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.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	284	Motor inverter fail (MFIV) signal detection (inverter overheating)	• 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 • w/ converter inverter assembly

WIRING DIAGRAM

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.

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

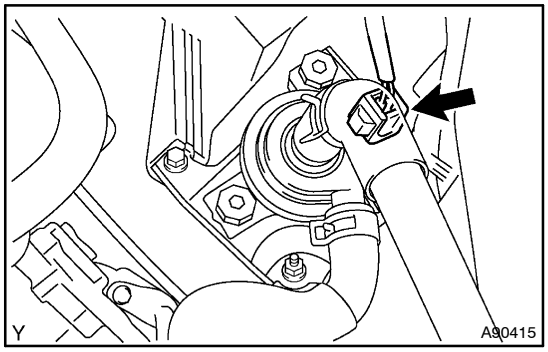
3 CHECK COOLANT HOSE

(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

4	CHECK CONNECTION CONDITION OF WATER PUMP CONNECTOR(LOOSENESS AND POOR CONTACT)



(a) Check the connection condition of the water pump connector.
OK: Connector has been connected securely and there is no poor connection.

NG → **CONNECT SECURELY**

OK

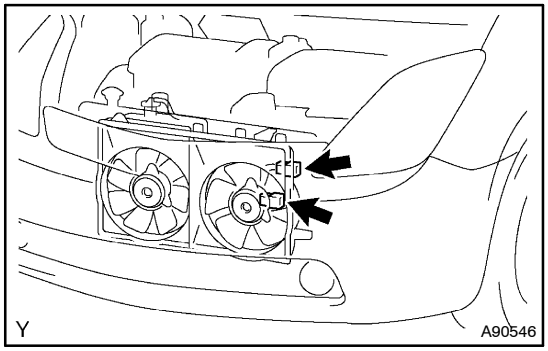
5	CHECK WATER W/MOTOR & BRACKET PUMP ASSY

(a) Turn the power switch ON (IG).
(b) Check the operation of the water pump.
OK: Coolant is sloshing in the reservoir tank

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

OK

6	CHECK CONNECTION CONDITION OF COOLING FAN MOTOR CONNECTOR(LOOSENESS AND POOR CONTACT)



(a) Check the connection condition of the cooling fan motor connectors.
OK: Connectors have been connected securely and there is no poor connection.

NG → **CONNECT SECURELY**

OK

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

NG → **REPLACE COOLING FAN MOTOR AND ADD ENGINE COOLANT**

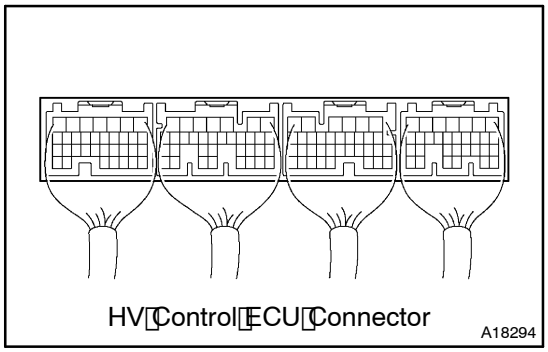
OK

8	INSPECT COOLING FAN MOTOR NO.2 (See page 16–8)

NG → REPLACE COOLING FAN MOTOR NO.2 AND ADD ENGINE COOLANT

OK

9	CHECK CONNECTION CONDITION OF HYBRID VEHICLE CONTROL ECU CONNECTOR(LOOSENESS AND POOR CONTACT)



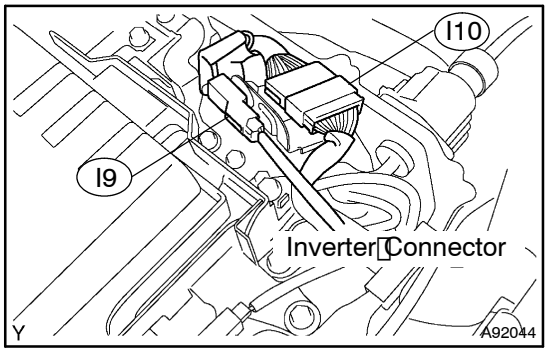
(a) Check the connection condition of all the connectors at the HV control ECU.
OK: Connectors have been connected securely and there is no poor connection.

NG → CONNECT SECURELY

OK

10	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

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

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

A

12 INSPECT HYBRID VEHICLE MOTOR ASSY

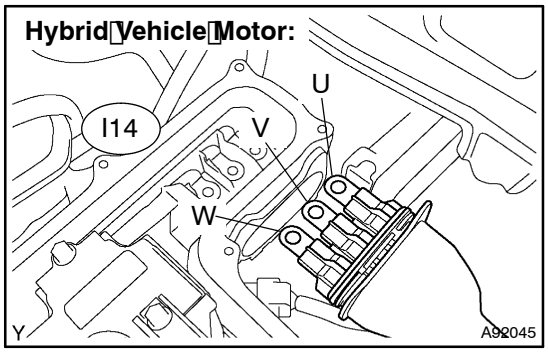
CAUTION:
Wear insulated gloves before performing the following operation.

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

(e) Using a milliohm meter, measure the resistance between the three–phase alternating current cable terminals of the hybrid vehicle motor.

NOTICE:
If the motor temperature is too high, the resistance varies considerably, which hinders determining malfunction. Therefore, measure the resistance at a minimum 8 hours after the vehicle has been stopped.

Standard:

Tester Connection	Specified Condition*
U (I14–1) – V (I14–2)	Below 135 mΩ at 20°C
V (I14–2) – W (I14–3)	Below 135 mΩ at 20°C
W (I14–3) – U (I14–1)	Below 135 mΩ at 20°C

*: Apply the formula given below to correct the resistance.

$R20 = Rt \div (1 + 0.00393 \times (T - 20))$

R20: Resistance converted to 20 °C (mΩ)

Rt: Resistance between measured lines (mΩ)

T: Ambient air temperature during measurement (°C)

(f) Calculate the difference between the maximum and minimum resistance between terminals U – V, V – W, and W – U.

Standard: Below 2 mΩ

(g) Using a megohmmeter, check the insulation resistance between the three–phase alternating current cable terminals of the hybrid vehicle motor and the body ground.

Standard:

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

(h) Reconnect the three–phase alternating current cable for the hybrid vehicle motor.

NG → **REPLACE HYBRID VEHICLE MOTOR 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) 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.

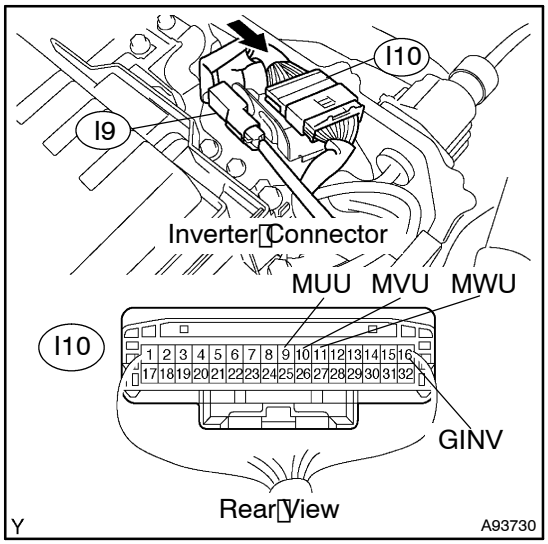
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.

(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.

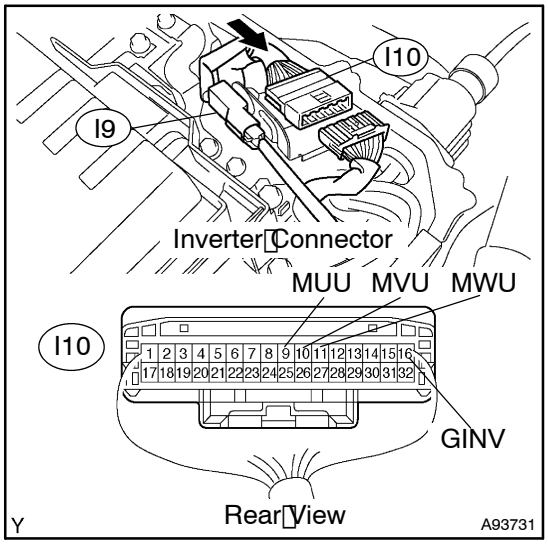


NG → **Go to step 14**

OK

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

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

OK →

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