DTC	P0A78/279	DRIVE MOTOR "A" INVERTER PERFORMANCE

DTC	P0A78/503	DRIVE MOTOR "A" INVERTER PERFORMANCE

DTC	P0A78/504	DRIVE MOTOR "A" INVERTER PERFORMANCE

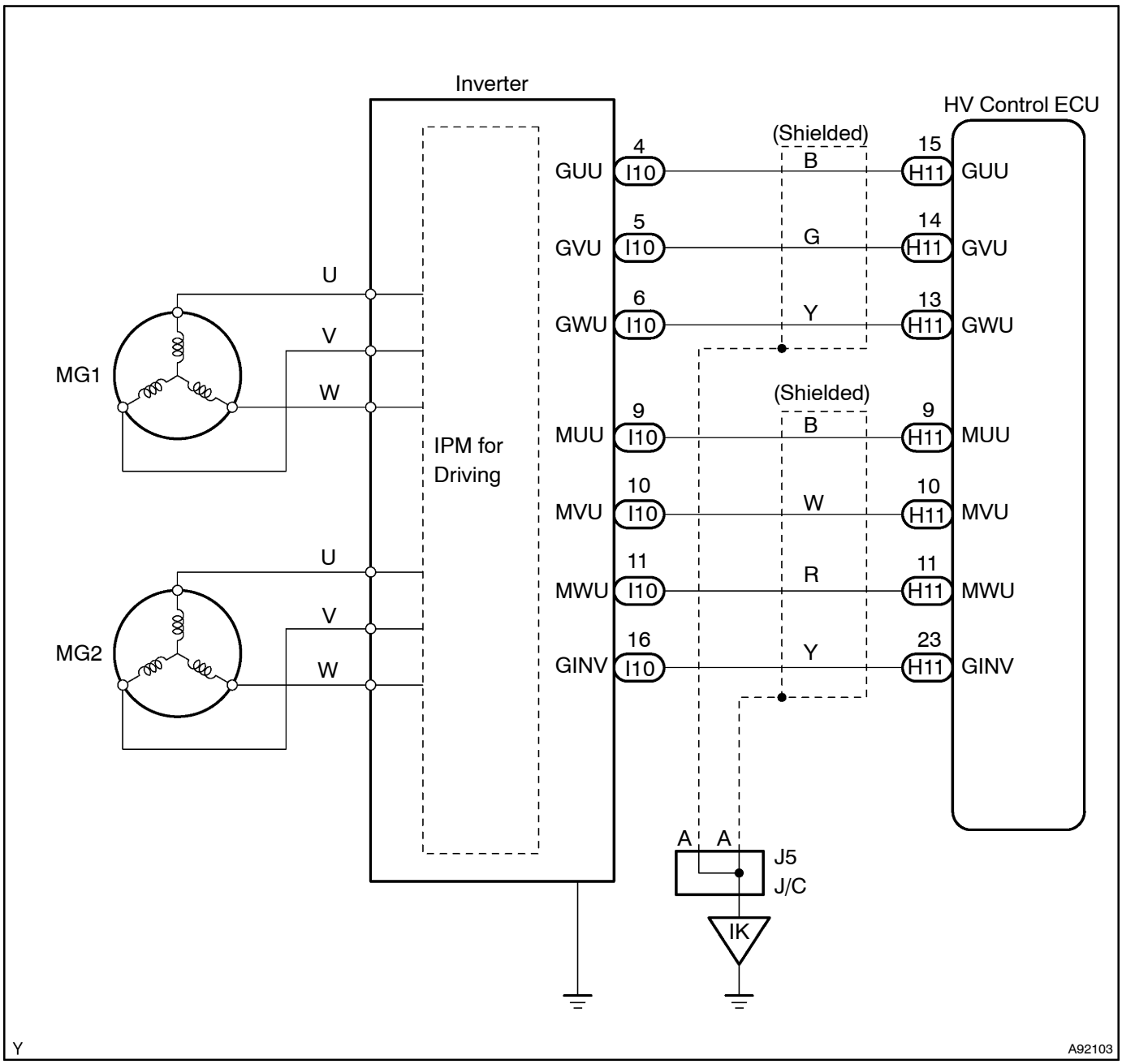
CIRCUIT DESCRIPTION

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.

DTC No.	INF Code	DTC Detection Condition	Trouble Area
P0A78	279	Motor inverter over–voltage (OVH) signal detection (over–voltage by inverter assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly
P0A78	503	Motor inverter over–voltage (OVH) signal detection (over–voltage by HV control ECU malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly
P0A78	504	Motor inverter over–voltage (OVH) signal detection (over–voltage by HV transaxle assembly malfunction)	• Wire harness or connector • HV transaxle assembly • Hybrid vehicle motor • Hybrid vehicle generator • HV control ECU • w/ converter inverter assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:

- **Before inspecting the high–voltage system, take safety precautions to prevent electrical shocks, such as wearing insulated gloves and removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from 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	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)

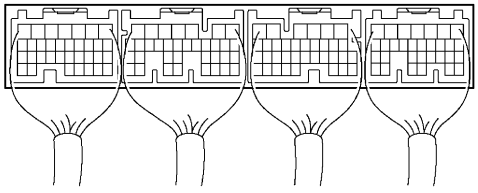
HINT:

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

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

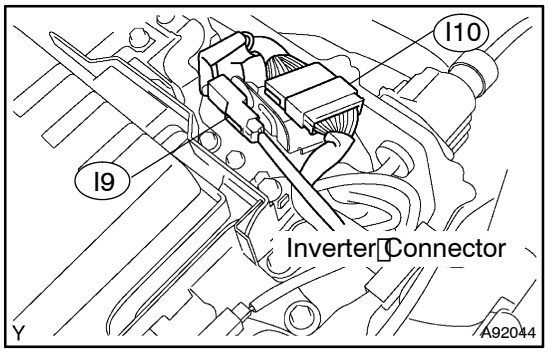
3	CHECK CONNECTION CONDITION OF INVERTER CONNECTOR(LOOSENESS AND POOR CONTACT)

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

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	REPLACE W/CONVERTER INVERTER ASSY (See page 21–25)
D	REPLACE HYBRID VEHICLE TRANSAXLE ASSY (See page 22–11)

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 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) 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

6 INSPECT HYBRID VEHICLE MOTOR ASSY

CAUTION:
Wear insulated gloves before performing the following operation.

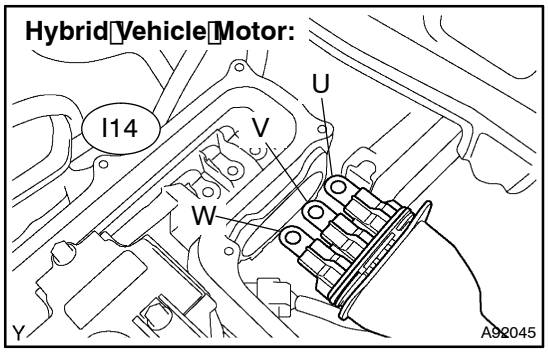
(a) Turn the power switch OFF.

(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).

Hybrid Vehicle Motor:



(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:

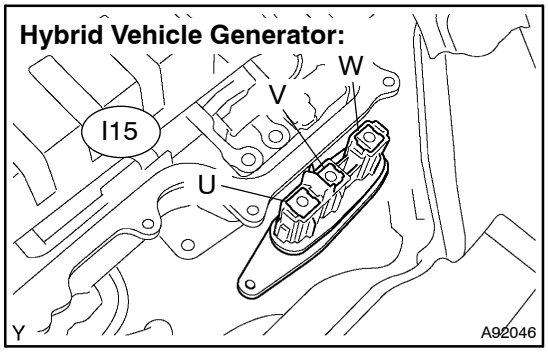
Tester Connection	Specified Condition
U (I14–1) – Body ground	10 MΩ or higher
V (I14–2) – Body ground	10 MΩ or higher
W (I14–3) – Body ground	10 MΩ or higher

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

NG → **REPLACE HYBRID VEHICLE MOTOR ASSY**

OK

7	INSPECT HYBRID VEHICLE GENERATOR ASSY



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 three–phase alternating current cable for the hybrid vehicle generator from the inverter.

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

NOTICE:
If the generator 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 (I15–1) – V (I15–2)	Below 109 mΩ at 20°C
V (I15–2) – W (I15–3)	Below 109 mΩ at 20°C
W (I15–3) – U (I15–1)	Below 109 mΩ at 20°C

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

R20 = Rt ÷ (1 + 0.00393 × (T – 20))

R20: Resistance converted to 20 °C (mΩ)

Rt: Resistance between measured lines (mΩ)

T: Ambient air temperature during measurement (°C)

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

Standard: Below 2 mΩ

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

Standard:

Tester Connection	Specified Condition
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

(f) Reconnect the three–phase alternating current cable for the hybrid vehicle generator.

NG → **REPLACE HYBRID VEHICLE GENERATOR ASSY**

OK

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.

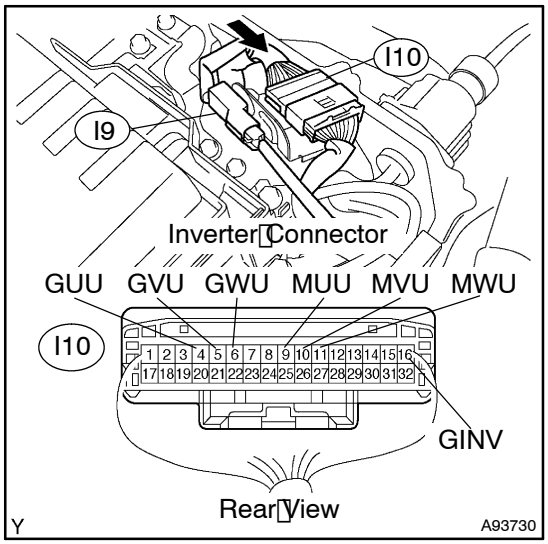
(e) On the intelligent tester II, enter the following menus: Powertrain / Hybrid Control / Active Test.

(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.

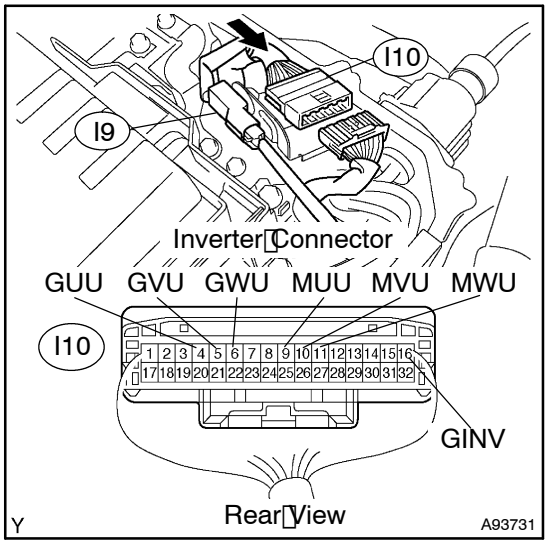


NG → **Go to step 9**

OK

REPLACE HYBRID VEHICLE CONTROL ECU AND W/CONVERTER INVERTER ASSY (See page 21–128 and 21–25)

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

OK

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