.

Standard resistance:

Tester Connection	Specified Condition
CPWM (I10–13) – GCNV (I10–32)	1 to 1.5 kΩ

(f) Reconnect the inverter connector.
(g) Reconnect the negative auxiliary battery terminal.
(h) Reinstall the inverter cover (see page 21–25).
(i) Reinstall the service plug grip (see page 21–120).



NO → **Go to step 4**

[Corrected]

OK

REPLACE W/CONVERTER INVERTER ASSY AND HYBRID VEHICLE CONTROL ECU

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4	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–588 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

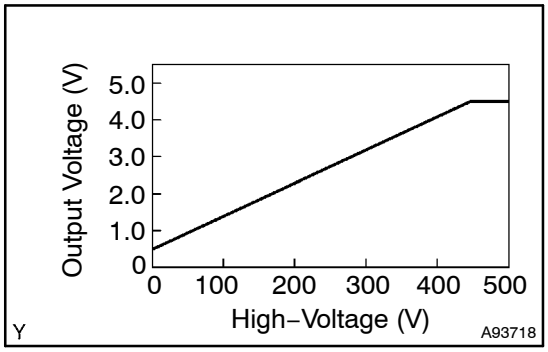
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DTC	P0A94/589	DC/DC CONVERTER PERFORMANCE

DTC	P0A94/590	DC/DC CONVERTER PERFORMANCE

CIRCUIT DESCRIPTION

See the description of the boost converter on page 05–477.



The HV control ECU uses a voltage sensor, which has been built into the boost converter, to detect the high voltage before it is boosted and for boost control.

The boost converter voltage sensor outputs a voltage that varies between 0 and 5 V in accordance with the changes in the high voltage. The higher the high voltage, the higher the output voltage, and the lower the high voltage, the lower the output voltage.

The HV control ECU monitors a signal line of the boost converter voltage sensor and detects malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A94	589	Open or GND short in boost converter voltage (VL) sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P0A94	590	+B short in boost converter voltage (VL) sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P0A94	589	• VL–Voltage before Boosting
P0A94	590	

HINT:

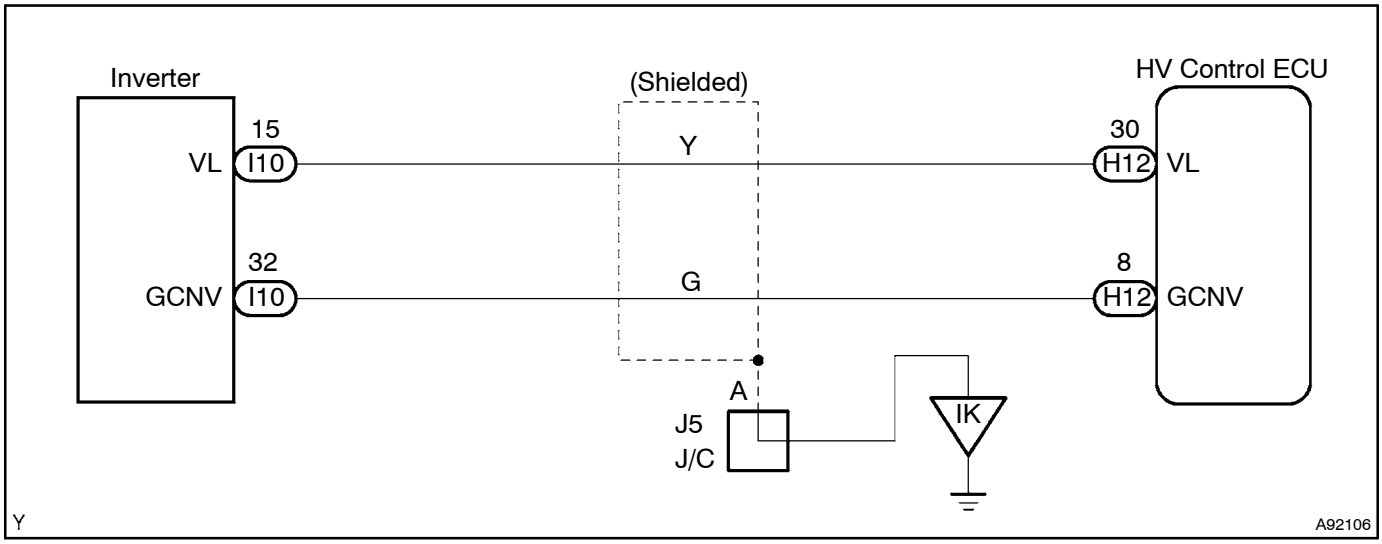
After confirming DTC P0A94 (INF 589 or 590), confirm VL–Voltage before Raise in Powertrain / Hybrid Control / Data List using the intelligent tester II.

[Added]

Voltage Displayed	Malfunction
510 V	+B short circuit
0 V	Open or GND short circuit

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WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  [Added]

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ VALUE OF INTELLIGENT TESTER II(VL–VOLTAGE BEFORE RAISE)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) Read the VL–Voltage before Raise value on the intelligent tester II.

Result:

Voltage Displayed	Proceed to
510 V	A
0 V	B
1 to 509 V	C

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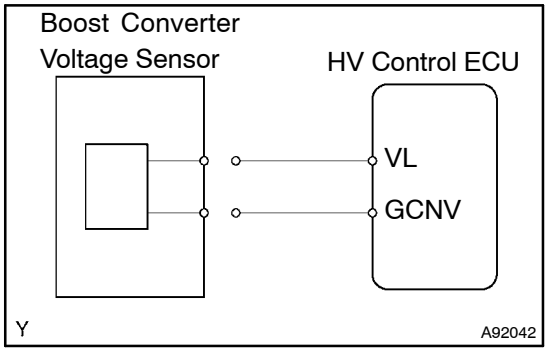
HINT:

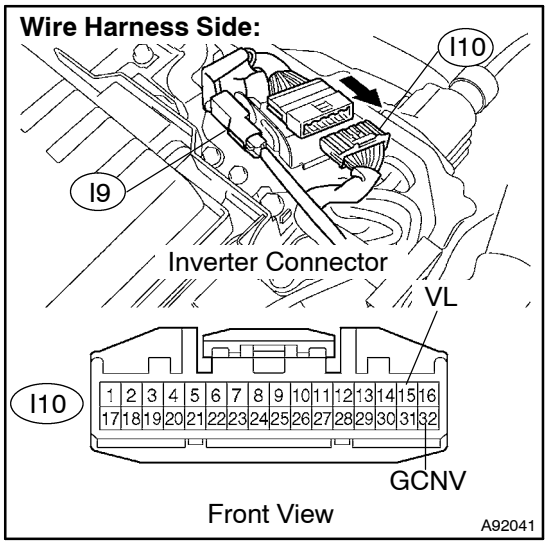
- If there is a +B short circuit, the intelligent tester II indicates 510 V.
- If there is an open GND short circuit, the intelligent tester II indicates 0 V.

B	Go to step 4
C	CHECK FOR INTERMITTENT PROBLEMS (See page 05–232)

A

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





CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Disconnect the I10 inverter connector.
(e) Turn the power switch ON (IG).

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

(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(g) Read the VL–Voltage before Raise value on the intelligent tester II.
Standard: 0 V
(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

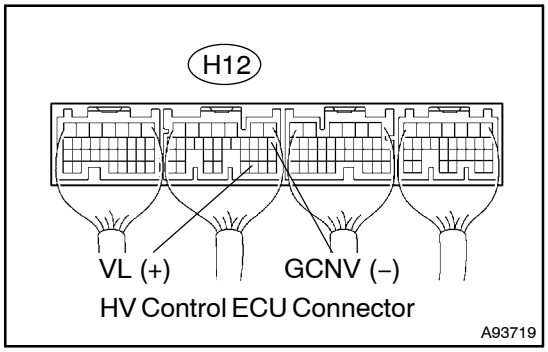
[Corrected]

OK	Go to step 6

NG [Corrected]

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5 INSPECT HYBRID VEHICLE CONTROL ECU(VL VOLTAGE)



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

HINT:

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

(b) Measure the voltage between the terminals of the H12 HV control ECU connector.

Standard:

Tester Connection	Specified Condition
VL (H12–30) – GCNV (H12–8)	1.9 to 3.4 V

NG → **Go to step 6**

[Corrected]

OK

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

6 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P0A94–589, 590 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

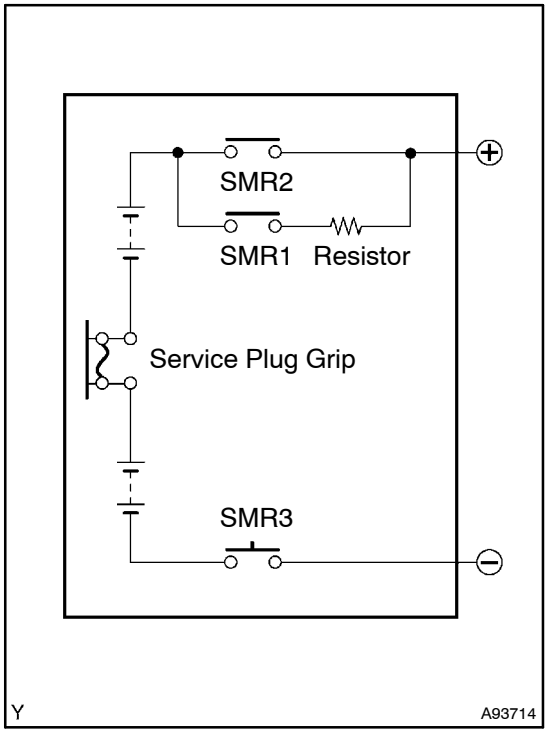
[Corrected]

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DTC	P0AA1/224	HYBRID BATTERY POSITIVE CONTACTOR CIRCUIT STUCK CLOSED

DTC	P0AA2/225	HYBRID BATTERY POSITIVE CONTACTOR CIRCUIT STUCK OPEN

CIRCUIT DESCRIPTION



The SMRs (System Main Relays) connect and disconnect the high–voltage power supply circuit in accordance with requests from the HV control ECU. To ensure a reliable operation, they consists of a total of three relays (one for the negative side and two for the positive side).

To connect, SMR1 and SMR3 turn ON initially. Then, SMR2 turns ON and SMR1 turns OFF. This process protects the circuit from the high–voltage surge current by allowing the limit current to flow via the resistor. To disconnect, SMR2 and SMR3 turn OFF in that order. The HV control ECU checks that the relays have turned OFF properly.

The HV control ECU monitors the proper operation of the SMRs (CON1, CON2 and CON3) to check for malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0AA1	224	Open or +B short in system main relay No. 1 circuit Primary circuit of SMRP is malfunctioning.	• Wire harness or connector • System main relay No. 1 • HV control ECU
P0AA2	225	GND short in system main relay No. 1 circuit Primary circuit of SMRP is malfunctioning.	• Wire harness or connector • System main relay No. 1 • HV control ECU

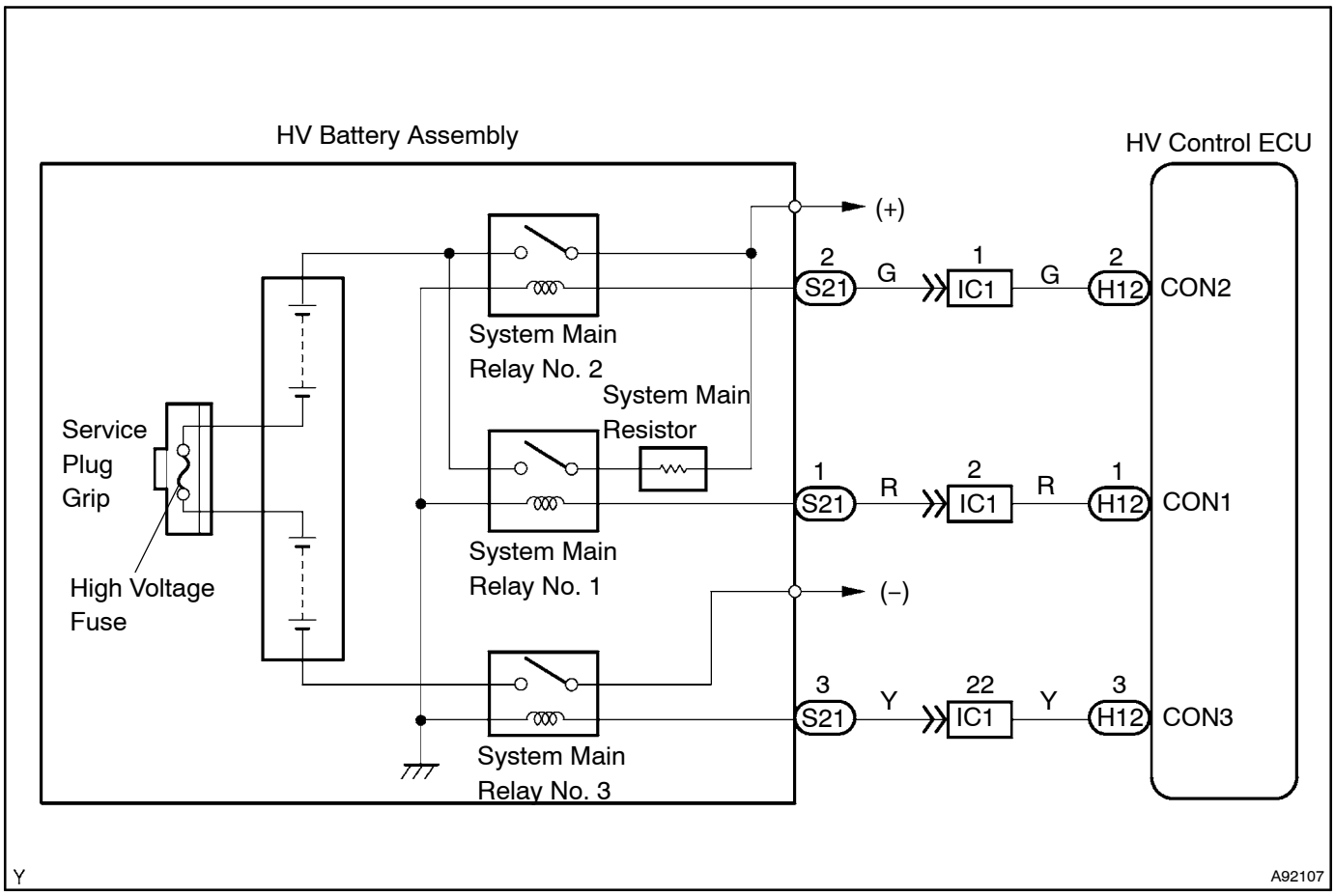
Related Data List

DTC No.	INF Code	Data List
P0AA1	224	• VL–Voltage before Boosting • Power Resource VB • System Main Relay Status–SMRG • System Main Relay Status–SMRB • System Main Relay Status–(SMRP)
P0AA2	225	

[Added]

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WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

HINT:

After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch off and wait for 30 seconds or more.
2. Turn the power switch on (READY) and wait for 30 seconds or more.
3. Turn the power switch off and wait for 60 seconds or more.

1	**INSPECT SYSTEM MAIN RELAY NO.1 (See page 21–42)**

NG → **REPLACE SYSTEM MAIN RELAY NO.1 (See page 21–85)**

OK

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DTC	P0AA1/226	HYBRID BATTERY POSITIVE CONTACTOR CIRCUIT STUCK CLOSED

DTC	P0AA2/227	HYBRID BATTERY POSITIVE CONTACTOR CIRCUIT STUCK OPEN

CIRCUIT DESCRIPTION

Refer to DTC P0AA1 (INF 224) on page 05–537.

The HV control ECU monitors the proper operation of the system main relay No. 2 (CON2) to check for malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0AA1	226	Open or +B short in system main relay No. 2 circuit Primary circuit of SMR (+) is malfunctioning.	• Wire harness or connector • System main relay No. 2 • HV control ECU
P0AA2	227	GND short in system main relay No. 2 circuit Primary circuit of SMR (+) is malfunctioning.	• Wire harness or connector • System main relay No. 2 • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P0AA1	226	• VH–Voltage after Boosting • Power Resource VB • System Main Relay Status–SMRG • System Main Relay Status–SMRB • System Main Relay Status–(SMRP)
P0AA2	227	

WIRING DIAGRAM

[Added]

Refer to DTC P0AA1 (INF 224) on page 05–537.

INSPECTION PROCEDURE

CAUTION:

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

  [Added]

  HINT:

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

HINT:

After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch off and wait for 30 seconds or more.
2. Turn the power switch on (READY) and wait for 30 seconds or more.
3. Turn the power switch off and wait for 60 seconds or more.

1	**INSPECT SYSTEM MAIN RELAY NO.2 (See page 21–42)**

NG → **REPLACE SYSTEM MAIN RELAY NO.2 (See page 21–89)**

OK

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DTC	P0AA1/231	HYBRID BATTERY POSITIVE CONTACTOR CIRCUIT STUCK CLOSED

CIRCUIT DESCRIPTION

Refer to DTC P0AA1 (INF 224) on page 05–537.

Because it might be impossible to shut off the high–voltage system if either of the system main relay No. 1 and No. 2 becomes stuck, the HV control ECU monitors the two relays and stops the system if malfunction is found in either relay.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0AA1	231	System main relay terminal of HV battery positive side stuck closed (1 trip detection logic)	• System main relay No. 1 • System main relay No. 2

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

[Added]

HINT:

After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch off and wait for 5 seconds or more.
2. Turn the power switch on (READY) and wait for 5 seconds or more.
3. Turn the power switch off and wait for 5 seconds or more.

1	INSPECT SYSTEM MAIN RELAY NO.1 (See page 21–42)

NG → REPLACE SYSTEM MAIN RELAY NO.1 (See page 21–85)

OK

REPLACE SYSTEM MAIN RELAY NO.2 (See page 21–89)

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DTC	P0AA1/233	HYBRID BATTERY POSITIVE CONTACTOR CIRCUIT STUCK CLOSED

CIRCUIT DESCRIPTION

Refer to DTC P0AA1 (INF 224) on page 05–537.

Because it might be impossible to shut off the high–voltage system if any one of the system main relay No. 1 to No. 3 becomes stuck, the HV control ECU monitors the three relays and stops the system if malfunction is found in either relay.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0AA1	233	System main relay terminals of HV battery positive and negative sides stuck closed (1 trip detection logic)	• System main relay No. 1 • System main relay No. 2 • System main relay No. 3

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

[Added]

HINT:

After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch off and wait for 5 seconds or more.
2. Turn the power switch on (READY) and wait for 5 seconds or more.
3. Turn the power switch off and wait for 5 seconds or more.

1	INSPECT SYSTEM MAIN RELAY NO.1 (See page 21–42)

NG → REPLACE SYSTEM MAIN RELAY NO.1 (See page 21–85)

OK

2	INSPECT SYSTEM MAIN RELAY NO.2 (See page 21–42)

NG → REPLACE SYSTEM MAIN RELAY NO.2 (See page 21–89)

OK

REPLACE SYSTEM MAIN RELAY NO.3 (See page 21–92)

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DTC	P0AA4/228	HYBRID BATTERY NEGATIVE CONTACTOR CIRCUIT STUCK CLOSED

DTC	P0AA5/229	HYBRID BATTERY NEGATIVE CONTACTOR CIRCUIT STUCK OPEN

CIRCUIT DESCRIPTION

Refer to DTC P0AA1 (INF 224) on page 05–537.

The HV control ECU monitors the proper operation of the system main relay No. 3 (CON3) to check for malfunction.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0AA4	228	Open or +B short in system main relay No. 3 circuit Primary circuit of SMR (–) is malfunctioning.	• Wire harness or connector • System main relay No. 3 • HV control ECU
P0AA5	229	GND short in system main relay No. 3 circuit Primary circuit of SMR (–) is malfunctioning.	• Wire harness or connector • System main relay No. 3 • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P0AA4	228	• VH–Voltage after Boosting • Power Resource VB • System Main Relay Status–SMRG • System Main Relay Status–SMRB • System Main Relay Status–(SMRP)
P0AA5	229	

WIRING DIAGRAM

[Added]

Refer to DTC P0AA1 (INF 224) on page 05–537.

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

[Added]

HINT:

After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch off and wait for 30 seconds or more.
2. Turn the power switch on (READY) and wait for 30 seconds or more.
3. Turn the power switch off and wait for 60 seconds or more.

1	**INSPECT SYSTEM MAIN RELAY NO.3 (See page 21–42)**

NG → **REPLACE SYSTEM MAIN RELAY NO.3 (See page 21–92)**

OK

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DTC	P0AA4/232	HYBRID BATTERY NEGATIVE CONTACTOR CIRCUIT STUCK CLOSED

CIRCUIT DESCRIPTION

Refer to DTC P0AA1 (INF 224) on page 05–537.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0AA4	232	System main relay terminal of HV battery negative side stuck closed (1 trip detection logic)	• System main relay No. 3

INSPECTION PROCEDURE

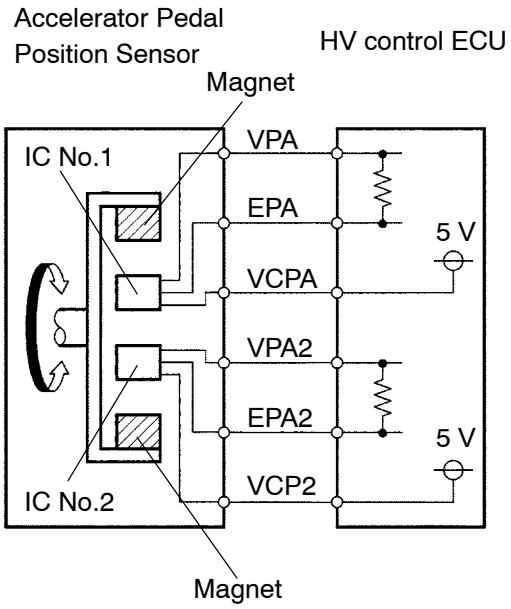
If the information (INF) code is present, replace the system main relay No. 3.

[Added]

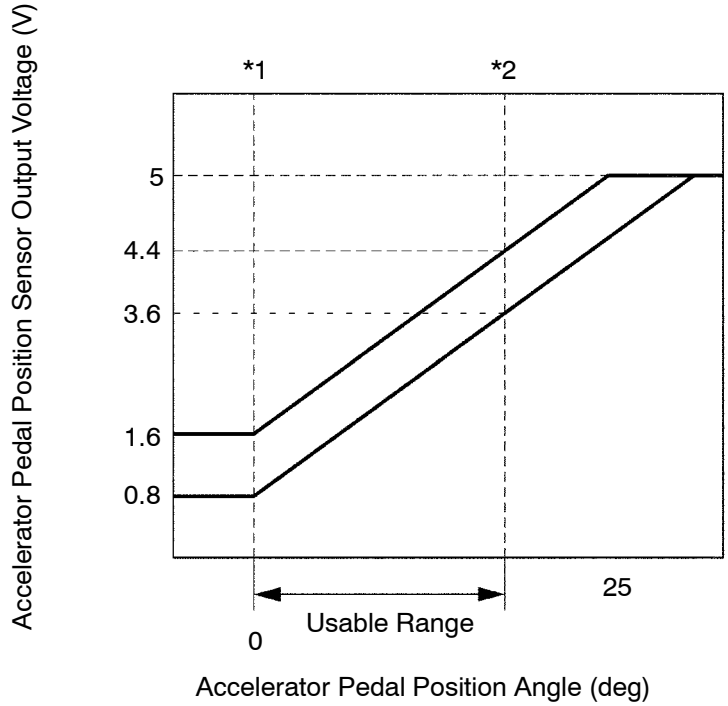
HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Turn the power switch off and wait for 5 seconds or more.
2. Turn the power switch on (READY) and wait for 5 seconds or more.
3. Turn the power switch off and wait for 5 seconds or more.

REPLACE SYSTEM MAIN RELAY NO. 3 (See page 21–92)

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A19694



*1: Accelerator Pedal Released

*2: Accelerator Pedal Fully Depressed

A19803

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P2122	104	Open or GND short in accelerator pedal position main sensor circuit The main sensor voltage is 0.4 V or less for 0.5 seconds. (1 trip detection logic)	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU
P2123	105	+B short in accelerator pedal position main sensor circuit The main sensor voltage is 4.8 V or more for 2 seconds. (1 trip detection logic)	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU
P2127	107	Open or GND short in accelerator pedal position sub sensor circuit The sub sensor voltage is 1.2 V or less for 0.5 seconds. (1 trip detection logic)	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU
P2128	108	+B short in accelerator pedal position sub sensor circuit The sub sensor voltage is 4.8 V or more for 2 seconds while the main sensor is operating properly. (1 trip detection logic)	• Wire harness or connector • Accelerator pedal rod assembly • HV control ECU

[Corrected]

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DTC	P3000/388	BATTERY CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

Based on the malfunction signal received from the battery ECU, the system alerts the driver and effects fail–safe control.

This DTC is output when the SOC (state of charge) of the HV battery decreases as a result of leaving the vehicle in the N position, running out of fuel, or malfunction in the HV control system.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3000	388 [Corrected]	Abnormal signal input from battery ECU (discharge inhibition control malfunction) SOC drops drastically. (1 trip detection logic)	• HV control system • Fuel shortage • HV battery assembly • Engine assembly • HV transzxle assembly [Added]

Related Data List

DTC No.	INF Code	Data List
P3000	388	• State of Charge • WOUT Control Power • Power Resource VB • Power Resource IB

INSPECTION PROCEDURE

HINT:

- Repeated engine start checks may cause the SOC to drop, resulting in DTC P3000–388 being set. In this case, charge the HV battery using the THS charger.
- Cranking the engine once causes the SOC to drop approximately 1%.
- Charging the HV battery once (10 minutes) using the THS charger restores the SOC approximately 2%.
- Charging the HV battery using the THS charger takes approximately 10 minutes when the battery temperature is 25°C (77°F) or approximately 30 minutes when the battery temperature is 0°C (32°F).
- The THS charger is a supplemental charging device that enables the engine to start (READY–on state).
- After the repair, turn the power switch on (READY) with park (P) selected and confirm that the engine starts and charging starts. Confirm that SOC increases and remains in the appropriate range.

1	READ OUTPUT DTC(HYBRID CONTROL) [Added]

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

Result: DTC P3000 (INF 388) and other DTCs are output

HINT:

If any other codes besides P3000 (INF 388) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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DTC	P3000/389	BATTERY CONTROL SYSTEM MALFUNCTION

CIRCUIT DESCRIPTION

Based on the malfunction signal received from the battery ECU, the system alerts the driver and effects fail–safe control.

This DTC is output if the HV battery is depleted or the HV control system has malfunction.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3000	[Corrected] 389	Abnormal signal input from battery ECU (drop of high voltage) Voltage of a battery block drops drastically. (1 trip detection logic)	• HV control system • HV battery assembly • Engine assembly • HV transaxle assembly [Added]

Related Data List

DTC No.	INF Code	Data List
P3000	389	• State of Charge • V1 to V14 Batt Block (Hybrid Battery System) • WOUT Control Power • Power Resource VB • Power Resource IB

INSPECTION PROCEDURE

HINT:

- DTC P3000–389 may be stored if the SOC has dropped due to the vehicle being left for a while with the shift lever in N or running out of fuel.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) with park (P) selected.
  (b) Wait until the engine starts and then stops.

1	READ OUTPUT DTC(HYBRID CONTROL) [Added]

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P3000 (INF 389) and other DTCs are output

HINT:

If any other codes besides P3000 (INF 389) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

2	CHECK IF ENGINE STARTS

(a) Turn the power switch ON (READY).
(b) Check if the engine starts.
OK: The engine starts

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DTC	P3004/131	HIGH VOLTAGE POWER RESOURCE MALFUNCTION

CIRCUIT DESCRIPTION

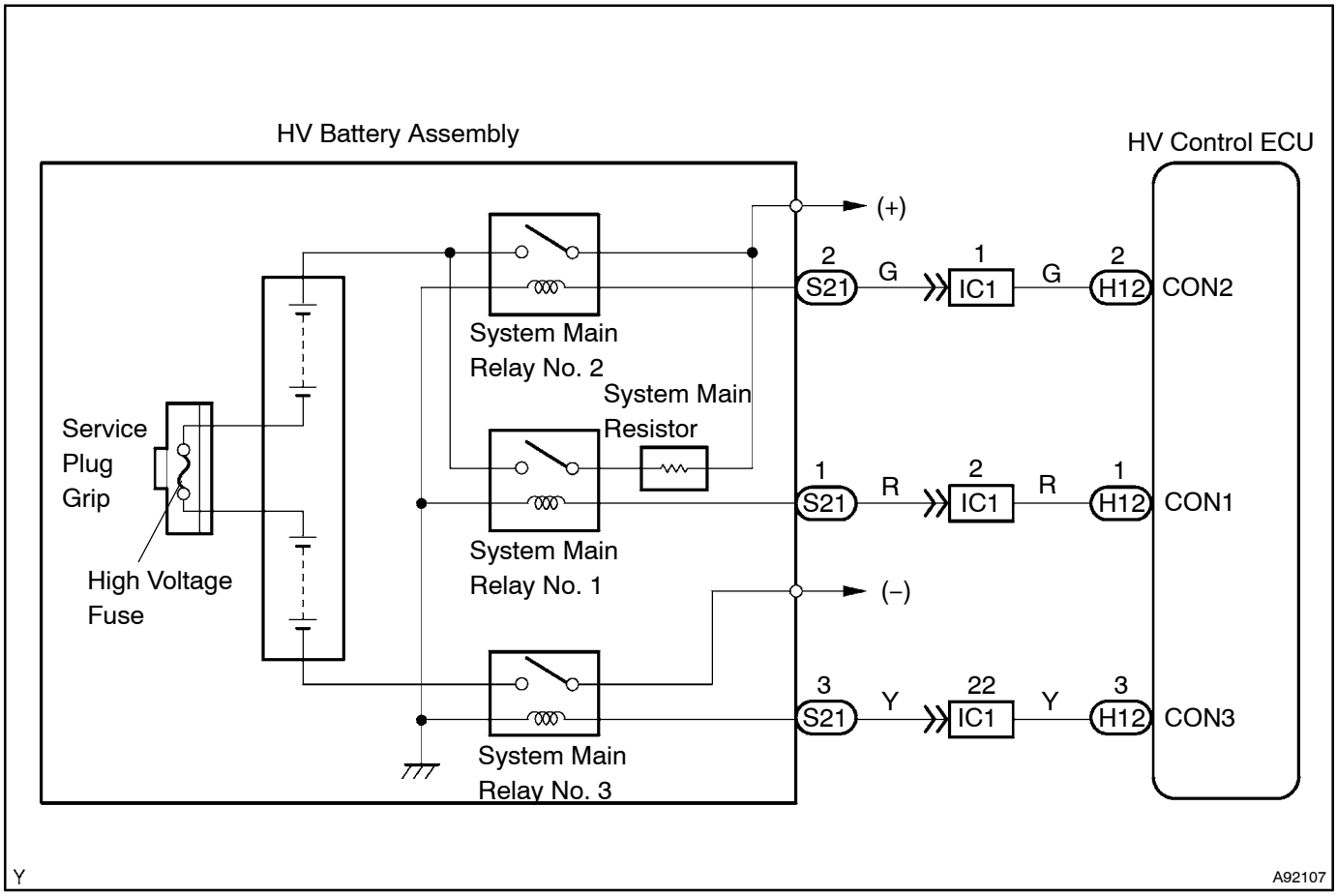
DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3004	[Corrected] 131	High voltage fuse has blown out, service plug grip is disconnected or limiter resistance is cut off Although commanded to turn on SMR when the power switch was turned on (READY), the voltage did not increase after boosting. High voltage circuit malfunction between the HV battery and w/converter inverter assembly (1 trip detection logic)	• HV battery system • System main resistor • System main relay No. 1 • System main relay No. 2 • System main relay No. 3 • Main battery cable • Main battery cable No. 2 • Frame wire • w/ converter inverter assembly • HV control ECU

HINT:
This DTC may be stored if the EV battery fuse in the service plug grip is blown, the service plug grip is disconnected, or there is an open in No. 1 system main relay, No. 2 system main relay or the system main resistor.

WIRING DIAGRAM

[Added]

Refer to DTC P0A78 (INF 266) on page 05–365.



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

HINT:

After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch on (IG) and wait for 15 seconds or more.

1	READ OUTPUT DTC(HV BATTERY)

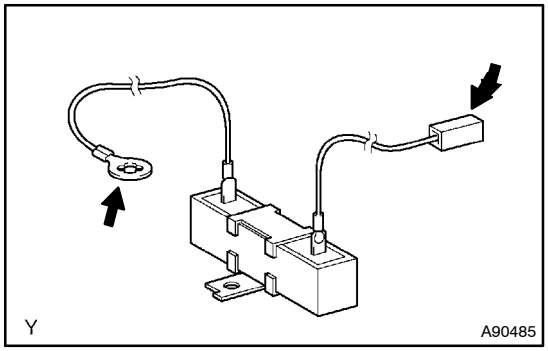
(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / HV Battery / DTC.
(e) Read DTCs.

Result: DTC P0A95 is output

YES → **GO TO DTC P0A95 (See page 05–686)**

NO

2	INSPECT SYSTEM MAIN RESISTOR



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Remove the system main resistor (see page 21–94).
(b) Measure the resistance between the terminals.
Standard: 18 to 22 Ω
(c) Reinstall the system main resistor (see page 21–94).

NG → **REPLACE SYSTEM MAIN RESISTOR (See page 21–94)**

OK

3	INSPECT SYSTEM MAIN RELAY NO.1 (See page 21–42)

NG → **REPLACE SYSTEM MAIN RELAY NO.1 (See page 21–85)**

OK

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DTC	P3004/132	HIGH VOLTAGE POWER RESOURCE MALFUNCTION

CIRCUIT DESCRIPTION

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3004	[Corrected] 132	Although commanded to turn on SMR when the power switch was turned on (READY), the voltage did not increase after boosting. High voltage circuit malfunction between the HV battery and w/converter inverter assembly (1 trip detection logic)	• HV control system • System main resistor • System main relay No. 1 • System main relay No. 3 • Main battery cable • Main battery cable No. 2 • Frame wire • w/ converter inverter assembly • HV control ECU

HINT:
This DTC may be stored if the EV battery fuse in the service plug grip is blown, the service plug grip is disconnected, or there is an open in No. 1 system main relay, No. 2 system main relay or the system main resistor.

WIRING DIAGRAM

Refer to DTC P3004 (INF 131) on page 05–557. [Added]

INSPECTION PROCEDURE

CAUTION:

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

HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V. [Added]
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 30 seconds or more.

1	READ OUTPUT DTC(HYBRID CONTROL)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / DTC.
(e) Read DTCs.
Result: DTC P3004 (INF 132) and other DTCs are output

HINT:
If any other codes besides P3004 (INF 132) are output, perform troubleshooting for those DTCs first.

YES → **GO TO RELEVANT DTC CHART (See page 05–268)**

NO

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DTC	P3009/526	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/611	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/612	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/613	HIGH VOLTAGE POWER SHORT CIRCUIT

DTC	P3009/614	HIGH VOLTAGE POWER SHORT CIRCUIT

CIRCUIT DESCRIPTION

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

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HINT:

- *1: A P3009–526 DTC will set upon initial detection of a malfunction in undetermined area of the HV system insulation.
- *2: After DTC P3009–526 is stored, if the following operations are performed within the same trip, the parts which the insulation resistance dropped will be determined and DTC P3009–611, 612, 613 or 614 will be stored.
  (a) 1 minute or more has elapsed with the power switch on (READY), park (P) selected, the vehicle stopped and the air conditioning system on (Lo/COOL MAX, blower speed HI).
  (b) 1 minute or more has elapsed after the engine switch was turned off.

Related Data List

DTC No.	INF Code	Data List
P3009	526	• Short Wave Highest Val • VL–Voltage before Boostiing • VH–Voltage after Boosting • Power Resource VB • System Main Relay Status – (SMRP) • System Main Relay Status – SMRB • System Main Relay Status – SMRG • MG2 Gate Status • MG1 Gate Status • Converter Gate Status • Aircon Gate Status • A/C Consumption Pwr
	611	
	612	
	613	
	614	

”Short Wave Highest Val” cannot be used as a reference under the following conditions:

— Within 1 minute of the power switch turned on (IG)

— If any of the system voltages (Power Resource VB, VL–Voltage before Boosting or VH–Voltage after Boosting) fluctuate

HINT:

- Items to be checked using the freeze frame data.

Operation Status

Freeze Frame Data	Diagnostic Note
A/C Consumption Pwr	If more than 0 kW, a malfunction when the air conditioning system was on can be suspected.

Driving Status

Freeze Frame Data	Diagnostic Note
Vehicle Spd	–
Accel Pedal Pos #1	–
Engine Revolution	–
Shift Sensor Shift Pos	–
Master Cylinder Ctrl Trq	–

Operation Conditions

Freeze Frame Data	Diagnostic Note
Motor Temp No1	If coolant has leaked into the transaxle, the insulation resistance may decrease only when the transaxle temperature is high. The motor temperature is likely to increase if the motor speed is low and output torque is high such as when cruising uphill slowly or accelerating from a low speed.
Motor Temp No2	If coolant has leaked into the transaxle, the insulation resistance may decrease only when the transaxle temperature is high. The generator temperature is likely to increase under repeat acceleration and deceleration while the vehicle is driven in the mid speed range (60 to 80 km/h (30 to 50 mph)).
Engine Coolant Temp	If coolant has leaked into the transaxle, the insulation resistance may decrease only when the transaxle temperature is high.

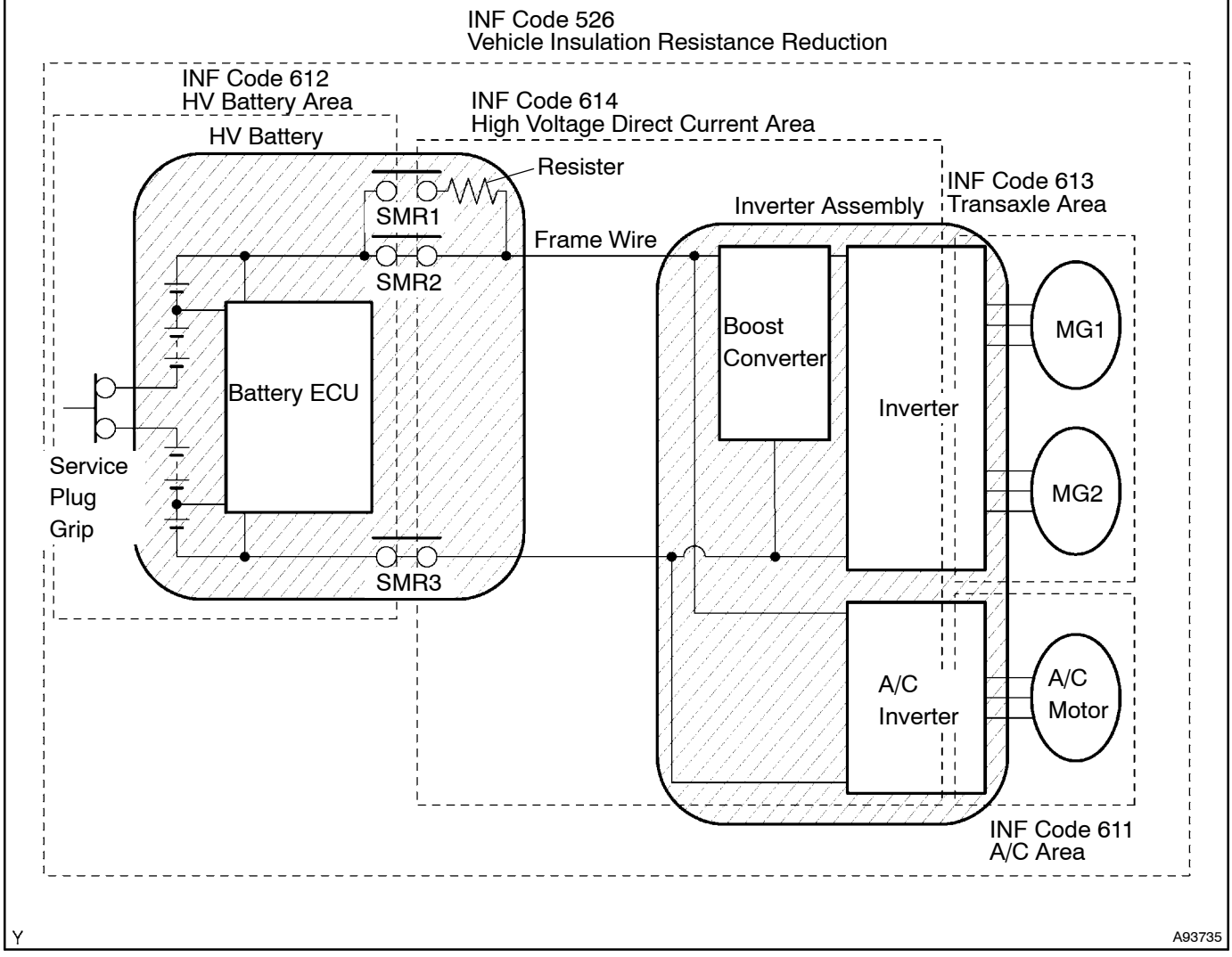
[Added]

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Freeze Frame Data	Diagnostic Note
Driving Condition (acceleration, deceleration, turning, etc.)	Changes in the insulation of the parts with insufficient insulation due to changes in G force or vibration is suspected.
Road Condition (unpaved, etc.)	
Weather (rain, snow, etc.)	Water intrusion is suspected
Washing the vehicle (Whether the malfunction occurred after washing the vehicle?)	

WIRING DIAGRAM

Outline of High–Voltage Circuit and Areas:



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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the inverter with converter assembly.

HINT:

- When measuring insulation resistance using a megohmmeter, set the megohmmeter to 500 V.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

  (Do not turn the power switch off during this inspection.)

  (a) Apply the parking brake and secure the wheels using chocks.

  (b) When the vehicle is stationary, turn the power switch on (READY) with park (P) selected and wait for 75 seconds or more.

  (c) Turn the air conditioning system on (MAX COLD, blower speed HI).

  (d) d)While depressing the brake pedal without depressing the accelerator pedal, move the shift lever to D and wait for 5 minutes.

  (If no DTCs are output, proceed to the next step.)

  (e) Drive the vehicle for approximately 5 minutes referring to the following freeze frame data items: “Vehicle Spd” “Shift Sensor Shift Pos” “Accel Pedal Pos #1” “Engine Revolution” “Engine Coolant Temp” “Master Cylinder Ctrl Trq” “Motor Temp MG2 (No2)” “Motor Temp MG2 (No1)”

  (If DTC P0AA6–526 is output, stop the vehicle, select park (P), turn the power switch on (READY), turn the air condition system on (Lo/COOL MAX, blower speed HI) and wait for 1 minute. Then turn the power switch off and wait for another 1 minute.)

  (If the freeze frame data item “Vehicle Spd” is 10 km/h or less, drive the vehicle at 10 km/h or more.)
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the inverter with converter assembly.

[Added]

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1	READ OUTPUT DTC(HYBRID CONTROL)

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

Result:

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

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

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

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

A

2	READ OUTPUT INF CODE

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

[Added]

NOTICE:
If a drop in insulation resistance is detected and DTC P3009–526 is output, turn the power switch on (READY) and turn the air condition system on for 1 minute. Turn the power switch off and wait for 1 minute to determine the information code (611, 612, 613 or 614).

Result:

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

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B	Go to step 18
C	Go to step 19
D	Go to step 27
E	Go to step 28

A

3	CHECK W/MOTOR COMPRESSOR ASSY

CAUTION:
Wear insulated gloves before performing the following operation.

(a) Turn the power switch OFF.

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

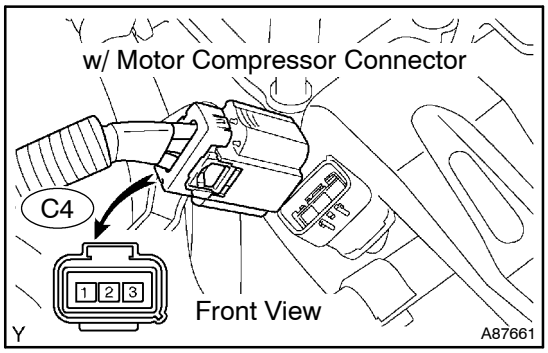
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction. Therefore, never turn the power switch ON (READY) in this state.

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

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

Standard:

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



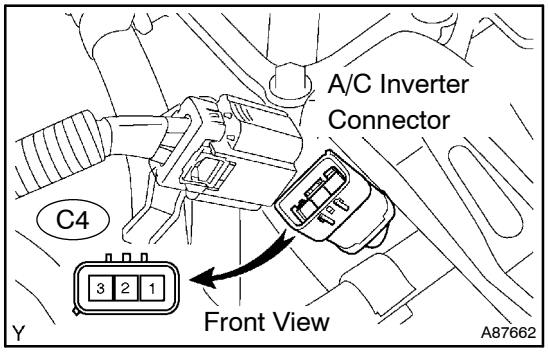
NG	REPLACE W/MOTOR COMPRESSOR ASSY (See page 55–39)

OK

[Corrected]

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



CAUTION:
Wear insulated gloves before performing the following operation.

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

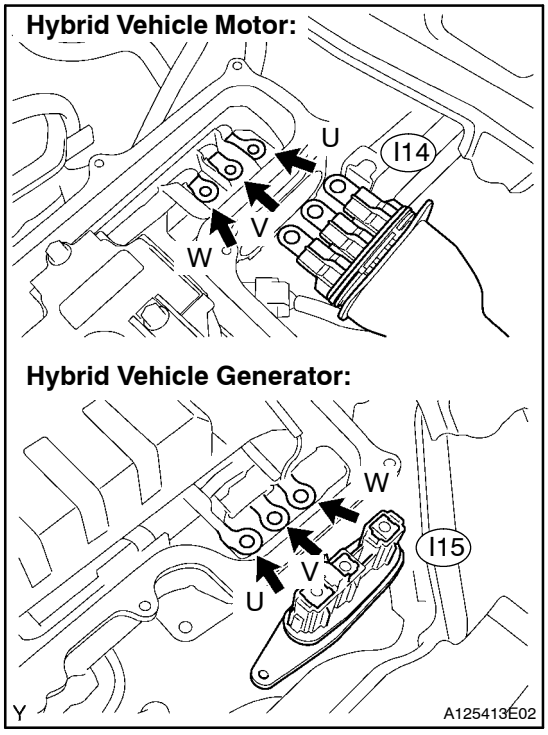
Standard:

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

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

OK

5	CHECK HV TRANSAXLE AREA FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

HINT:
Confirm that the inverter coolant level has not decreased. If inverter coolant leaks into the HV transaxle and mixes with ATF, the insulation resistance may decrease.

(a) Check that the service plug grip has been detached.
(b) Remove the inverter cover (see page 21–25).
(c) Disconnect the three–phase alternating current cables for the motor and generator from the inverter.
(d) Using a megohmmeter set to 500 V, measure the insulation resistance between the six terminals of the three–phase alternating current cables on transaxle side and the body ground.

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

[Corrected]

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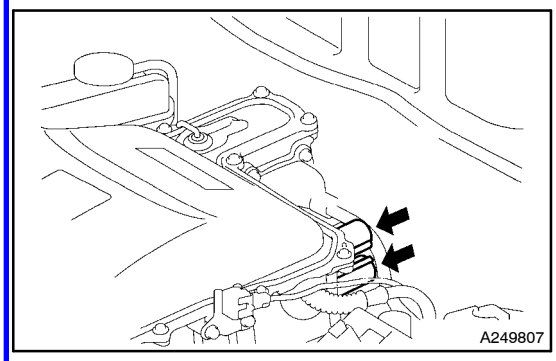
Standard resistance

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

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

OK

6 CHECK W/CONVERTER INVERTER ASSEMBLY FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.
HINT:
Make sure that no foreign matter, coolant or water has entered the inverter.

(a) Check that the service plug grip has been detached.
(b) Disconnect the frame wire from the inverter.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminals of the inverter and the body ground.

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

Standard resistance: 2 MΩ or higher

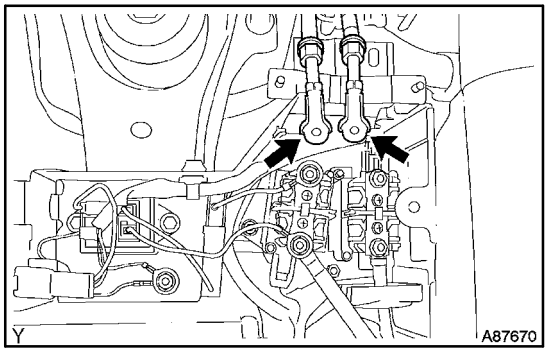
NG → **REPLACE W/ CONVERTER INVERTER ASSY (See page 21–25)**

OK

[Corrected]

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7	CHECK FRAME WIRE FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Disconnect the frame wire from the system main relays.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the frame wire and the body ground.

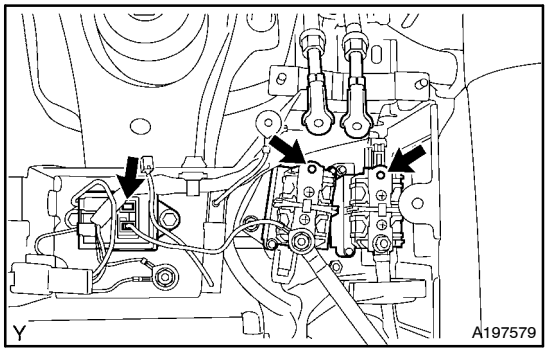
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard resistance: 10 MΩ or higher

NG → **REPLACE FRAME WIRE**

OK

8	CHECK SYSTEM MAIN RELAYS FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Disconnect the system main resistor from the system main relays.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminals of the system main relays and the body ground.

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

Standard resistance: 10 MΩ or higher

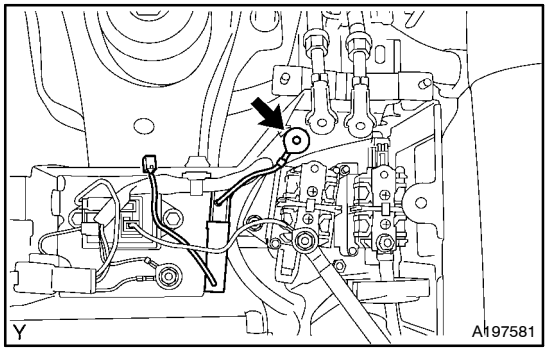
NG → **REPLACE SYSTEM MAIN RELAY WITH REDUCED INSULATION RESISTANCE**

OK

[Corrected]

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9	CHECK SYSTEM MAIN RESISTOR FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that both terminals of the system main resistor have been disconnected.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminal of the system main resistor and the body ground.

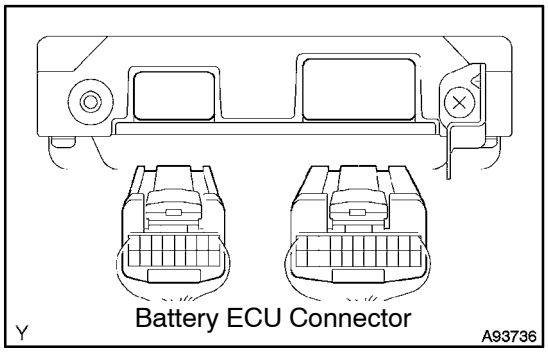
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard resistance: 10 MΩ or higher

NG	REPLACE SYSTEM MAIN RESISTOR

OK

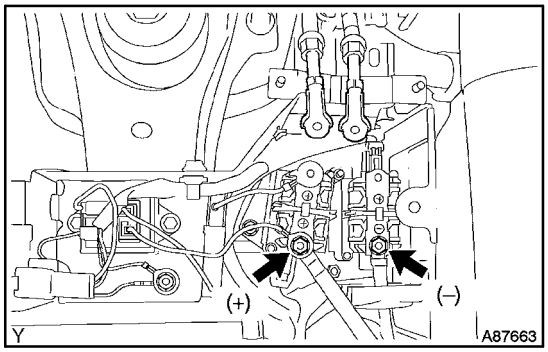
10	CHECK HV BATTERY AREA



CAUTION:
Wear insulated gloves before performing the following operation.

HINT:
Make sure that no foreign matter or water has entered the HV battery assembly.

(a) Check that the service plug grip has been detached.
(b) Disconnect the B12 and B13 battery ECU connectors.



(c) Disconnect the main battery cables from the system main relays.
(d) Using a megohmmeter set to 500 V, measure the insulation resistance between the positive terminal on the HV battery side of the system main relay and the body ground.

[Corrected]

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NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

(e) Using a megohmmeter set to 500 V, measure the insulation resistance between the negative terminal on the HV battery side of the system main relay and the body ground.

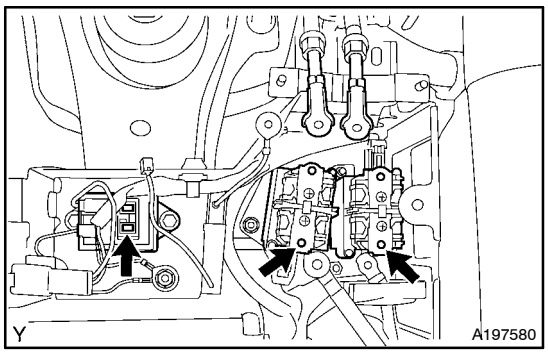
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

NG	**Go to step 11**

OK

REPLACE BATTERY ECU ASSY (See page 21–128)

11	**CHECK SYSTEM MAIN RELAYS FOR INSULATION**



CAUTION:
Wear insulated gloves before performing the following operation.

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

(b) Check that all the high–voltage terminals of the system main relays have been disconnected.

(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminals of the system main relays and the body ground.

NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

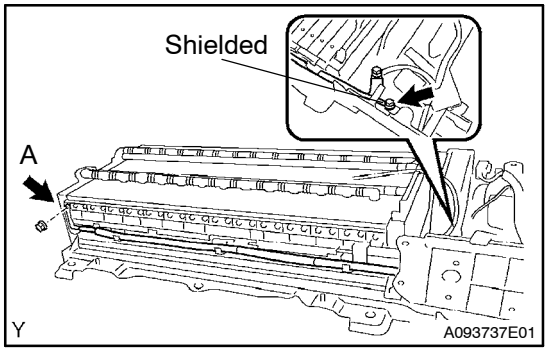
NG	**REPLACE SYSTEM MAIN RELAY WITH REDUCED INSULATION RESISTANCE**

OK

[Corrected]

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12	INSPECT MAIN BATTERY CABLE



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

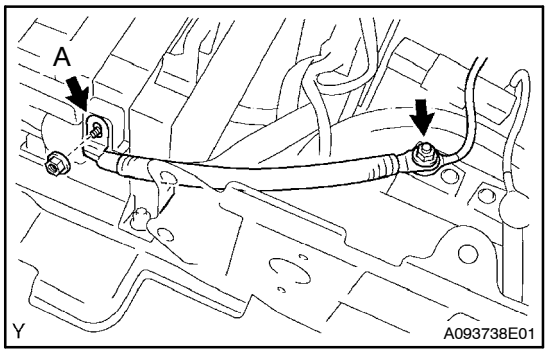
(a) Remove the HV battery assembly (see page 21–56).
(b) Remove the battery cover (see page 21–56).
(c) Check if the main battery cable cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body
(d) Remove the terminal (A in the illustration) on the battery module side of the main battery cable only.
(e) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the main battery cable and shield ground.

NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

NG → **REPLACE MAIN BATTERY CABLE**

OK

13	INSPECT NO. 2 MAIN BATTERY CABLE



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

(a) Following the previous step, check if the No. 2main battery cable cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body
(b) Remove the terminal (A in illustration) on the battery module side of the No. 2 main battery cable only.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the No. 2 main battery cable and shield ground.

NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

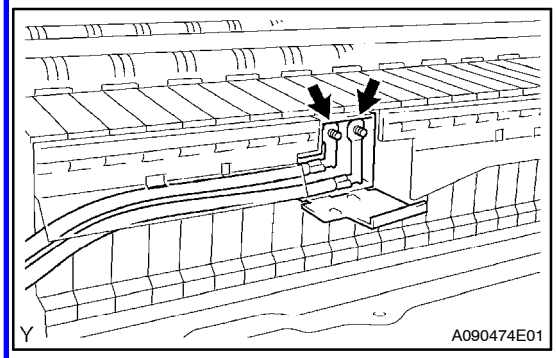
[Corrected]

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NG → REPLACE NO. 2 MAIN BATTERY CABLE

OK

14 INSPECT BATTERY PLUG



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

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

NOTICE:
Do not reinstall the service plug grip.

(b) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the battery plug wire harness and body ground.

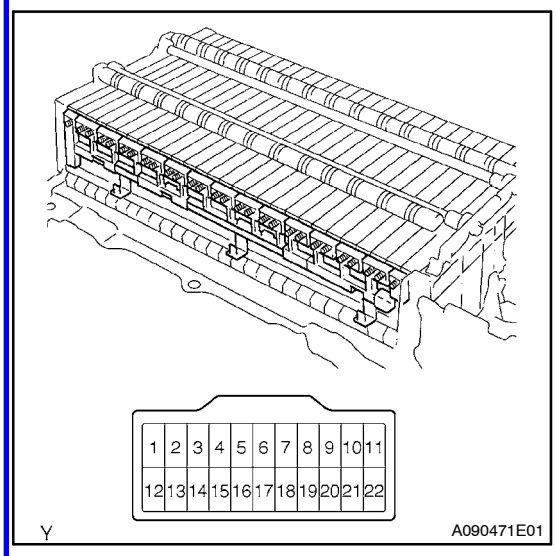
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard resistance: 10 MΩ or higher

NG → REPLACE BATTERY PLUG

OK

15 INSPECT NO. 2 FRAME WIRE



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

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

OK: Electrical leads are not in contact with the battery case or body.

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

(c) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the No. 2 frame wire connector and the battery case.

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

Standard resistance: 10 MΩ or higher

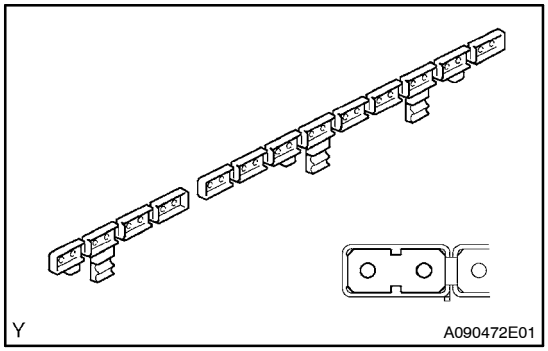
NG → REPLACE NO. 2 FRAME WIRE

OK

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[Corrected]

16	INSPECT JUNCTION BLOCK ASSEMBLY



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

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

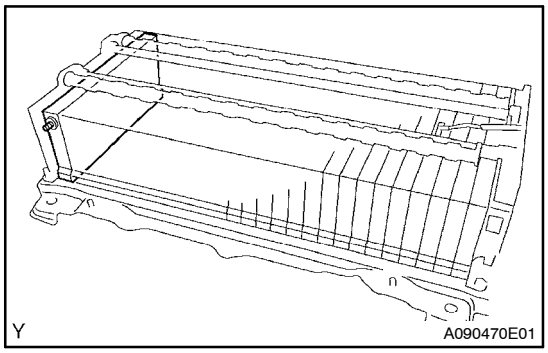
(b) Visually check the junction block assembly for any damage.

OK: No cracks or damage

NG	REPLACE JUNCTION BLOCK ASSY

OK

17	INSPECT HV BATTERY ASSY



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

(a) Following the previous step, measure the insulation resistance between each terminal (positive and negative side) of each battery module of the HV battery assembly and the battery case using a megohmmeter set to 500 V.

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

Standard resistance: None of the battery modules have continuity of below 10 MΩ

NG	REPLACE HV SUPPLY BATTERY ASSY (See page 21–128)

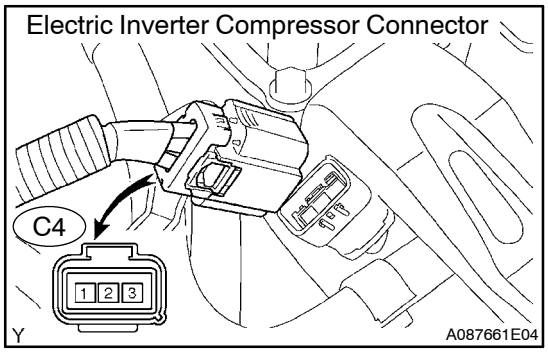
OK

REPLACE BATTERY ECU ASSY (See page 21–56)

[Corrected]

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18	CHECK ELECTRIC INVERTER COMPRESSOR



CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Disconnect the electric inverter compressor connector.
(d) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminals of the electric inverter compressor connector and the body ground.

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

Standard resistance

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

NOTICE:
The A/C inverter is integrated with the inverter assembly. It is necessary to replace the PCU box assembly (w/ converter inverter assembly) if the A/C inverter (inverter assembly) needs to be replaced because the A/C inverter (inverter assembly) cannot be replaced alone.

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

OK

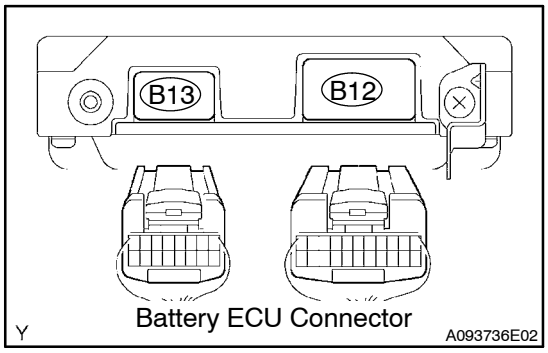
REPLACE ELECTRIC VEHICLE CONVERTER ASSEMBLY

[Corrected]

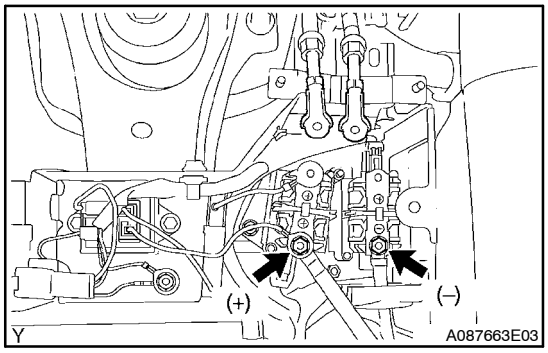
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19	CHECK HV BATTERY AREA

CAUTION:
Wear insulated gloves before performing the following operation.
HINT:
Make sure that no foreign matter or water has entered the HV battery assembly.
(a) Turn the power switch OFF.
(b) Remove the service plug grip (see page 21–120).
NOTICE:
Turning the power switch ON (READY) with the service plug grip removed could cause malfunction.
Therefore, never turn the power switch ON (READY) in this state.
(c) Disconnect the B12 and B13 battery ECU connectors.



Battery ECU Connector



(d) Disconnect the main battery cables from the system main relays.
(e) Using a megohmmeter set to 500 V, measure the insulation resistance between the positive terminal on the HV battery side of the system main relay and the body ground.
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher
(f) Using a megohmmeter set to 500 V, measure the insulation resistance between the negative terminal on the HV battery side of the system main relay and the body ground.
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

[Corrected]

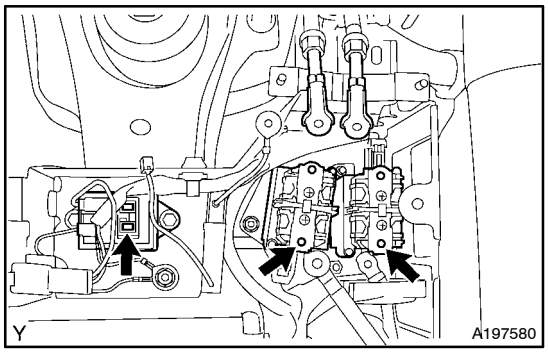
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NG	Go to step 20

OK

REPLACE BATTERY ECU ASSY (See page 21–100)

20 CHECK SYSTEM MAIN RELAYS FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that all the high–voltage terminals of the system main relays have been disconnected.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminals of the system main relays and the body ground.

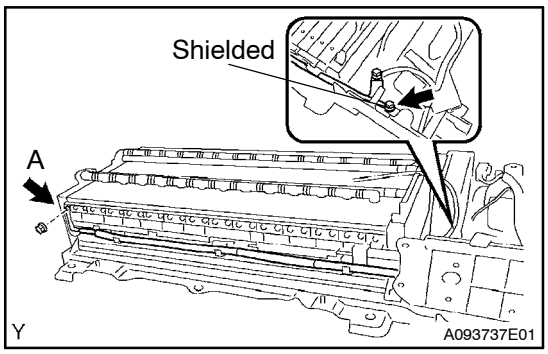
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard resistance: 10 MΩ or higher

NG	REPLACE SYSTEM MAIN RELAY WITH REDUCED INSULATION RESISTANCE

OK

21 INSPECT MAIN BATTERY CABLE



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

(a) Remove the HV battery assembly (see page 21–56).
(b) Remove the battery cover (see page 21–56).
(c) Check if the main battery cable cover is not damaged or internal electrical leads are not in contact with the battery case or body.
OK: Electrical leads are not in contact with the battery case or body
(d) Remove the terminal (A in the illustration) on the battery module side of the main battery cable only.
(e) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the main battery cable and shield ground.

[Corrected]

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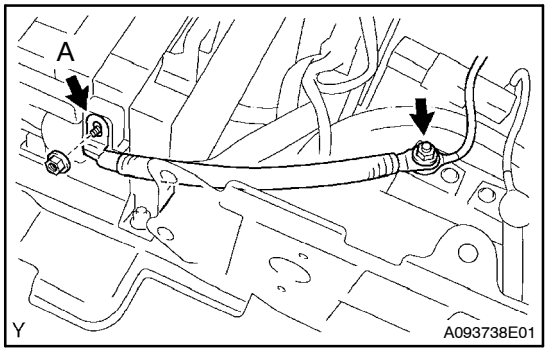
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

NG → **REPLACE MAIN BATTERY CABLE**

OK

22	INSPECT NO. 2 MAIN BATTERY CABLE

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



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

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

(c) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the No. 2 main battery cable and shield ground.

NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.
Standard resistance: 10 MΩ or higher

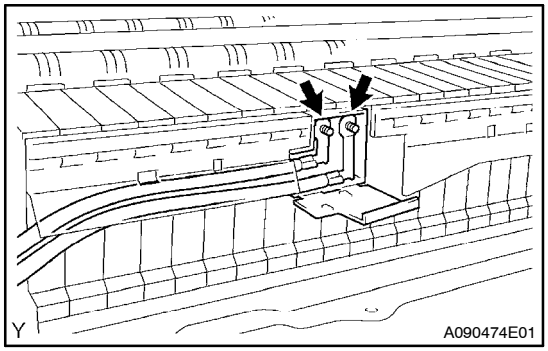
NG → **REPLACE NO. 2 MAIN BATTERY CABLE**

OK

[Corrected]

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23	INSPECT BATTERY PLUG



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

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

NOTICE:
Do not reinstall the service plug grip.

(b) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the battery plug wire harness and body ground.

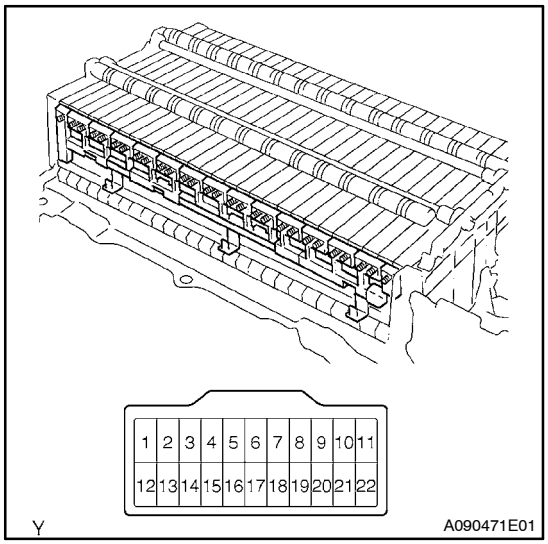
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard resistance: 10 MΩ or higher

NG	REPLACE BATTERY PLUG

OK

24	INSPECT NO. 2 FRAME WIRE



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

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

OK: Electrical leads are not in contact with the battery case or body.

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

(c) Using a megohmmeter set to 500 V, measure the insulation resistance between each terminal of the No. 2 frame wire connector and the battery case.

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

Standard resistance: 10 MΩ or higher

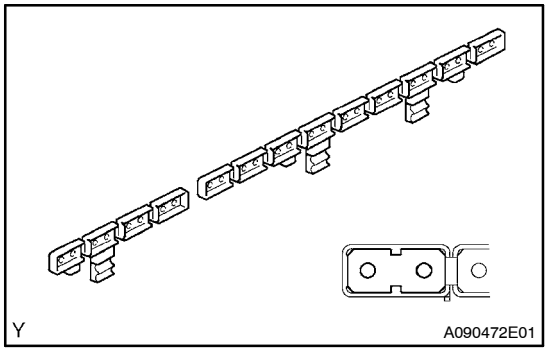
NG	REPLACE NO. 2 FRAME WIRE

OK

[Corrected]

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25	INSPECT JUNCTION BLOCK ASSEMBLY



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

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

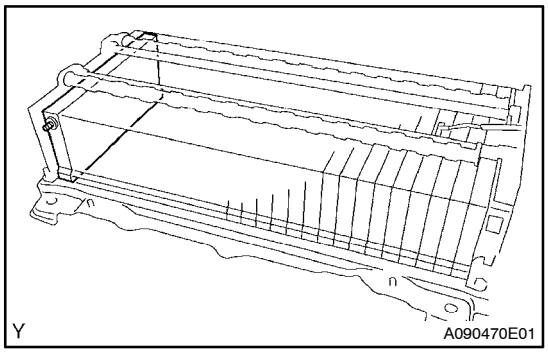
(b) Visually check the junction block assembly for any damage.

OK: No cracks or damage

NG → **REPLACE JUNCTION BLOCK ASSY**

OK

26	INSPECT HV BATTERY ASSEMBLY



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

(a) Following the previous step, measure the insulation resistance between each terminal (positive and negative side) of each battery module of the HV battery assembly and the battery case using a megohmmeter set to 500 V.

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

Standard resistance: None of the battery modules have continuity of below 10 MΩ

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

OK

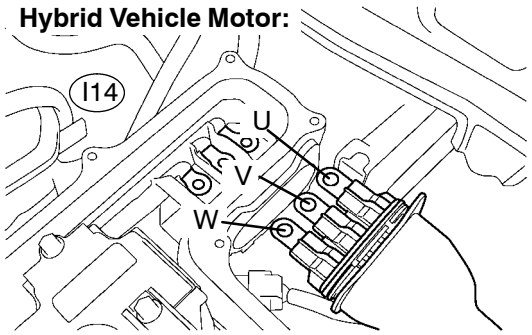
REPLACE BATTERY ECU ASSEMBLY (See page 21–100)

[Corrected]

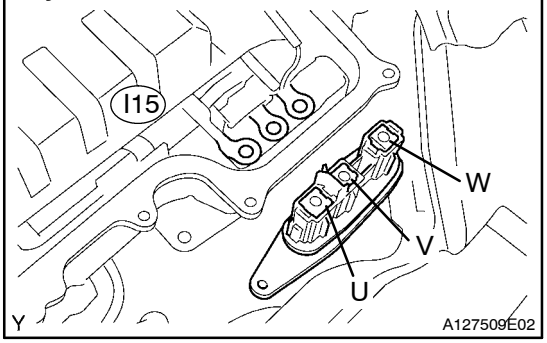
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27	CHECK HV TRANSAXLE ASSEMBLY FOR INSULATION

Hybrid Vehicle Motor:



Hybrid Vehicle Generator:



CAUTION:
Wear insulated gloves before performing the following operation.

HINT:

Confirm that the inverter coolant level has not decreased. If inverter coolant leaks into the HV transaxle and mixes with ATF, the insulation resistance may decrease.

(a) Turn the power switch OFF.

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

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

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

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

(e) Using a megohmmeter set to 500 V, measure the insulation resistance between the six terminals of the three–phase alternating current cables on the transaxle side and the body ground.

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

Standard resistance

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

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

OK

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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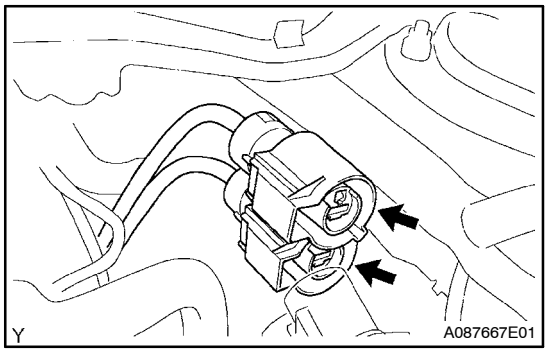
28	CHECK HIGH VOLTAGE DIRECT CURRENT AREA FOR INSULATION

CAUTION:
Wear insulated gloves before performing the following operation.
HINT:
Make sure that no foreign matter, coolant or water has entered the inverter.

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

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

(c) Disconnect the frame wire from the inverter.
(d) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminals of the frame wire and the body ground.



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

Standard resistance: 10 MΩ or higher

NG	Go to step 29

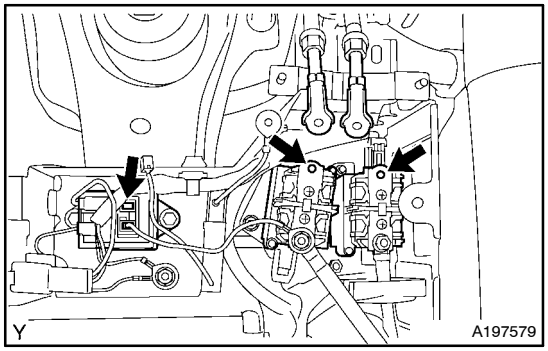
OK

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

[Corrected]

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29	CHECK SYSTEM MAIN RELAYS FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Disconnect the frame wire and system main resistor from the system main relays.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminals of the system main relays and the body ground.

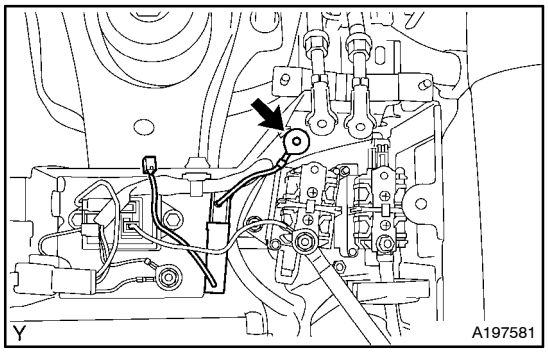
NOTICE:
Be sure to set the megohmmeter to 500 V when performing this test. Using a setting higher than 500 V can result in damage to the component being inspected.

Standard resistance: 10 MΩ or higher

NG	REPLACE SYSTEM MAIN RELAY WITH REDUCED INSULATION RESISTANCE

OK

30	CHECK SYSTEM MAIN RESISTOR FOR INSULATION



CAUTION:
Wear insulated gloves before performing the following operation.

(a) Check that the service plug grip has been detached.
(b) Check that both terminals of the system main resistor have been disconnected.
(c) Using a megohmmeter set to 500 V, measure the insulation resistance between the high–voltage terminal of the system main resistor and the body ground.

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

Standard resistance: 10 MΩ or higher

NG	REPLACE SYSTEM MAIN RESISTOR

OK

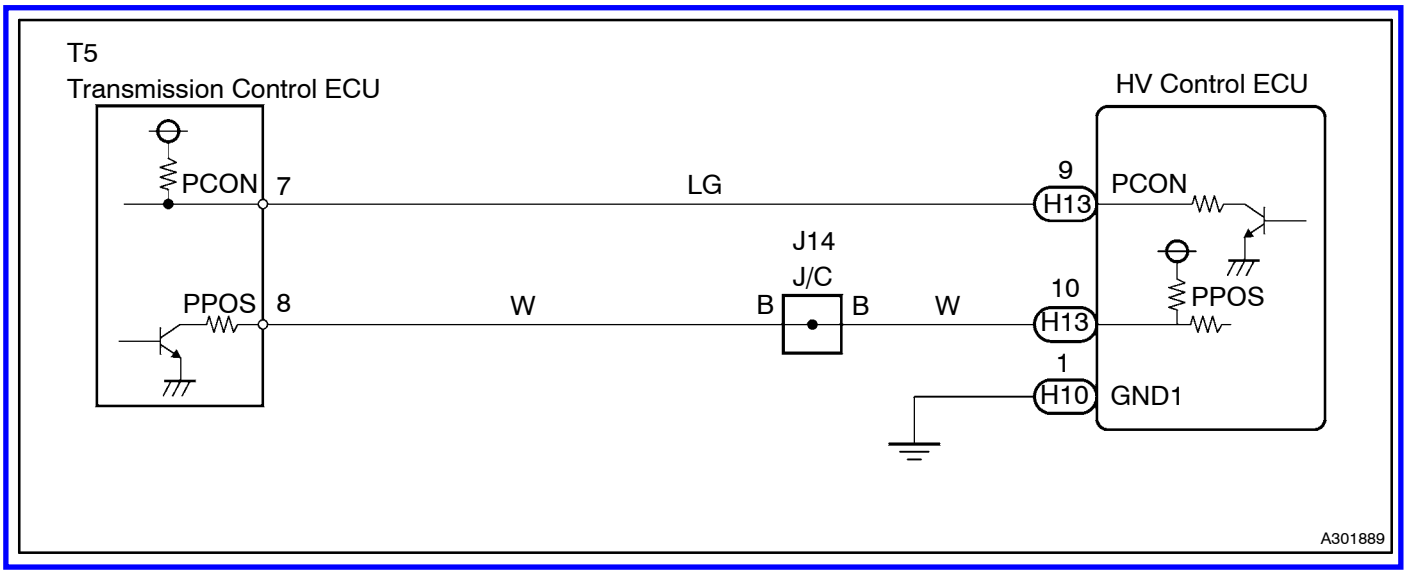
REPLACE FRAME WIRE

[Corrected]

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DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3102	524	BEAN communication problem of transmission control ECU	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU
P3102	525	Transmission control ECU IG OFF command malfunction	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU
P3102	581	Transmission control ECU malfunction	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU
P3102	582	P position (PPOS) signal is logically inconsistent	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU
P3102	597	GND short in P position (PPOS) signal circuit	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU
P3102	598	+B short in P position (PPOS) signal circuit	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU
P3102	599	P position (PPOS) signal malfunction (output pulse is abnormal)	• Wire harness or connector • Transmission control ECU • HV control ECU • Power source control ECU

WIRING DIAGRAM



[Corrected]

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DTC	P3107/213	LOST COMMUNICATION WITH AIRBAG SYSTEM CONTROL MODULE

DTC	P3107/214	LOST COMMUNICATION WITH AIRBAG SYSTEM CONTROL MODULE

DTC	P3107/215	LOST COMMUNICATION WITH AIRBAG SYSTEM CONTROL MODULE

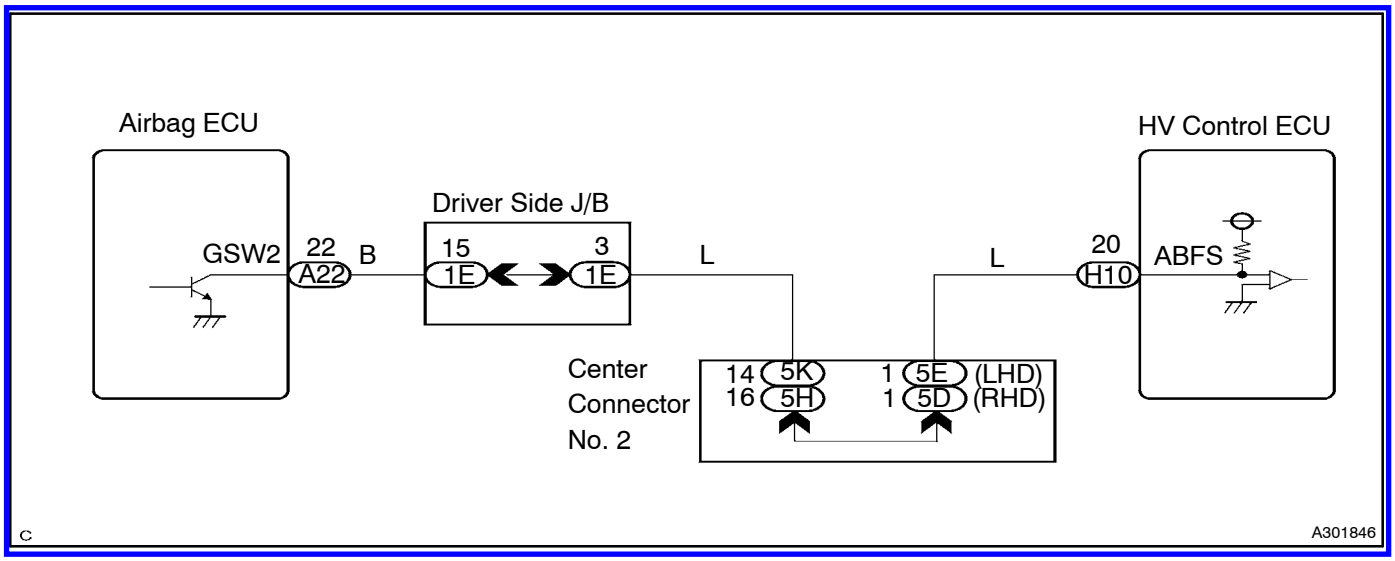
CIRCUIT DESCRIPTION

The HV control ECU detects a malfunction of the collision signal circuit from the airbag ECU and gives warning to the driver.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3107	213	GND short in communication circuit between center airbag sensor and HV control ECU Communication from the center airbag sensor stopped and Circuit Low has been detected for a certain period. (1 trip detection logic)	• Wire harness or connector • Airbag ECU
P3107	214	Open or +B short in communication circuit between airbag ECU and HV control ECU	• Wire harness or connector • Airbag ECU
P3107	215	Abnormal communication signals between airbag ECU and HV control ECU	• Wire harness or connector • Airbag ECU

WIRING DIAGRAM



[Corrected]

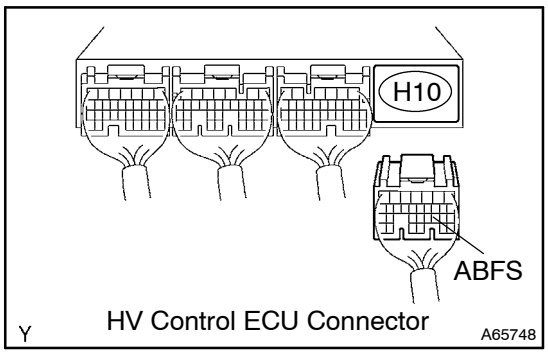
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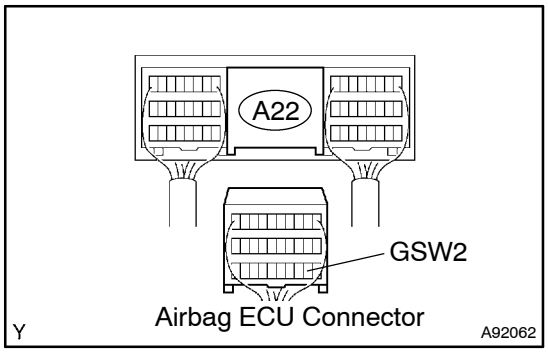
INSPECTION PROCEDURE

[Added]

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Turn the power switch on (IG) and wait for 15 seconds or more.

1	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – AIRBAG ECU)





(a) Disconnect the H10 HV control ECU connector.
(b) Disconnect the A22 airbag ECU connector.
(c) Turn the power switch ON (IG).
(d) Measure the voltage between the terminal of the HV control ECU connector and body ground.

Standard:

Tester Connection	Specified Condition
ABFS (H10–20) – Body ground	Below 1 V

(e) Turn the power switch OFF.
(f) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
ABFS (H10–20) – GSW2 (A22–22)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
ABFS (H10–20) or GSW2 (A22–22) – Body ground	10 kΩ or higher

(g) Reconnect the airbag ECU connector.
(h) Reconnect the HV control ECU connector.

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

OK

REPLACE AIR BAG ECU ASSY (See page 60–54)

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DTC	P3140/350	HV INTERLOCK SWITCH OPERATION

CIRCUIT DESCRIPTION

If the HV control ECU detects the operation of the safety devices (removal of the service plug grip and inverter cover) while the vehicle is stopped (vehicle speed below 5 km/h [3 mph]), it will shut down the system main relays. If the safety devices are correctly reinstalled, it will resume the normal operation after the power source is supplied again. If it does not, there is a possibility of an open circuit, so perform the same inspection as the DTC P3143 (INF 351).

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3140	350	Either of the following conditions is met: • With the vehicle stopped and the service plug grip or inverter cover removed. • With the vehicle stopped and the interlock signal circuit open. (1 trip detection logic)	• Service plug grip installation • Inverter cover installation

INSPECTION PROCEDURE

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.

1	CHECK SERVISE PLUG GRIP INSTALLATION

[Added]

(a) Check that the service plug grip has been installed properly.
Standard: The service plug grip has been installed properly

NG → **CORRECTLY REINSTALL**

OK

2	CHECK INVERTER COVER INSTALLATION

(a) Check that the inverter cover has been installed properly.
Standard: The Inverter cover has been installed properly

NG → **CORRECTLY REINSTALL**

OK

GO TO DTC P3143/351 (see page 05–604)

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DTC	P3143/351	HV INTERLOCK SWITCH OPEN/SHORT

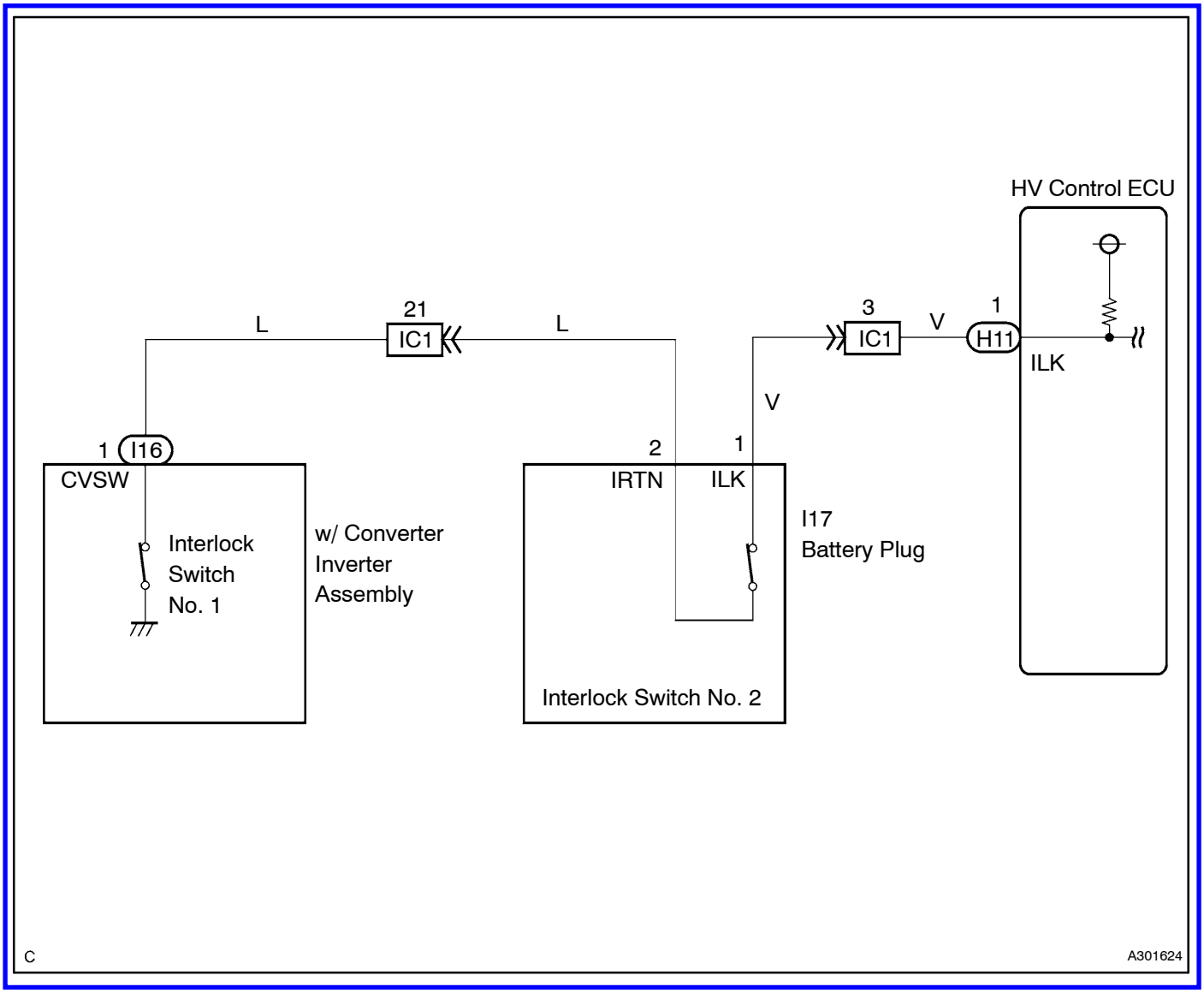
CIRCUIT DESCRIPTION

A short pin for the interlock switch is provided on the service plug grip and the inverter cover. Therefore, the interlock signal line circuit opens when the service plug grip or the inverter cover is removed.
If the HV control ECU detects an open circuit in the interlock signal line while the vehicle is in motion (vehicle speed above 5 km/h [3 mph]), it stores the information (INF) code 351 in its memory and alerts the driver. While the vehicle is in motion, the HV control ECU will not shut down the high–voltage system even if an open circuit in the interlock system is detected.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3143	351	Open in interlock signal circuit while vehicle is running (vehicle speed above 3 mph [5 km/h]) (1 trip detection logic)	• Wire harness or connector • Battery plug (interlock switch No. 2) • w/ converter inverter assembly (interlock switch No. 1)

WIRING DIAGRAM



[Corrected]

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INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

  (a) Turn the power switch on (IG) and wait for 5 seconds or more.

1	CHECK INVERTER COVER INSTALLATION

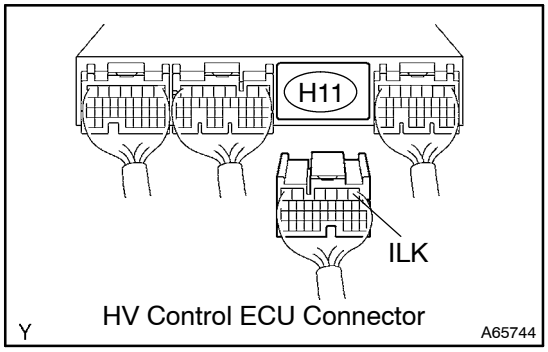
(a) Check that the inverter cover has been installed properly.

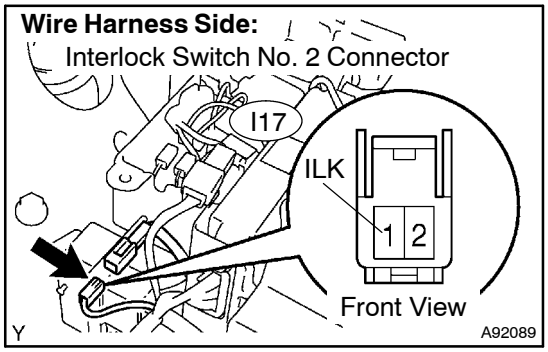
Standard: The inverter cover has been installed properly

NG → **CORRECTLY REINSTALL**

OK

2	CHECK HARNESS AND CONNECTOR(HYBRID VEHICLE CONTROL ECU – INTERLOCK SWITCH NO. 2)





(a) Disconnect the H11 HV control ECU connector.

(b) Disconnect the I17 interlock switch No. 2 connector.

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

Standard (Check for open):

Tester Connection	Specified Condition
ILK (H11–1) – ILK (I17–1)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
ILK (H11–1) or ILK (I17–1) – Body ground	10 kΩ or higher

(d) Reconnect the interlock switch No. 2 connector.

(e) Reconnect the HV control ECU connector.

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

OK

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DTC	P3211/276	DRIVE MOTOR ”A” INVERTER TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC	P3211/277	DRIVE MOTOR ”A” INVERTER TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P3212 (INF 275) on page 05–612.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3211	276	Sudden change in motor inverter temperature sensor output*1 (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • Power module intelligent transistor set
P3211	277	Motor inverter temperature sensor output deviation The difference between the estimated motor inverter temperature and the temperature sensor output is large. (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • Power module intelligent transistor set

HINT:
*1: If only DTC P3211–276 is output, a temperature sensor malfunction is more likely to be the cause than a sudden change in actual temperature.

WIRING DIAGRAM

[Added]

Refer to DTC P3212 (INF 275) on page 05–612.

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

[Added]

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HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 30 seconds or more.
  (b) Drive the vehicle for approximately 5 minutes referring to the following freeze frame data or Data List items: “Vehicle Spd” “Inverter Temp–(MG2)” “Inverter Temp–(MG1)” “Converter Temperature”.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	CHECK QUANTITY OF HV COOLANT

(a) Check that there is a sufficient amount of coolant for the inverter.
OK: There is a sufficient amount of coolant for the inverter

NG → **ADD HV COOLANT (See page 22–4)**

OK

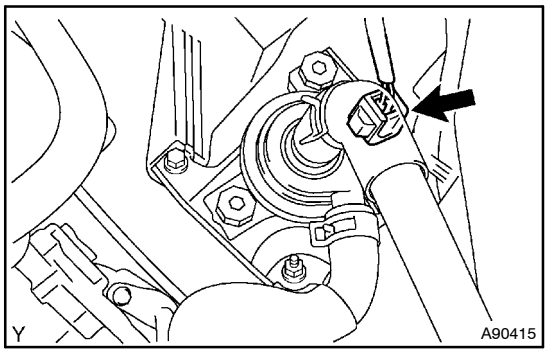
2	CHECK COOLANT HOSE

(a) Check that the hoses of the cooling system are not bent or clogged (see the cooling system on page 05–474).
OK: The hoses of the cooling system are not bent or clogged

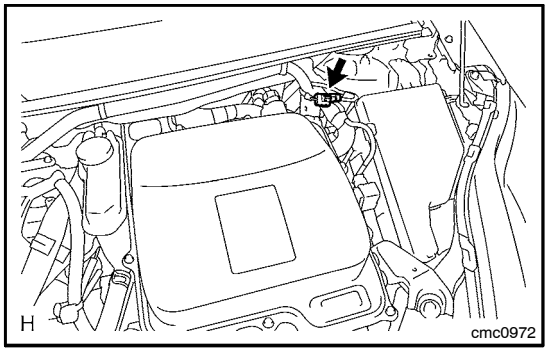
NG → **CORRECT TO NORMAL CONDITION**

OK

3	CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP CONNECTOR AND SHORT CONNECTOR)



(a) Check the connection condition of the water pump connector.
OK: Connector has been connected securely and there is no poor connection.



(b) Check the connection condition of the short connector.
OK: Connector has been connected securely and there is no poor connection.

NG → **CONNECT SECURELY**

OK

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11	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

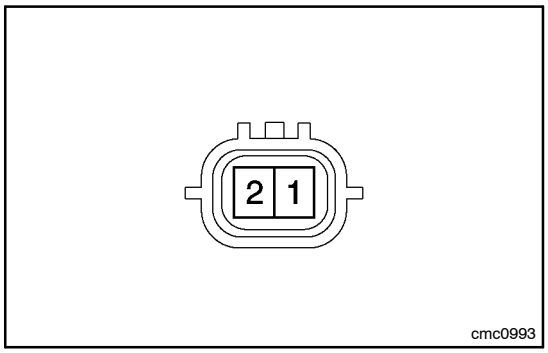
Result	Proceed to
Only P3211–276, 277 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

12	CHECK WATER W/MOTOR & BRACKET PUMP ASSY



(a) Remove the water w/ motor & bracket pump assy.
(b) Connect the battery positive terminal to terminal 2 and the battely negative terminal to terminal 1.
(c) Check that the pump motor operates properly.

NOTICE:

- **Do not connect the positive and negative poles of the battery to the wrong terminals.**
- **Complete the check within 10 seconds of connection.**

OK: Pump motor operates properly.

NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (WATER W/MOTOR & BRACKET PUMP ASSY CIRCUIT)

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DTC	P3212/275	DRIVE MOTOR ”A” INVERTER TEMPERATURE SENSOR CIRCUIT HIGH/LOW

DTC	P3213/274	DRIVE MOTOR ”A” INVERTER TEMPERATURE SENSOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The HV control ECU uses a temperature sensor, which is built into the inverter, to detect the temperature of the motor inverter. The same cooling system that is routed to the MG1 and MG2 cools the inverter. This cooling system is independent from the engine cooling system.

The characteristic of the motor inverter temperature sensor is the same as the boost converter temperature sensor (see the description on page 05–517).

The HV control ECU limits the load based on the signals transmitted by the motor inverter temperature sensor, in order to check the effectiveness of the inverter cooling system and prevent the inverter from overheating. Furthermore, the HV control ECU detects a malfunction in the wiring of the motor inverter temperature sensor, as well as in the sensor itself.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3212	275	Open or GND short in motor inverter temperature sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P3213	274	+B short in motor inverter temperature sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P3212	275	• Inverter Temp–(MG2)
P3213	274	

HINT:

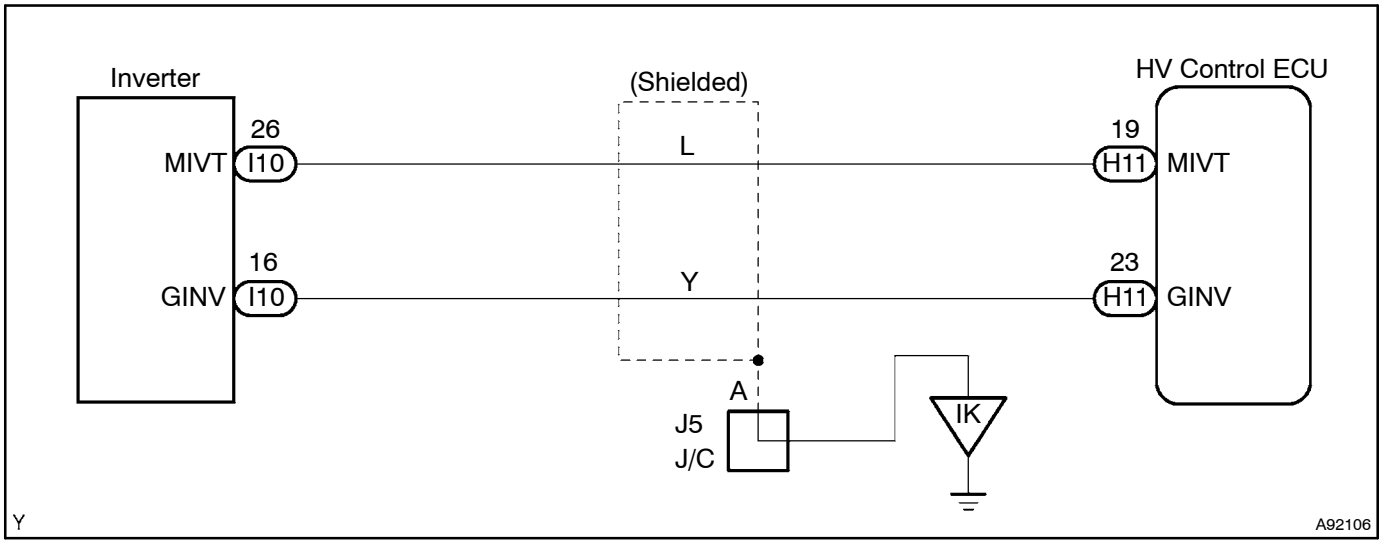
After confirming DTC P3212 (INF 275) or P3213 (INF 274), confirm Inverter Temp–(MG2) in Powertrain / Hybrid Control / Data List using the intelligent tester II.

[Added]

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

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WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	**READ VALUE OF INTELLIGENT TESTER II(INVERTER TEMP–(MG2))**

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) Read the Inverter Temp–(MG2) value on the intelligent tester II.

Result:

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

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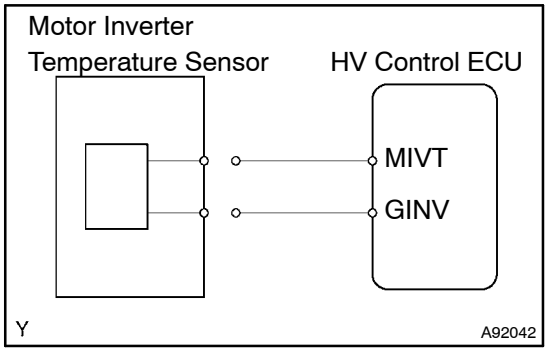
HINT:

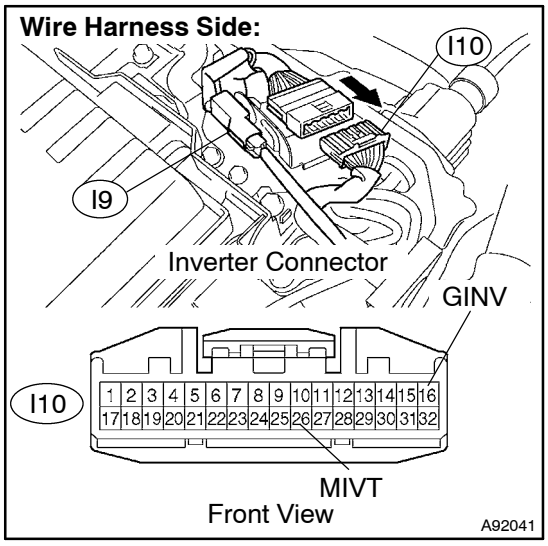
- If there is a +B short circuit, the intelligent tester II indicates –50°C (–58°F).
- If there is an open or GND short circuit, the intelligent tester II indicates 205°C (401°F).

B	**Go to step 4**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–232)**

A

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





CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Disconnect the I10 inverter connector.
(e) Turn the power switch ON (IG).

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

(f) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(g) Read the Inverter Temp–(MG2) value on the intelligent tester II.
Standard: 205°C (401°F)
(h) Turn the power switch OFF.
(i) Reconnect the inverter connector.
(j) Reinstall the inverter cover (see page 21–25).
(k) Reinstall the service plug grip (see page 21–120).

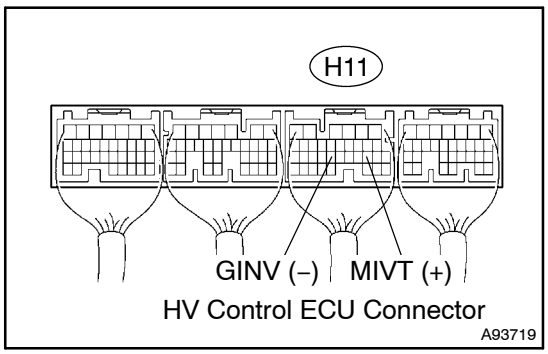
[Corrected]

OK	**Go to step 6**

NG [Corrected]

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5	INSPECT HYBRID VEHICLE CONTROL ECU(MIVT VOLTAGE)



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

HINT:

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

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

Standard:

Tester Connection	Specified Condition
MIVT (H11–19) – GINV (H11–23)	2.0 to 4.5 V

NG → **Go to step 6**

[Corrected]

OK

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

6	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P3212–275, P3213–274 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

[Corrected]

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DTC	P3221/314	GENERATOR INVERTER TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC	P3221/315	GENERATOR INVERTER TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

CIRCUIT DESCRIPTION

Refer to DTC P3222 (INF 313) on page 05–623.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3221	314	Sudden change in generator inverter temperature sensor output*1 (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • Power module intelligent transistor set
P3221	315	Generator inverter temperature sensor output deviation The difference between the estimated generator inverter temperature and the temperature sensor output is large. (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • Power module intelligent transistor set

HINT:
*1: If only DTC P3221–314 is output, a temperature sensor malfunction is more likely to be the cause than a sudden change in actual temperature.

WIRING DIAGRAM

[Added]

Refer to DTC P3222 (INF 313) on page 05–623.

INSPECTION PROCEDURE

CAUTION:

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

NOTICE:
If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.
HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 30 seconds or more.
  (b) Drive the vehicle for approximately 5 minutes referring to the following freeze frame data or Data List items: “Vehicle Spd” “Inverter Temp–(MG2)” “Inverter Temp–(MG1)” “Converter Temperature”.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

[Added]

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11	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

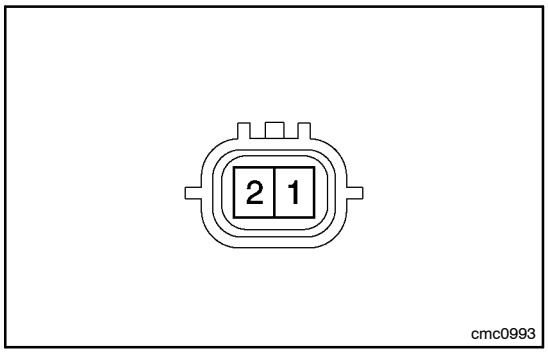
Result	Proceed to
Only P3221–314, 315 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

12	CHECK WATER W/MOTOR & BRACKET PUMP ASSY



(a) Remove the water w/ motor & bracket pump assy.
(b) Connect the battery positive terminal to terminal 2 and the battely negative terminal to terminal 1.
(c) Check that the pump motor operates properly.

NOTICE:

- **Do not connect the positive and negative poles of the battery to the wrong terminals.**
- **Complete the check within 10 seconds of connection.**

OK: Pump motor operates properly.

NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (WATER W/MOTOR & BRACKET PUMP ASSY CIRCUIT)

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

DTC	P3223/312	GENERATOR INVERTER TEMPERATURE SENSOR CIRCUIT HIGH

CIRCUIT DESCRIPTION

The HV control ECU uses a temperature sensor, which is built into the inverter, to detect the temperature of the generator inverter. The same cooling system that is routed to the MG1 and MG2 cools the inverter. This cooling system is independent from the engine cooling system.

The characteristic of the generator inverter temperature sensor is the same as the boost converter temperature sensor (see the description on page 05–517).

The HV control ECU limits the load based on the signals transmitted by the generator inverter temperature sensor, in order to check the effectiveness of the inverter cooling system and prevent the inverter from overheating. Furthermore, the HV control ECU detects a malfunction in the wiring of the generator inverter temperature sensor, as well as in the sensor itself.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3222	313	Open or GND short in generator inverter temperature sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU
P3223	312	+B short in generator inverter temperature sensor circuit (1 trip detection logic)	• Wire harness or connector • Power module intelligent transistor set • HV control ECU

Related Data List

DTC No.	INF Code	Data List
P3222	313	• Inverter Temp–(MG1)
P3223	312	

[Added]

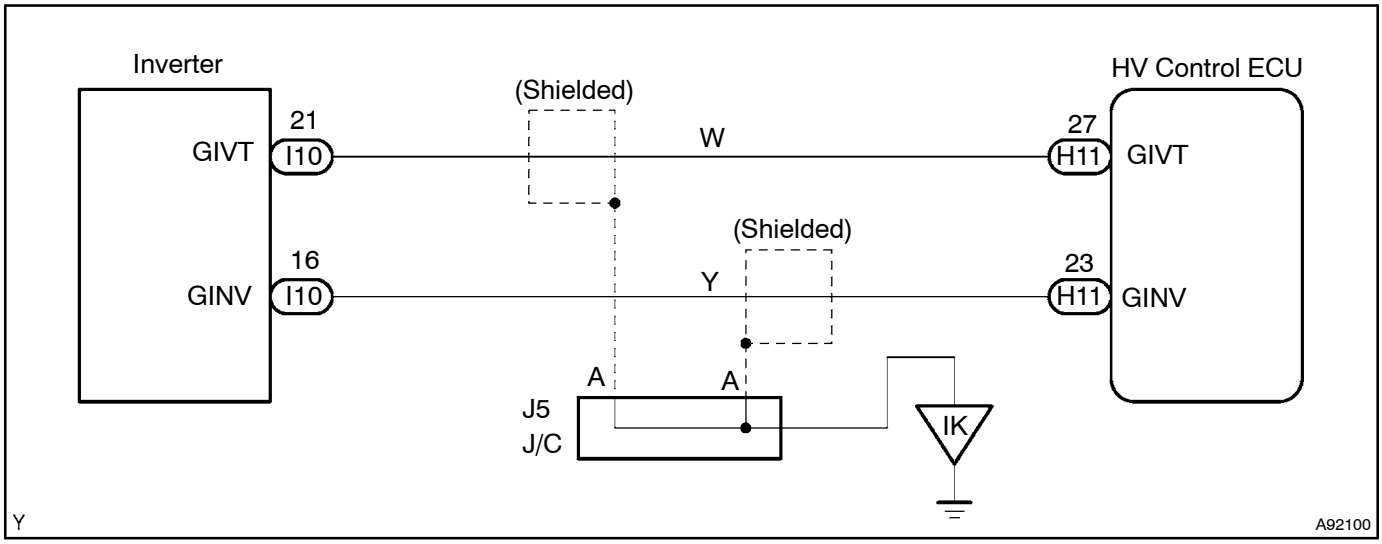
HINT:

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

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

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WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (IG) and wait for 5 seconds or more.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	READ VALUE OF INTELLIGENT TESTER II(INVERTER TEMP–(MG1))

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Data List.
(e) Read the Inverter Temp–(MG1) value on the intelligent tester II.

Result:

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

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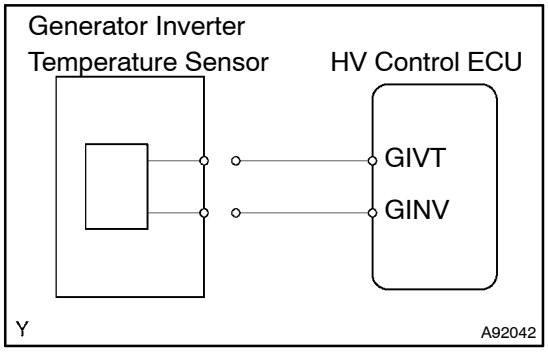
HINT:

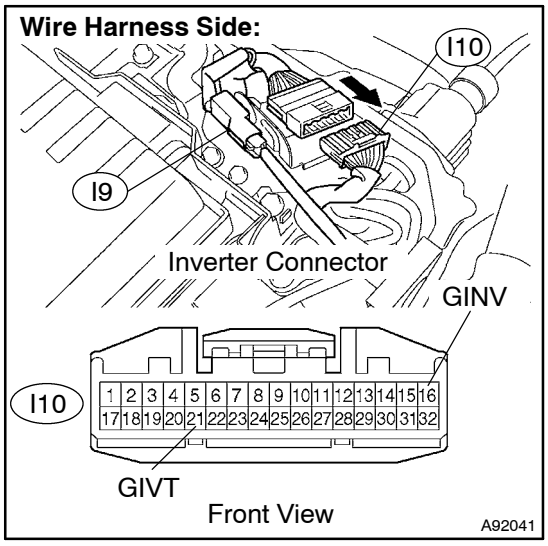
- If there is a +B short circuit, the intelligent tester II indicates –50°C (–58°F).
- If there is an open or GND short circuit, the intelligent tester II indicates 205°C (401°F).

B	**Go to step 4**
C	**CHECK FOR INTERMITTENT PROBLEMS (See page 05–232)**

A

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





CAUTION:
Wear insulated gloves before performing the following operation.

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

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

(c) Remove the inverter cover (see page 21–25).
(d) Disconnect the I10 inverter connector.
(e) Turn the power switch ON (IG).

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

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

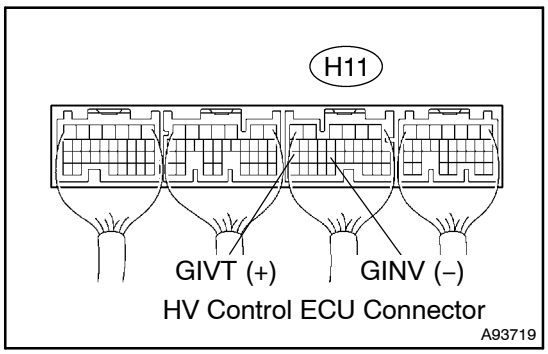
[Corrected]

OK	**Go to step 6**

NG	[Corrected]

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5 INSPECT HYBRID VEHICLE CONTROL ECU(GIVT VOLTAGE)



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

HINT:

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

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

Standard:

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

NG → **Go to step 6** [Corrected]

OK

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

6 CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

Result	Proceed to
Only P3222–313, P3223–312is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET [Corrected]

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DTC	P3226/562	DC/DC(BOOST) CONVERTER TEMPERATURE SENSOR MALFUNCTION

DTC	P3226/563	DC/DC(BOOST) CONVERTER TEMPERATURE SENSOR MALFUNCTION

CIRCUIT DESCRIPTION

Refer to DTC P0A94 (INF 583) on page 05–517.

[Corrected]

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P3226	562	Sudden change in boost converter temperature sensor output*1 (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • Power module intelligent transistor set
P3226	563	Boost converter temperature sensor output deviation The difference between the estimated boost converter temperature and the temperature sensor output is large. (1 trip detection logic)	• Wire harness or connector • Inverter cooling system • Water w/ motor & bracket pump assembly • Cooling fan motor • Cooling fan motor No. 2 • Power module intelligent transistor set

HINT:

*1: If only DTC P3226–562 is output, a temperature sensor malfunction is more likely to be the cause than a sudden change in actual temperature.

Related Data List

DTC No.	INF Code	Data List
P3226	562	• Converter Temperature
P3226	563	

WIRING DIAGRAM

Refer to DTC P0A94 (INF 583) on page 05–517.

[Added]

INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

NOTICE:

If the power module intelligent transistor set or electric vehicle converter assembly is malfunctioning, remove the inverter cover and check for coolant leaks, water intrusion, excessive deposits and damage. If any of these items are found, replace the w/ converter inverter assembly.

[Added]

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HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a) Turn the power switch on (READY) and wait for 30 seconds or more.
  (b) Drive the vehicle for approximately 5 minutes referring to the following freeze frame data or Data List items: “Vehicle Spd” “Inverter Temp–(MG2)” “Inverter Temp–(MG1)” “Converter Temperature”.
- If the DTCs are stored again after the power module intelligent transistor set or electric vehicle converter assembly has been replaced, replace the w/ converter inverter assembly.

1	CHECK QUANTITY OF HV COOLANT

(a) Check that there is a sufficient amount of coolant for the inverter.
OK: There is a sufficient amount of coolant for the inverter

NG → **ADD HV COOLANT (See page 22–4)**

OK

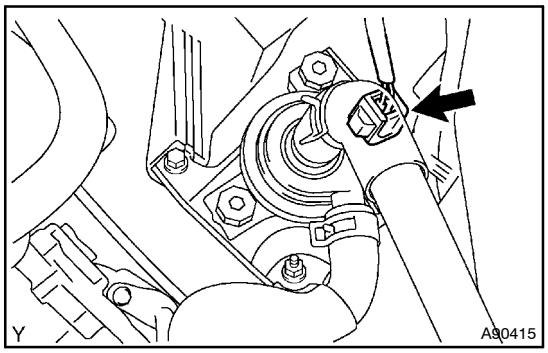
2	CHECK COOLANT HOSE

(a) Check that the hoses of the cooling system are not bent or clogged (see the cooling system on page 05–474).
OK: The hoses of the cooling system are not bent or clogged

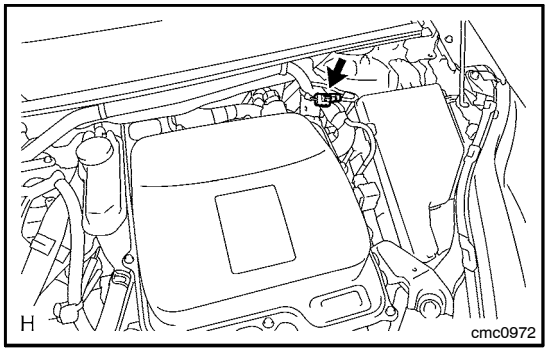
NG → **CORRECT TO NORMAL CONDITION**

OK

3	CHECK CONNECTOR CONNECTION CONDITION (WATER PUMP CONNECTOR AND SHORT CONNECTOR)



(a) Check the connection condition of the water pump connector.
OK: Connector has been connected securely and there is no poor connection.



(b) Check the connection condition of the short connector.
OK: Connector has been connected securely and there is no poor connection.

NG → **CONNECT SECURELY**

OK

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11	CHECK DTC OUTPUT

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

NOTICE:

- **Refer to the DTC Malfunctioning Area Table (See page 05–246).**
- **Using only the DTCs listed in the DTC Malfunctioning Area Table, perform the following judgment.**

Result

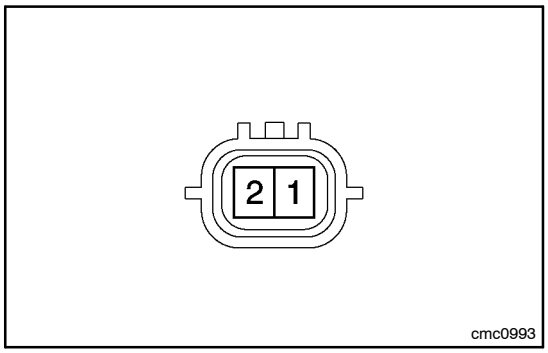
Result	Proceed to
Only P3226–562, 563 is output.	A
Only power module intelligent transistor set related DTCs are output.	A
Electric vehicle converter assembly or w/ converter inverter assembly related DTCs are also output.	B

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

A

REPLACE POWER MODULE INTELLIGENT TRANSISTOR SET

12	CHECK WATER W/MOTOR & BRACKET PUMP ASSY



(a) Remove the water w/ motor & bracket pump assy.
(b) Connect the battery positive terminal to terminal 2 and the battely negative terminal to terminal 1.
(c) Check that the pump motor operates properly.

NOTICE:

- **Do not connect the positive and negative poles of the battery to the wrong terminals.**
- **Complete the check within 10 seconds of connection.**

OK: Pump motor operates properly.

NG → **REPLACE WATER W/MOTOR & BRACKET PUMP ASSY**

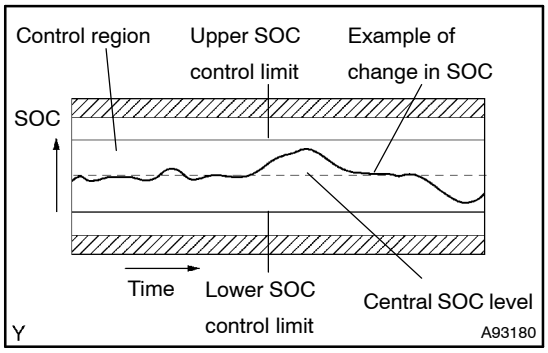
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR (WATER W/MOTOR & BRACKET PUMP ASSY CIRCUIT)

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DTC P0A7F HYBRID BATTERY PACK DETERIORATION

CIRCUIT DESCRIPTION



The battery ECU calculates the SOC (state of charge) of the HV battery by estimating the amperage that flows into the HV battery and monitoring other values.
The battery ECU sends the calculated SOC to the HV control ECU. The HV control ECU charge and discharge depending on driving patterns based on the information sent by the battery ECU.

[Corrected]

DTC No.	DTC Detection Condition	Trouble Area
P0A7F	When either condition below is met: • Resistance of an HV battery block exceeds the standard value (1 trip detection logic) • Difference in capacity between each battery block is larger than the standard (2 trip detection logic)	• HV battery assembly • Battery ECU [Added]

Related Data List

DTC No.	Data list
P0A7F	• IR01 to 14 • Battery SOC • V1 to V14 Batt Block

INSPECTION PROCEDURE

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Drive the vehicle on urban roads for approximately 10 minutes.
   Note: This DTC may not be stored if the vehicle is stopped or being driven at a constant speed.
2. Turn the power switch off and wait for 30 seconds or more.
3. Perform a road test again.

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT) [Added]

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / HV Battery / DTC.
(e) Read DTCs.
Result: DTC P0A1F is output

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

NO

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

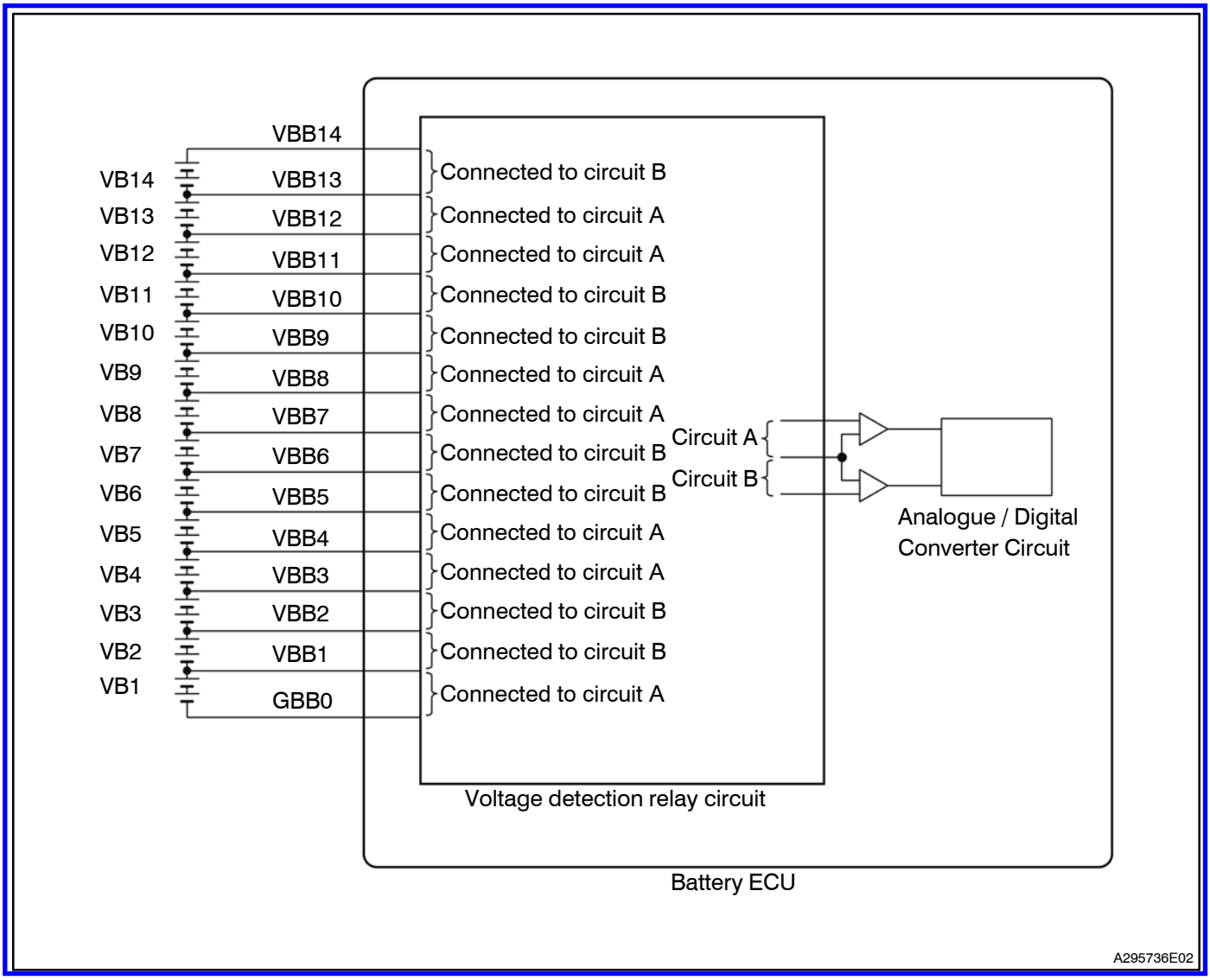
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DTC	P0A80	REPLACE HYBRID BATTERY PACK

CIRCUIT DESCRIPTION

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

The battery ECU, which monitors two modules as a single battery block, detects the battery block voltage at a total of 14 locations.



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

Related Data List

DTC No.	Data list
P0A80	• V1 to V14 Batt Block • Battery SOC

[Added]

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HINT:
DTC P0A80 is stored when a malfunction is detected in the HV battery or battery ECU. If the HV supply battery is malfunctioning, the malfunction may not be reproduced when the condition of the HV supply battery changes due to changes in driving load (amperage), battery SOC and battery temperature.
Therefore, use the freeze frame data when performing a repair.

- When the HV battery is malfunctioning:
  - Voltage of one or a few of the battery blocks have dropped. (voltage difference from that of the next block is 1 V or more)
  - Voltage of all battery blocks is output randomly with no certain pattern.
- When the battery ECU is malfunctioning:
  - Differences in battery block voltages have a certain pattern.

INSPECTION PROCEDURE

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

1. Turn the power switch on (IG) and confirm that “Batt Temp” is 0°C or more.
   HINT:
   If the HV battery temperature is low, leave the vehicle in a warm place or drive the vehicle.
2. Turn the power switch on (READY) and wait for 30 seconds or more.
3. Drive the vehicle until the cumulative traveling time driven at 40 km/h or more reaches 5 minutes.
4. Stop the vehicle, move the shift lever to N and wait until the Data List item “Battery SOC” reaches 30%.

NOTICE:
Although DTC P3000–388 is stored when the Data List item “Battery SOC” drops to 20% or lower, this is not a malfunction.

5. Turn the power switch off and wait for 30 seconds or more.
6. Perform a road test again.

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

[Added]

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / HV Battery / DTC.
(e) Read DTCs.
Result: DTC P0A1F is output

YES → **GO TO RELEVANT DTC CHART**

[Corrected]

NO

2	CHECK FREEZE FRAME DATA

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch on (IG).
(c) Using the intelligent tester II, make a note of the freeze frame data item “V1 to V14 Batt Block”.
(d) Compare the freeze frame data item “V1 to V14 Batt Block” values with those shown in the following combination tables.

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Table 1

Circuit A Battery Block	Circuit B Battery Block	Condition
V1 Batt Block (VB1)	V2 Batt Block (VB2)	V1 Batt Block – V2 Batt Block = 0.3 V or more
V4 Batt Block (VB4)	V3 Batt Block (VB3)	V4 Batt Block – V3 Batt Block = 0.3 V or more
V5 Batt Block (VB5)	V6 Batt Block (VB6)	V5 Batt Block – V6 Batt Block = 0.3 V or more
V8 Batt Block (VB8)	V7 Batt Block (VB7)	V8 Batt Block – V7 Batt Block = 0.3 V or more
V9 Batt Block (VB9)	V10 Batt Block (VB10)	V9 Batt Block – V10 Batt Block = 0.3 V or more
V12 Batt Block (VB12)	V11 Batt Block (VB11)	V12 Batt Block – V11 Batt Block = 0.3 V or more
V13 Batt Block (VB13)	V14 Batt Block (VB14)	V13 Batt Block – V14 Batt Block = 0.3 V or more

Table 2

Circuit A Battery Block	Circuit B Battery Block	Condition
V1 Batt Block (VB1)	V2 Batt Block (VB2)	V2 Batt Block – V1 Batt Block = 0.3 V or more
V4 Batt Block (VB4)	V3 Batt Block (VB3)	V3 Batt Block – V4 Batt Block = 0.3 V or more
V5 Batt Block (VB5)	V6 Batt Block (VB6)	V6 Batt Block – V5 Batt Block = 0.3 V or more
V8 Batt Block (VB8)	V7 Batt Block (VB7)	V7 Batt Block – V8 Batt Block = 0.3 V or more
V9 Batt Block (VB9)	V10 Batt Block (VB10)	V10 Batt Block – V9 Batt Block = 0.3 V or more
V12 Batt Block (VB12)	V11 Batt Block (VB11)	V11 Batt Block – V12 Batt Block = 0.3 V or more
V13 Batt Block (VB13)	V14 Batt Block (VB14)	V14 Batt Block – V13 Batt Block = 0.3 V or more

Result

Result	Proceed to
All conditions in table 1 are met.	A
All conditions in table 2 are met.	A
Other than above	B



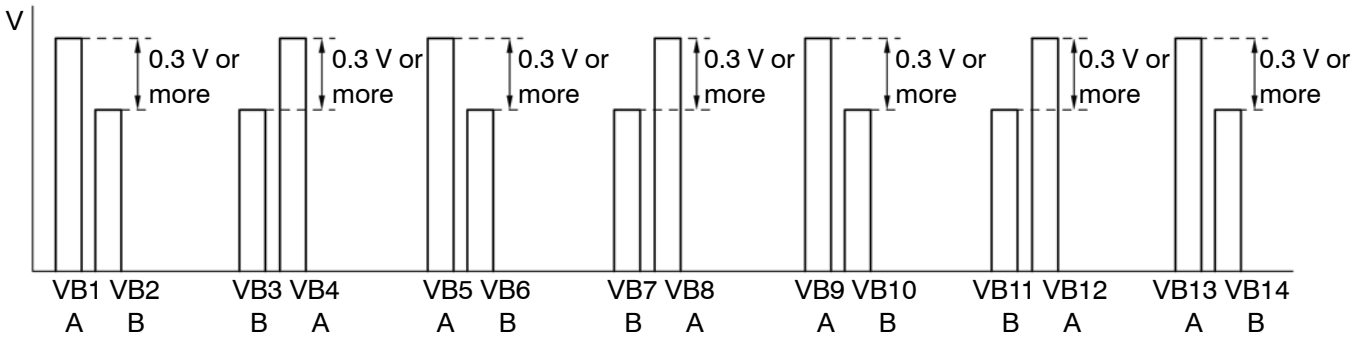
[Corrected]

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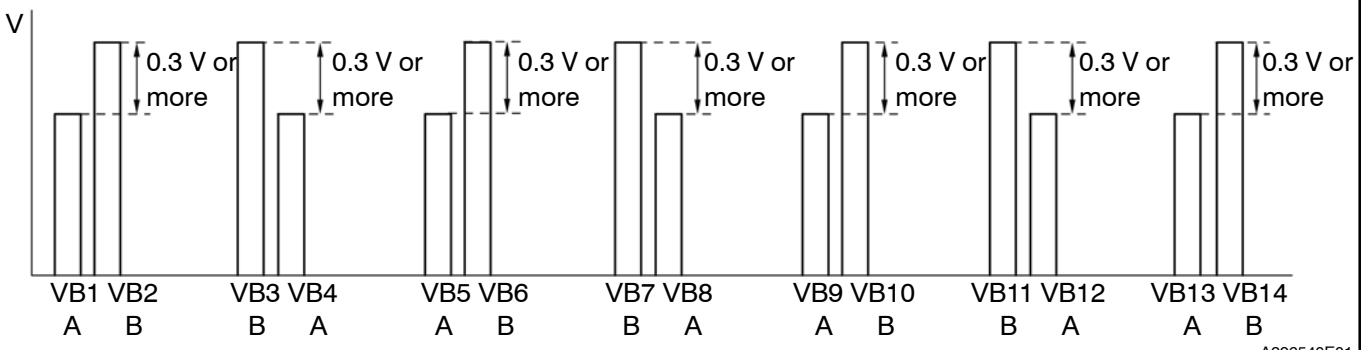
Example: When the difference in voltage of all 7 pairs of blocks is 0.3 V or more

A: Circuit A Battery Block Voltage
B: Circuit B Battery Block Voltage

All conditions in table 1 are met.



All conditions in table 2 are met.



HINT:
When an internal malfunction occurs in the battery ECU, this symptom (difference in voltage of 0.3 V or more for all 7 pair of blocks) will occur.

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

A

REPLACE BATTERY ECU ASSY (See page 21–100)

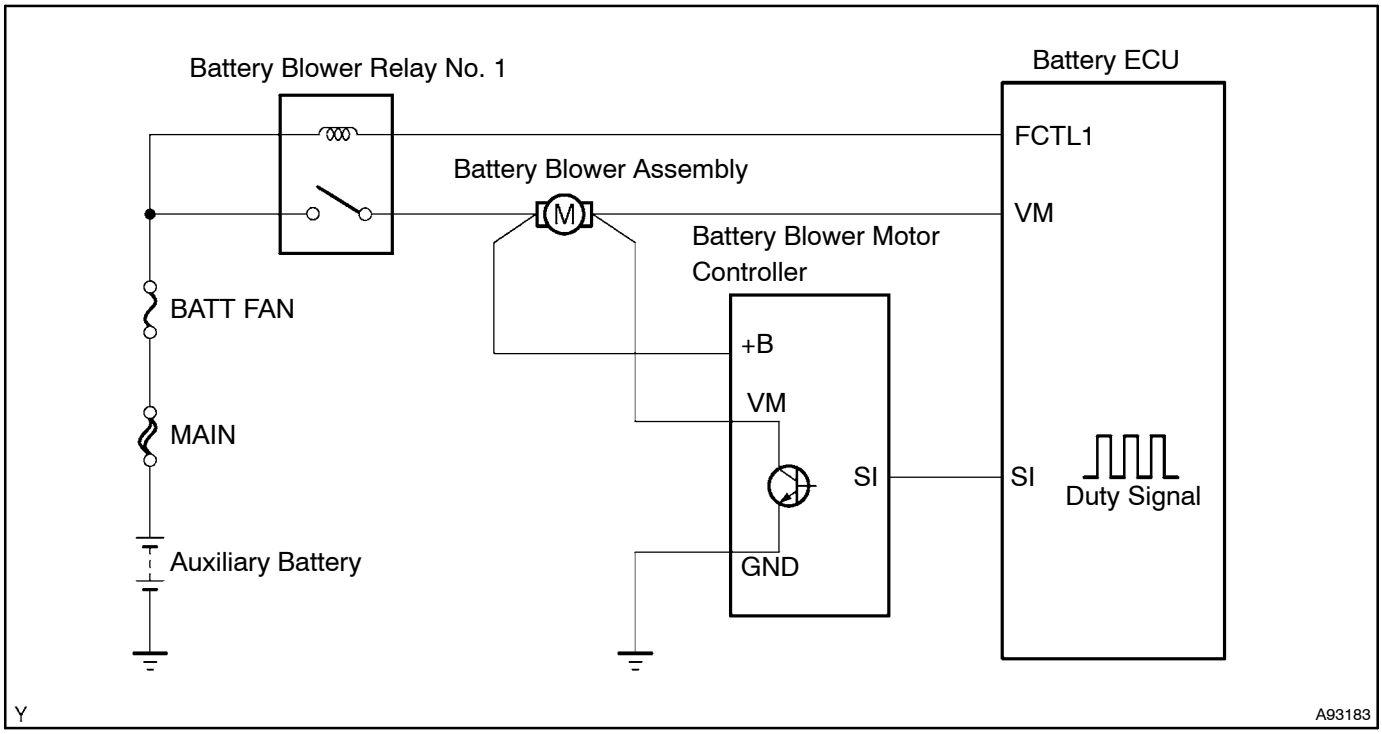
[Corrected]

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DTC	P0A85	HYBRID BATTERY PACK COOLING FAN 1

CIRCUIT DESCRIPTION

The blower motor controller regulates the voltage of the battery blower assembly. The blower motor controller has fins made of aluminum. The exhaust air from the HV battery assembly that flows through the quarter vent duct cools the blower motor controller, which is installed in the quarter vent duct.
The current flows from the FCTL1 terminal of the battery ECU to the relay coil of the battery blower relay No. 1 and as the contact point of the relay closes, the power is supplied to the battery blower assembly.
When a fan actuation signal is transmitted from the battery ECU, the blower motor controller adjusts voltage (VM) which is applied to the battery blower assembly in order to get the requested fan speed. The adjusted voltage is also transmitted to the VM terminal of the battery ECU in the form of a monitoring signal. The blower motor controller corrects the voltage at the blower motor by monitoring voltage at the +B terminal of the battery blower assembly.



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

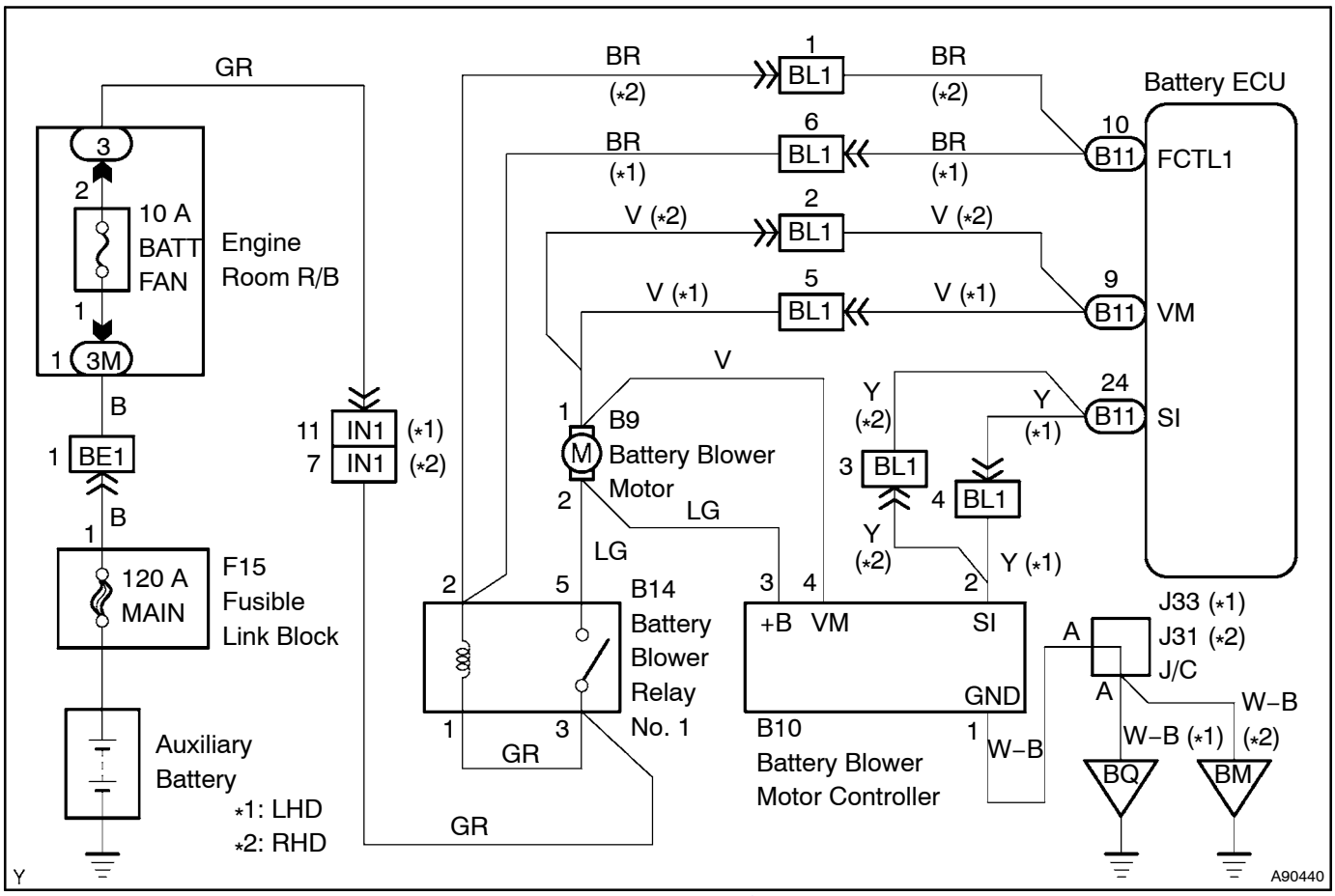
Related Data List

DTC No.	Data List
P0A85	• VMF Fan Voltage • Cooling Fan Mode • Batt Temp 1 to 3

[Added]

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WIRING DIAGRAM



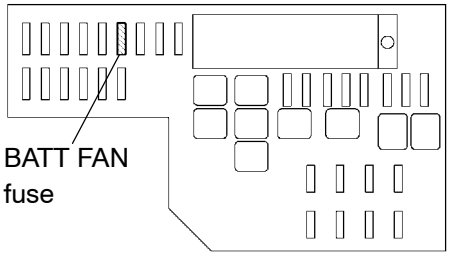
[Added]

INSPECTION PROCEDURE

HINT:
After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
1. Drive the vehicle until the Data List item “Batt Temp 1 to 3” exceeds 36°C (97°F).
2. Drive the vehicle for approximately 1 minute.

1	CHECK FUSE(BATT FAN 10 A)

Engine Room R/B:



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

NG → **Go to step 13**

OK

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DTC P0A95 HIGH VOLTAGE FUSE

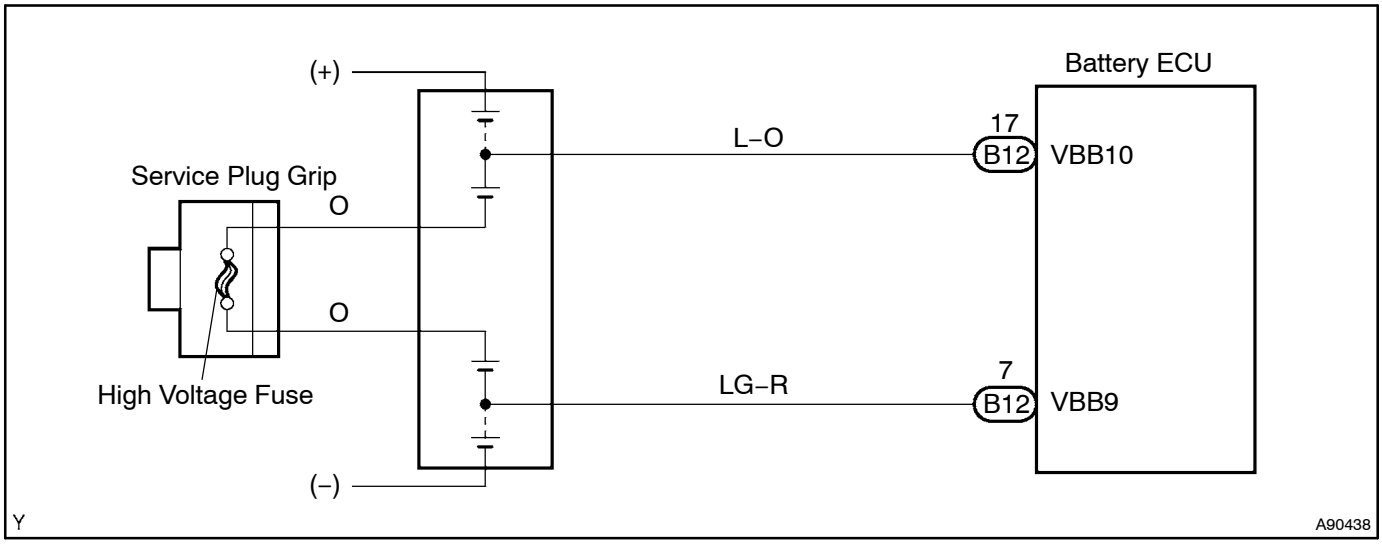
CIRCUIT DESCRIPTION

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

Related Data List

DTC No.	Data List
P0A95	• Battery Block Vol V01 – V14

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

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

  HINT:

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

HINT:

- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.
  (a)Turn the power switch on (IG) and wait for 5 seconds or more.
- The interlock switch opens when the service plug grip is removed.

1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

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

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CIRCUIT DESCRIPTION

Refer to DTC P0A80 on page 05–672.

DTC No.	DTC Detection Condition	Trouble Area
P3011 P3012 P3013 P3014 P3015 P3016 P3017 P3018 P3019 P3020 P3021 P3022 P3023 P3024	[Corrected] Difference between each battery block voltage or internal resistance of each battery block exceeds a specified value. (1 trip detection logic)	• HV battery assembly • Battery ECU [Added]

Related Data List

DTC No.	Data List
P3011 P3012 P3013 P3014 P3015 P3016 P3017 P3018 P3019 P3020 P3021 P3022 P3023 P3024	• IR01 to IR14 • V1 to V14 Batt Block • Battery State of Charge

HINT:

This DTC is stored when a malfunction is detected in the HV battery or battery ECU. However, depending on the driving conditions, the malfunction may not be reproduced if the status of the HV battery changes. If resistance is abnormal, the voltage of the battery blocks indicated by the DTCs are likely to drop more than others during acceleration (discharging), and increase more than others during deceleration (charging).

- When the HV battery is malfunctioning:
  - Voltage of one or a few of the battery blocks have dropped (voltage difference from that of the next block is 1 V or more).
  - Voltage of all battery blocks is output randomly with no certain pattern.
- When the battery ECU is malfunctioning:
  - Differences in battery block voltages have a certain pattern.

INSPECTION PROCEDURE

HINT:

- P3011–123 and P3024–123 will not be set unless the vehicle is driven for approximately 10 minutes after clearing the DTCs.
- After the repair, clear the DTCs and perform the following procedure to check that DTCs are not output.

(a) Drive the vehicle on urban roads for approximately 10 minutes.

This DTC may not be stored if the vehicle is stopped or being driven at a constant speed.

[Added]

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1	READ OUTPUT DTC(DTC P0A1F IS OUTPUT)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the power switch ON (IG).
(c) Turn the intelligent tester II ON.
(d) On the intelligent tester II, enter the following menus: Powertrain / HV Battery / DTC.
(e) Read DTCs.
Result: DTC P0A1F is output

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

NO

2	CHECK BATTERY BLOCK VOLTAGE

(a) Depress the brake pedal and turn the power switch ON (IG).
(b) Depress the brake pedal and accelerator pedal to charge with the HV battery.
(c) Read the battery block voltage in the DATA LIST. Enter the following menus: Powertrain / HV Battery / Data List. Read the values of “V1 Batt Block” to “V14 Batt Block”.
(d) Compare the DATA LIST item “V1 to V14 Batt Block” values with those shown in the following combination tables.

Table 1

Circuit A Battery Block	Circuit B Battery Block	Condition
V1 Batt Block (VB1)	V2 Batt Block (VB2)	V1 Batt Block – V2 Batt Block = 0.3 V or more
V4 Batt Block (VB4)	V3 Batt Block (VB3)	V4 Batt Block – V3 Batt Block = 0.3 V or more
V5 Batt Block (VB5)	V6 Batt Block (VB6)	V5 Batt Block – V6 Batt Block = 0.3 V or more
V8 Batt Block (VB8)	V7 Batt Block (VB7)	V8 Batt Block – V7 Batt Block = 0.3 V or more
V9 Batt Block (VB9)	V10 Batt Block (VB10)	V9 Batt Block – V10 Batt Block = 0.3 V or more
V12 Batt Block (VB12)	V11 Batt Block (VB11)	V12 Batt Block – V11 Batt Block = 0.3 V or more
V13 Batt Block (VB13)	V14 Batt Block (VB14)	V13 Batt Block – V14 Batt Block = 0.3 V or more

Table 2

Circuit A Battery Block	Circuit B Battery Block	Condition
V1 Batt Block (VB1)	V2 Batt Block (VB2)	V2 Batt Block – V1 Batt Block = 0.3 V or more
V4 Batt Block (VB4)	V3 Batt Block (VB3)	V3 Batt Block – V4 Batt Block = 0.3 V or more
V5 Batt Block (VB5)	V6 Batt Block (VB6)	V6 Batt Block – V5 Batt Block = 0.3 V or more
V8 Batt Block (VB8)	V7 Batt Block (VB7)	V7 Batt Block – V8 Batt Block = 0.3 V or more
V9 Batt Block (VB9)	V10 Batt Block (VB10)	V10 Batt Block – V9 Batt Block = 0.3 V or more
V12 Batt Block (VB12)	V11 Batt Block (VB11)	V11 Batt Block – V12 Batt Block = 0.3 V or more
V13 Batt Block (VB13)	V14 Batt Block (VB14)	V14 Batt Block – V13 Batt Block = 0.3 V or more

Result

Result	Proceed to
All conditions in table 1 are met.	A
All conditions in table 2 are met.	A
Other than above	B

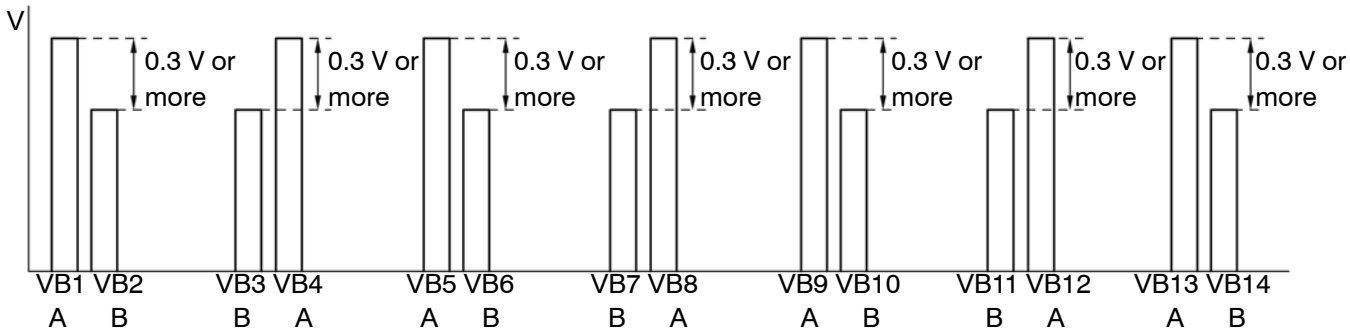
[Corrected]

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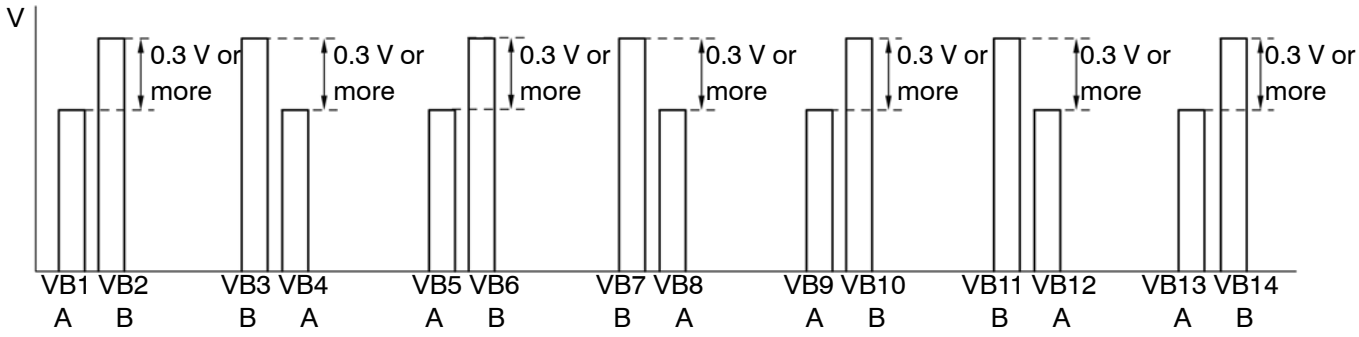
Example: When the difference in voltage of all 7 pairs of blocks is 0.3 V or more

A: Circuit A Battery Block Voltage
B: Circuit B Battery Block Voltage

All conditions in table 1 are met.



All conditions in table 2 are met.



A296540E01

HINT:
When an internal malfunction occurs in the battery ECU, this symptom (difference in voltage of 0.3 V or more for all 7 pair of blocks) will occur.

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

A

REPLACE BATTERY ECU ASSY (See page 21–100)

[Corrected]

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2102N–01

ELECTRIC VEHICLE CONVERTER PRECAUTION

1. PRECAUTION WHEN REMOVING/INSTALLING W/ CONVERTER INVERTER ASSY

CAUTION:

Be careful not to injure yourself on the edges of the with converter inverter assembly when performing work.

NOTICE:

Observe the following in order to prevent entry of foreign matter:

- **Do not allow any dust, foreign matter or water to enter the converter assembly.**
- **Do not use air tools in areas other than specified to prevent entry of dust.**
- **Prevent wind from blowing through the workshop to prevent entry of dust.**
- **Do not drop any bolts or tools into the with converter inverter assembly.**

NOTICE:

PRECAUTION WHEN HANDLING ELECTRONIC COMPONENTS

- **Do not touch any connector terminals, static electricity may be applied to the internal circuits.**
- **Do not drop electronic components such as circuit boards or subject them to impact.**
- **Keep the removed parts free from dust.**
- **Electronic components are very sensitive. Be sure to observe the handling instructions.**

NOTICE:

PRECAUTION WHEN SUSPENDING WORK

- **If suspending work, temporarily install the inverter cover to the inverter case to prevent entry of foreign matter.**

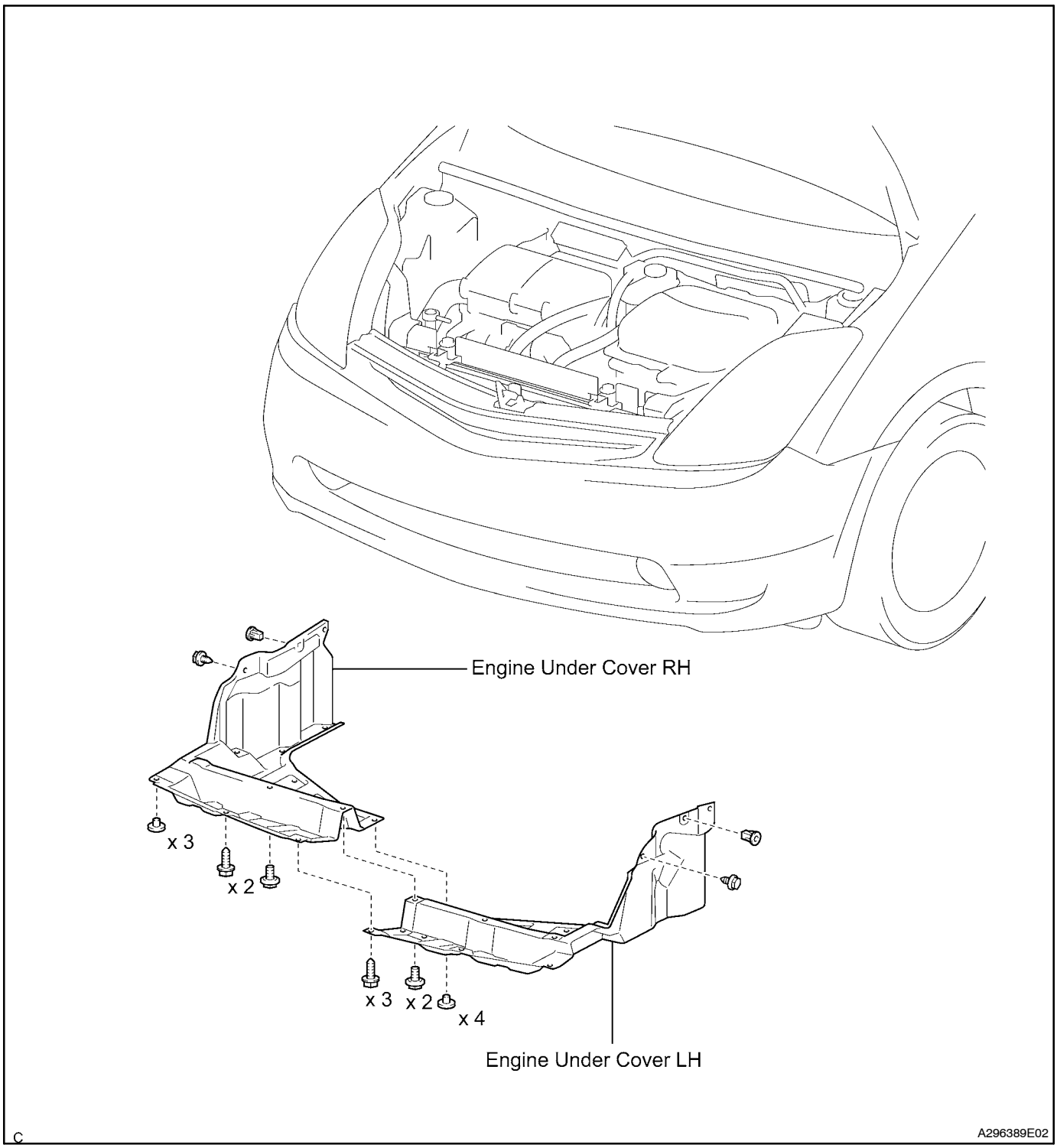
HINT:

- Arrange the removed parts in the correct order so that they can be installed to the correct position and in the correct orientation.
- It is recommended to take pictures of parts before removing them to ensure correct installation.

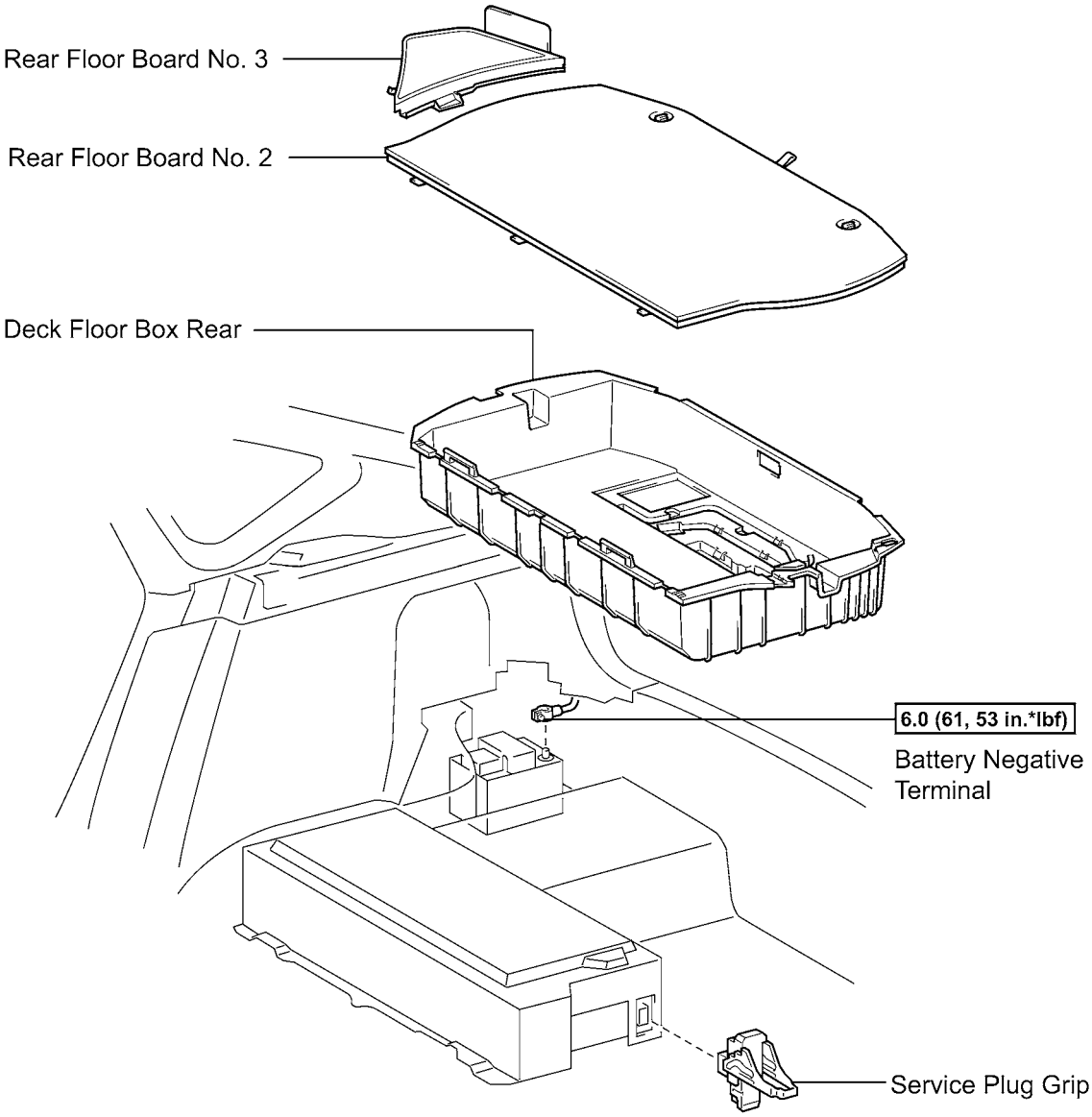
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2102M–01

COMPONENTS



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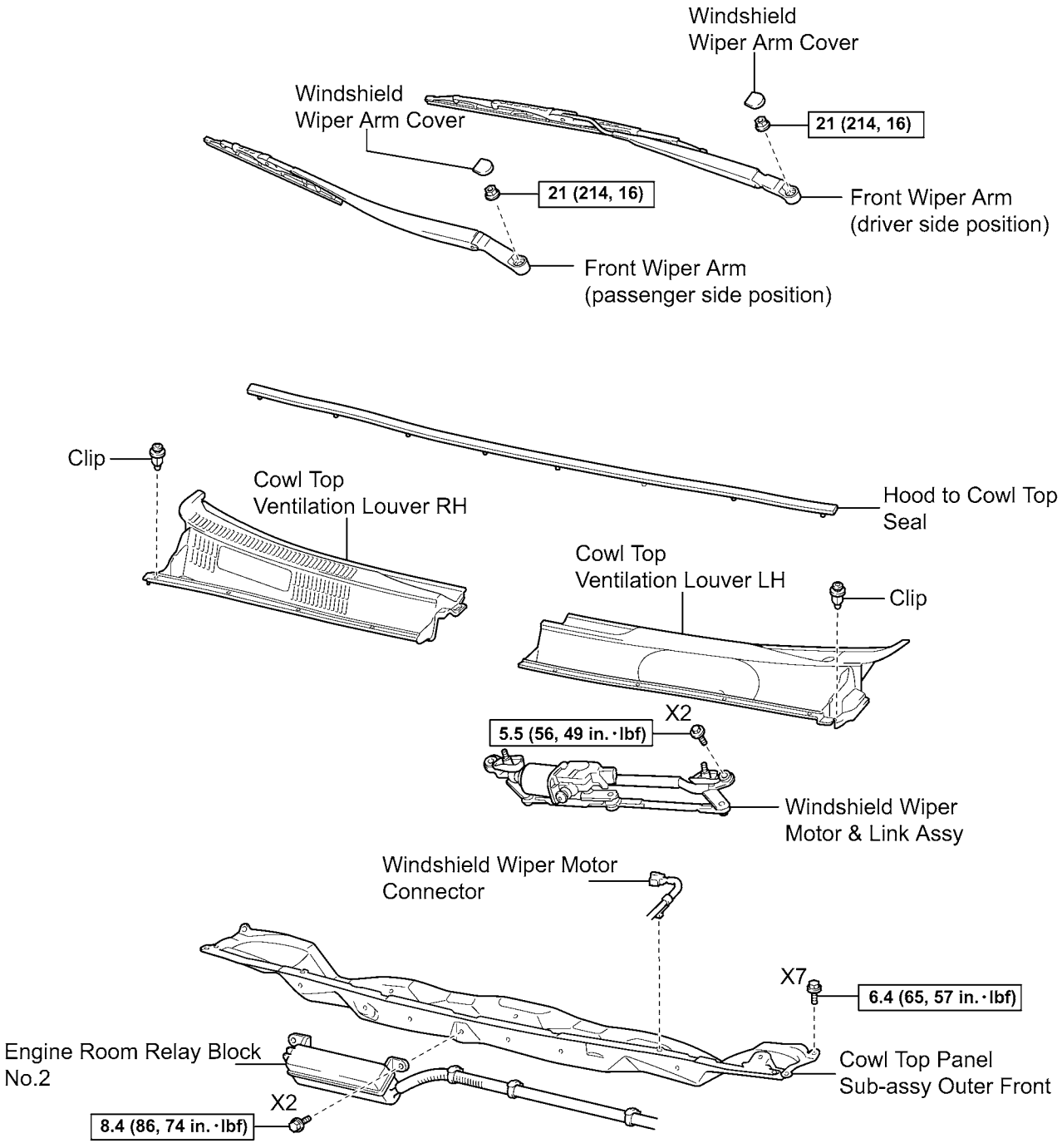
N*m (kgf*cm, ft.*lbf) : Specified torque

O

A124443E18

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LHD Steering Position Type:



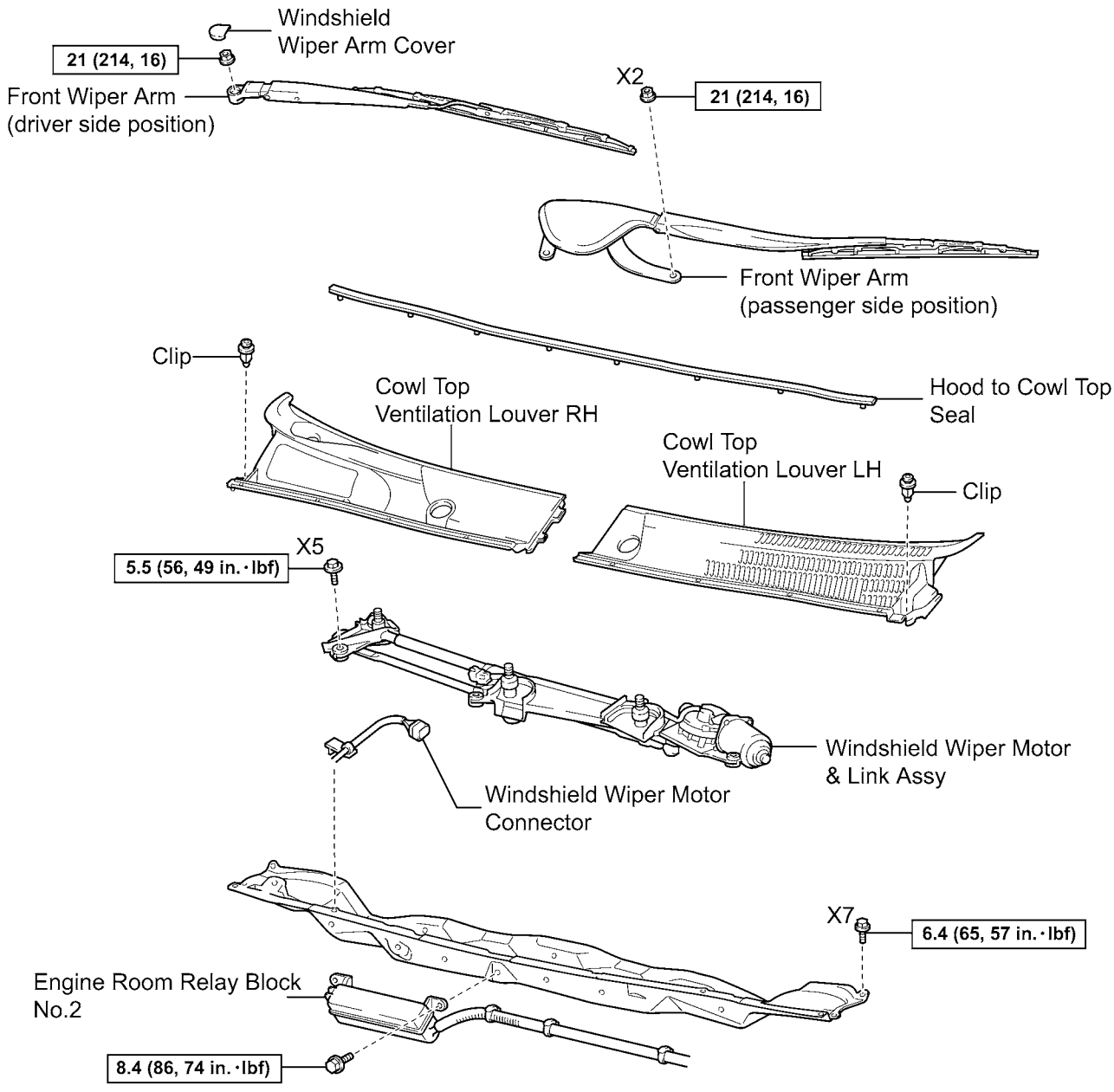
N·m (kgf·cm, ft·lbf) : Specified torque

C

A298198

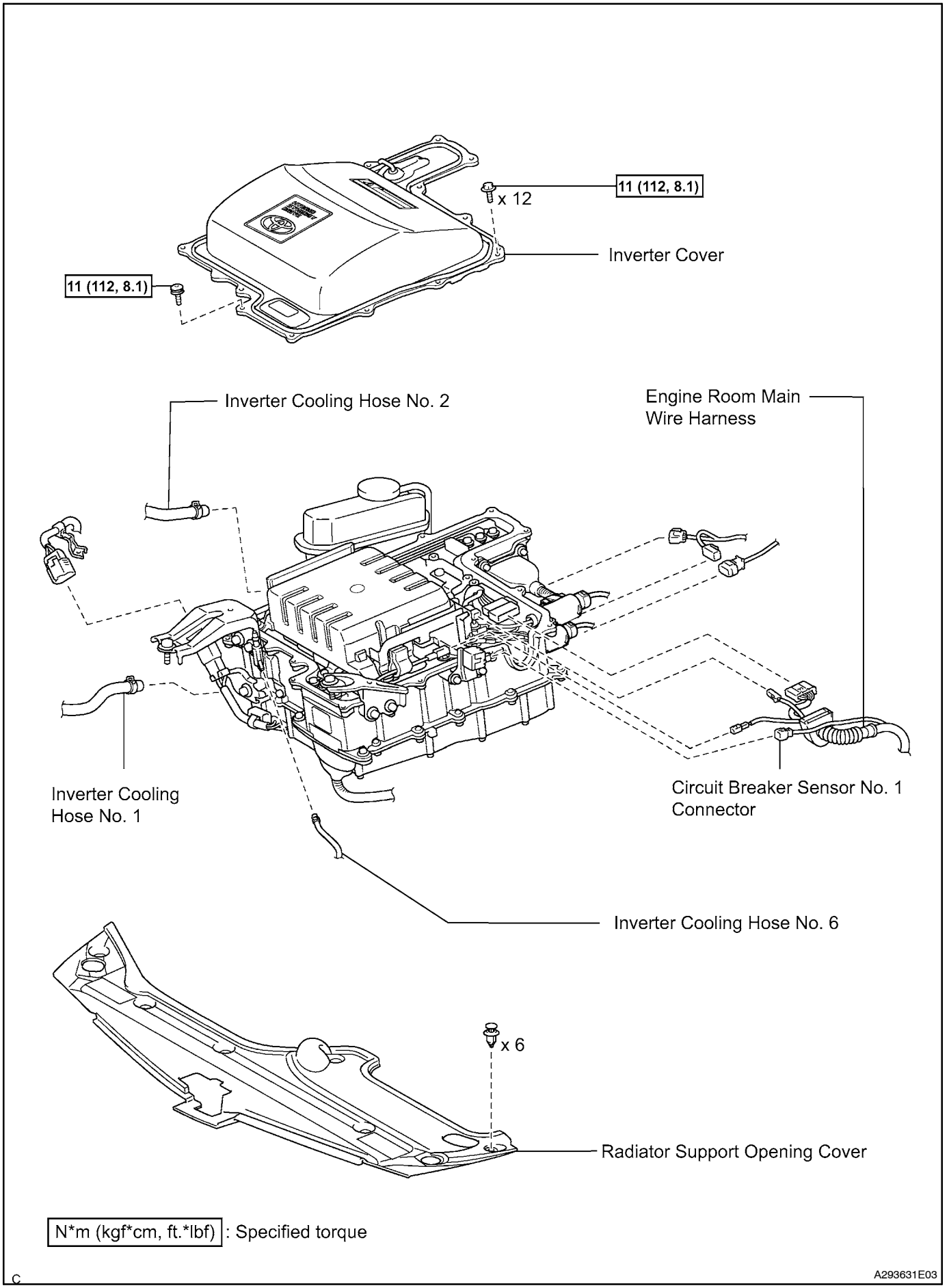
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RHD Steering Position Type:

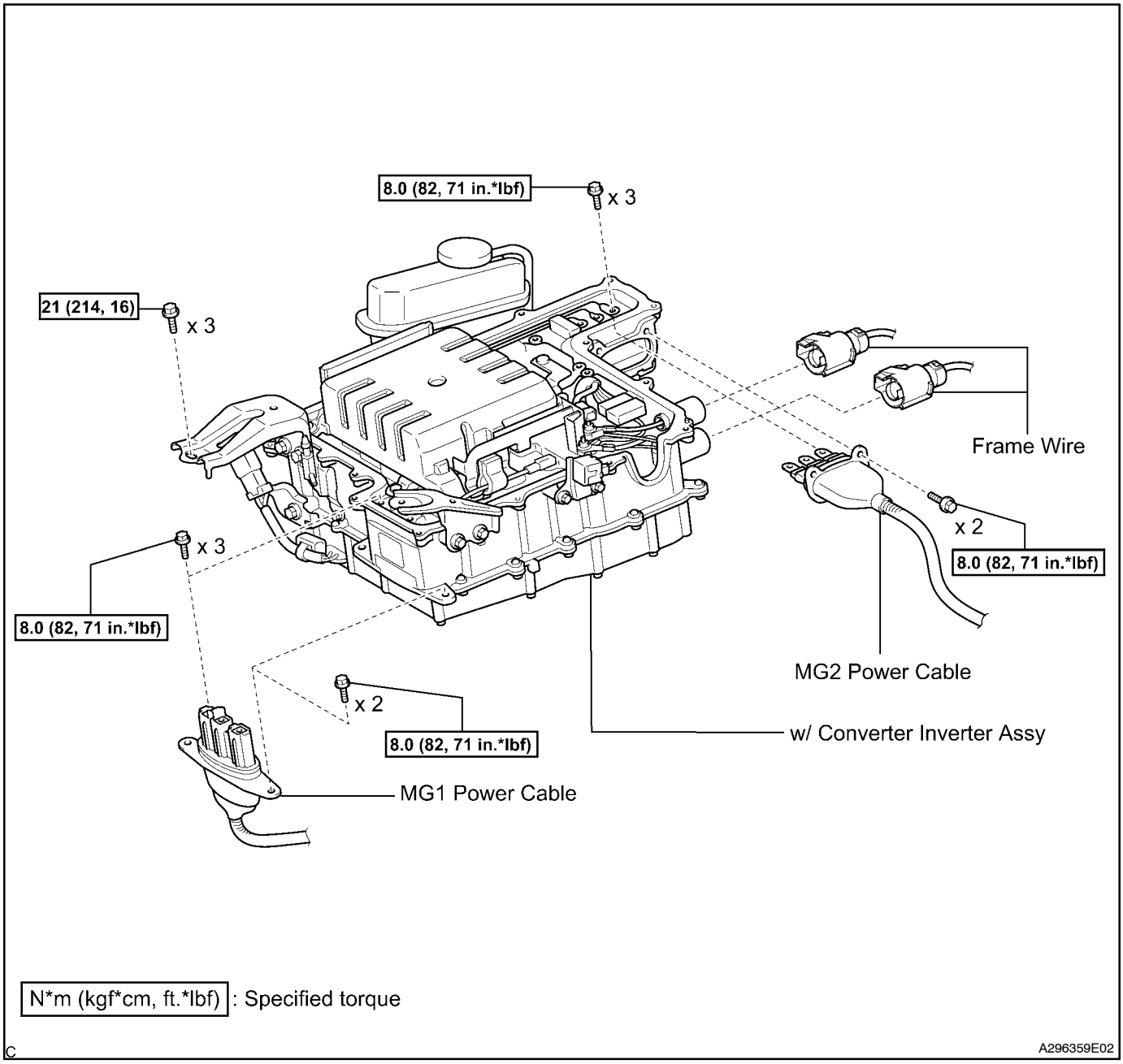


A298199

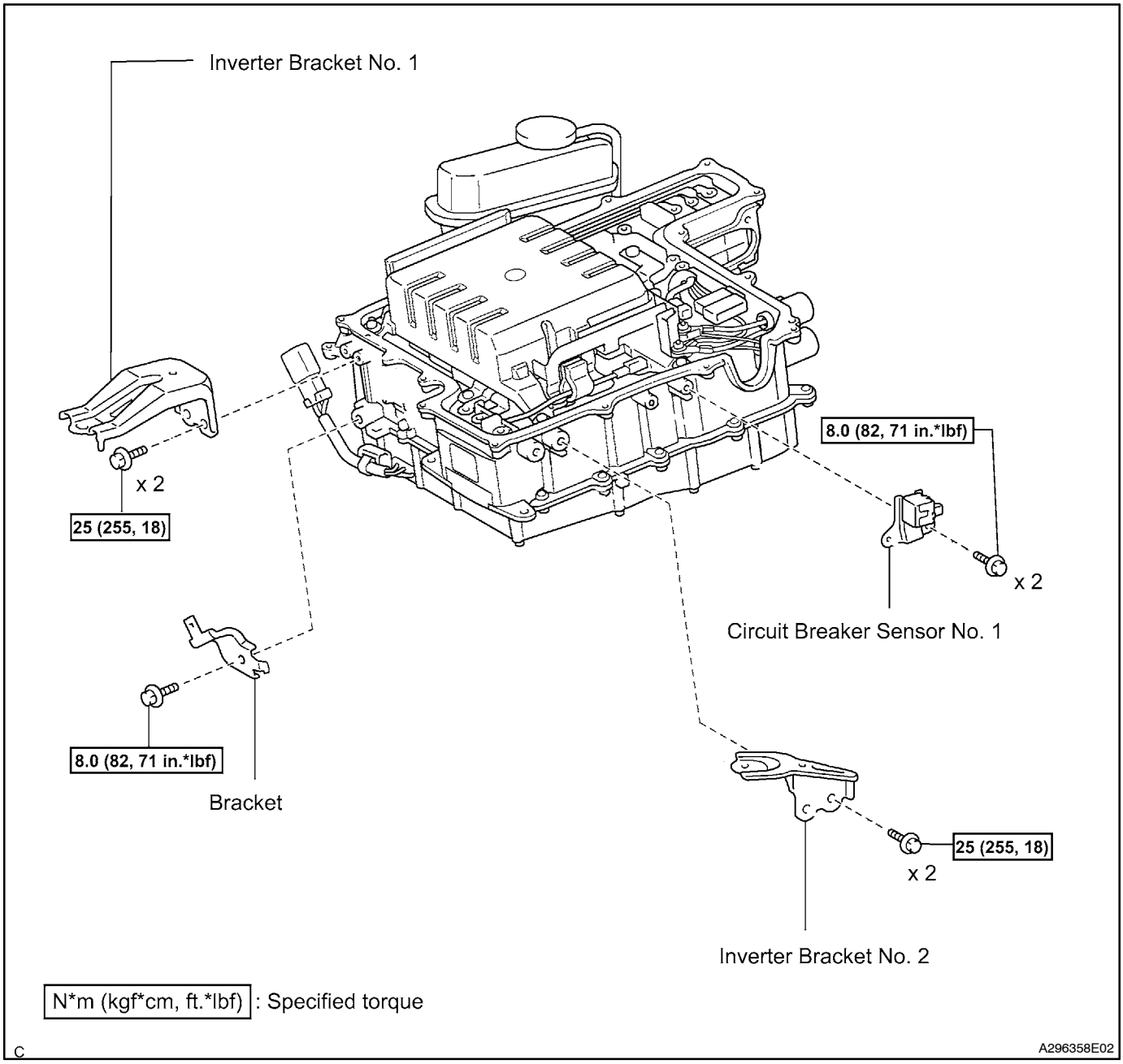
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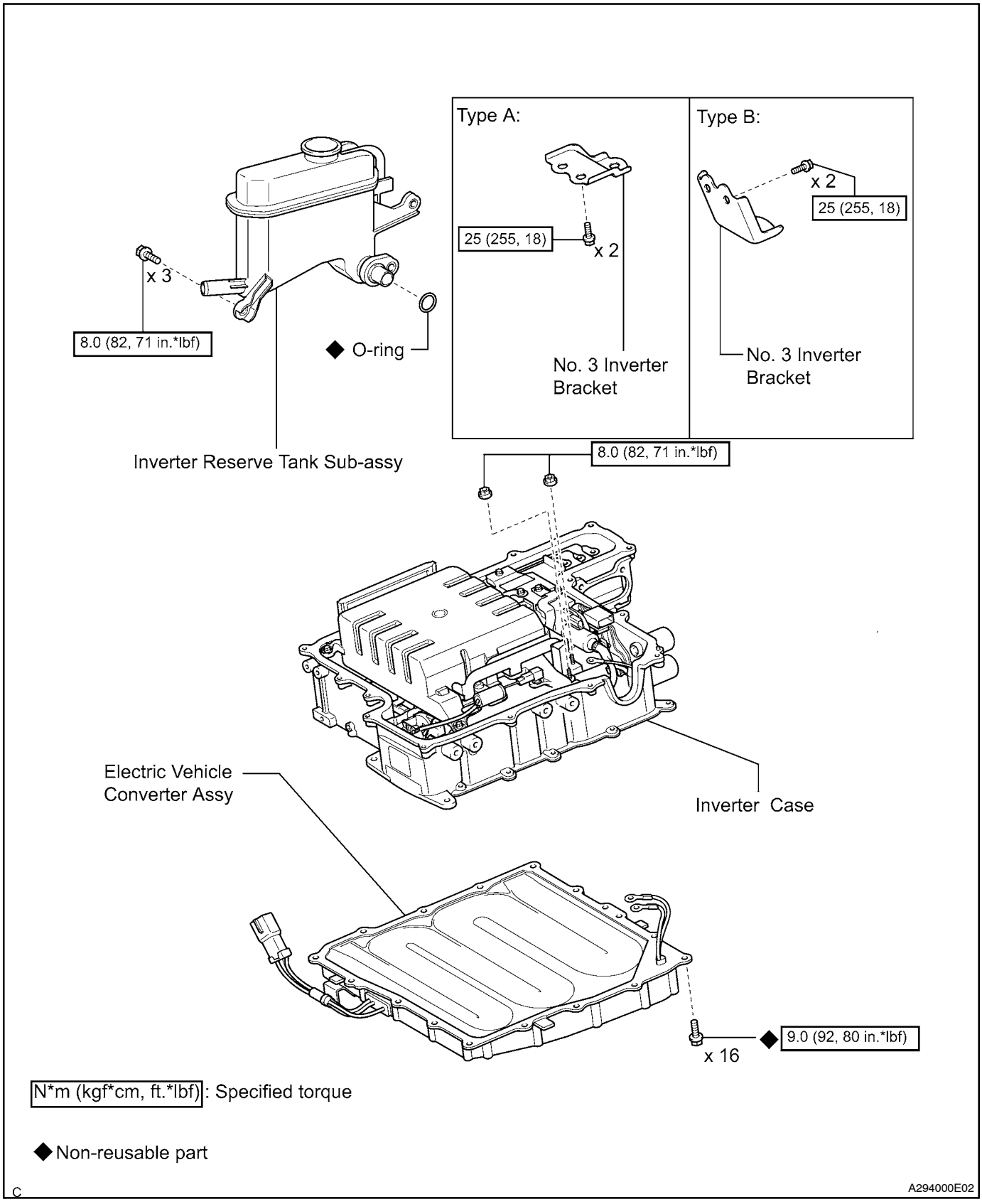
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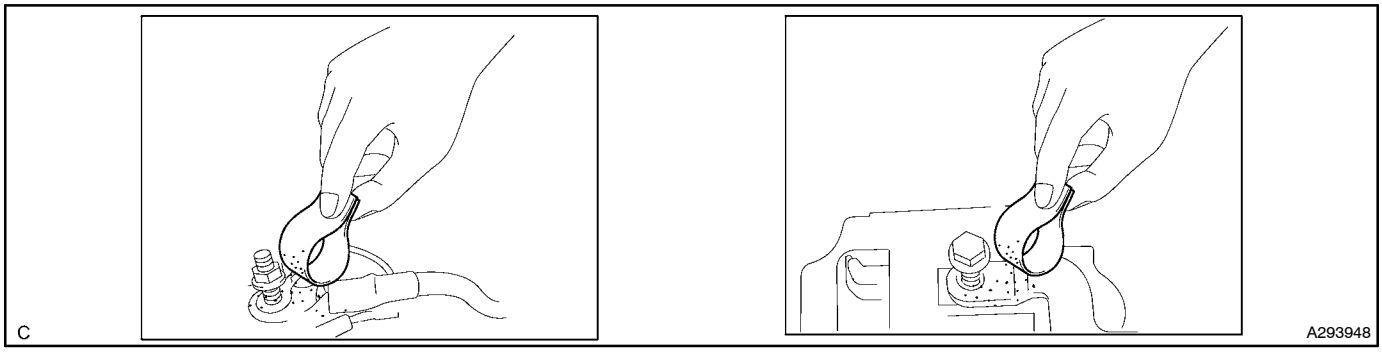
REMOVAL

CAUTION:

- **When working on high voltage systems, always wear insulating gloves.**
- **Keep the removed service plug grip in your pocket to prevent other technicians from reconnecting it while you are servicing the vehicle.**
- **After removing the service plug grip, do not touch the high voltage connectors and terminals for 5 minutes.**

NOTICE:

- **After removing the service plug grip, do not operate the power switch as it may damage the hybrid vehicle control ECU.**
- **If metal shavings are generated when bolts or nuts are removed from the with converter inverter assembly, remove them using tape or equivalent.**



1. PRECAUTION

CAUTION:

The hybrid system uses high voltage circuits, so improper handling could cause an electric shock or leakage. During service (including installation/ removal, inspection and replacement of parts), be sure to follow the procedures (See page 21–8).

2. REMOVE ENGINE UNDER COVER LH
3. REMOVE ENGINE UNDER COVER RH
4. DRAIN HV COOLANT (See page 22–4)
5. REMOVE REAR FLOOR BOARD NO. 2 (See page 21–120)
6. REMOVE DECK FLOOR BOX REAR (See page 21–120)
7. REMOVE REAR FLOOR BOARD NO. 3 (See page 21–120)
8. DISCONNECT BATTERY NEGATIVE TERMINAL (See page 21–120)
9. REMOVE SERVICE PLUG GRIP (See page 21–120)
10. REMOVE FRONT WIPER ARM HEAD CAP
11. REMOVE FRONT WIPER ARM (DRIVER SIDE POSITION) (See page 66–16)
12. REMOVE FRONT WIPER ARM (PASSENGER SIDE POSITION) (See page 66–16)
13. REMOVE HOOD TO COWL TOP SEAL (See page 66–16)
14. REMOVE COWL TOP VENTILATOR LOUVER LH (See page 66–16)
15. REMOVE COWL TOP VENTILATOR LOUVER RH (See page 66–16)
16. REMOVE WINDSHIELD WIPER MOTOR & LINK ASSY (See page 66–16)
17. REMOVE COWL TOP PANEL SUB–ASSY OUTER FRONT (See page 11–16)
18. REMOVE RADIATOR SUPPORT OPENING COVER
19. REMOVE INVERTER COVER (See page 21–25)
20. VERIFY THAT VOLTAGE OF W/CONVERTER INVERTER ASSY IS 0 V (See page 21–25)
21. DISCONNECT INVERTER COOLING HOSE NO. 2 (See page 21–25)
22. DISCONNECT INVERTER COOLING HOSE NO. 1 (See page 21–25)
23. DISCONNECT INVERTER COOLING HOSE NO. 6 (See page 21–25)

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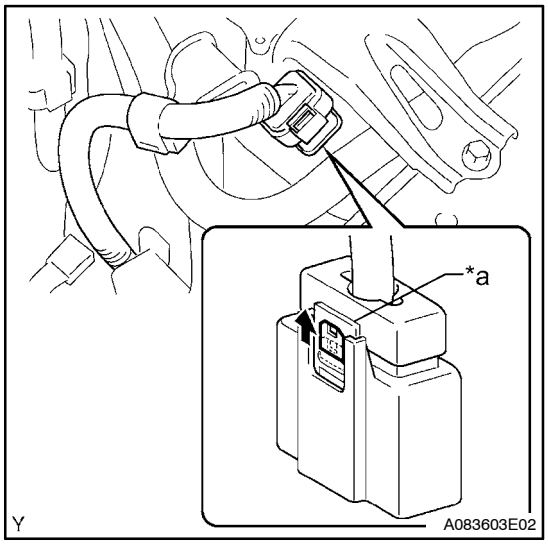
24. DISCONNECT CIRCUIT BREAKER SENSOR NO. 1 (See page 21–25)

25. DISCONNECT FRAME WIRE (See page 21–25)

26. REMOVE W/CONVERTER INVERTER ASSY

NOTICE:

If metal shavings are created, remove them using tape or equivalent.



(a) Using a small screwdriver, lift up the lock pin (green) to unlock it as shown in the illustration.

Text in Illustration

*a	Lock Pin

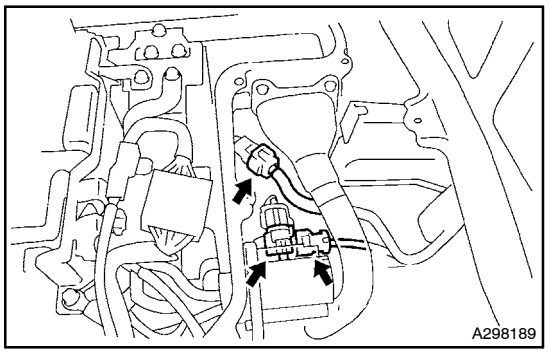
CAUTION:

Wear insulating gloves.

(b) Disconnect the connector for the air conditioning inverter.

CAUTION:

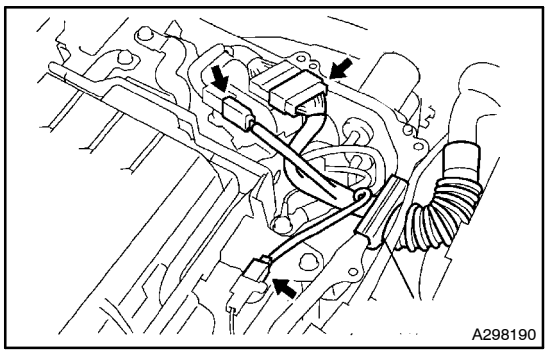
Wear insulating gloves.



(c) Disconnect the 3 connectors.

CAUTION:

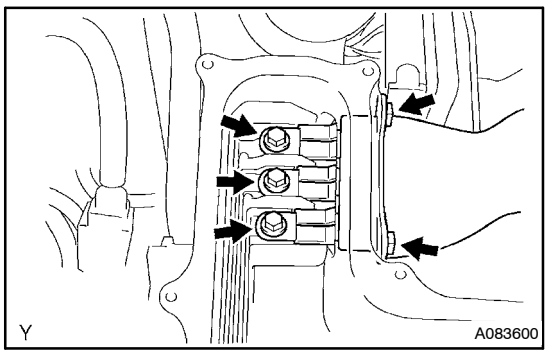
Wear insulating gloves.



(d) Disconnect the 3 connectors shown in the illustration and the engine main wire harness.

CAUTION:

Wear insulating gloves.

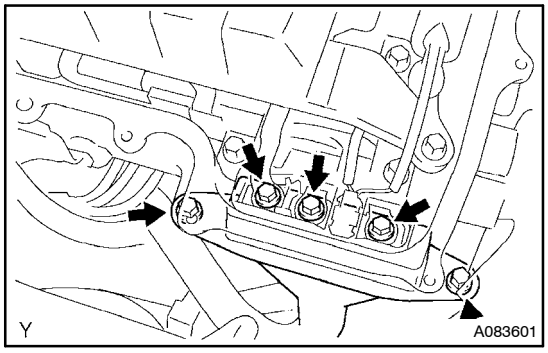


(e) Remove the 5 bolts, then disconnect the MG2 power cable.

CAUTION:

- **Wear insulating gloves.**
- **Insulate the connector parts with insulating tape.**

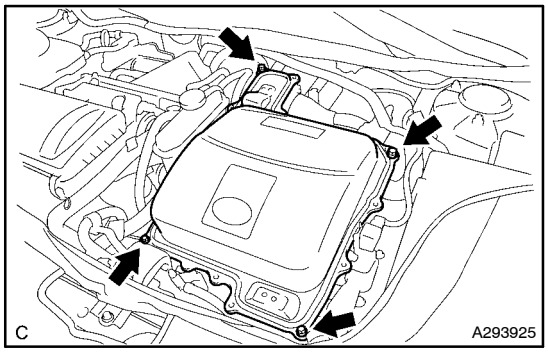
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(f) Remove the 5 bolts, then disconnect the MG1 power cable.

CAUTION:

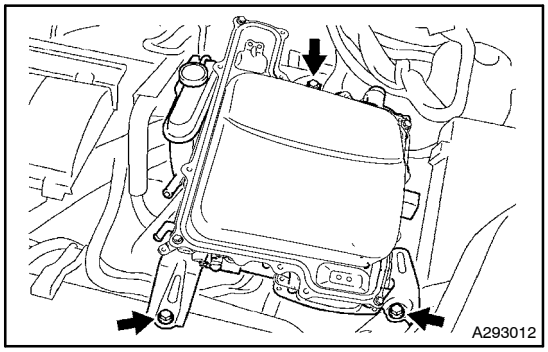
- **Wear insulating gloves.**
- **Insulate the connector parts with insulating tape.**



(g) Temporarily install the inverter cover with 4 bolts.

CAUTION:

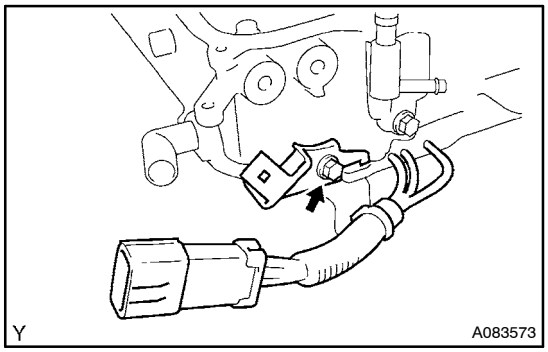
Wear insulating gloves.



(h) Remove the 3 bolts and the with converter inverter assembly.

CAUTION:

Wear insulating gloves.



(i) Disconnect the connector for the air conditioning inverter from the bracket.

CAUTION:

Wear insulating gloves.

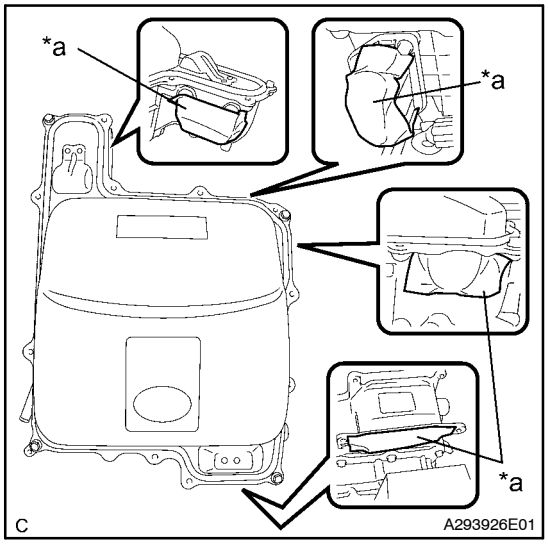
(j) Remove the bolt and bracket.

27. **REMOVE INVERTER BRACKET NO. 1**
    (See page 21–25)
28. **REMOVE INVERTER BRACKET NO. 2**
    (See page 21–25)
29. **REMOVE CIRCUIT BREAKER SENSOR NO. 1**
    (See page 21–25)
30. **DRAIN HV COOLANT**

CAUTION:

Wear insulating gloves.

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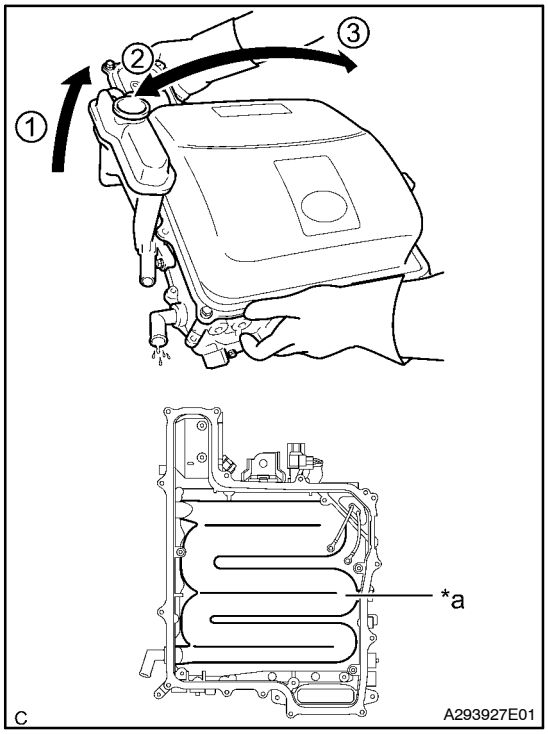
(a) Attach tape to the areas shown in the illustration.

Text in Illustration

*a	Tape

NOTICE:

- **Do not allow HV coolant to enter any component of the with converter inverter assembly other than the coolant passages when draining the HV coolant.**
- **Use non–residue type tape.**



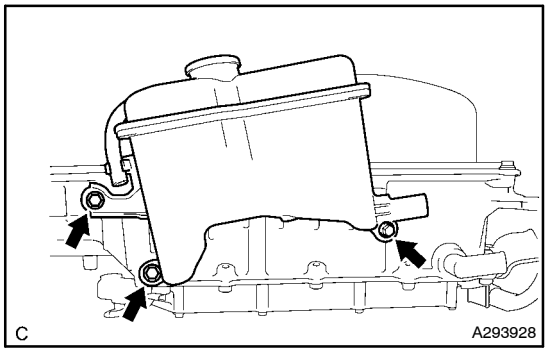
(b) Tilt the with converter inverter assembly as indicated by the arrow (1) in the illustration, then repeat the movements indicated by the arrows (2) and (3) 10 times to drain the HV coolant completely.

Text in Illustration

*a	HV coolant Passage

HINT:

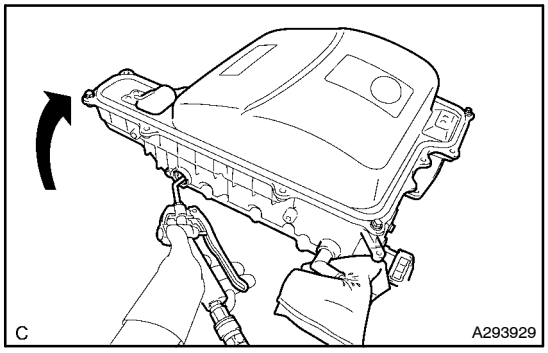
The HV coolant passage is designed as shown in the illustration. Tilt the with converter inverter assembly back and forth to drain the HV coolant.



(c) Remove the 3 bolts and inverter reserve tank sub–assembly from the with converter inverter assembly.

(d) Remove the O–ring from the inverter reserve tank sub–assembly.

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(e) Place the with converter inverter assembly at an angle and blow compressed air into it until the HV coolant stops coming out.

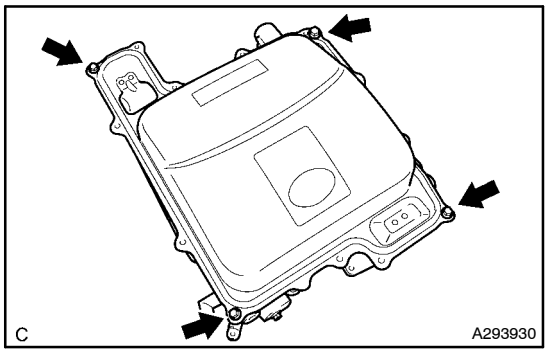
HINT:

- Use a piece of cloth as shown in the illustration to prevent the HV coolant from spraying.
- Cover the air inlet port with a piece of cloth to minimize air leakage.

31. REMOVE INVERTER COVER

CAUTION:

Wear insulating gloves.



(a) Remove the 4 bolts and inverter cover from the with converter inverter assembly.

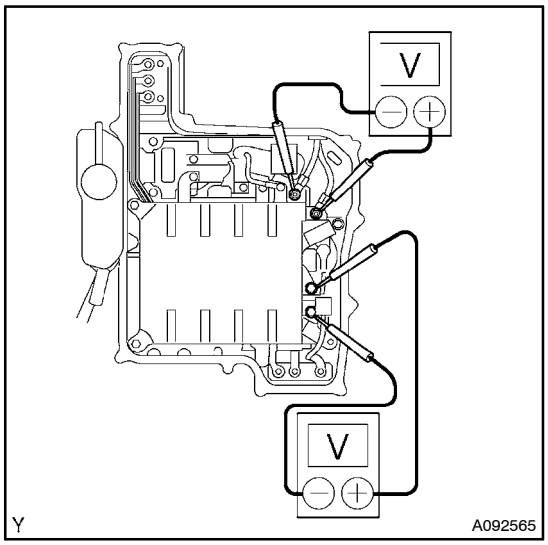
32. VERIFY THAT VOLTAGE OF W/CONVERTER INVERTER IS 0 V

CAUTION:

Wear insulating gloves.

NOTICE:

Do not allow any foreign matter or water to enter the with converter inverter assembly.



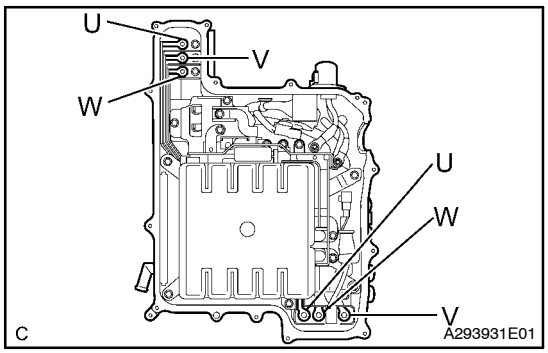
(a) Using a voltmeter, measure the voltage of the high voltage DC line.

Standard voltage:

0V

HINT:

Use a measuring range of DC 400 V or more on the voltmeter.



(b) Using the voltmeter, measure the voltage between the terminals of the three phase connector (U – V, V – W, U – W).

Standard voltage:

0V

HINT:

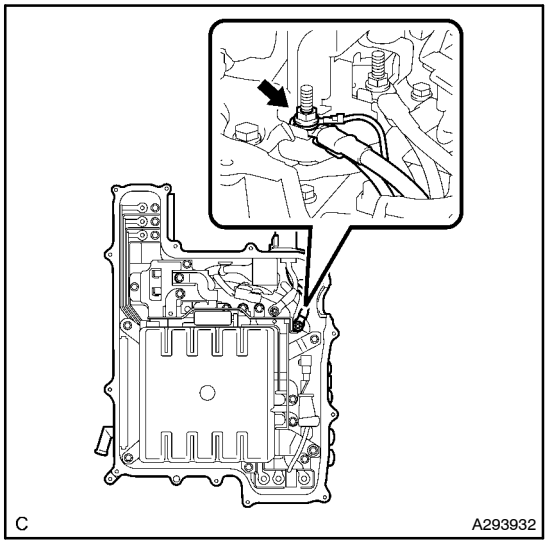
- Use a measuring range of DC 400 V or more on the voltmeter.
- If it is confirmed that high–voltage is not being applied to the with converter inverter assembly, removal/installation can be performed without using insulated tools or gloves after this step.

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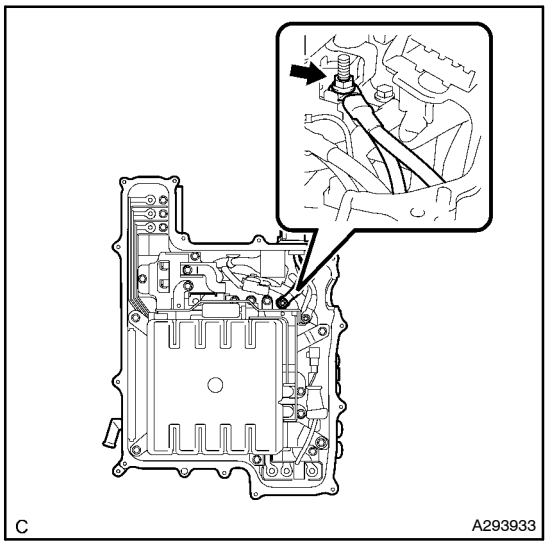
33. REMOVE ELECTRIC VEHICLE CONVERTER ASSY

NOTICE:

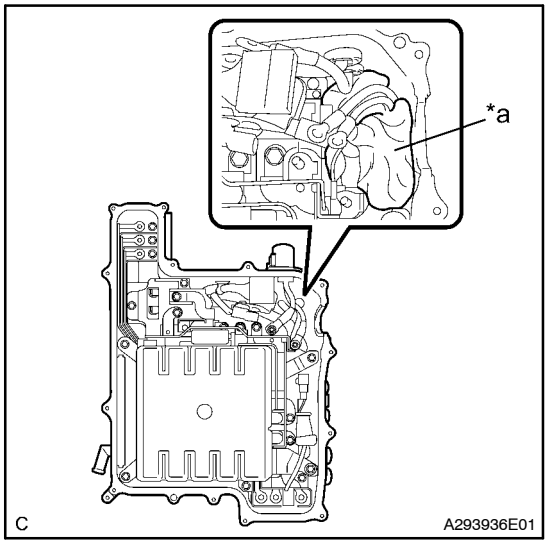
If metal shavings are created, remove them using tape or equivalent.



(a) Remove the nut and disconnect the 3 wire harnesses from the hybrid vehicle capacitor sub–assembly.



(b) Remove the nut and disconnect the 2 wire harnesses from the hybrid vehicle capacitor sub–assembly.



(c) Remove the nut and disconnect the 2 wire harnesses from the hybrid vehicle capacitor sub–assembly.

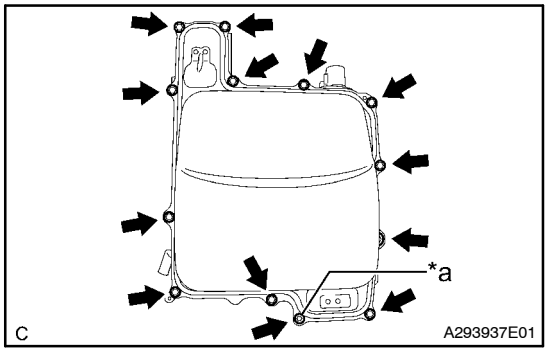
Text in Illustration

*a	Piece of Cloth

HINT:

Cover the area with a piece of clean cloth to prevent HV coolant from entering the inverter case when removing the electric vehicle converter assembly.

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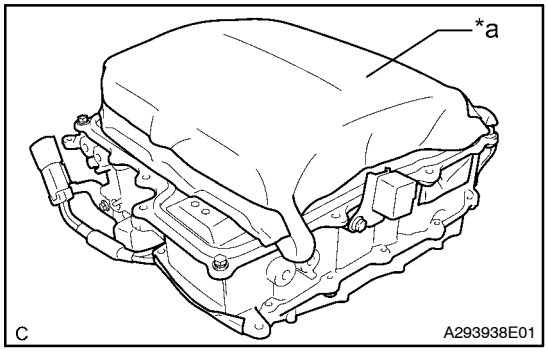
(d) Temporarily install the inverter cover with the 12 bolts and "TORX" screw.

Text in Illustration

*a	TORX Screw

HINT:

Install the inverter cover to prevent HV coolant from entering the inverter case when removing the electric vehicle converter assembly.



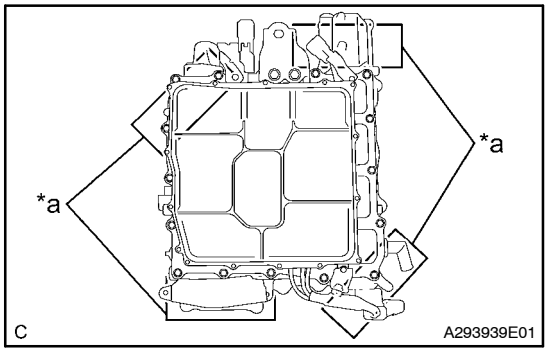
(e) Cover the inverter cover with a piece of cloth.

Text in Illustration

*a	Piece of Cloth

HINT:

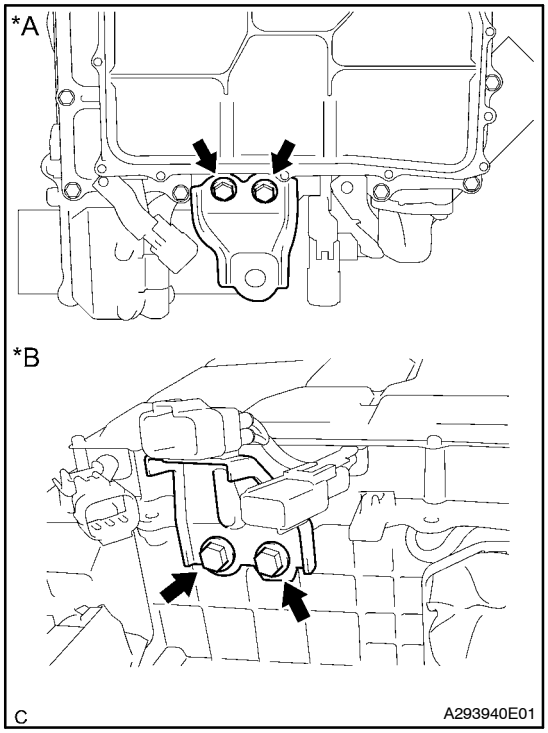
- Cover the inverter cover with a piece of cloth to prevent it from being damaged when the with converter inverter assembly is placed upside down.
- Secure the cloth to the inverter cover with tape.



(f) Place the with converter inverter assembly upside down on wooden blocks covered with pieces of cloth.

Text in Illustration

*a	Wooden Block

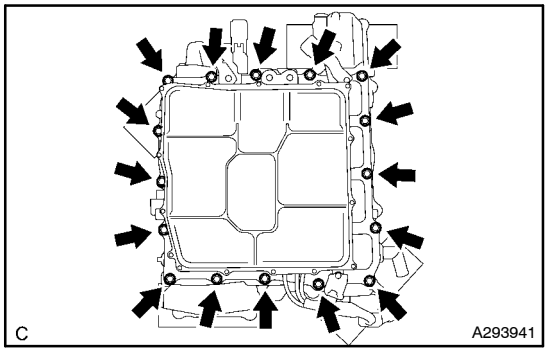


(g) Remove the 2 bolts and No. 3 inverter bracket.

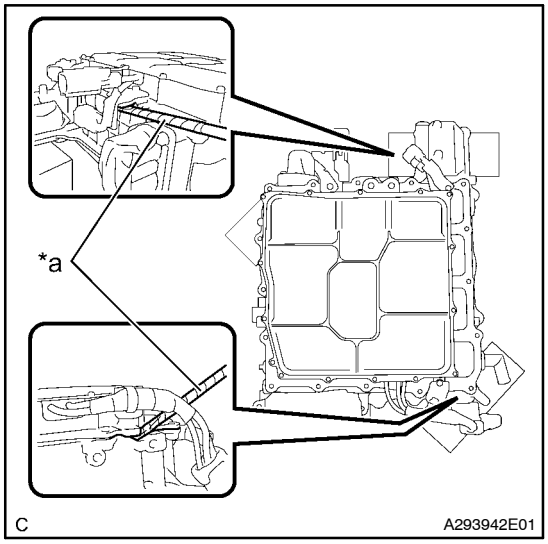
Text in Illustration

*A	Type A
*B	Type B

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(h) Remove the 16 bolts.



(i) Remove the electric vehicle converter assembly by prying between the electric vehicle converter assembly and inverter case with a screwdriver as shown in the illustration.

Text in Illustration

*a	Protective Tape

NOTICE:

- **Be careful not to damage the contact surfaces of the inverter case.**
- **If HV coolant is spilled when the electric vehicle converter assembly is removed, wipe it up with a piece of cloth.**

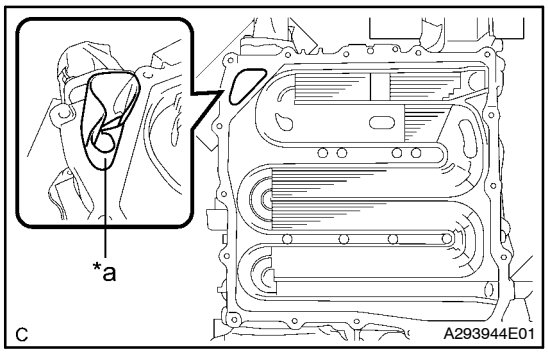
HINT:

Tape the screwdriver tip before use.

INSTALLATION

NOTICE:

Make sure not to cross–thread the bolts when installing them.



1. INSTALL ELECTRIC VEHICLE CONVERTER ASSY

(a) Attach tape to the inner wall of the inverter case.

Text in Illustration

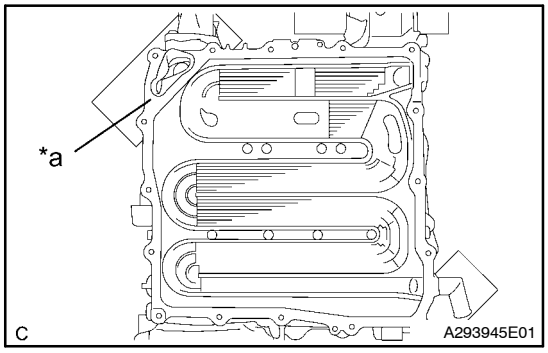
*a	Tape

NOTICE:

Use non–residue type tape.

HINT:

Use tape to prevent any remaining seal packing from entering the inverter case.



(b) Remove any remaining seal packing completely from the area shown in the illustration.

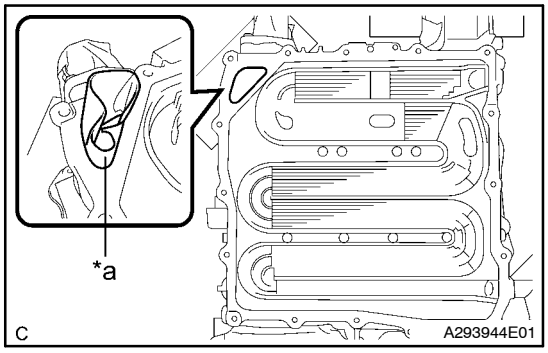
Text in Illustration

*a	Seal Packing Removal Area

NOTICE:

- **HV coolant may enter the inverter case if any seal packing is remaining on the contact surfaces of the inverter case during installation. Make sure to remove any seal packing completely.**
- **Keep the inside of the inverter case free from remaining seal packing.**

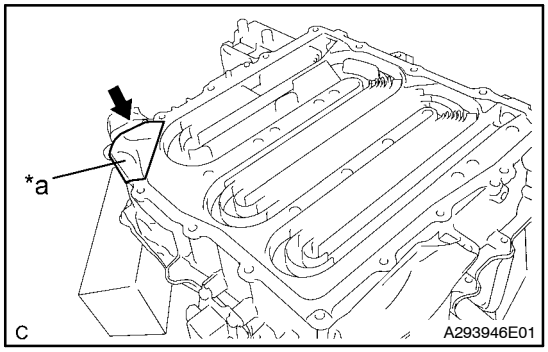
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(c) Remove the tape.

Text in Illustration

*a	Tape



(d) Attach tape to the area shown in the illustration.

Text in Illustration

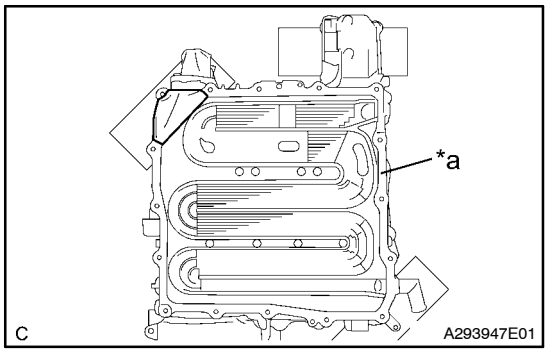
*a	Tape

NOTICE:

Use non–residue type tape.

HINT:

Use tape to prevent any remaining seal packing from entering the inverter case.



(e) Remove any remaining seal packing completely from the area shown in the illustration.

Text in Illustration

*a	Seal Packing Removal Area

NOTICE:

Keep the inside of the inverter case free from remaining seal packing.

(f) Use compressed air to completely remove any remaining seal packing from the inverter case.

NOTICE:

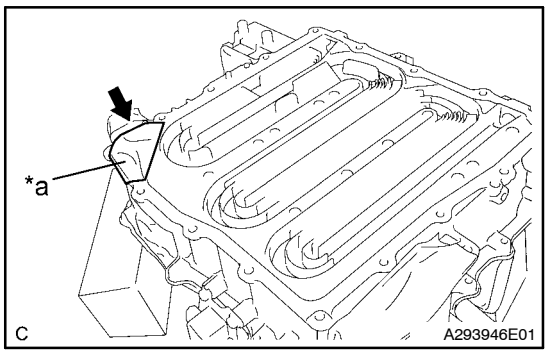
Keep the removed parts and new electric vehicle converter assembly free from foreign matter.

(g) Remove the piece of cloth used to cover the inverter case.

(h) Remove the tape.

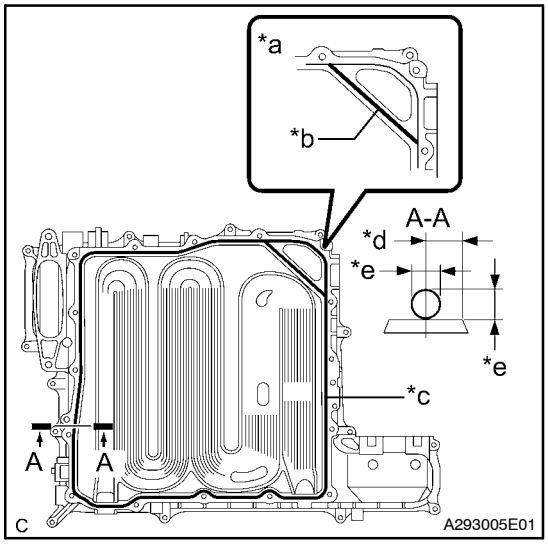
Text in Illustration

*a	Tape



(i) Clean the seal packing application areas.

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(j) Apply seal packing as shown in the illustration.

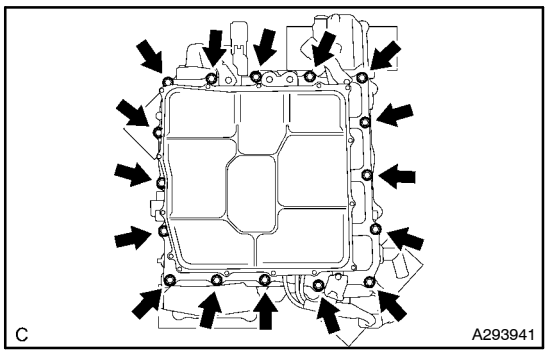
Text in Illustration

*a	Area (*a)
*b	Be sure to apply seal packing here
*c	Seal Packing Application Area
*d	4.0mm (0.157 in.)
*e	2.0mm (0.787 in.) or more

Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1282B or equivalent

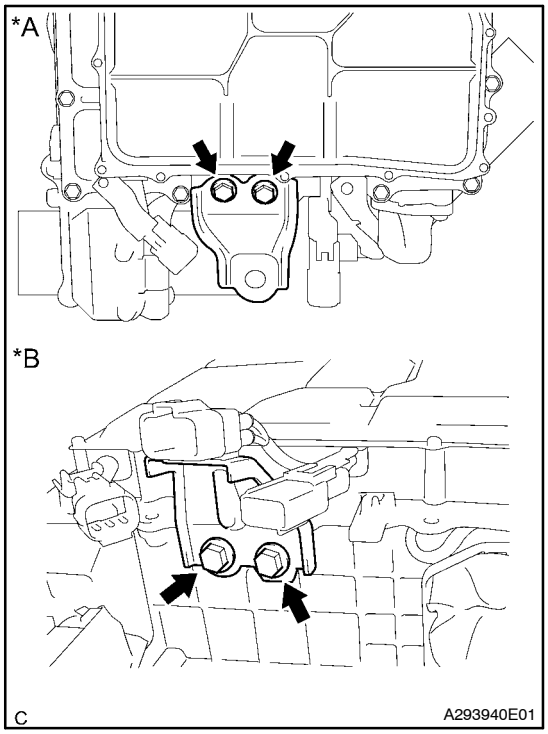
NOTICE:

- **Be sure to apply the seal packing to the area (*a), or HV coolant may leak into the inverter case.**
- **Install the electric vehicle converter assembly within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.**
- **Do not add HV coolant for at least 2 hours after installation.**



(k) Install the electric vehicle converter assembly to the inverter case with 16 new bolts.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)



(l) Install the No. 3 inverter bracket with the 2 bolts.

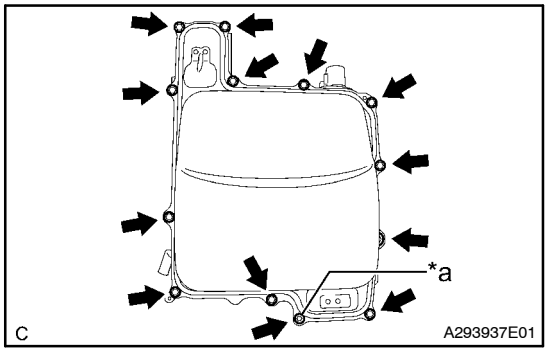
Text in Illustration

*A	Type A
*B	Type B

Torque: 25 N*m (255 kgf*cm, 18 ft.*lbf)

(m) Turn the with converter inverter assembly so that it is facing up.

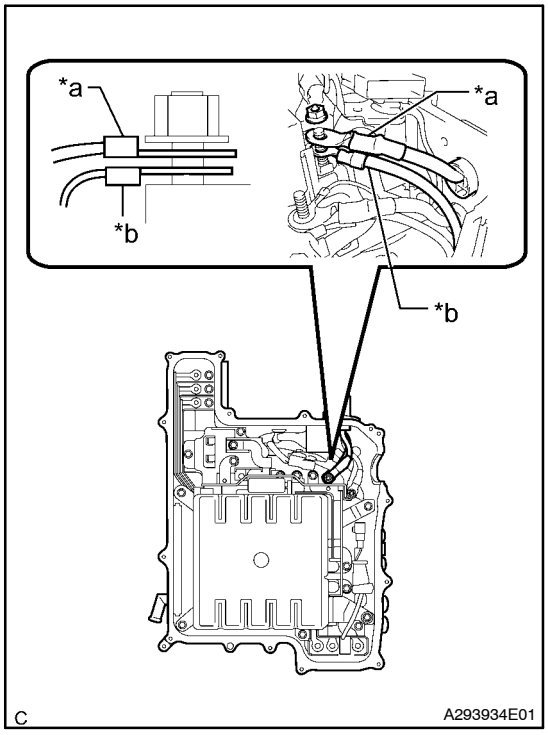
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(n) Remove the 12 bolts, "TORX" screw and inverter cover from the with converter inverter assembly.

Text in Illustration

*a	TORX Screw



(o) Connect the 2 wire harnesses to the hybrid vehicle capacitor sub–assembly as shown in the illustration.

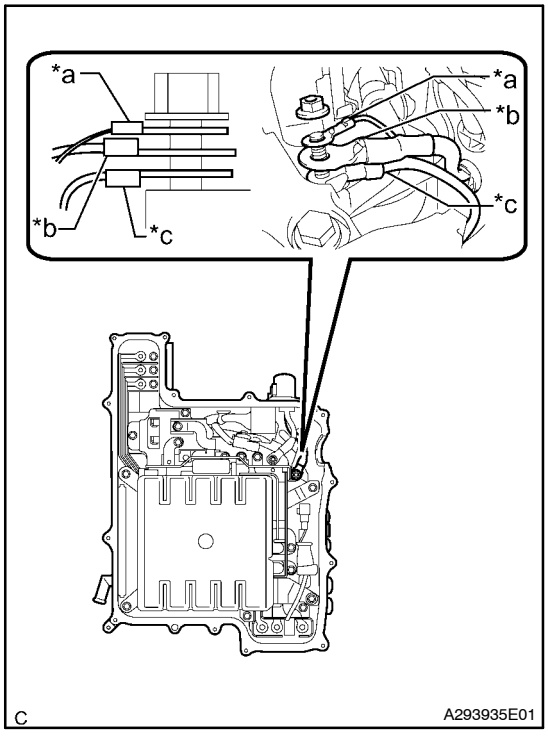
Text in Illustration

*a	Wire Harness Color: Orange Tube Color: Black Tab Facing Up
*b	Wire Harness Color: Black Tube Color: White Tab Facing Down

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NOTICE:

Connect the wire harnesses to the correct positions in the correct order.



(p) Connect the 3 wire harnesses to the hybrid vehicle capacitor sub–assembly as shown in the illustration.

Text in Illustration

*a	Tab Facing Up
*b	Wire Harness Color: Orange Tube Color: Red Tab Facing Up
*c	Wire Harness Color: Orange Tube Color: White Tab Facing Down

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NOTICE:

Connect the wire harnesses to the correct positions in the correct order.

2. INSTALL INVERTER RESERVE TANK SUB–ASSY

(a) Install a new O–ring to the inverter reserve tank sub–assembly.

NOTICE:

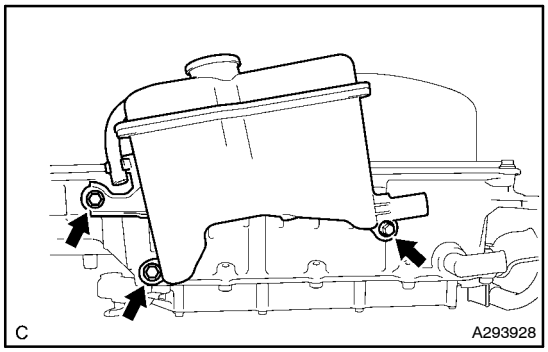
Fully seat the O–ring.

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(b) Apply a small amount of HV coolant to the O–ring installation surface of the with converter inverter assembly.

NOTICE:

Do not spill HV coolant inside the with converter inverter assembly.

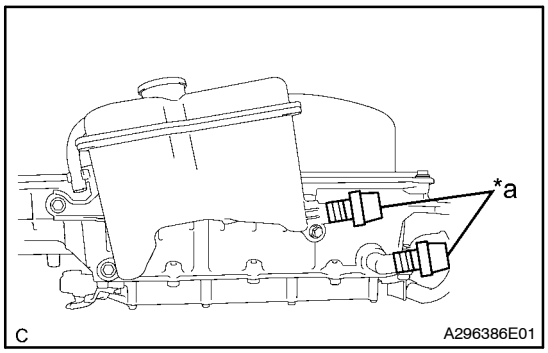


(c) Install the inverter reserve tank sub–assembly to the with converter inverter assembly with the 3 bolts.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NOTICE:

Make sure that the O–ring is free of foreign matter.



3. AIR TIGHTNESS TEST

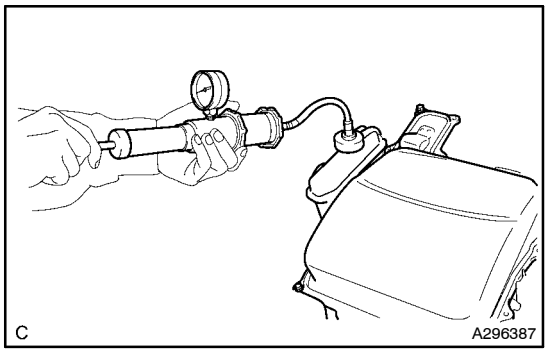
(a) Install 2 hose plugs with tape to the positions shown in the illustration.

Text in Illustration

*a	Hose Plug

NOTICE:

Use non–residue type tape.



(b) Install the radiator cap tester to the inverter reserve tank sub–assembly.

(c) Pump the radiator cap tester to 49 kPa (0.49 kgf/ cm2, 7.1 psi), and then check that the pressure does not drop.

Standard:

Pressure is maintained for 10 seconds or more

NOTICE:

Do not perform an air tightness test for at least 2 hours after installing the electric vehicle converter assembly.

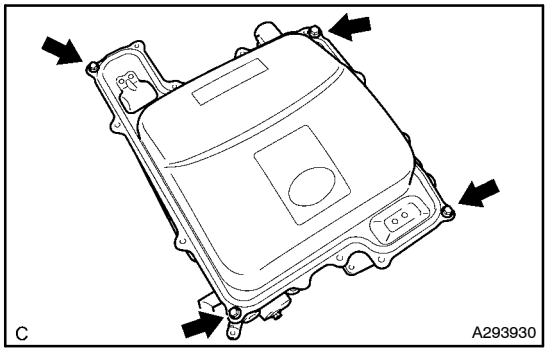
HINT:

If the pressure drops, check that the hose plugs are installed securely to the inverter reserve tank sub–assembly. If no problem is found, reapply the seal packing as there may be a leak in it.

(d) Remove the radiator cap tester from the inverter reserve tank sub–assembly.

(e) Remove the 2 hose plugs.

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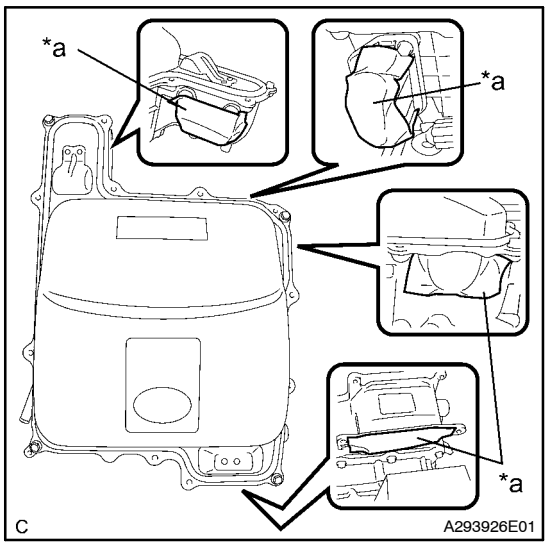
4. INSTALL INVERTER COVER

(a) Temporarily install the inverter cover to the with converter inverter assembly with the 4 bolts.

5. INSTALL CIRCUIT BREAKER SENSOR NO. 1
(See page 21–25)

6. INSTALL INVERTER BRACKET NO. 2
(See page 21–25)

7. INSTALL INVERTER BRACKET NO. 1
(See page 21–25)

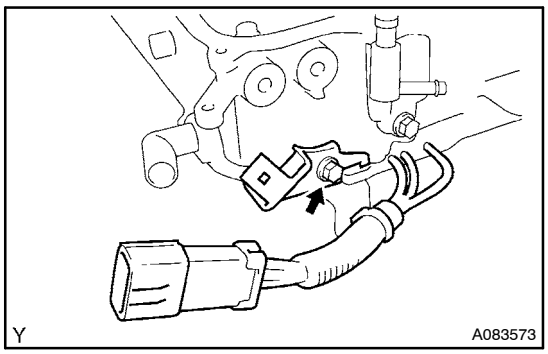


8. INSTALL W/CONVERTER INVERTER ASSY

(a) Remove the tape shown in the illustration.

Text in Illustration

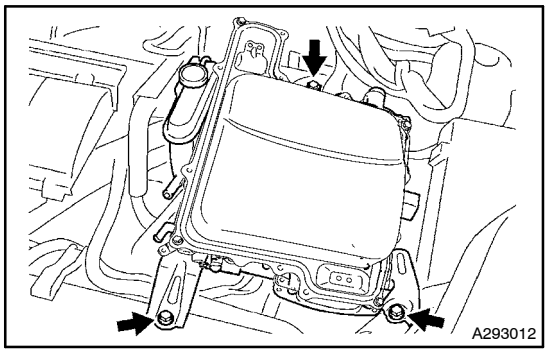
*a	Tape



(b) Install the bracket to the with converter inverter assembly with the bolt.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

(c) Connect the connector for the air conditioning inverter to the bracket.

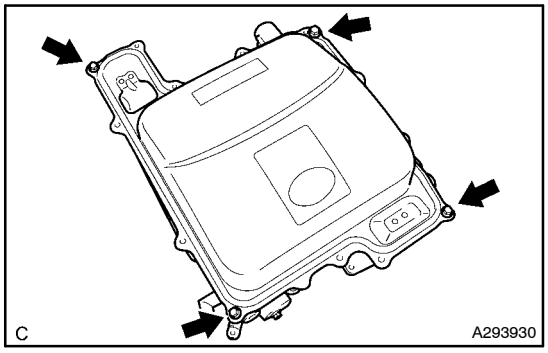


(d) Install the with converter inverter assembly with the 3 bolts.

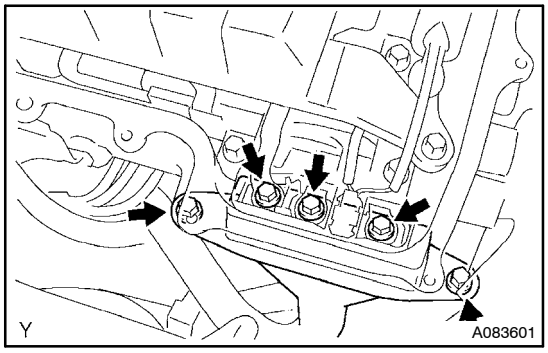
NOTICE:
Wear insulating gloves.

Torque: 21 N*m (214 kgf*cm, 16 ft.*lbf)

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(e) Remove the 4 bolts and inverter cover from the with converter inverter assembly.

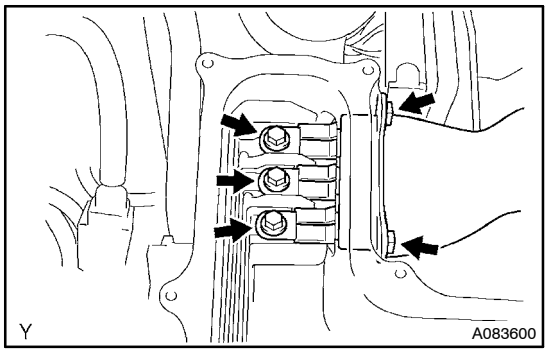


(f) Install the MG1 power cable to the MG1 power cable terminal with the 5 bolts.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

CAUTION:

Wear insulating gloves.

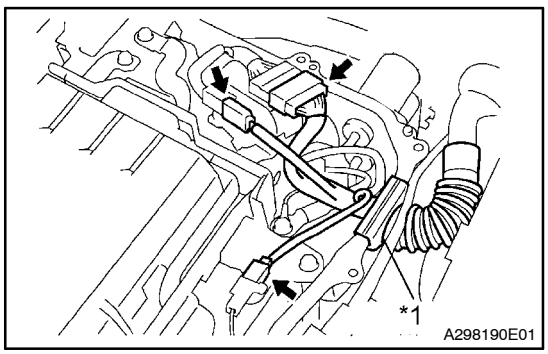


(g) Install the MG2 power cable to the MG2 power cable terminal with the 5 bolts.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

CAUTION:

Wear insulating gloves.



(h) Connect the 3 connectors.

Text in Illustration

*1	Grommet

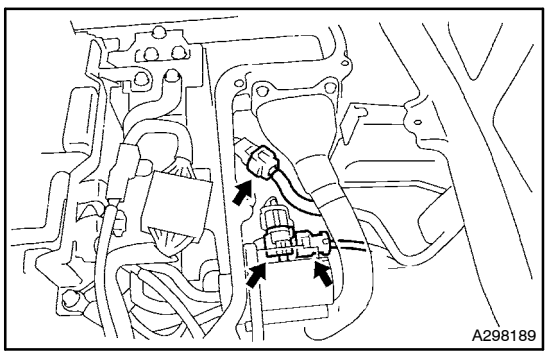
CAUTION:

Wear insulating gloves.

(i) Insert the grommet of the engine main wire harness into the U–shaped groove of the inverter case.

CAUTION:

Wear insulating gloves.



(j) Connect the 3 connectors.

CAUTION:

Wear insulating gloves.

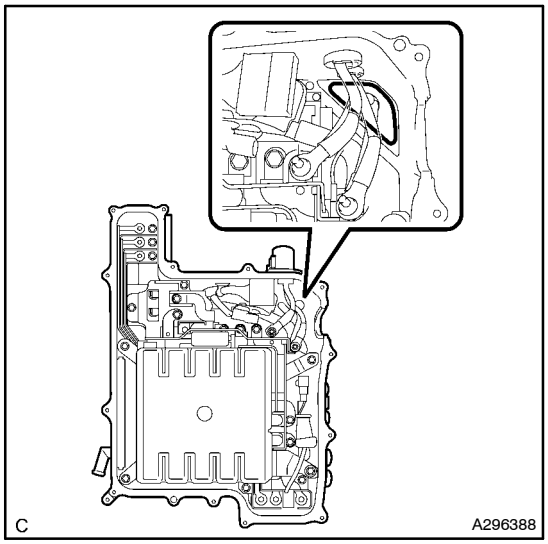
(k) Connect the connector for the air conditioning inverter, then lock the connector with the lock pin.

CAUTION:

Wear insulating gloves.

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9. CONNECT FRAME WIRE (See page 21–25)
10. CONNECT CIRCUIT BREAKER SENSOR NO. 1 (See page 21–25)
11. CONNECT INVERTER COOLING HOSE NO. 6
12. CONNECT INVERTER COOLING HOSE NO. 1
13. CONNECT INVERTER COOLING HOSE NO. 2
14. INSTALL INVERTER COVER (See page 21–25)
15. INSTALL SERVICE PLUG GRIP (See page 21–120)
16. CONNECT BATTERY NEGATIVE TERMINAL (See page 21–120)
17. ADD HV COOLANT (See page 22–4)
18. DISCONNECT BATTERY NEGATIVE TERMINAL (See page 21–120)
19. REMOVE SERVICE PLUG GRIP (See page 21–120)
20. REMOVE INVERTER COVER (See page 21–25)



21. CHECK FOR HV COOLANT LEAK
    (a) Check that HV coolant has not entered the inverter case.
22. INSTALL INVERTER COVER (See page 21–25)
23. INSTALL RADIATOR SUPPORT OPENING COVER
24. INSTALL COWL TOP PANEL SUB–ASSY OUTER FRONT (See page 11–16)
25. INSTALL WINDSHIELD WIPER MOTOR & LINK ASSY (See page 66–16)
26. INSTALL COWL TOP VENTILATOR LOUVER RH
27. INSTALL COWL TOP VENTILATOR LOUVER LH
28. INSTALL HOOD TO COWL TOP SEAL
29. INSTALL FRONT WIPER ARM (DRIVER SIDE POSITION) (See page 66–16)
30. INSTALL FRONT WIPER ARM (PASSENGER SIDE POSITION) (See page 66–16)
31. INSTALL FRONT WIPER ARM HEAD CAP
32. INSTALL SERVICE PLUG GRIP (See page 21–120)
33. CONNECT BATTERY NEGATIVE TERMINAL (See page 21–120)
34. INSTALL REAR FLOOR BOARD NO. 3 (See page 21–120)
35. INSTALL DECK FLOOR BOX REAR (See page 21–120)
36. INSTALL REAR FLOOR BOARD NO. 2 (See page 21–120)
37. CHECK FOR HV COOLANT LEAK (See page 22–4)
38. INSTALL ENGINE UNDER COVER RH
39. INSTALL ENGINE UNDER COVER LH

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40. OPERATION CHECK

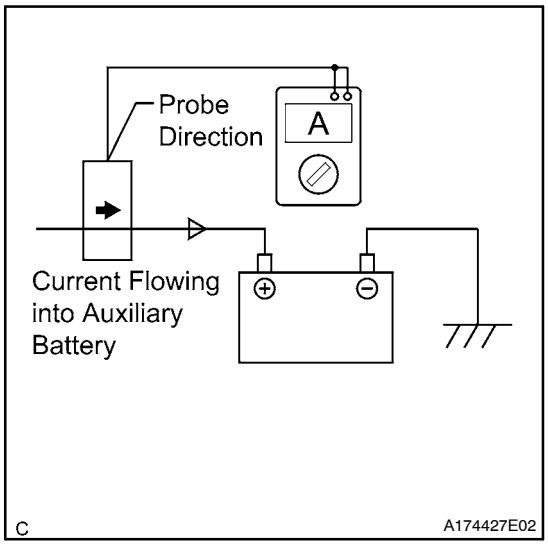
HINT:

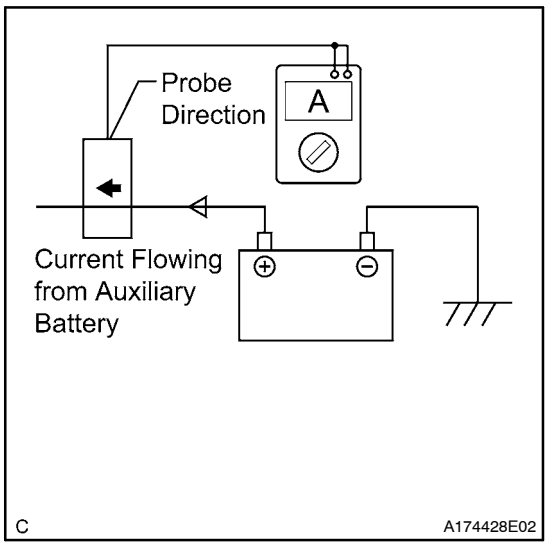
- After the repair, check the operation as follows. Then check for DTCs again.
- The current at the AMD terminal cannot be measured directly because of space limitations. Measure the current flowing at the auxiliary battery instead.

(a) Connect the AC/DC 400 A probe to the positive (+) auxiliary battery cable.

(b) Turn the power switch on (READY) and leave the vehicle as is until the electric current flowing into the auxiliary battery becomes 10 A or less.

(c) Measure the current flowing from the auxiliary battery with the power switch on (READY), headlight position switch and blower motor switch in the HI position, and rear window defogger turned on.





Standard Current

Item	Switch Condition	Specified Condition
Current flowing from auxiliary battery	Power switch on (READY) (Headlight position switch and blower motor switch in HI position, rear window defogger on)	0 A or less (no current from auxiliary battery)

(d) Turn the power switch off.

41. POWER WINDOW CONTROL SYSTEM INITIALIZE (See page 01–29)

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2102N–01

POWER MODULE INTELLIGENT TRANSISTOR PRECAUTION

1. PRECAUTION WHEN REMOVING/INSTALLING W/ CONVERTER INVERTER ASSY

CAUTION:

Be careful not to injure yourself on the edges of the with converter inverter assembly when performing work.

NOTICE:

Observe the following in order to prevent entry of foreign matter:

- **Do not allow any dust, foreign matter or water to enter the converter assembly.**
- **Do not use air tools in areas other than specified to prevent entry of dust.**
- **Prevent wind from blowing through the workshop to prevent entry of dust.**
- **Do not drop any bolts or tools into the with converter inverter assembly.**

NOTICE:

PRECAUTION WHEN HANDLING ELECTRONIC COMPONENTS

- **Do not touch any connector terminals, static electricity may be applied to the internal circuits.**
- **Do not drop electronic components such as circuit boards or subject them to impact.**
- **Keep the removed parts free from dust.**
- **Electronic components are very sensitive. Be sure to observe the handling instructions.**

NOTICE:

PRECAUTION WHEN SUSPENDING WORK

- **If suspending work, temporarily install the inverter cover to the inverter case to prevent entry of foreign matter.**

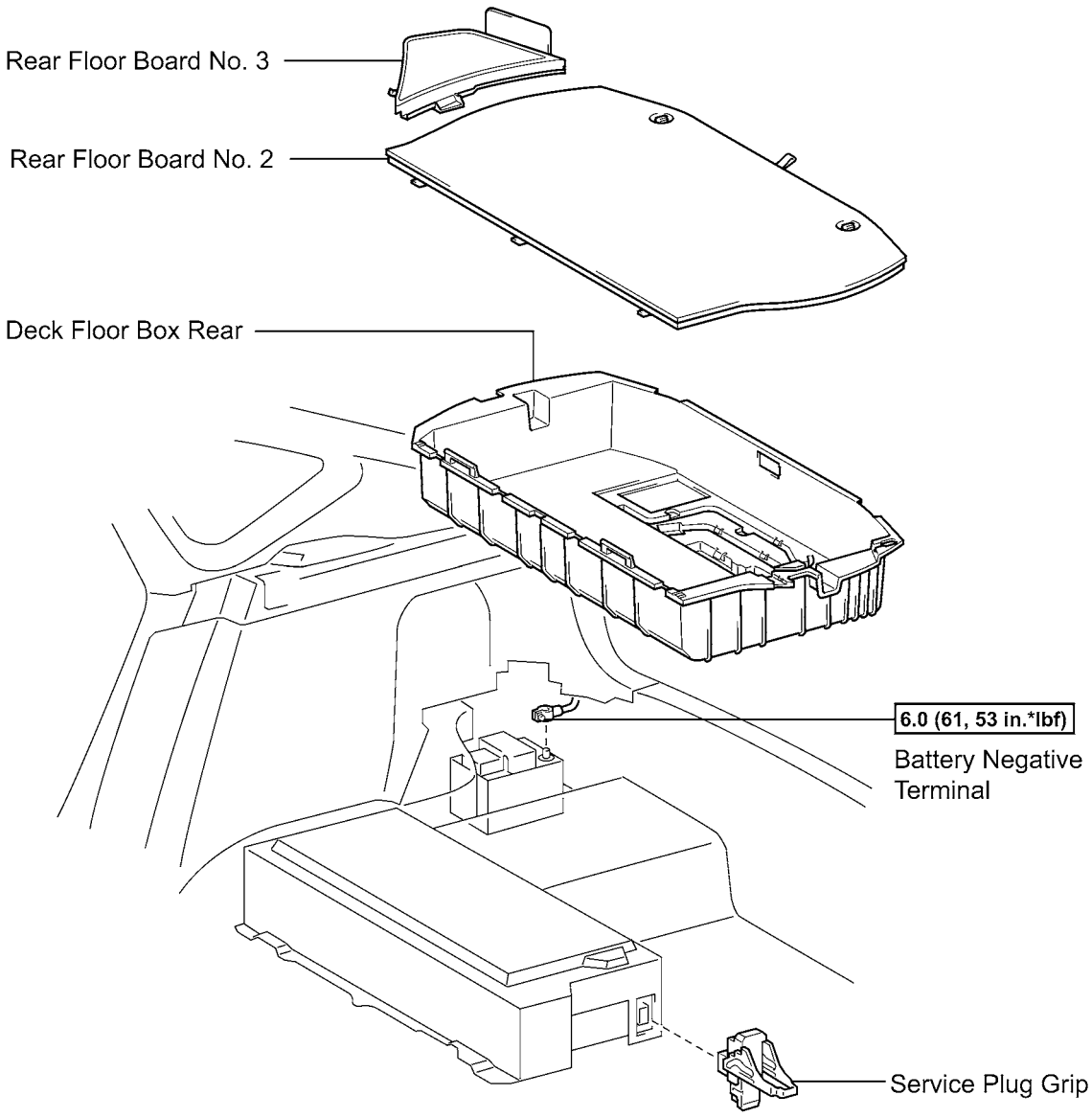
HINT:

- Arrange the removed parts in the correct order so that they can be installed to the correct position and in the correct orientation.
- It is recommended to take pictures of parts before removing them to ensure correct installation.

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2102M–01

COMPONENTS



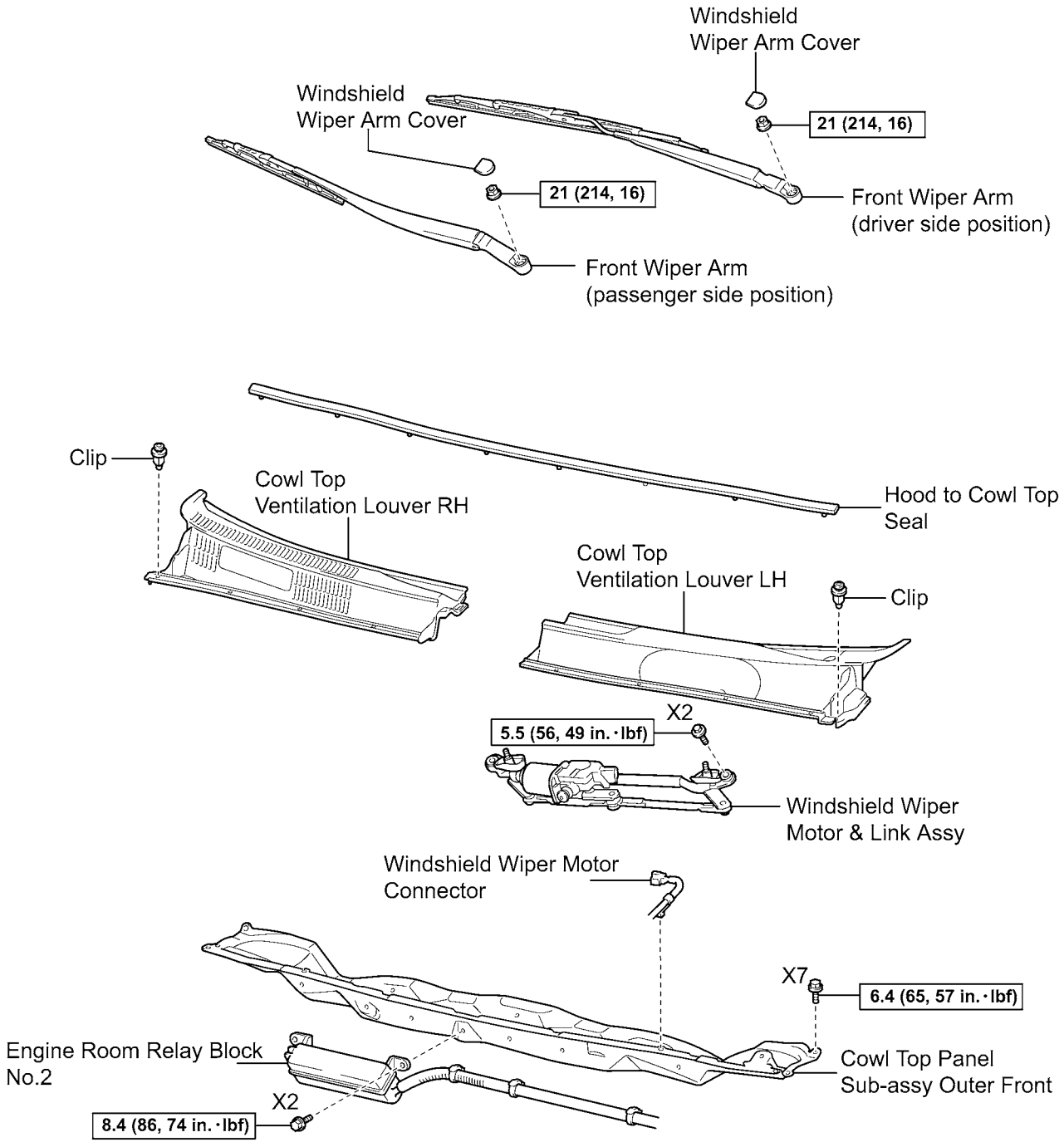
N*m (kgf*cm, ft.*lbf) : Specified torque

O

A124443E18

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LHD Steering Position Type:



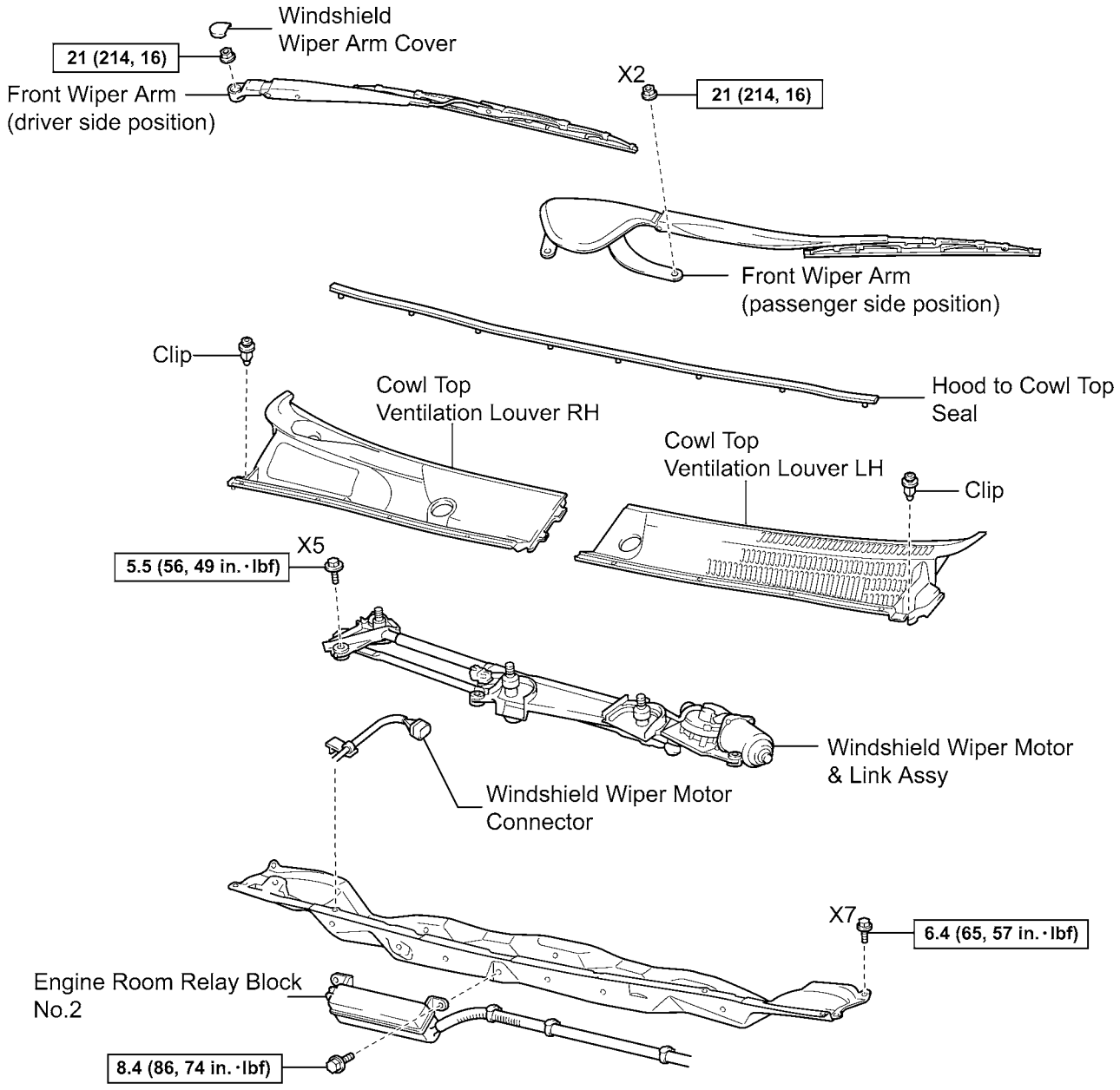
N·m (kgf·cm, ft·lbf) : Specified torque

C

A298198

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RHD Steering Position Type:

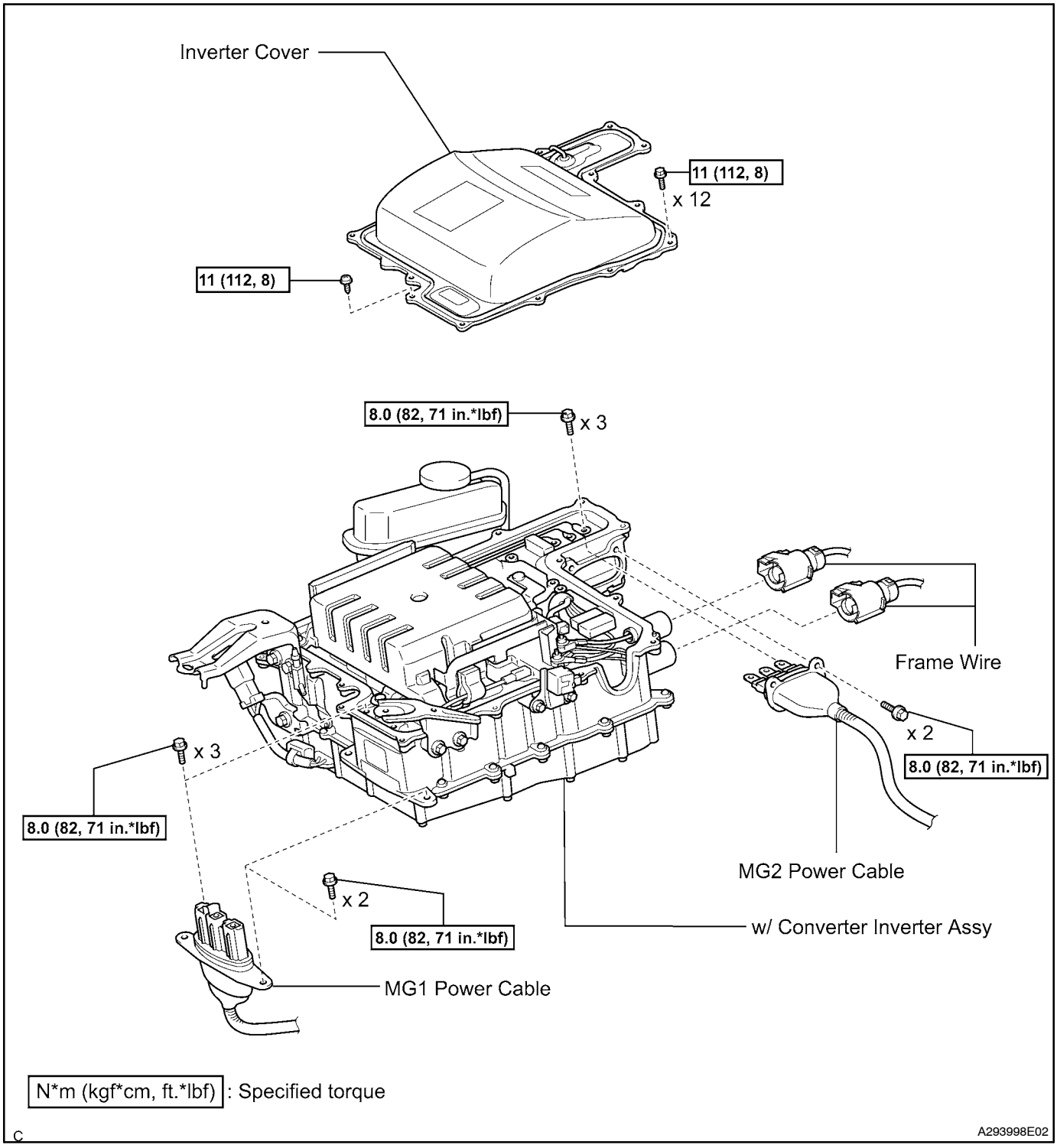


N·m (kgf·cm, ft·lbf) : Specified torque

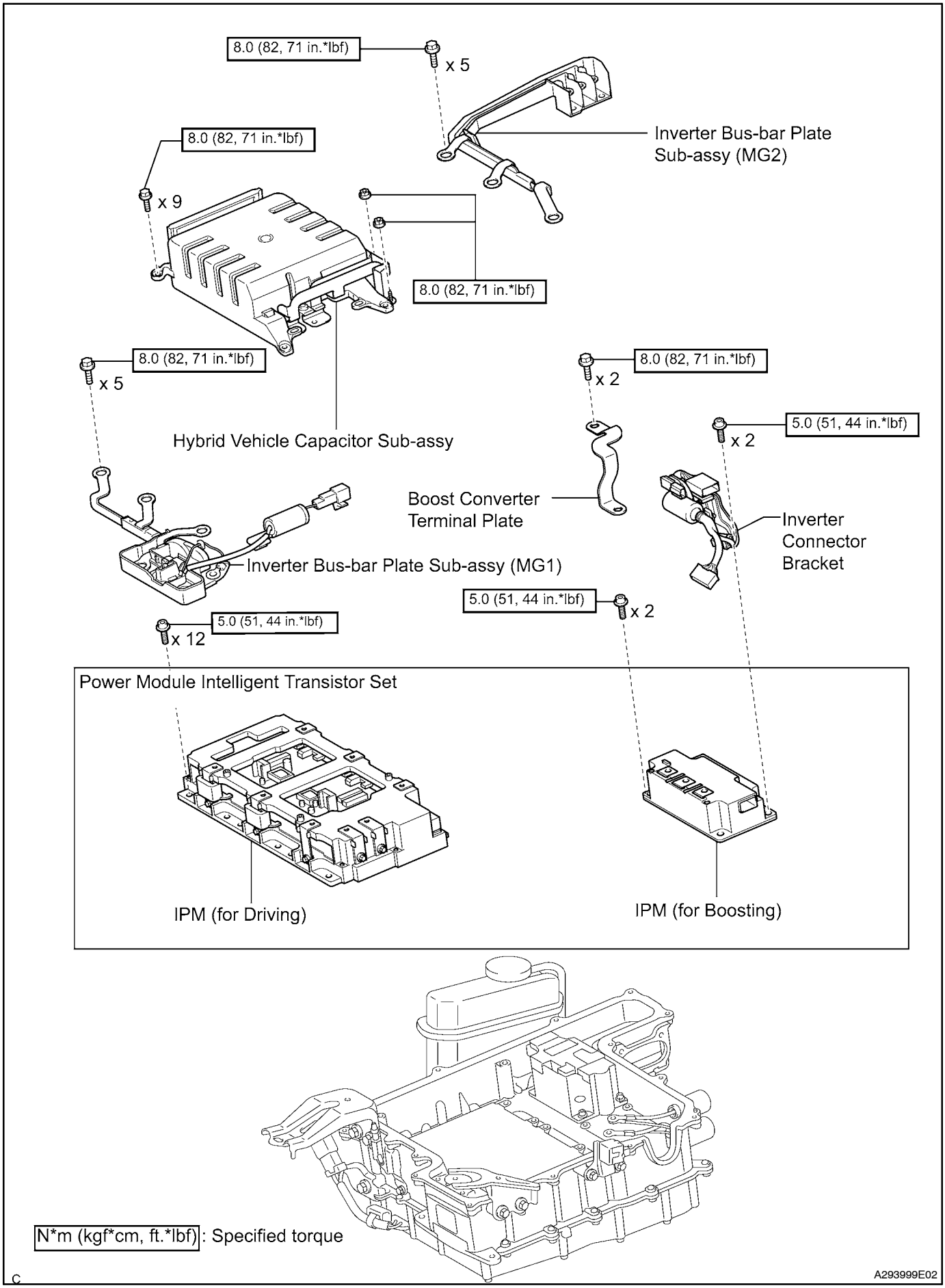
C

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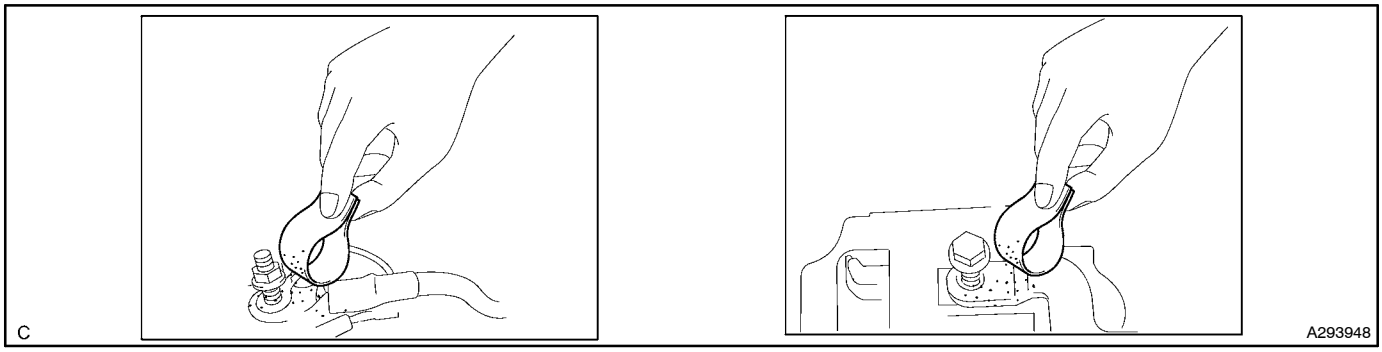
REMOVAL

CAUTION:

- **When working on high voltage systems, always wear insulating gloves.**
- **Keep the removed service plug grip in your pocket to prevent other technicians from reconnecting it while you are servicing the vehicle.**
- **After removing the service plug grip, do not touch the high voltage connectors and terminals for 5 minutes.**

NOTICE:

- **After removing the service plug grip, do not operate the power switch as it may damage the hybrid vehicle control ECU.**
- **If metal shavings are generated when bolts or nuts are removed from the with converter inverter assembly, remove them using tape or equivalent.**



HINT:

Prepare 3 tubes of grease G747 (08887–02409) when replacing the power module intelligent transistor set. Use 1 tube for the IPM (for boosting) and 2 tubes for the IPM (for driving).

1. PRECAUTION

CAUTION:

The hybrid system uses high voltage circuits, so improper handling could cause an electric shock or leakage. During service (including installation/ removal, inspection and replacement of parts), be sure to follow the procedures (see page 21–8).

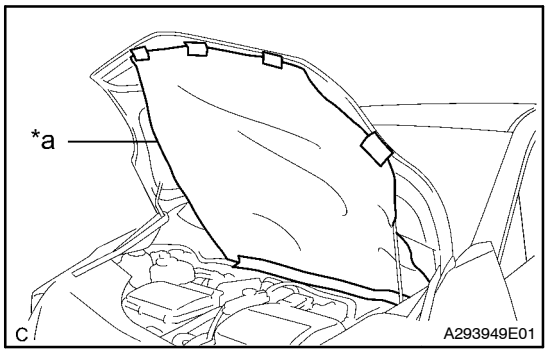
2. REMOVE REAR FLOOR BOARD NO. 2 (See page 21–120)
3. REMOVE DECK FLOOR BOX REAR (See page 21–120)
4. REMOVE REAR FLOOR BOARD NO. 3 (See page 21–120)
5. DISCONNECT BATTERY NEGATIVE TERMINAL (See page 21–120)
6. REMOVE SERVICE PLUG GRIP (See page 21–120)
7. REMOVE FRONT WIPER ARM HEAD CAP
8. REMOVE FRONT WIPER ARM (DRIVER SIDE POSITION) (See page 66–16)
9. REMOVE FRONT WIPER ARM (PASSENGER SIDE POSITION) (See page 66–16)
10. REMOVE HOOD TO COWL TOP SEAL (See page 66–16)
11. REMOVE COWL TOP VENTILATOR LOUVER LH (See page 66–16)
12. REMOVE COWL TOP VENTILATOR LOUVER RH (See page 66–16)
13. REMOVE WINDSHIELD WIPER MOTOR & LINK ASSY (See page 66–16)
14. REMOVE COWL TOP PANEL SUB–ASSY OUTER FRONT (See page 11–16)

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15. REMOVE INVERTER COVER

(a) Remove any foreign matter and moisture from the engine room, windshield and vehicle body.

(b) Attach a plastic sheet to the vehicle as shown in the illustration.

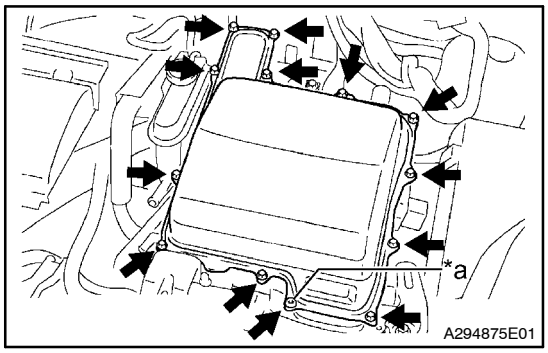


Text in Illustration

*a	Plastic Sheet

HINT:

Use a plastic sheet to keep the with converter inverter assembly free from foreign matter and moisture.



(c) Using a T30 ”TORX” socket, remove the TORX screw.

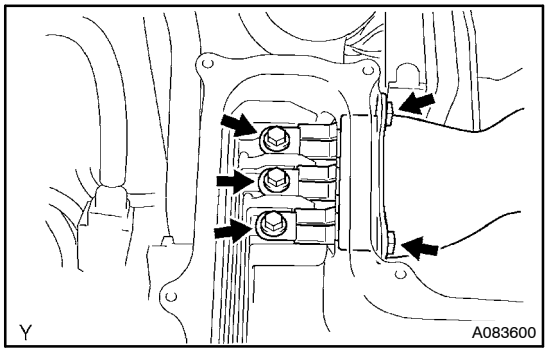
Text in Illustration

*a	TORX Screw

(d) Remove the 12 bolts and inverter cover.

16. VERIFY THAT VOLTAGE OF W/CONVERTER INVERTER ASSY IS 0 V (See page 21–25)

17. DISCONNECT FRAME WIRE (See page 21–25)



18. DISCONNECT MG2 POWER CABLE

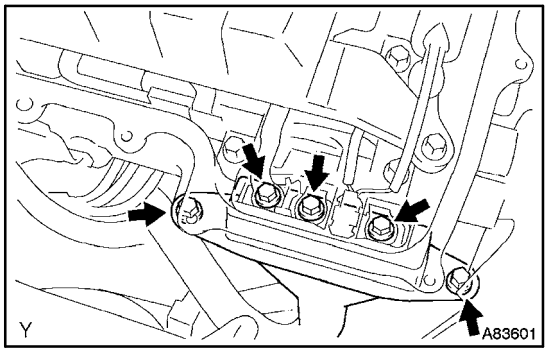
(a) Remove the 5 bolts, then disconnect the MG2 power cable.

CAUTION:

- **Wear insulating gloves.**
- **Insulate the connector parts with insulating tape.**

NOTICE:

If metal shavings are created, remove them using tape or equivalent.



19. DISCONNECT MG1 POWER CABLE

(a) Remove the 5 bolts, then disconnect the MG1 power cable.

CAUTION:

- **Wear insulating gloves.**
- **Insulate the connector parts with insulating tape.**

NOTICE:

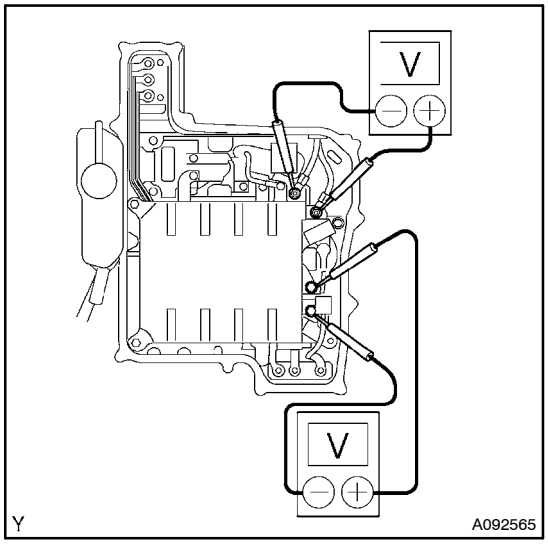
If metal shavings are created, remove them using tape or equivalent.

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20. VERIFY THAT VOLTAGE OF W/CONVERTER INVERTER ASSY IS 0 V

CAUTION:

Wear insulating gloves.



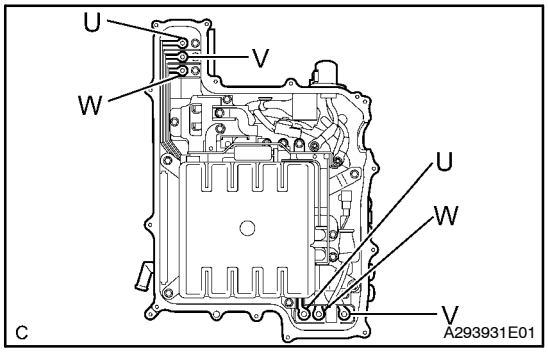
(a) Using a voltmeter, measure the voltage of the high voltage DC line.

Standard voltage:

0 V

HINT:

Use a measuring range of DC 400 V or more on the voltmeter.



(b) Using the voltmeter, measure the voltage between the terminals of the three phase connector (U – V, V – W, U – W).

Standard voltage:

0 V

HINT:

- Use a measuring range of DC 400 V or more on the voltmeter.
- If it is confirmed that high–voltage is not being applied to the with converter inverter assembly, removal/installation can be performed without using insulated tools or gloves after this step.

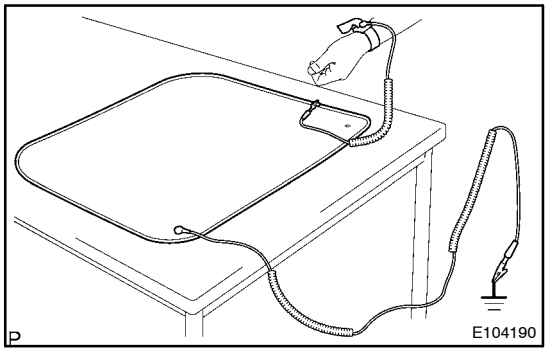
21. HOW TO PREVENT STATIC ELECTRICITY

SST 09890–47010

NOTICE:

- **Static electricity should be eliminated when handling the power module intelligent transistor set.**
- **Do not touch the electronic components of a circuit board.**
- **Keep clothes away from electronic components.**
- **Place electronic components removed from the inverter with converter assembly on SST (anti–static mat).**

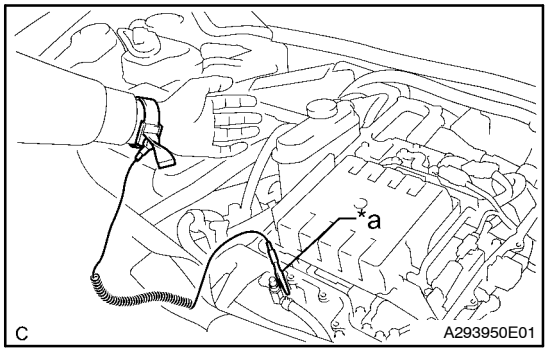
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(a) Connect the ground clip of SST (anti–static mat) securely to a ground point provided in the workshop or on a workbench (anchor bolt).

HINT:

If the ground clip cable is too short, use an extension cable.



(b) Wear SST (wrist band).

Text in Illustration

*a	Ground Clip

(c) Connect the ground clip of SST (wrist band) to the point shown in the illustration.

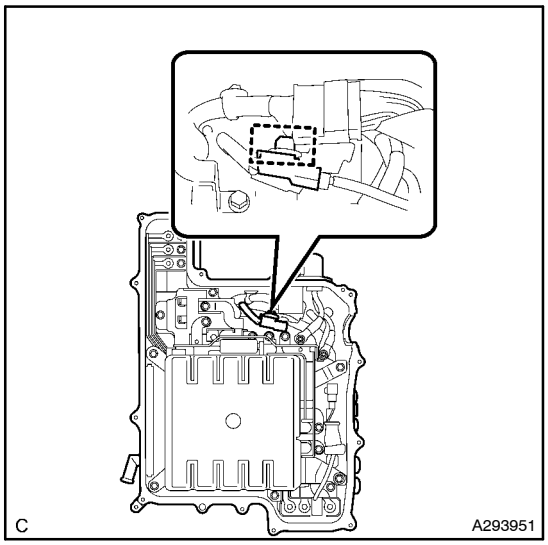
HINT:

After performing the second 0 V check, perform work with bare hands to prevent damage from static electricity and entry of foreign matter.

22. REMOVE HYBRID VEHICLE CAPACITOR SUB–ASSY

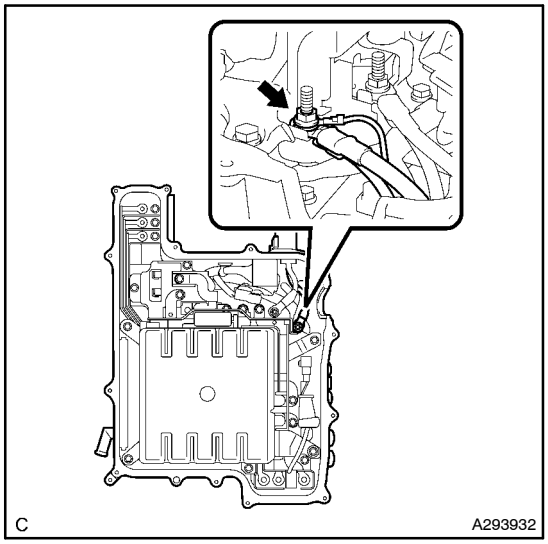
NOTICE:

If metal shavings are created, remove them using tape or equivalent.

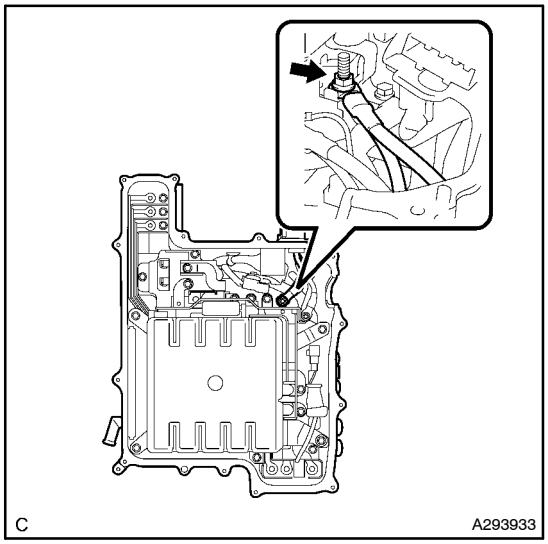


(a) Disconnect the clamp.

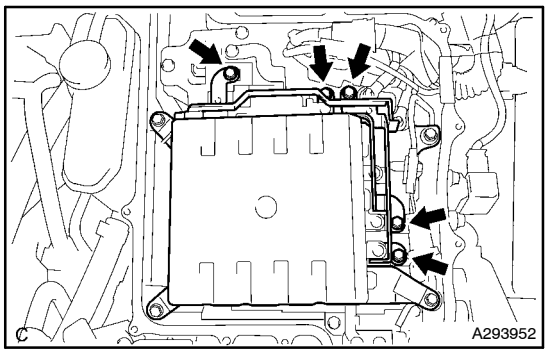
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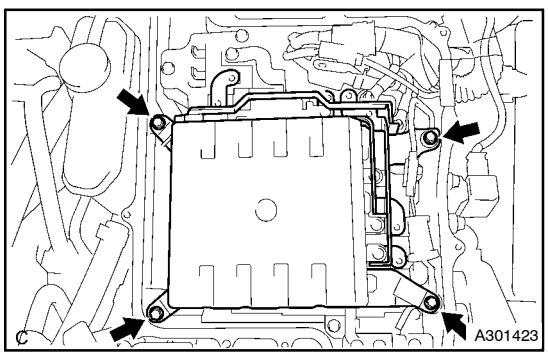
(b) Remove the nut and disconnect the 3 wire harnesses from the hybrid vehicle capacitor sub–assembly.



(c) Remove the nut and disconnect the 2 wire harnesses from the hybrid vehicle capacitor sub–assembly.

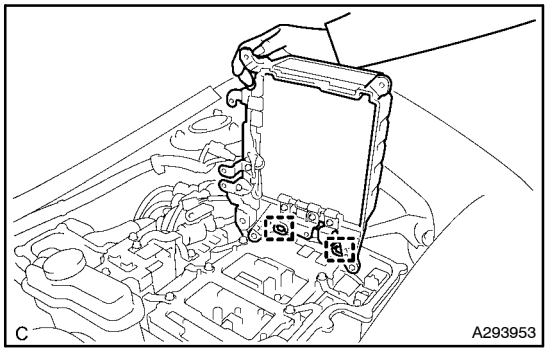


(d) Remove the 5 bolts.



(e) Remove the 4 bolts.

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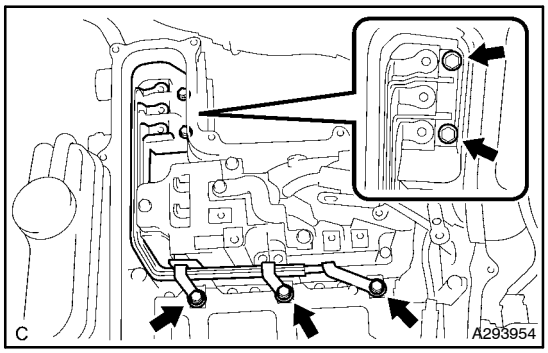


(f) Set the hybrid vehicle capacitor sub–assembly straight up, disconnect the 2 clamps and remove the hybrid vehicle capacitor sub–assembly.

23. REMOVE INVERTER BUS–BAR PLATE SUB–ASSY (MG2)

NOTICE:

If metal shavings are created, remove them using tape or equivalent.

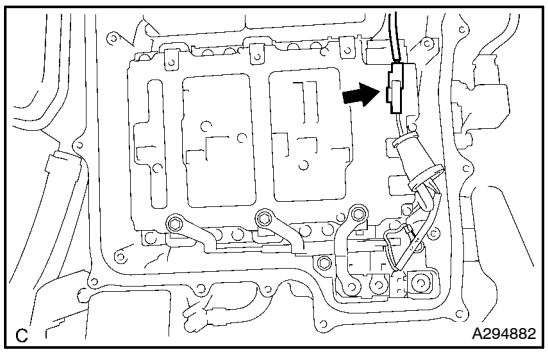


(a) Remove the 5 bolts and inverter bus–bar plate sub–assembly (MG2).

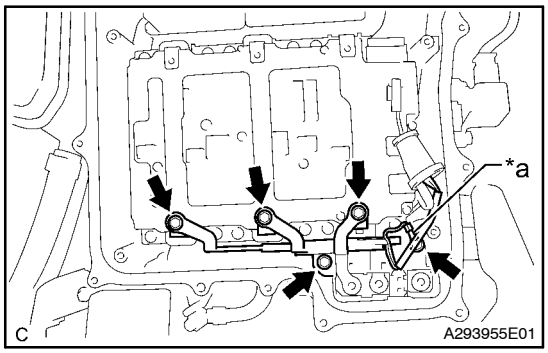
24. REMOVE INVERTER BUS–BAR PLATE SUB–ASSY (MG1)

NOTICE:

If metal shavings are created, remove them using tape or equivalent.



(a) Disconnect the connector.



(b) Remove the 5 bolts and disconnect the interlock wire and inverter bus–bar plate sub–assembly (MG1).

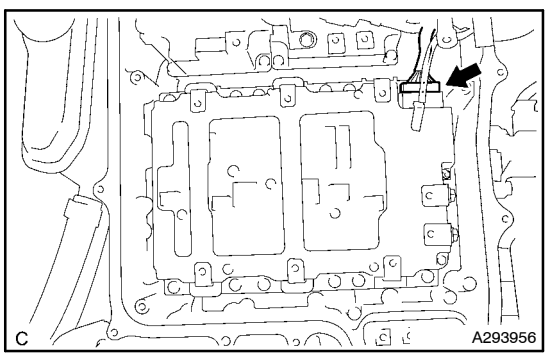
Text in Illustration

*a	Interlock Wire

25. REMOVE POWER MODULE INTELLIGENT TRANSISTOR SET

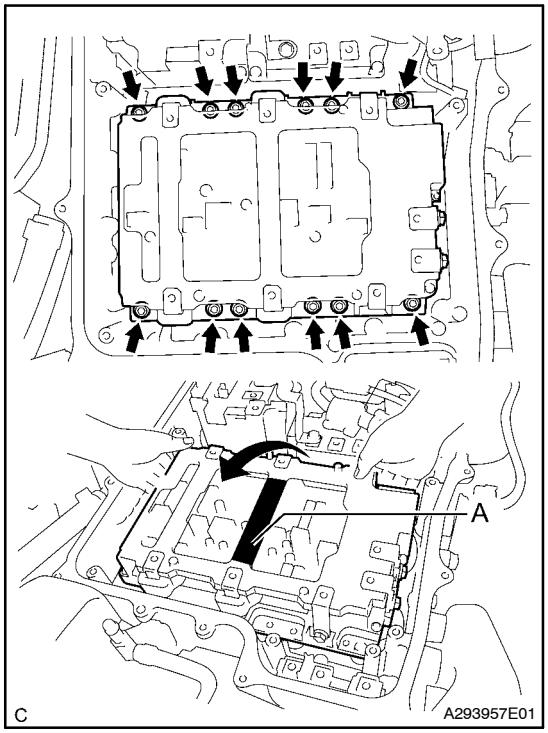
NOTICE:

If metal shavings are created, remove them using tape or equivalent.



(a) Disconnect the connector from the IPM (for driving).

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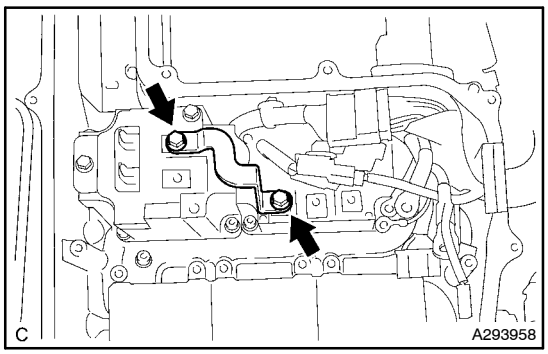
(b) Using a 5 mm hexagon wrench, remove the 12 bolts and IPM (for driving).

NOTICE:

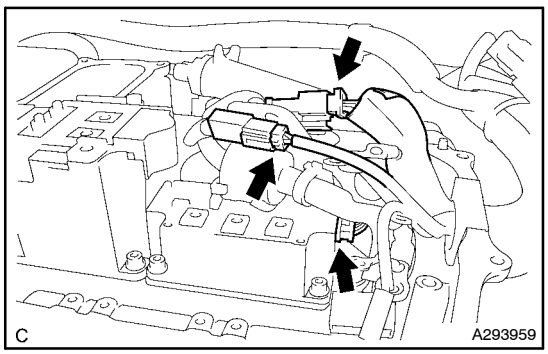
Do not hold the section (A) shown in the illustration when removing the IPM (for driving).

HINT:

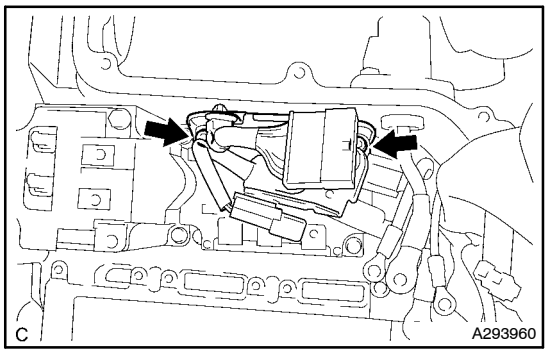
The IPM (for driving) is attached tightly with grease. Remove it by pulling up a corner.



(c) Remove the 2 bolts and boost converter terminal plate.

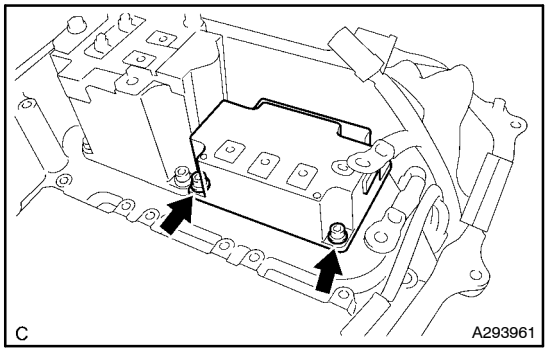


(d) Disconnect the 3 connectors.



(e) Using a 5 mm hexagon wrench, remove the 2 bolts and inverter connector bracket.

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(f) Using a 5 mm hexagon wrench, remove the 2 bolts and IPM (for boosting).

HINT:
The IPM (for boosting) is attached tightly by grease. Remove it by pulling up a corner.

INSTALLATION

NOTICE:
Make sure not to cross–thread the bolts when installing them.

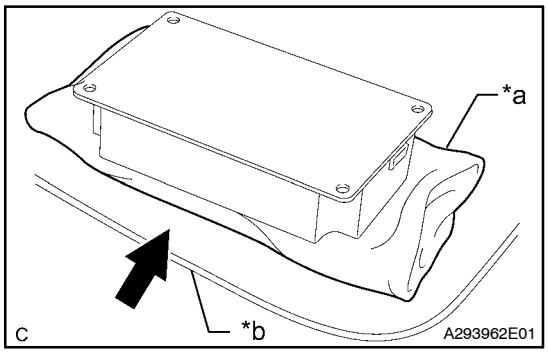
1. INSTALL POWER MODULE INTELLIGENT TRANSISTOR SET

NOTICE:

- **Keep the parts free from foreign matter.**
- **Keep grease away from other parts.**
- **Keep the bolt holes free from grease when cleaning. Clean the bolt holes if necessary.**
- **Do not spray parts cleaner directly onto the parts when cleaning.**
- **Apply parts cleaner to a piece of cloth when cleaning.**
- **Do not use compressed air when cleaning to prevent dust from flying.**

HINT:
Prepare 3 tubes of grease G747 (08887–02409) when replacing the power module intelligent transistor set. Use 1 tube for the IPM (for boosting) and 2 tubes for the IPM (for driving).

(a) Clean the bolts and inverter case with a piece of cloth and completely remove any remaining grease.



(b) Place a piece of clean cloth on SST (anti–static mat) and place IPM (for boosting) on it horizontally, upside down, with a long side toward yourself.

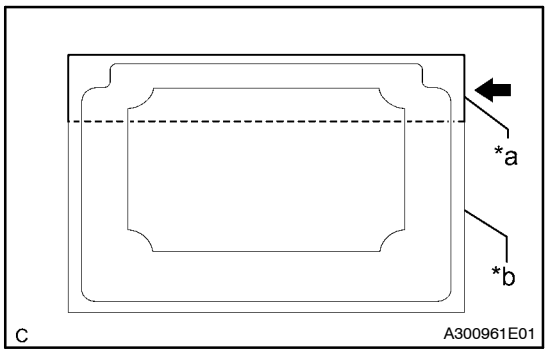
Text in Illustration

*a	Cloth
*b	SST (Anti–static Mat)

NOTICE:

- **Check that the workbench is free of foreign matter.**
- **Do not damage the installation surface of the IPM (for boosting).**

HINT:
Either of the long sides can be positioned toward yourself.



(c) Remove the backing paper (A) from the No. 2 masking seal.

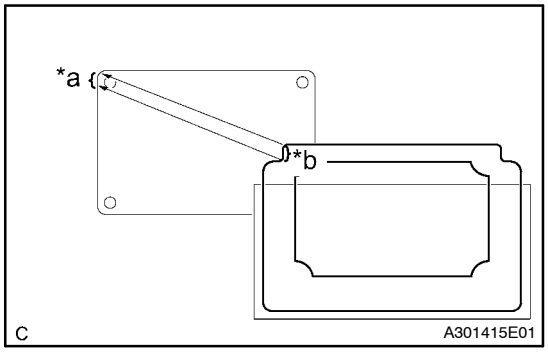
Text in Illustration

*a	Backing Paper (A)
*b	Backing Paper (B)

NOTICE:
Check that the No. 2 masking seal is not wrinkled or damaged.

HINT:
The No. 2 masking seal is included with a new power module intelligent transistor set.

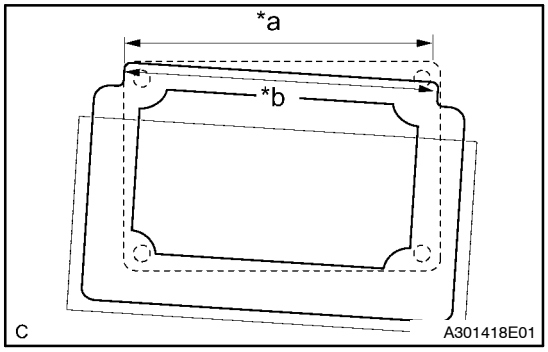
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(d) Align the edge of the No. 2 masking seal with the edge of the IPM (for boosting) as shown in the illustration.

Text in Illustration

*a	IPM (for boosting) Edge
*b	No. 2 Masking Seal Edge for Vertical Positioning

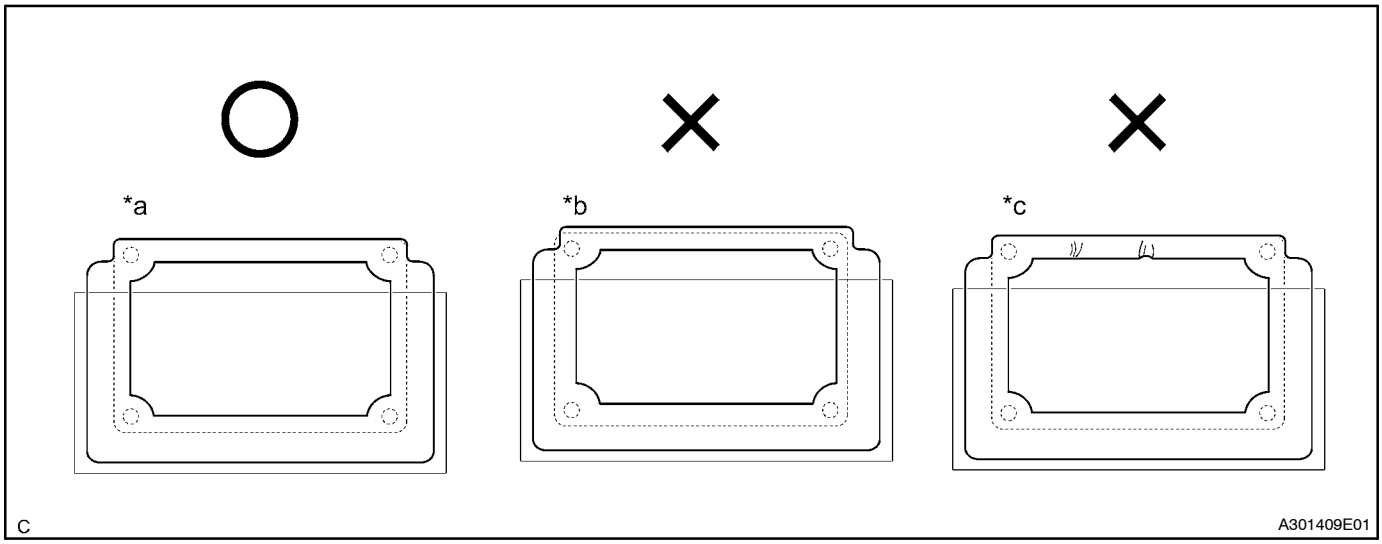


(e) Align the edge of the No. 2 masking seal with the edge of the IPM (for boosting) as shown in the illustration and temporarily attach the No. 2 masking seal.

Text in Illustration

*a	IPM (for boosting) Edge
*b	Edge of No. 2 Masking Seal for Horizontal Positioning

(f) Check that the No. 2 masking seal is attached correctly.



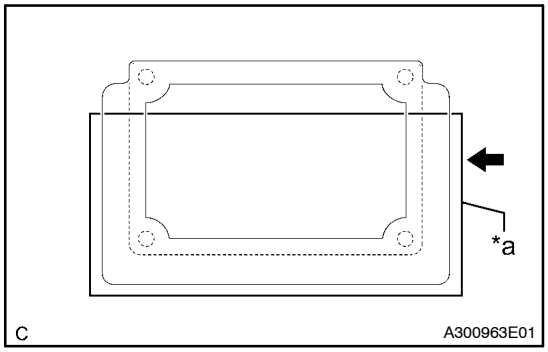
Text in Illustration

*a	OK (Edge of the No. 2 masking seal is aligned with the edge of the IPM (for boosting))	*b	NG (Edge of the No. 2 masking seal is not aligned with the edge of the IPM (for boosting))
*c	NG (No. 2 masking seal is wrinkled or partially separated)	–	–

HINT:

If the No. 2 masking seal is misaligned or wrinkled, reattach it.

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(g) Remove the backing paper (B) from the No. 2 masking seal and attach the No. 2 masking seal to the IPM (for boosting).

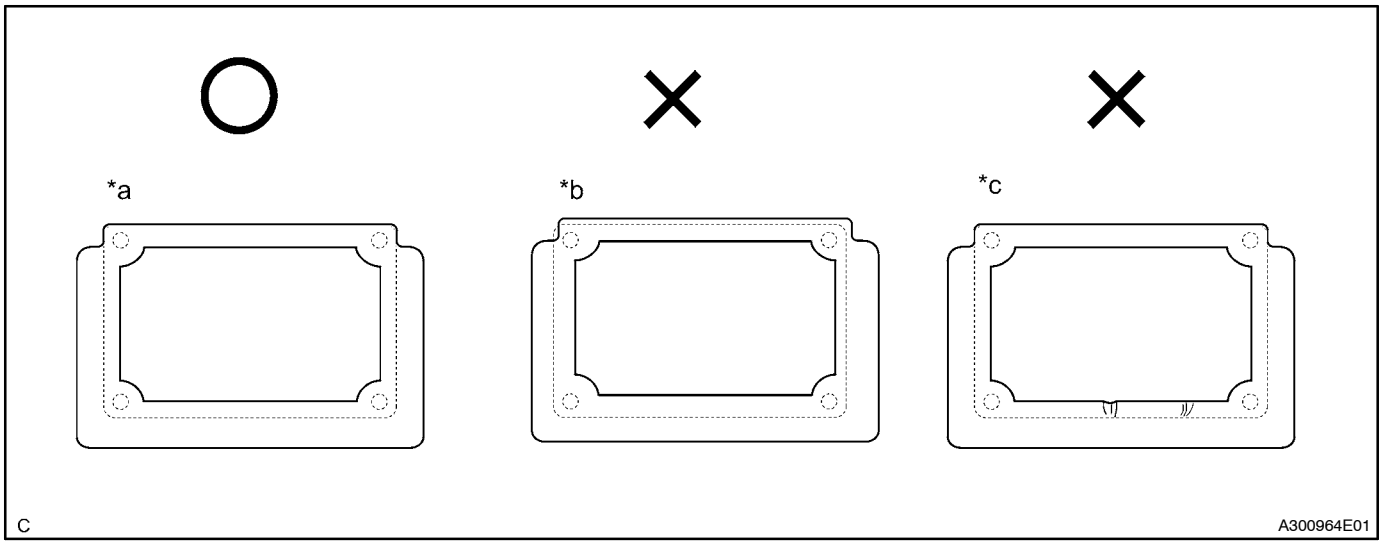
Text in Illustration

*a	Backing Paper (B)

HINT:

Carefully remove the backing paper (B) so that the No. 2 masking seal does not peel off of the IPM (for boosting).

(h) Check that the No. 2 masking seal is attached correctly, then firmly press on the No. 2 masking seal with your fingers to securely attach it.



Text in Illustration

*a	OK (Edge of the No. 2 masking seal is aligned with the edge of the IPM (for boosting))	*b	NG (Edge of the No. 2 masking seal is not aligned with the edge of the IPM (for boosting))
*c	NG (No. 2 masking seal is wrinkled or partially separated)	–	–

HINT:

If the No. 2 masking seal is misaligned or wrinkled, reattach it.

(i) Gently squeeze the tube of grease with the cap on to mix the ingredients.

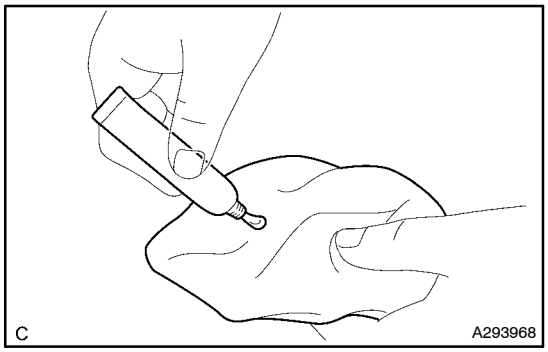
HINT:

Use 1 tube of grease G747 for the IPM (for boosting).

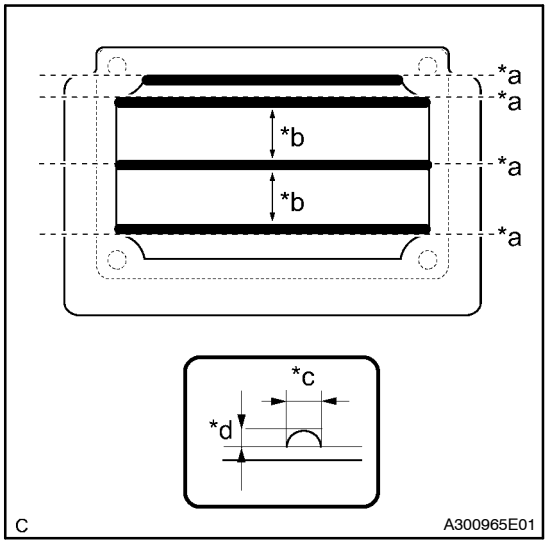
(j) Apply a small amount of grease to a piece of cloth.

HINT:

Some clear liquid may come out first. Squeeze it out completely onto a piece of cloth.



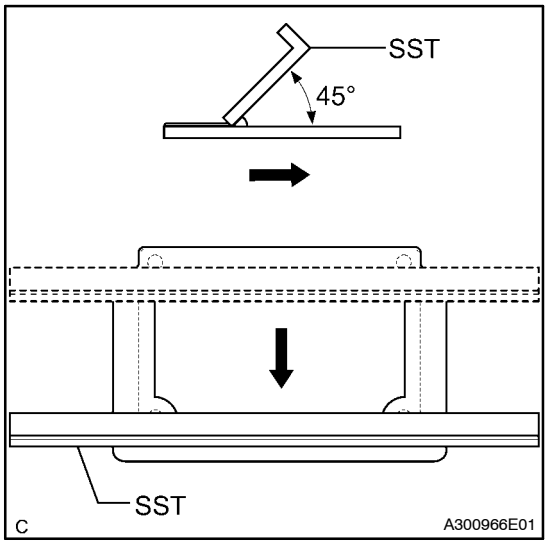
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(k) Apply grease along the 4 reference lines as shown in the illustration.

Text in Illustration

*a	Reference Line
*b	Equal Spacing
*c	Approximately 6.0 mm (0.236 in.)
*d	Approximately 2.5 mm (0.0984 in.)

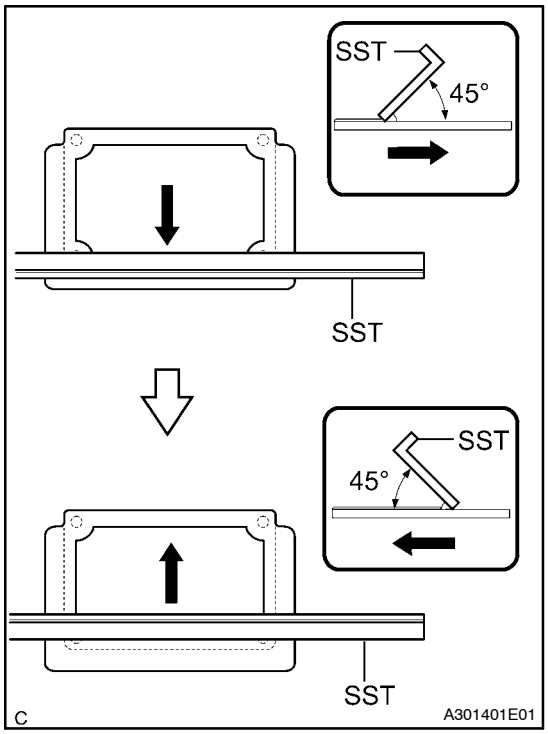


(l) Using SST, apply the grease smoothly and evenly by spreading it in the direction shown by the arrows in the illustration.

SST 09891–47010

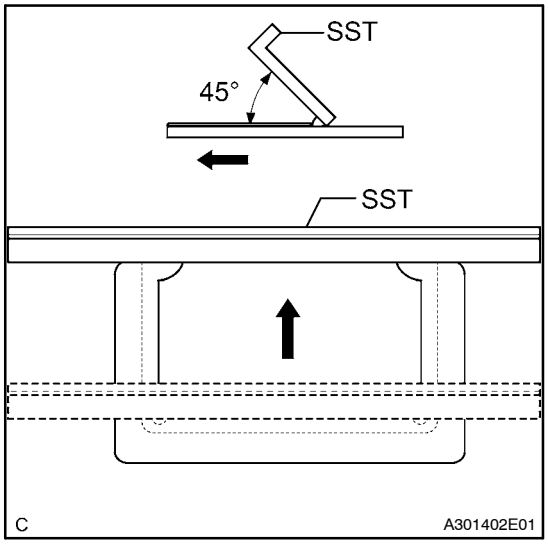
NOTICE:

- **Check that the area of SST that contacts the grease is not damaged.**
- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**



(m) Change the orientation of SST as shown in the illustration.

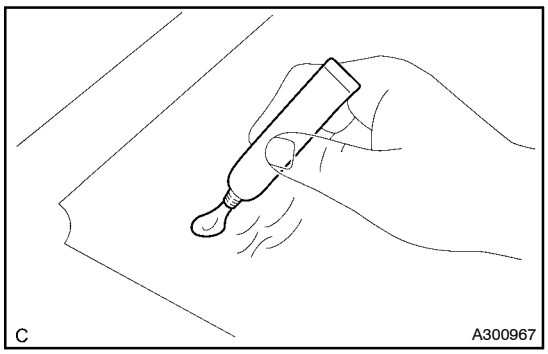
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(n) Using SST, apply the grease smoothly and evenly by spreading it in the direction shown by the arrows in the illustration.

NOTICE:

- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**

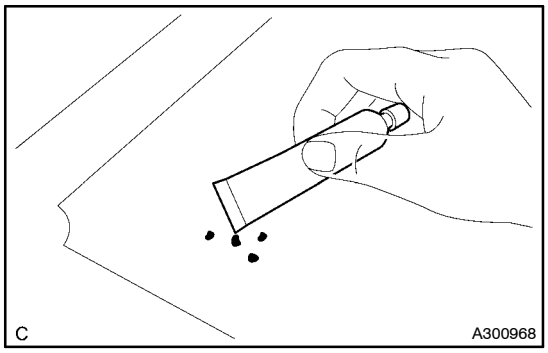


(o) If the grease layer is uneven and the part surface shows through, apply more grease.

(p) Using SST, apply the grease smoothly and evenly.

NOTICE:

- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**



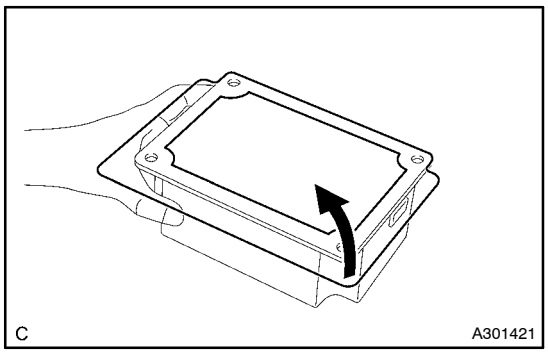
(q) If foreign matter has attached to the part surface, scrape it off using the edge of the grease tube, and apply more grease.

(r) Using SST, apply the grease smoothly and evenly.

NOTICE:

- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**

(s) Check that grease has been applied smoothly and evenly.

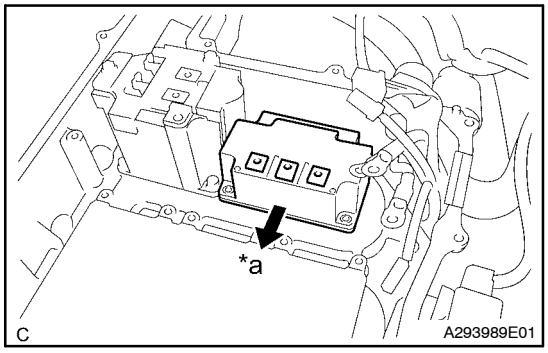


(t) Remove the No. 2 masking seal from the IPM (for boosting).

NOTICE:

Slowly remove the No. 2 masking seal without touching the grease surface.

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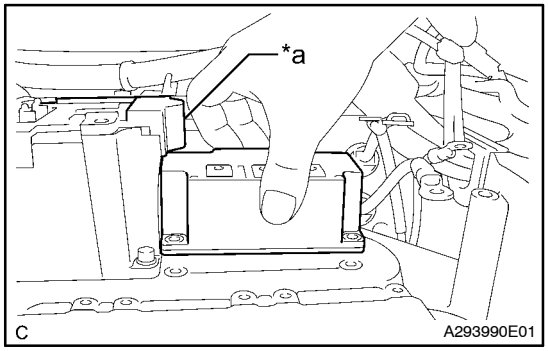
(u) Confirm the installation direction of the IPM (for boosting).

Text in Illustration

*a	Front of Vehicle

NOTICE:

Check that the IPM (for boosting) installation surface is free of foreign matter.



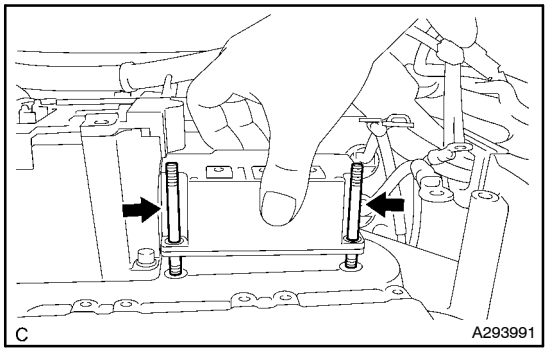
(v) Hold the IPM (for boosting) at a position under the protrusion of the boost converter reactor assembly.

Text in Illustration

*a	Protrusion of the Boost Converter Reactor Assembly

NOTICE:

Keep other parts free from grease.



(w) While holding the IPM (for boosting), install the 2 guide pins to hold the IPM (for boosting) in place.

NOTICE:

- **If the IPM (for boosting) moves after being installed to the inverter case, the grease layer may become uneven, resulting in improper heat transfer. Therefore, the guide pins are used to position the IPM (for boosting).**
- **Keep other parts free from grease.**

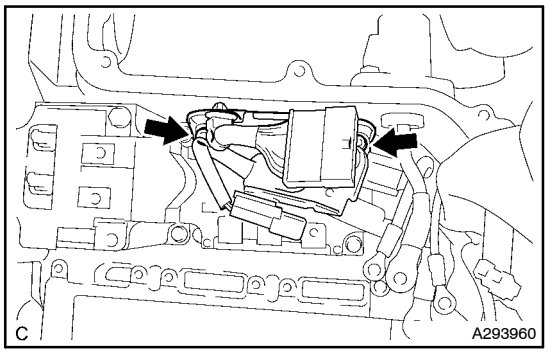
HINT:

The guide pins are included with a new power module intelligent transistor set.

(x) While aligning the bolt holes, set the IPM (for boosting) on the inverter case levelly.

NOTICE:

Keep other parts free from grease.



(y) Temporarily install the inverter connector bracket and IPM (for boosting) with the 2 bolts.

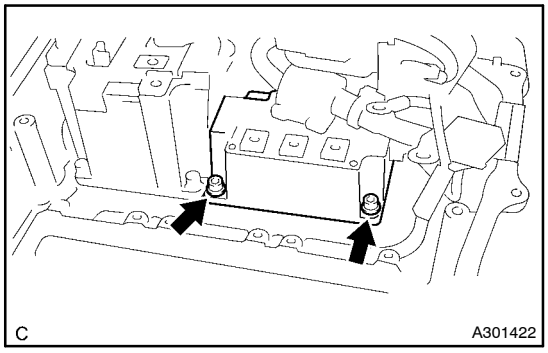
HINT:

Bolt length: 17 mm (0.669 in.)

NOTICE:

Keep other parts free from grease.

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(z) Remove the 2 guide pins and temporarily install the 2 bolts to the IPM (for boosting).

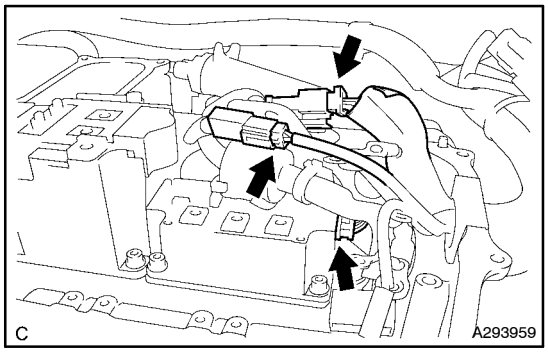
HINT:

Bolt length: 17 mm (0.669 in.)

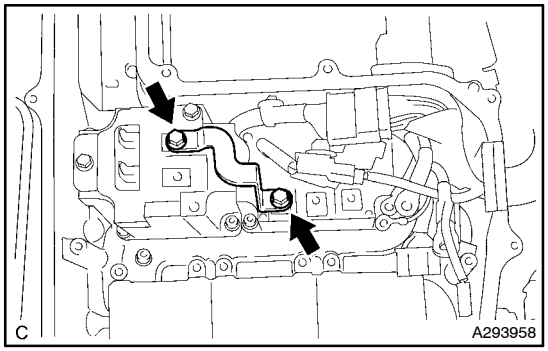
(aa) Using a 5 mm hexagon wrench, tighten the 4 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

HINT:

When the bolts are tightened, grease may seep out of the IPM (for boosting) installation surface. There is no need to wipe if off as performance and quality will not be affected.



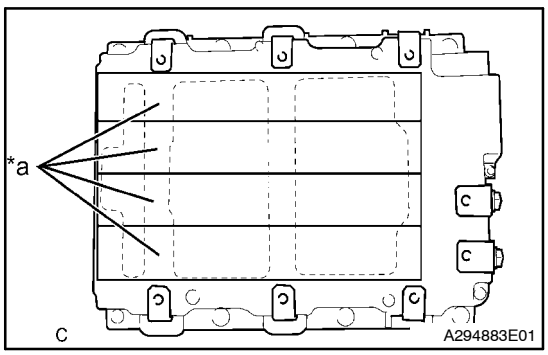
(ab) Connect the 3 connectors.



(ac) Install the boost converter terminal plate with the 2 bolts.
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

HINT:

Bolt length: 14 mm (0.551 in.)



(ad) Attach tape to the IPM (for driving) to keep the circuit board free from foreign matter.

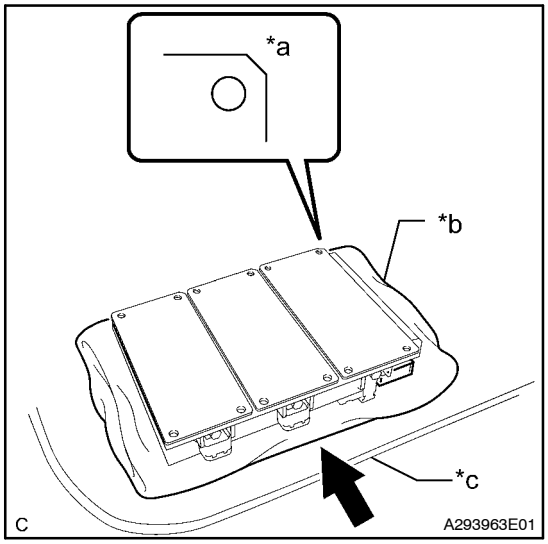
Text in Illustration

*a	Tape

NOTICE:

- **Use non–residue type masking tape.**
- **Do not cover the terminals.**
- **Attach the tape without leaving any space between each piece.**

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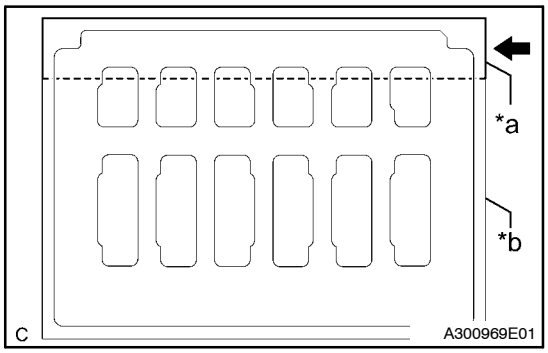
(ae) Place a piece of clean cloth on SST (anti–static mat) and place the IPM (for driving) on it horizontally, upside down, with the cut corner positioned away from yourself.

Text in Illustration

*a	Cut Corner
*b	Cloth
*c	SST (Anti–static Mat)

NOTICE:

- **Be sure to position the IPM (for driving) as specified. Grease must be applied and spread in a certain direction.**
- **Check that the workbench is free of foreign matter.**
- **Do not damage the installation surface of the IPM (for driving).**
- **Do not touch the circuit board of the IPM (for driving).**



(af) Remove the backing paper (A) from the No. 1 masking seal.

Text in Illustration

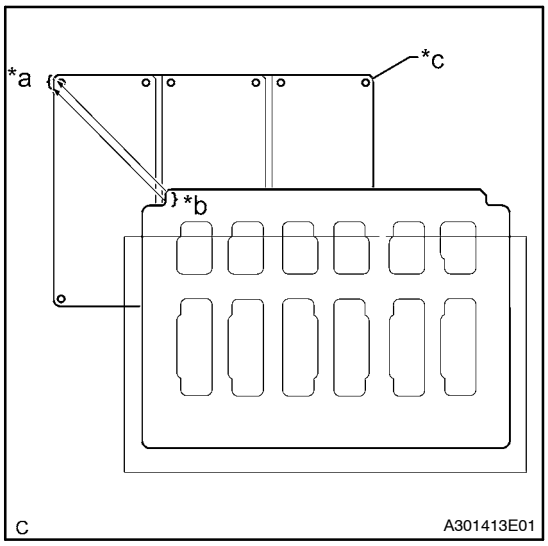
*a	Backing Paper (A)
*b	Backing Paper (B)

NOTICE:

Check that the No. 1 masking seal is not wrinkled or damaged.

HINT:

The No. 1 masking seal is included with a new power module intelligent transistor set.

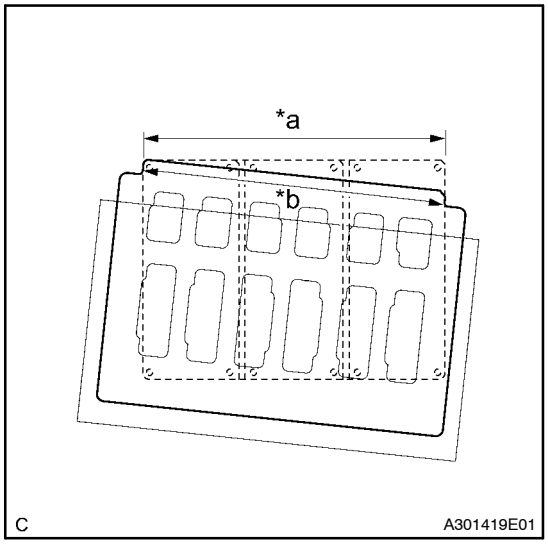


(ag) Align the edge of the No. 1 masking seal with the edge of the IPM (for driving) as shown in the illustration.

Text in Illustration

*a	IPM (for driving) Edge
*b	No. 1 Masking Seal Edge for Vertical Positioning
*c	Cut Corner

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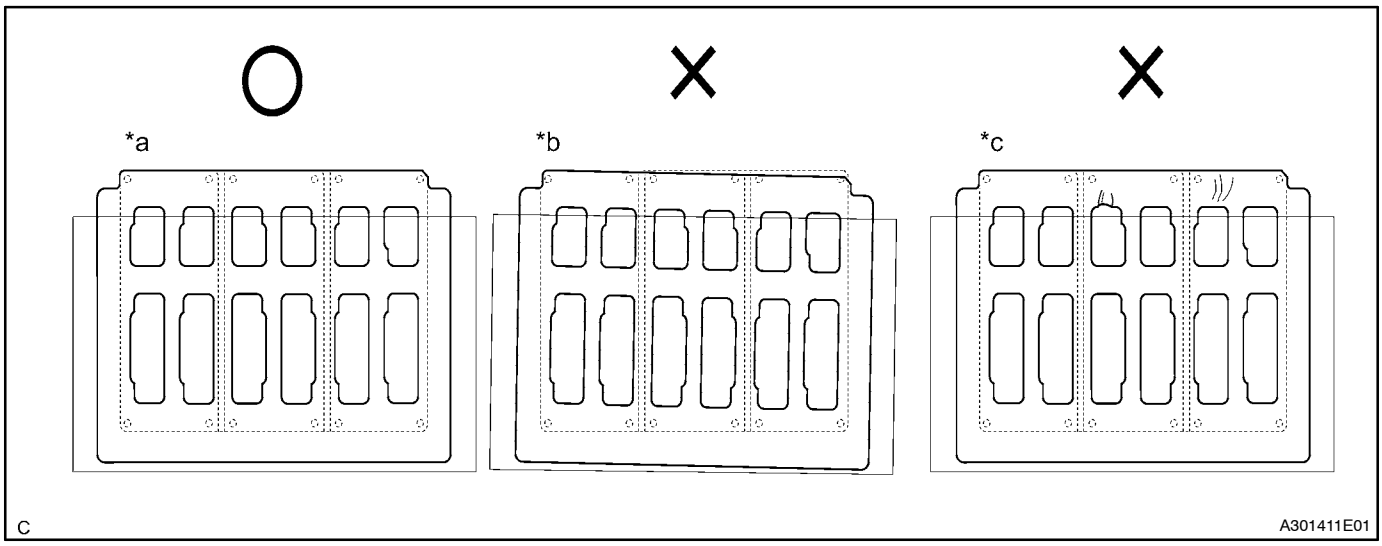


(ah) Align the edge of the No. 1 masking seal with the edge of the IPM (for driving) as shown in the illustration and temporarily attach the No. 1 masking seal.

Text in Illustration

*a	IPM (for driving) Edge
*b	Edge of No. 1 Masking Seal for Horizontal Positioning

(ai) Check that the No. 1 masking seal is attached correctly.

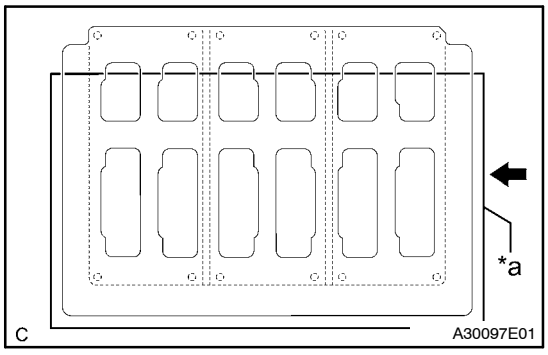


Text in Illustration

*a	OK (Edge of the No. 1 masking seal is aligned with the edge of the IPM (for driving))	*b	NG (Edge of the No. 1 masking seal is not aligned with the edge of the IPM (for driving))
*c	NG (No. 1 masking seal is wrinkled or partially separated)	–	–

HINT:

If the No. 1 masking seal is misaligned or wrinkled, reattach it.



(aj) Remove the backing paper (B) from the No. 1 masking seal and attach the No. 1 masking seal to the IPM (for driving).

Text in Illustration

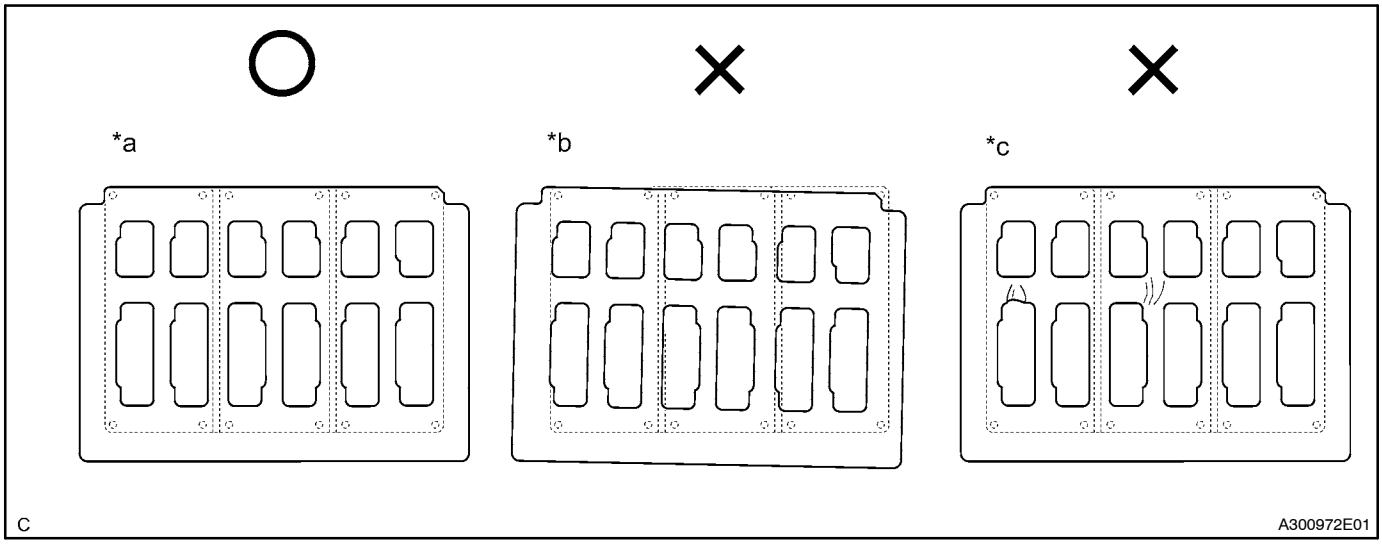
*a	Backing Paper (B)

HINT:

Carefully remove the backing paper (B) so that the No. 1 masking seal does not peel off of the IPM (for driving).

(ak) Check that the No. 1 masking seal is attached correctly, then firmly press on the No. 1 masking seal with your fingers to securely attach it.

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Text in Illustration

*a	OK (Edge of the No. 1 masking seal is aligned with the edge of the IPM (for driving))	*b	NG (Edge of the No. 1 masking seal is not aligned with the edge of the IPM (for driving))
*c	NG (No. 1 masking seal is wrinkled or partially separated)	–	–

HINT:

If the No. 1 masking seal is misaligned or wrinkled, reattach it.

(al) Gently squeeze the tube of grease with the cap on to mix the ingredients.

HINT:

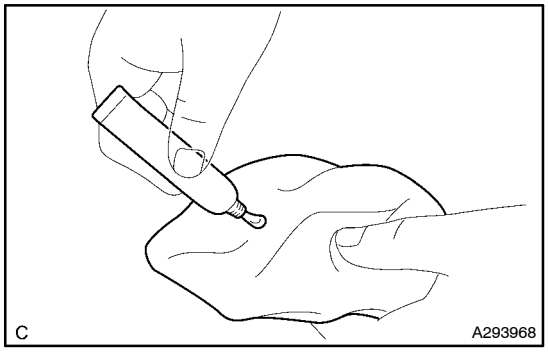
Use 2 tubes of grease G747 for the IPM (for driving).

(am) Apply a small amount of grease to a piece of cloth.

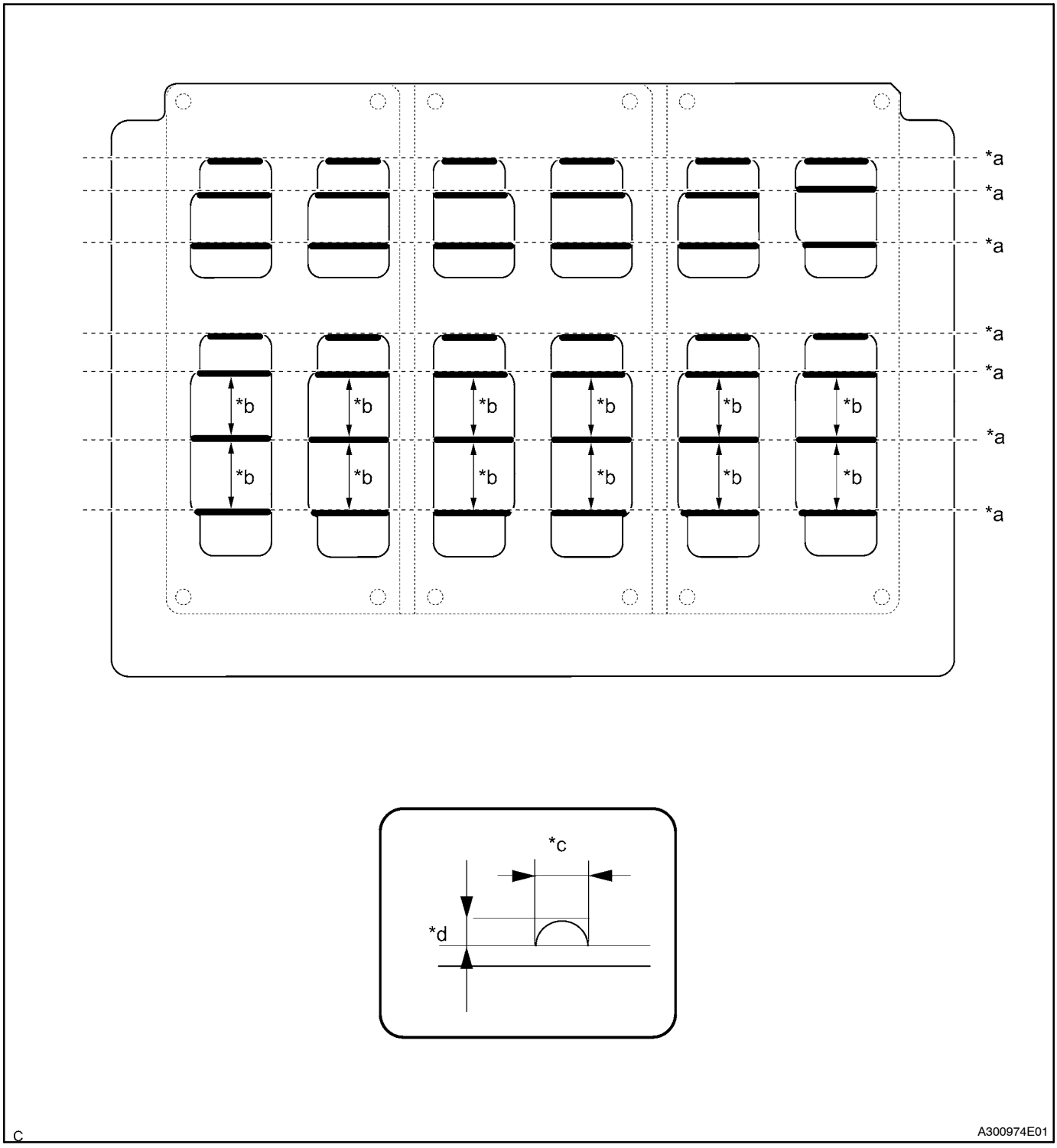
HINT:

Some clear liquid may come out first. Squeeze it out completely onto a piece of cloth.

(an) Apply grease along the 42 reference lines as shown in the illustration.



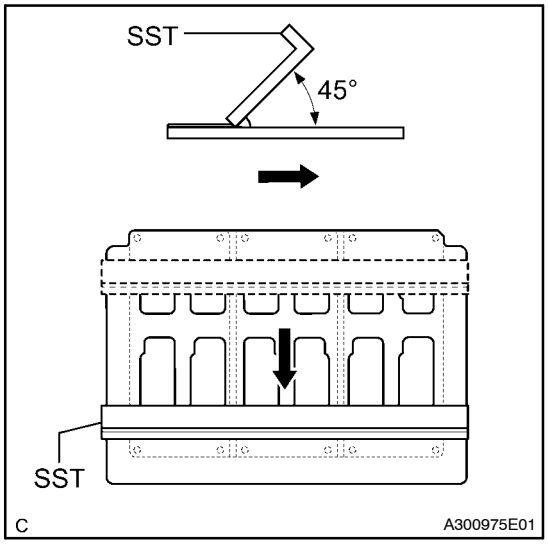
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Text in Illustration

*a	Reference Line	*b	Equal Spacing
*c	Approximately 6.0 mm (0.236 in.)	*d	Approximately 2.5 mm (0.0984 in.)

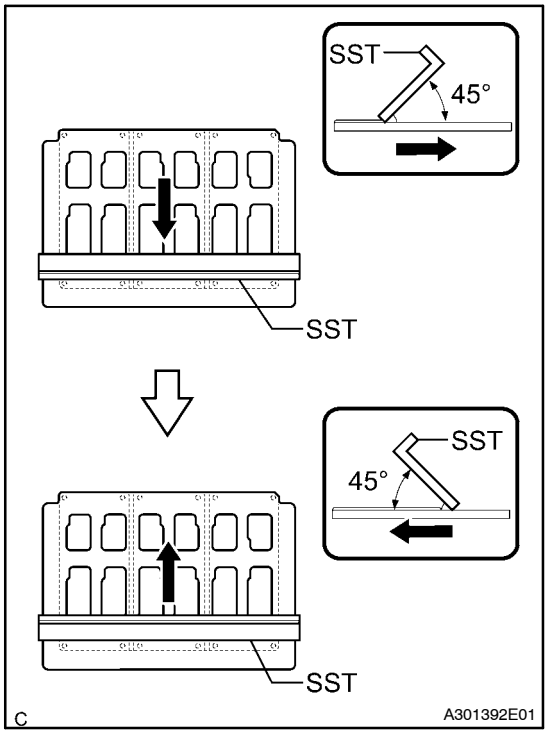
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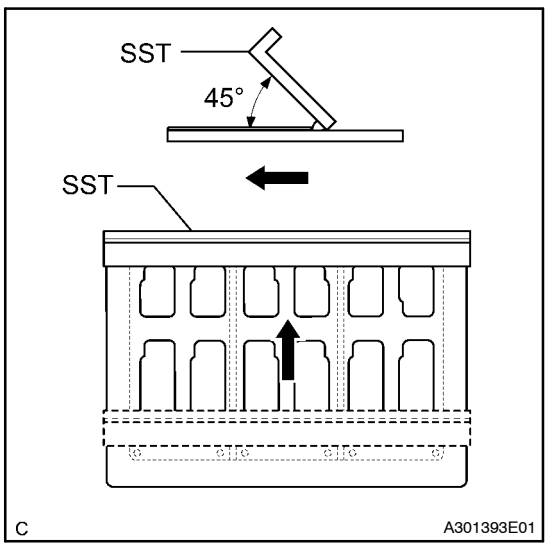
(ao) Using SST, apply the grease smoothly and evenly by spreading it in the direction shown by the arrows in the illustration.
SST 09891–47010

NOTICE:

- **Check that the area of SST that contacts the grease is not damaged.**
- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**



(ap) Change the orientation of SST as shown in the illustration.

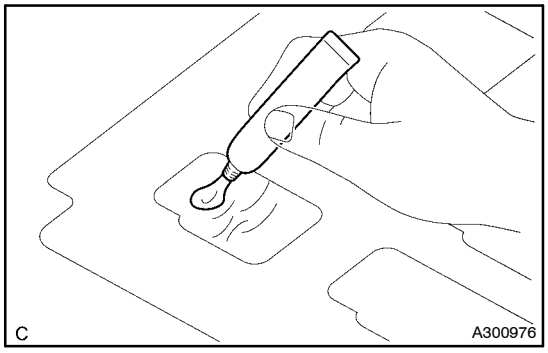


(aq) Using SST, apply the grease smoothly and evenly by spreading it in the direction shown by the arrows in the illustration.

NOTICE:

- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**

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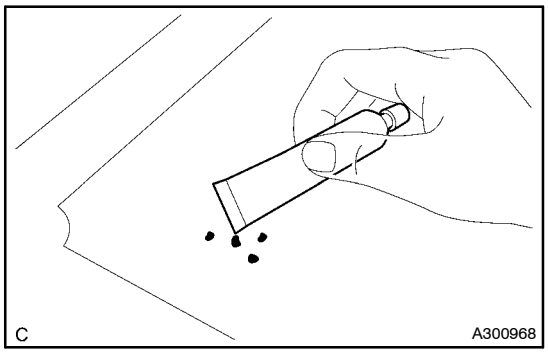


(ar) If the grease layer is uneven and the part surface shows through, apply more grease.

(as) Using SST, apply the grease smoothly and evenly.

NOTICE:

- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**



(at) If foreign matter has attached to the part surface, scrape it off using the edge of the grease tube, and apply more grease.

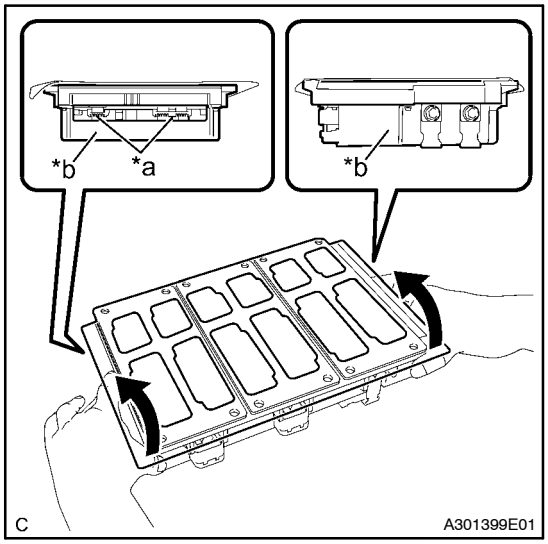
(au) Using SST, apply the grease smoothly and evenly.

NOTICE:

- **Apply the grease smoothly and evenly to ensure proper heat transfer.**
- **Keep the SST at a 45–degree angle and perform work carefully.**

(av) Check that grease has been applied smoothly and evenly.

(aw) Remove the No. 1 masking seal from the IPM (for driving) (two–person job).

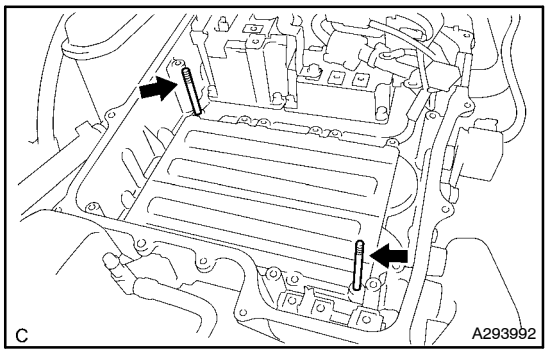


Text in Illustration

*a	Do not touch the circuit board.
*b	Hold

NOTICE:

- **Remove the No. 1 masking seal while having another person hold the IPM (for driving) as the No. 1 masking seal is attached by grease.**
- **Slowly remove the No. 1 masking seal without touching the grease surface.**



(ax) Install the 2 guide pins to the inverter case to position the IPM (for driving).

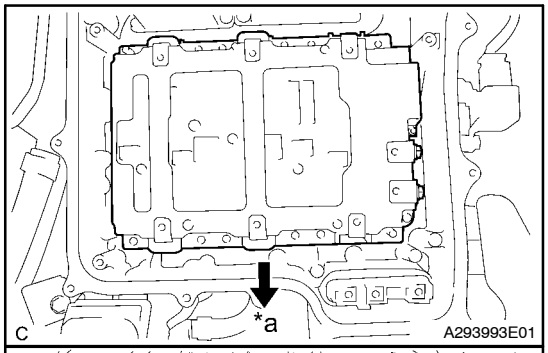
NOTICE:

- **Check that the IPM (for driving) installation surface is free of foreign matter.**
- **If the IPM (for driving) moves after being installed to the inverter case, the grease layer may become uneven, resulting in improper heat transfer. Therefore, the guide pins are used to position the IPM (for driving).**

HINT:

The guide pins are included with a new power module intelligent transistor set.

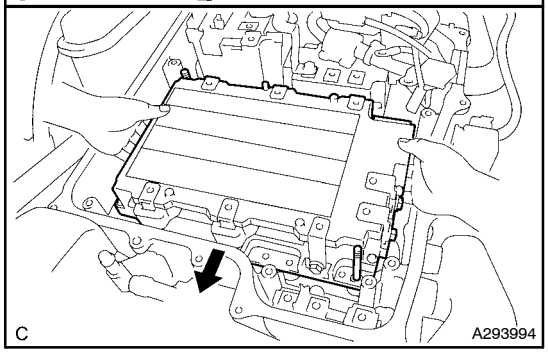
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(ay) Confirm the installation direction of the IPM (for driving).

Text in Illustration

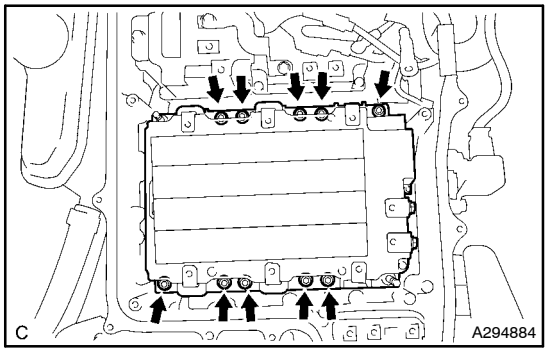
*a	Front of Vehicle



(az) While holding the IPM (for driving) by hand, set it on the inverter case levelly.

NOTICE:

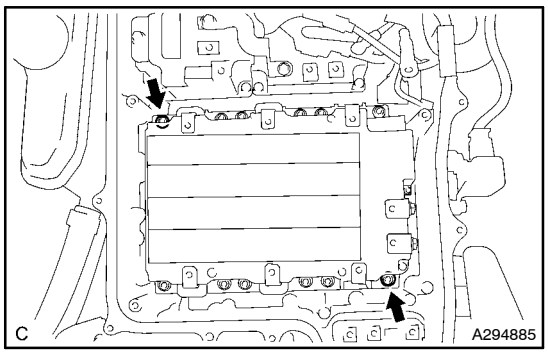
- **Do not touch the circuit board of the IPM (for driving).**
- **Keep other parts free from grease.**



(ba) Temporarily install the IPM (for driving) with the 10 bolts.

HINT:

Bolt length: 17 mm (0.669 in.)



(bb) Remove the 2 guide pins and temporarily install the 2 bolts to the IPM (for driving).

HINT:

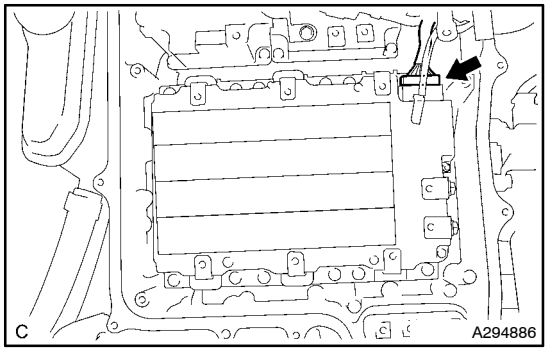
Bolt length: 17 mm (0.669 in.)

(bc) Using a 5 mm hexagon wrench, tighten the 12 bolts (in any tightening order).

Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

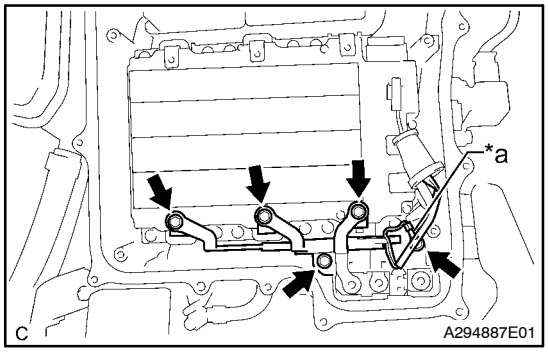
HINT:

When the bolts are tightened, grease may seep out of the IPM (for driving) installation surface. There is no need to wipe if off as performance and quality will not be affected.



(bd) Connect the connector to the IPM (for driving).

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2. INSTALL INVERTER BUS–BAR PLATE SUB–ASSY (MG1)

(a) Install the inverter bus–bar plate sub–assembly (MG1) and connect the interlock wire with the 5 bolts.

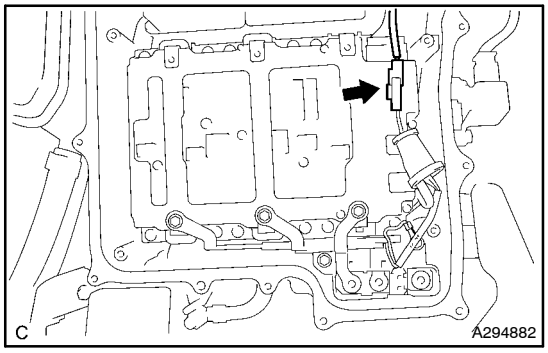
Text in Illustration

*a	Interlock Wire

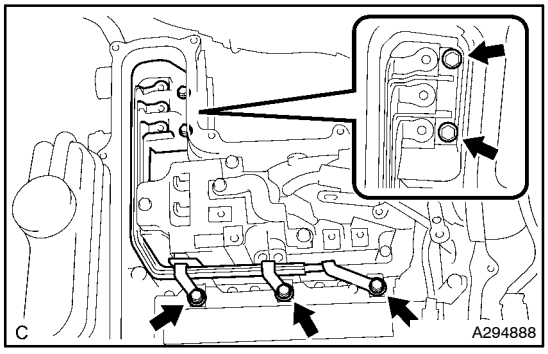
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

HINT:

Bolt length: 17 mm (0.551 in.)



(b) Connect the connector.



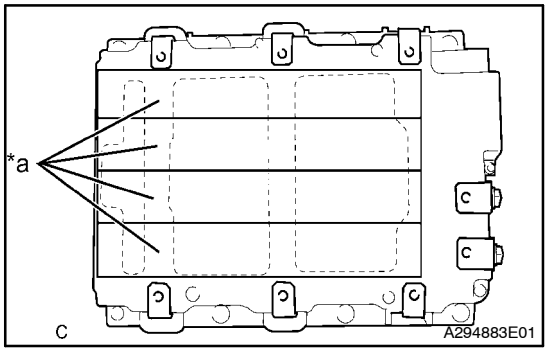
3. INSTALL INVERTER BUS–BAR PLATE SUB–ASSY (MG2)

(a) Install the inverter bus–bar plate sub–assembly (MG2) with the 5 bolts.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

HINT:

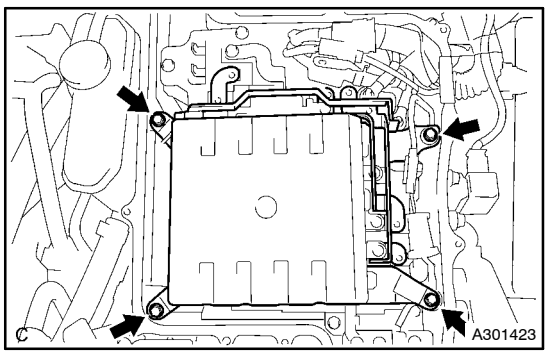
Bolt length: 14 mm (0.551 in.)



(b) Remove the tape from the IPM (for driving).

Text in Illustration

*a	Tape



4. INSTALL HYBRID VEHICLE CAPACITOR SUB–ASSY

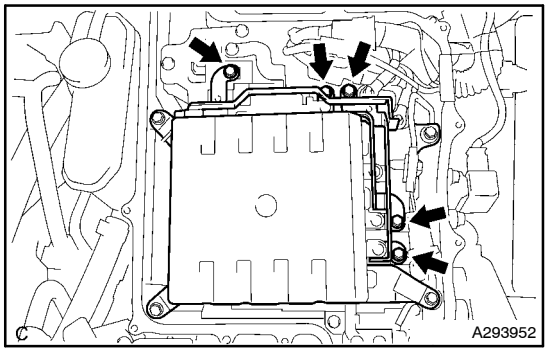
(a) Install the hybrid vehicle capacitor sub–assembly with the 4 bolts.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

HINT:

Bolt length: 14 mm (0.551 in.)

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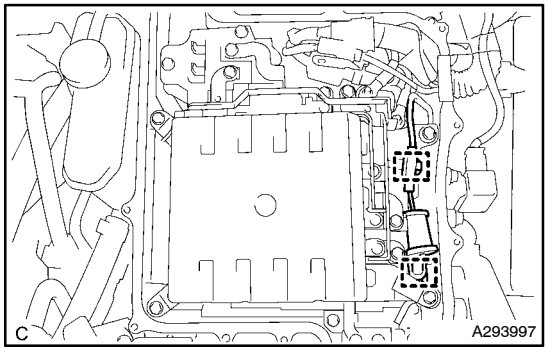


(b) Install the 5 bolts.

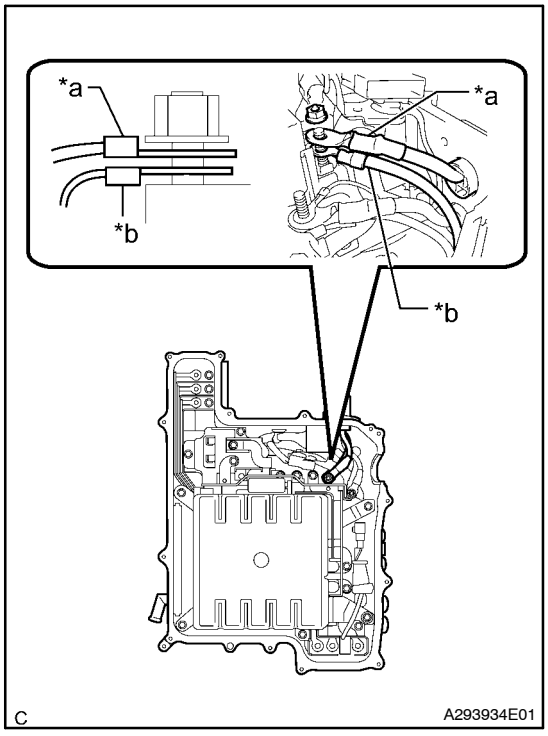
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

HINT:

Bolt length: 14 mm (0.551 in.)



(c) Connect the 2 clamps.



(d) Connect the 2 wire harnesses to the hybrid vehicle capacitor sub–assembly as shown in the illustration.

Text in Illustration

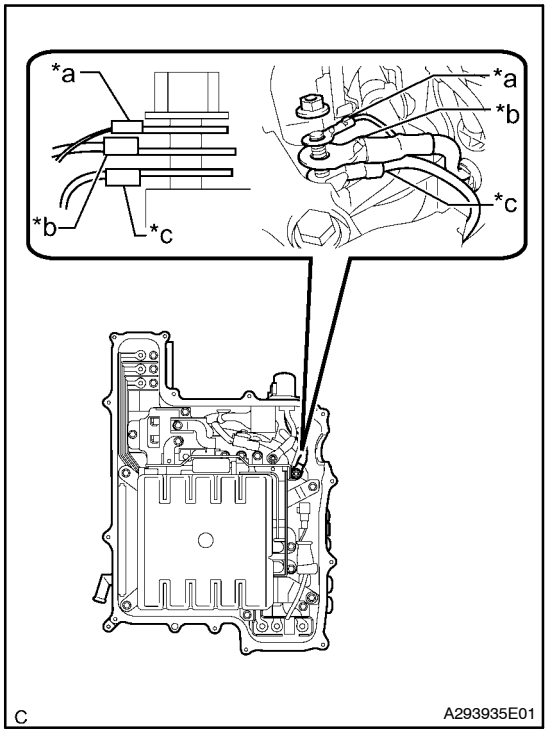
*a	Wire Harness Color: Orange Tube Color: Black Tab Facing Up
*b	Wire Harness Color: Black Tube Color: White Tab Facing Down

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NOTICE:

Connect the wire harnesses to the correct positions in the correct order.

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(e) Connect the 3 wire harnesses to the hybrid vehicle capacitor sub–assembly as shown in the illustration.

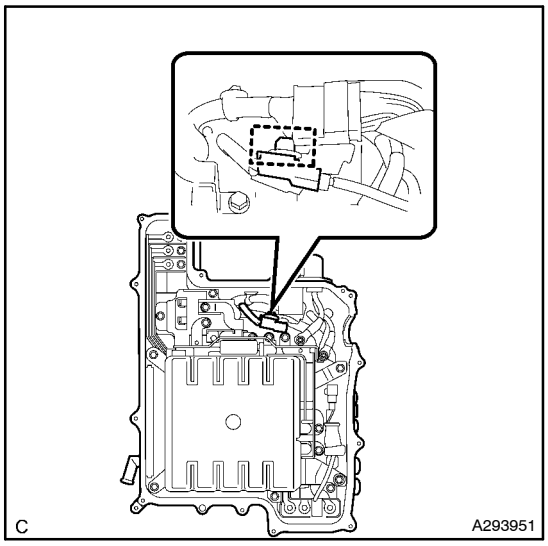
Text in Illustration

*a	Tab Facing Up
*b	Wire Harness Color: Orange Tube Color: Red Tab Facing Up
*c	Wire Harness Color: Orange Tube Color: White Tab Facing Down

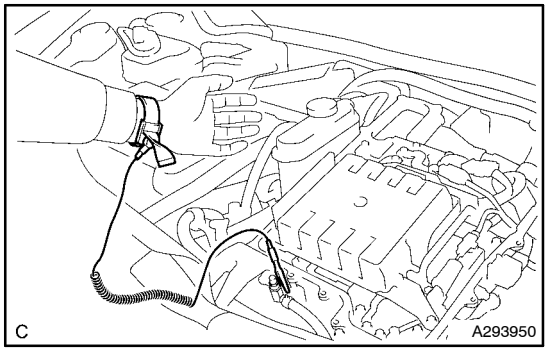
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

NOTICE:

Connect the wire harnesses to the correct positions in the correct order.

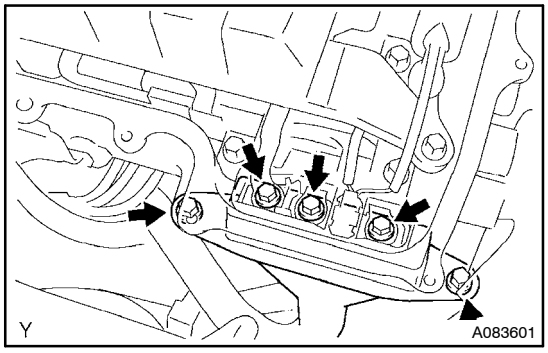


(f) Connect the clamp.



(g) Remove SST (wrist band).

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5. CONNECT MG1 POWER CABLE

(a) Connect the MG1 power cable to the MG1 power cable terminal with the 5 bolts.

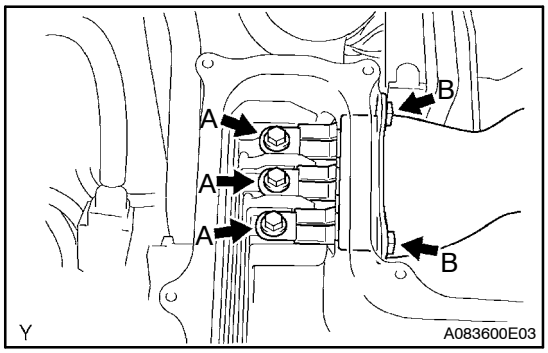
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

CAUTION:

Wear insulating gloves.

HINT:

Bolt length: 12 mm (0.472 in.)



6. CONNECT MG2 POWER CABLE

(a) Connect the MG2 power cable to the MG2 power cable terminal with the 5 bolts.

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

CAUTION:

Wear insulating gloves.

HINT:

- Bolt length (A): 12 mm (0.472 in.)
- Bolt length (B): 22 mm (0.866 in.)

7. CONNECT FRAME WIRE (See page 21–25)
8. INSTALL INVERTER COVER (See page 21–25)
9. INSTALL COWL TOP PANEL SUB–ASSY OUTER FRONT (See page 11–16)
10. INSTALL WINDSHIELD WIPER MOTOR & LINK ASSY (See page 66–16)
11. INSTALL COWL TOP VENTILATOR LOUVER RH
12. INSTALL COWL TOP VENTILATOR LOUVER LH
13. INSTALL HOOD TO COWL TOP SEAL
14. INSTALL FRONT WIPER ARM (DRIVER SIDE POSITION) (See page 66–16)
15. INSTALL FRONT WIPER ARM (PASSENGER SIDE POSITION) (See page 66–16)
16. INSTALL FRONT WIPER ARM HEAD CAP
17. INSTALL SERVICE PLUG GRIP (See page 21–120)
18. CONNECT BATTERY NEGATIVE TERMINAL (See page 21–120)
19. INSTALL REAR FLOOR BOARD NO. 3 (See page 21–120)
20. INSTALL DECK FLOOR BOX REAR (See page 21–120)
21. INSTALL REAR FLOOR BOARD NO. 2 (See page 21–120)
22. OPERATION CHECK

HINT:

After the repair, check the operation as follows. Then check for DTCs.

1. Connect the intelligent tester to the DLC3.
2. Turn the power switch ON (IG) and clear the DTCs according to the prompts on the intelligent tester screen.
3. Turn the power switch ON (READY).
4. Warm up the engine with park (P) selected and the A/C turned off until the engine stops.

HINT:

The engine will stop on its own when it is warmed up.

5. Depress the accelerator pedal with park (P) selected to start the engine.
6. As soon as the engine starts, release the accelerator pedal and wait until the engine stops.
7. Move the shift lever to D. Creep the vehicle forward 5 m (16.4 ft) with the engine stopped and without depressing the accelerator pedal.

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NOTICE:

Confirm the safety of the surrounding area before moving the vehicle.

8. Move the shift lever to R. Creep the vehicle backward 5 m (16.4 ft) with the engine stopped and without depressing the accelerator pedal.

NOTICE:

Confirm the safety of the surrounding area before moving the vehicle.

9. Operation check (electric vehicle converter assembly) (See page 21–32–17).

23. POWER WINDOW CONTROL SYSTEM INITIALIZE (See page 01–29)

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