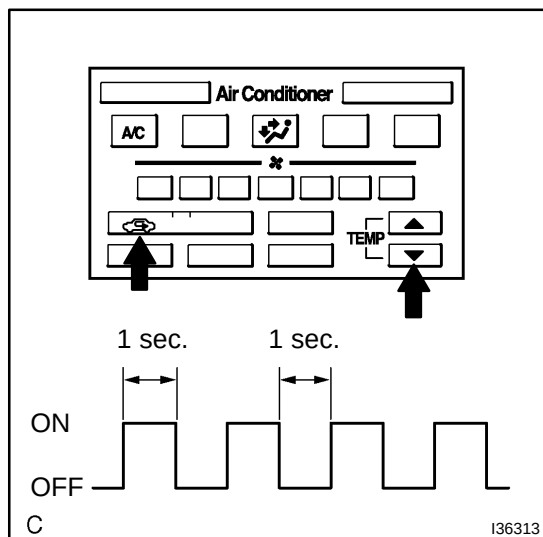


ACTUATOR CHECK



1. ACTUATOR CHECK

- Start the engine to warm it up.
- Perform the indicator check.
- Push the R/F (Recirculation/Fresh) switch to perform the actuator check when the sensor check is started after the indicator check.

HINT:

Be sure to perform the actuator check with the power switch on (READY).

- As the actuator check (continuous) is repeated from steps 0 to 9 at 1 second intervals, check the temperature and airflow visually and by hand.
- If the steps are difficult to read because they change automatically, push the "Fr.DEF" switch to display the steps step by step so that they can be read easily. The items are displayed step by step each time the "Fr.DEF" switch is pushed.

HINT:

- The display blinks at 1 second intervals in the step operation.
- The illustration indicates that code 4 is output. Push the "TEMP-" switch to finish panel diagnosis.

HINT:

Push the "AUTO" switch to enter the sensor check mode.

Step No.	Display code	Conditions				
		Blower level	Air flow vent	Air inlet damper	Air mix damper	A/C compressor revolution speed (rpm)
1	0	0	FACE (-10.0 %)	FRESH (110.0 %)	"COOL" side (-10.0 %)	0
2	1	1	FACE (-10.0 %)	FRESH (110.0 %)	"COOL" side (-10.0 %)	0
3	2	17	FACE (-10.0 %)	FRESH (110.0 %)	"COOL" side (-10.0 %)	7,500
4	3	17	FACE (-10.0 %)	RECIRCULATION (-1.0 %)	"COOL" side (-10.0 %)	7,500
5	4	17	B/L (12 %)	RECIRCULATION (-1.0 %)	"COOL"/ "HOT " (50.0 % opened)	4,500
6	5	17	FOOT (49 %)	RECIRCULATION (-1.0 %)	"COOL"/ "HOT " (65.0 % opened)	4,500
7	6	17	FOOT (49 %)	RECIRCULATION (-1.0 %)	"HOT " side (100.0 %)	4,500
8	7	17	F/D (69 %)	RECIRCULATION (-1.0 %)	"COOL"/ "HOT " (65.0 % opened)	4,500
9	8	17	F/D (95 %)	RECIRCULATION (-1.0 %)	"COOL"/ "HOT " (90.0 % opened)	4,500
10	9	31	DEF (110.0 %)	RECIRCULATION (-1.0 %)	"COOL"/ "HOT " (50.0 % opened)	4,500

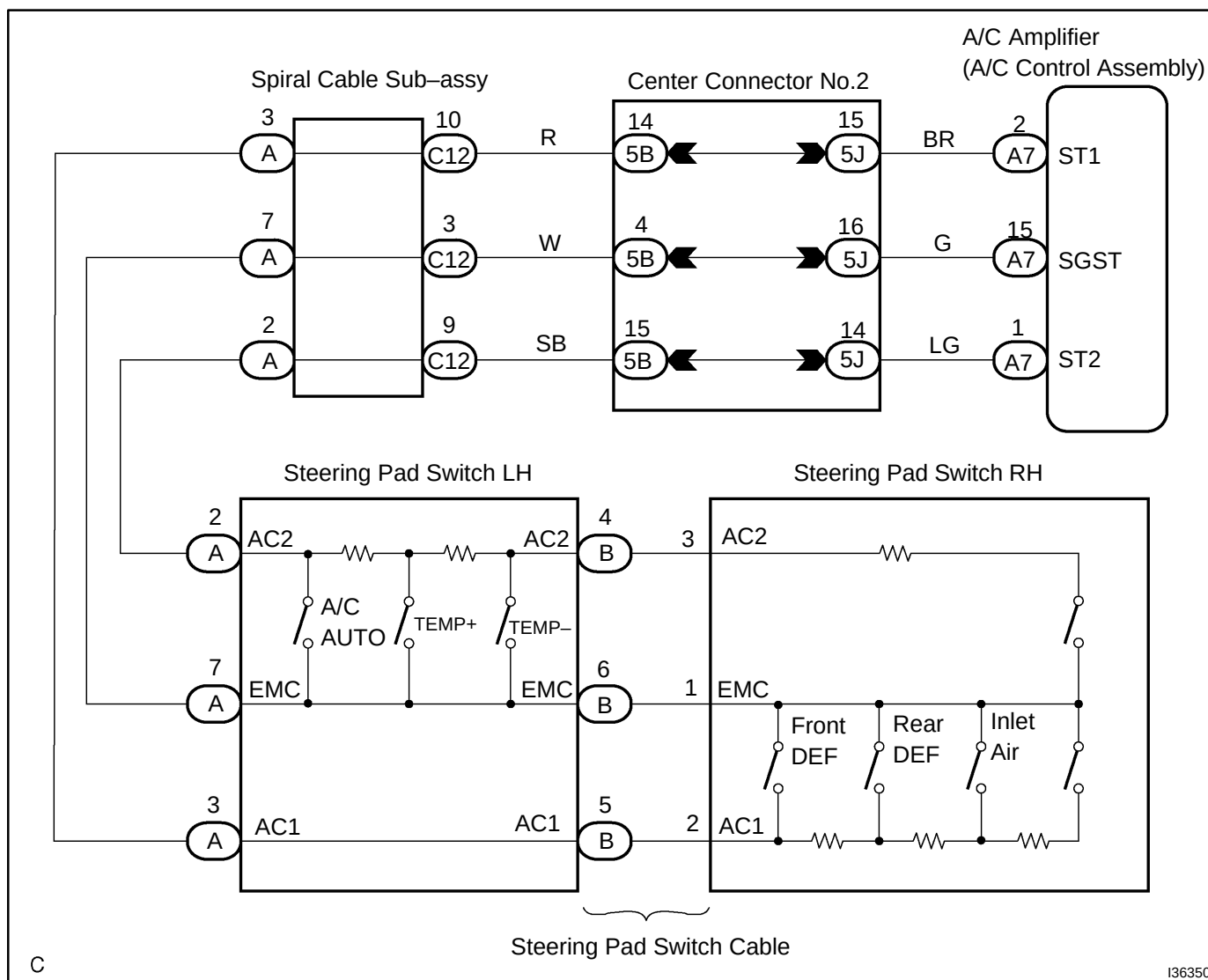
STEERING PAD SWITCH CIRCUIT

CIRCUIT DESCRIPTION

AUTO, TEMP UP (+), TEMP DOWN (-), Recirculation/Fresh, Fr. DEF and Rr. DEF switches are located on the steering pad switch.

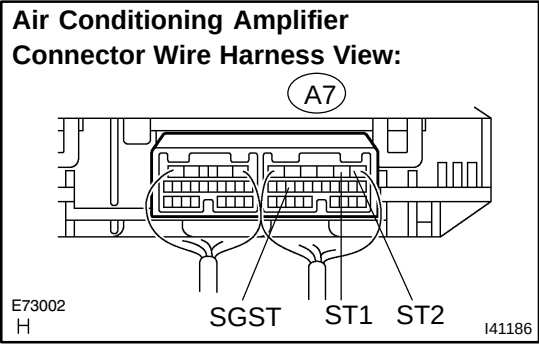
The resistance of the steering pad switch changes in accordance with switch operation. The air conditioner amplifier assy outputs voltage to the steering pad switch and reads voltage changes according to the resistance changes with switch operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT AIR CONDITIONING AMPLIFIER ASSY



- (a) Remove the A/C amplifier assy with connectors still connected.
- (b) Measure voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-2 (ST1) – A7-15 (SGST)	Power switch ON Fr. DEF switch ON	Below 0.3 V
A7-2 (ST1) – A7-15 (SGST)	Power switch ON Rr. DEF switch ON	0.8 to 1.5 V
A7-2 (ST1) – A7-15 (SGST)	Power switch ON Recirculation/ Fresh switch ON	2.0 to 2.9 V
A7-1 (ST2) – A7-15 (SGST)	Power switch ON AUTO switch ON	Below 0.3 V
A7-1 (ST2) – A7-15 (SGST)	Power switch ON TEMP+ switch ON	0.8 to 1.5 V
A7-1 (ST2) – A7-15 (SGST)	Power switch ON TEMP– switch ON	2.0 to 2.9 V

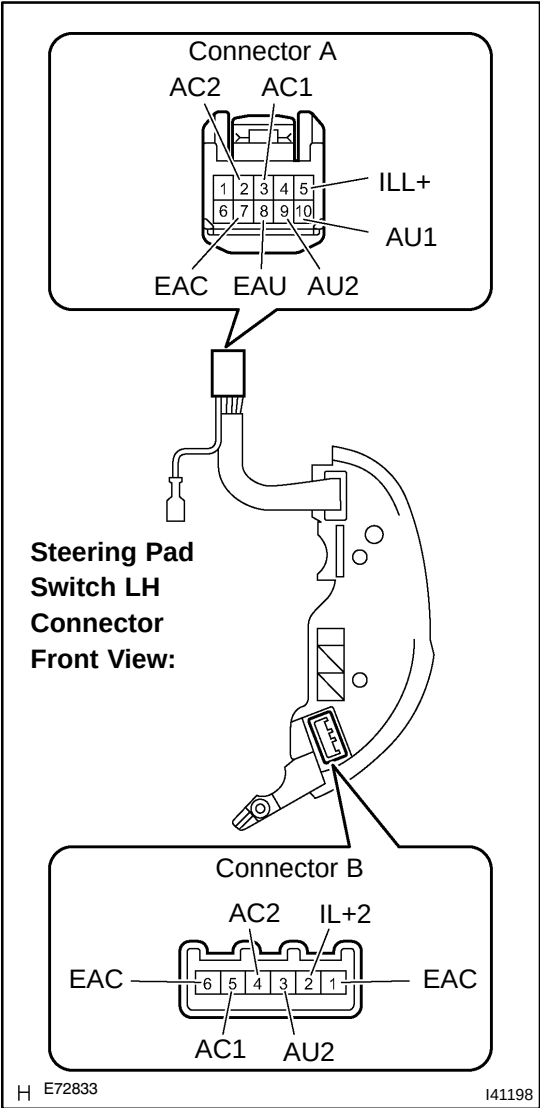
NG Go to step 2

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)

2

INSPECT STEERING PAD SWITCH LH



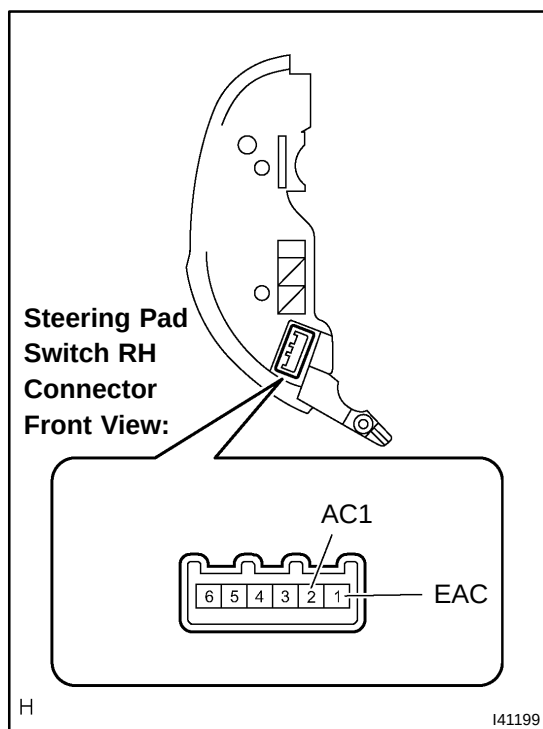
- (a) Remove the steering pad switch LH.
- (b) Measure resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A2 (AC2) – B5 (AC1)	Always	1,210 Ω
A7 (EAC) – B6 (EAC)	Always	Below 1 Ω
A3 (AC1) – B5 (AC1)	Always	Below 1 Ω
A2 (AC2) – A7 (EAC)	AUTO switch ON	Below 1 Ω
A2 (AC2) – A7 (EAC)	TEMP + switch ON	300 Ω
A2 (AC2) – A7 (EAC)	TEMP – switch ON	1,210 Ω

OK

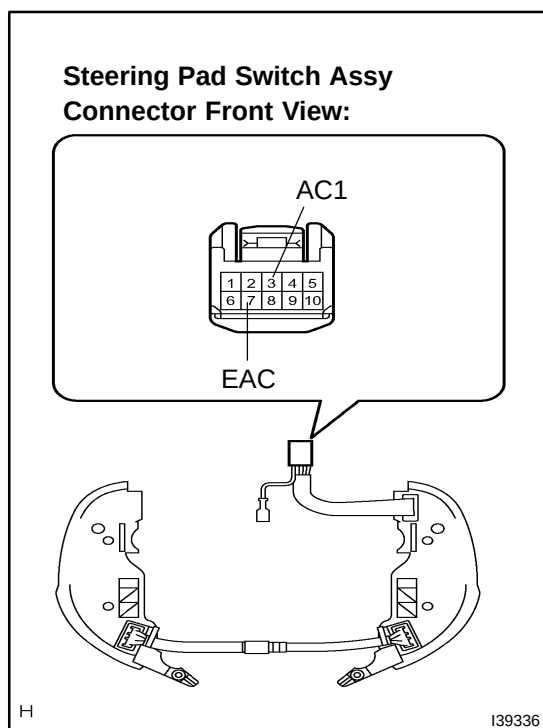
NG REPLACE STEERING PAD SWITCH LH

3 INSPECT STEERING PAD SWITCH RH

- Remove the steering pad switch RH.
- Measure resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
2 (AC1) – 1 (EAC)	Fr. DEF switch ON	Below 1 Ω
2 (AC1) – 1 (EAC)	Rr. DEF switch ON	300 Ω
2 (AC1) – 1 (EAC)	Recirculation/Fresh switch ON	1,210 Ω

NG**REPLACE STEERING PAD SWITCH RH****OK****4 INSPECT STEERING PAD SWITCH ASSY**

- Connect the steering pad switched RH and LH to the steering pad switch cable.
- Measure resistance according to the value(s) in the table below.

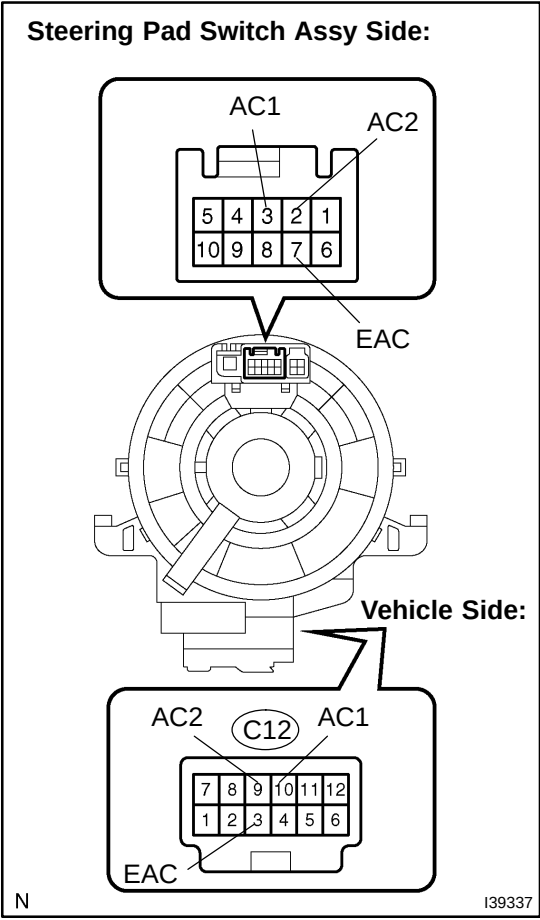
Standard:

Tester connection	Condition	Specified condition
3 (AC1) – 7 (EAC)	Fr. DEF switch ON	Below 1 Ω
3 (AC1) – 7 (EAC)	Rr. DEF switch ON	300 Ω
3 (AC1) – 7 (EAC)	Recirculation/Fresh switch ON	1,210 Ω

NG**REPLACE STEERING PAD SWITCH ASSY****OK**

5

INSPECT SPIRAL CABLE SUB-ASSY



- (a) Disconnect the spiral cable sub-assy connector.
- (b) Measure resistance according to the value(s) in the table below.

Standard:

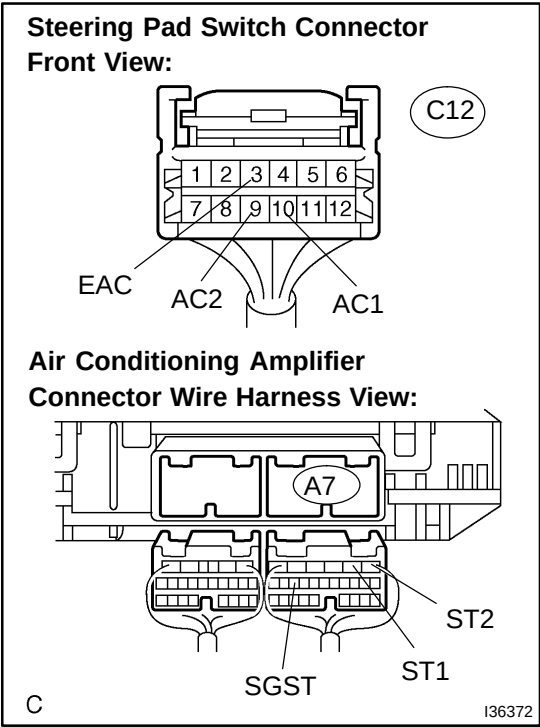
Tester connection	Condition	Specified condition
EAC (C12-3) – 7 (EAC)	Always	Below 1 Ω
AC2 (C12-9) – 2 (AC2)	Always	Below 1 Ω
AC1 (C12-10) – 3 (AC1)	Always	Below 1 Ω

OK

NG REPLACE SPIRAL CABLE SUB-ASSY

6

CHECK HARNESS AND CONNECTOR(STEERING PAD SWITCH – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



(a) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-2 (ST1) – C12-10 (AC1)	Always	Below 1 Ω
A7-15 (SGST) – C12-3 (EAC)	Always	Below 1 Ω
A7-1 (ST2) – C12-9 (AC2)	Always	Below 1 Ω
A7-2 (ST1) – Body ground	Always	10 kΩ or higher
A7-15 (SGST) – Body ground	Always	10 kΩ or higher
A7-1 (ST2) – Body ground	Always	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1411	ROOM TEMPERATURE SENSOR CIRCUIT
-----	-------	---------------------------------

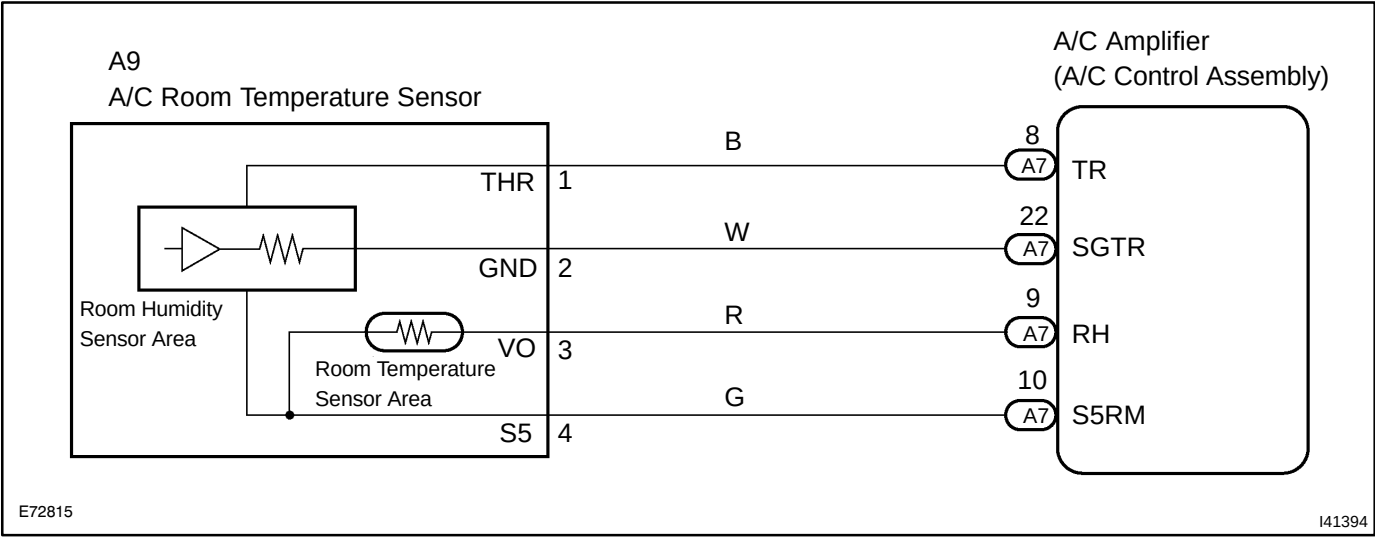
CIRCUIT DESCRIPTION

The A/C room temperature sensor is installed in the instrument panel to detect the room temperature and control the heater and air conditioner "AUTO" function. The resistance of the A/C room temperature sensor changes in accordance with the room temperature. As the temperature decreases, the resistance increases. As the temperature increases, the resistance decreases.

The A/C amplifier applies voltage (5V) to the A/C room temperature sensor and reads voltage changes as the resistance of the A/C room temperature sensor changes. This sensor also sends appropriate signals to the A/C amplifier. The room temperature sensor is integrated with the room humidity sensor.

DTC No.	Detection item	Trouble Area
B1411	Open or short in room temperature sensor circuit	• A/C room temperature sensor • Harness or connector between cooler A/C room temperature sensor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
----------	---------------------------------------

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
ROOM TEMP	Room temperature sensor / min.: -6.5°C (20.3°F) max.: 57.25°C (135.05°F)	Actual room temperature is displayed	Open in the circuit: -6.5°C (20.3°F) Short in the circuit: 57.25°C (135.05°F)

OK:

The display is as specified in the normal condition.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

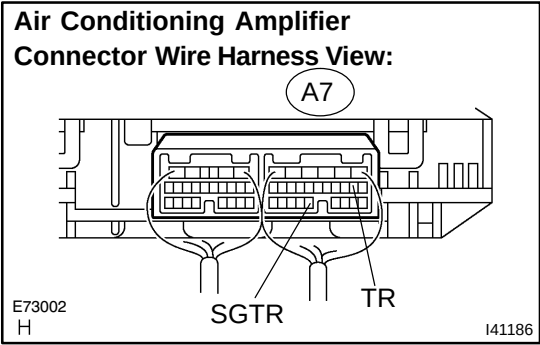
C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2

INSPECT AIR CONDITIONING AMPLIFIER(TR – SG-5)



- (a) Remove the A/C amplifier with connectors still connected.
- (b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-8 (TR) – A7-22 (SGTR)	Power switch ON (ON) at 25 °C (77 °F)	1.8 to 2.2 V
A7-8 (TR) – A7-22 (SGTR)	Power switch ON (ON) at 40 °C (104 °F)	1.2 to 1.6 V

HINT:
As the temperature increases, the voltage decreases.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

B

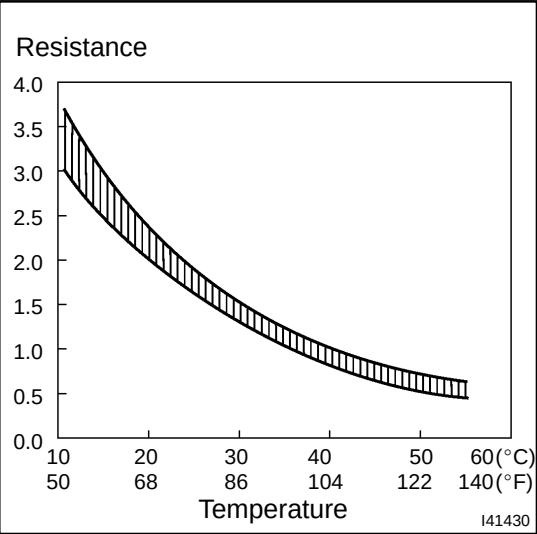
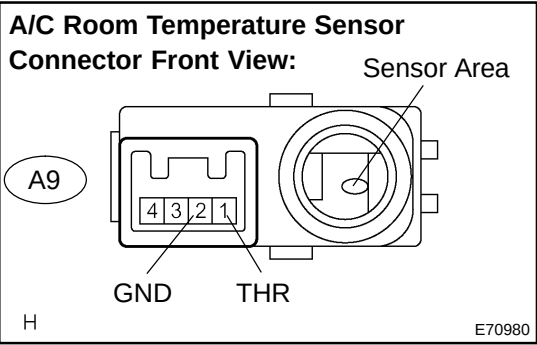
PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)

C

REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)

A

3 INSPECT A/C ROOM TEMPERATURE SENSOR



- (a) Remove the A/C room temperature sensor.
- (b) Disconnect the connector from A/C room temperature sensor.
- (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A9-1 (THR) – A9-2 (GND)	10°C (50°F)	3.00 to 3.73 kΩ
A9-1 (THR) – A9-2 (GND)	15°C (59°F)	2.45 to 2.88 kΩ
A9-1 (THR) – A9-2 (GND)	20°C (68°F)	1.95 to 2.30 kΩ
A9-1 (THR) – A9-2 (GND)	25°C (77°F)	1.60 to 1.80 kΩ
A9-1 (THR) – A9-2 (GND)	30°C (86°F)	1.28 to 1.47 kΩ
A9-1 (THR) – A9-2 (GND)	35°C (95°F)	1.00 to 1.22 kΩ
A9-1 (THR) – A9-2 (GND)	40°C (104°F)	0.80 to 1.00 kΩ
A9-1 (THR) – A9-2 (GND)	45°C (113°F)	0.65 to 0.85 kΩ
A9-1 (THR) – A9-2 (GND)	50°C (122°F)	0.50 to 0.70 kΩ
A9-1 (THR) – A9-2 (GND)	55°C (131°F)	0.44 to 0.60 kΩ
A9-1 (THR) – A9-2 (GND)	60°C (140°F)	0.36 to 0.50 kΩ

NOTICE:

- Even slightly touching the sensor may change the resistance value. Be sure to hold the connector of the sensor.
- When measuring, the sensor temperature must be the same as the ambient temperature.

HINT:

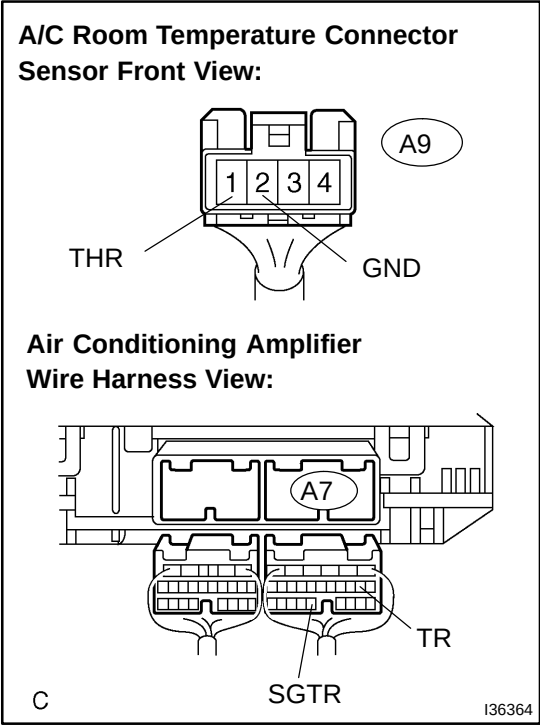
As the temperature increases, the resistance decreases (see the graph below).

NG REPLACE A/C ROOM TEMPERATURE SENSOR

OK

4

CHECK HARNESS AND CONNECTOR(A/C ROOM TEMPERATURE SENSOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector from A/C room temperature sensor and A/C amplifier.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-8 (TR) – A9-1 (THR)	Always	Below 1 Ω
A7-22 (SGTR) – A9-2 (GND)	Always	Below 1 Ω
A7-8 (TR) – Body ground	Always	10 kΩ or higher
A7-22 (SGTR) – Body ground	Always	10 kΩ or higher

NG

REPAIR OR
CONNECTOR

REPLACE HARNESS OR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1412	AMBIENT TEMPERATURE SENSOR CIRCUIT
-----	-------	------------------------------------

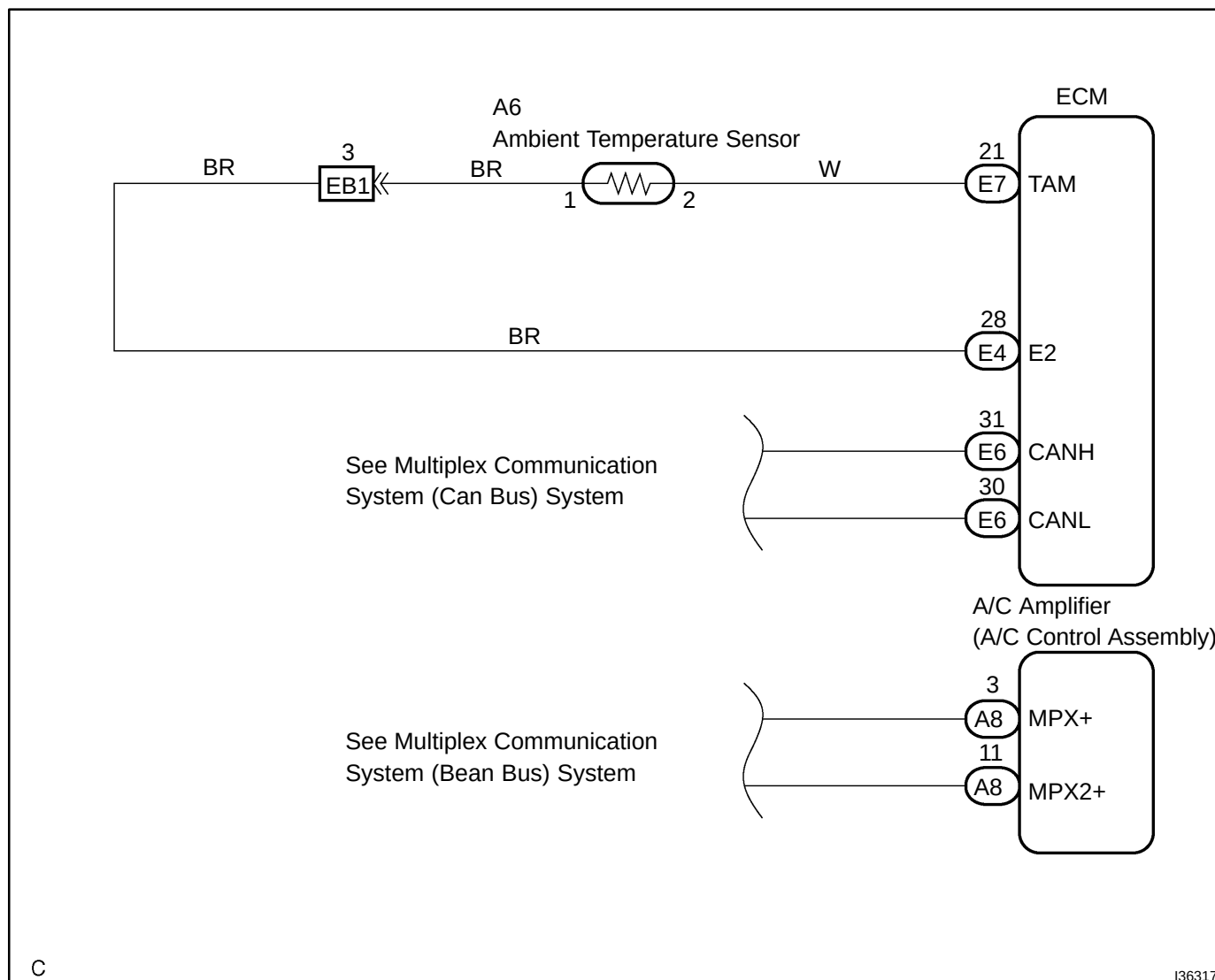
CIRCUIT DESCRIPTION

The A/C ambient temperature sensor is installed in the front part of the condenser to detect the ambient temperature and control the heater and air conditioner "AUTO" function. The sensor connected to the ECM detects fluctuation in the ambient temperature that is used for controlling the room temperature. The sensor sends a signal to the A/C amplifier via the ECM. The resistance of the A/C ambient temperature sensor changes in accordance with the ambient temperature. As the temperature decreases, the resistance increases. As the temperature increases, the resistance decreases.

The ECM applies voltage (5V) to the A/C ambient temperature sensor and reads voltage changes as the resistance of the A/C ambient temperature sensor changes. The ECM sends the read signal to the A/C amplifier via CAN and body multiplex communications.

DTC No.	Detection item	Trouble Area
B1412	Open or short in ambient temperature sensor circuit	• A/C ambient temperature sensor • Harness or connector between A/C ambient temperature sensor and ECM • ECM • Multiplex communication circuit • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
----------	---------------------------------------

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
AMBI TEMP SENS	Ambient temperature sensor / min.: -23.3°C (-9.94°F) max.: 65.95°C (150.71°F)	Actual ambient temperature is displayed	Open in the circuit: -23.3°C (-9.94°F) Short: in the circuit: 65.95°C (150.71°F)

OK:**The display is as specified in the normal condition.****Result:**

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

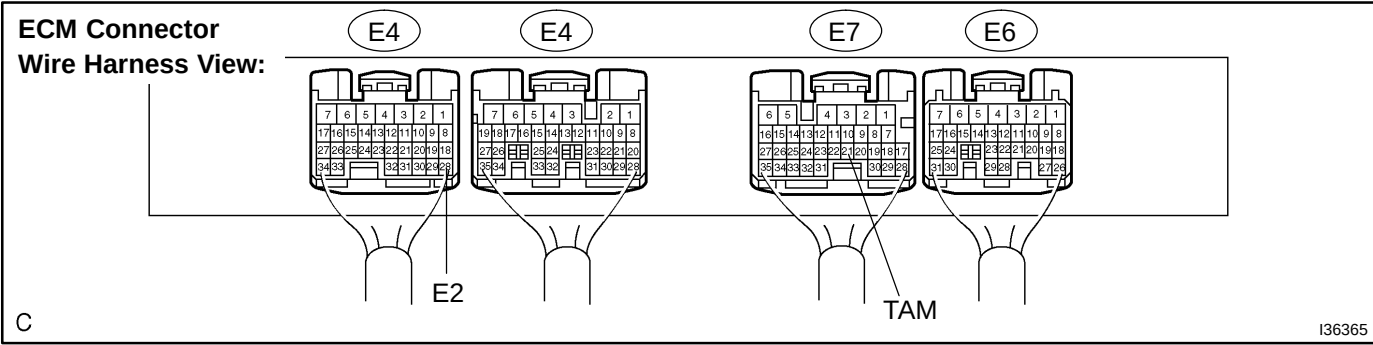
**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2 INSPECT ECM(TAM – E2)



- (a) Remove the ECM with connectors still connected.
- (b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
E7-21 (TAM) – E4-28 (E2)	Power switch ON (ON) at 25 °C (77 °F)	1.8 to 2.2 V
E7-21 (TAM) – E4-28 (E2)	Power switch ON (ON) at 40 °C (104 °F)	1.2 to 1.6 V

HINT:
As the temperature increases, the voltage decreases.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

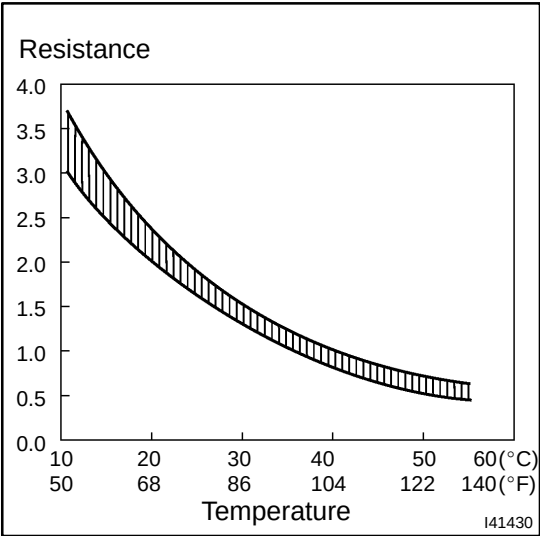
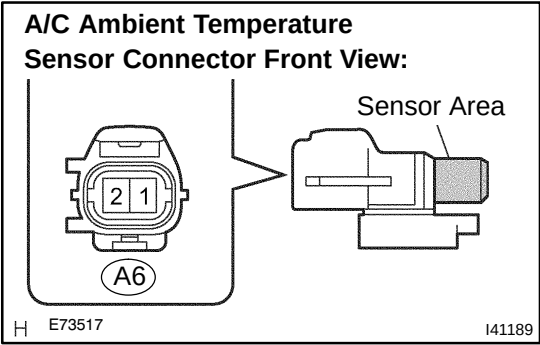
B PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)

C REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

A

3

INSPECT A/C AMBIENT TEMPERATURE SENSOR



- (a) Remove the A/C ambient temperature sensor.
- (b) Disconnect the connector from A/C ambient temperature sensor.
- (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A6-1 – A6-2	10°C (50°F)	3.00 to 3.73 kΩ
A6-1 – A6-2	15°C (59°F)	2.45 to 2.88 kΩ
A6-1 – A6-2	20°C (68°F)	1.95 to 2.30 kΩ
A6-1 – A6-2	25°C (77°F)	1.60 to 1.80 kΩ
A6-1 – A6-2	30°C (86°F)	1.28 to 1.47 kΩ
A6-1 – A6-2	35°C (95°F)	1.00 to 1.22 kΩ
A6-1 – A6-2	40°C (104°F)	0.80 to 1.00 kΩ
A6-1 – A6-2	45°C (113°F)	0.65 to 0.85 kΩ
A6-1 – A6-2	50°C (122°F)	0.50 to 0.70 kΩ
A6-1 – A6-2	55°C (131°F)	0.44 to 0.60 kΩ
A6-1 – A6-2	60°C (140°F)	0.36 to 0.50 kΩ

NOTICE:

- Even slightly touching the sensor may change the resistance value. Be sure to hold the connector of the sensor.
- When measuring, the sensor temperature must be the same as the ambient temperature.

HINT:

As the temperature increases, the resistance decreases (see the graph below).

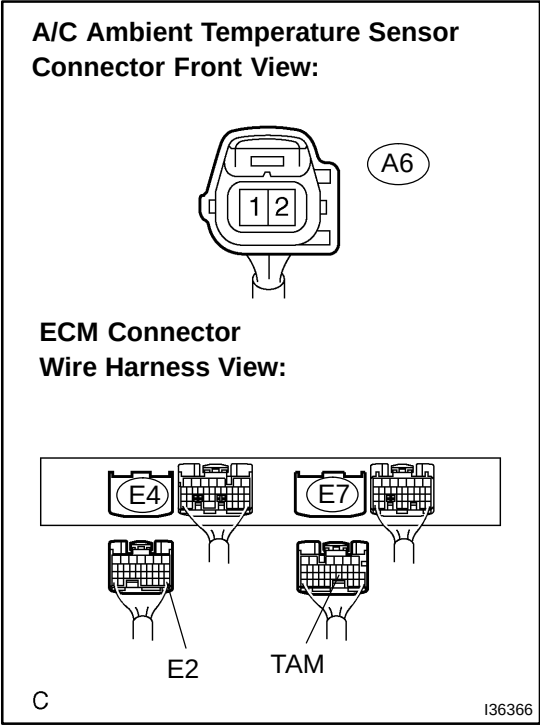
NG

REPLACE A/C AMBIENT TEMPERATURE SENSOR

OK

4

CHECK HARNESS AND CONNECTOR(A/C AMBIENT TEMPERATURE SENSOR – ECM) (SEE PAGE 01-47)



- (a) Disconnect the connector from A/C ambient temperature sensor.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
E7-21 (TAM) – A6-2	Always	Below 1 Ω
E4-28 (E2) – A6-1	Always	Below 1 Ω
E7-21 (TAM) – Body ground	Always	10 k Ω or higher
E4-28 (E2) – Body ground	Always	10 k Ω or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1413	EVAPORATOR TEMPERATURE SENSOR CIRCUIT
-----	-------	---------------------------------------

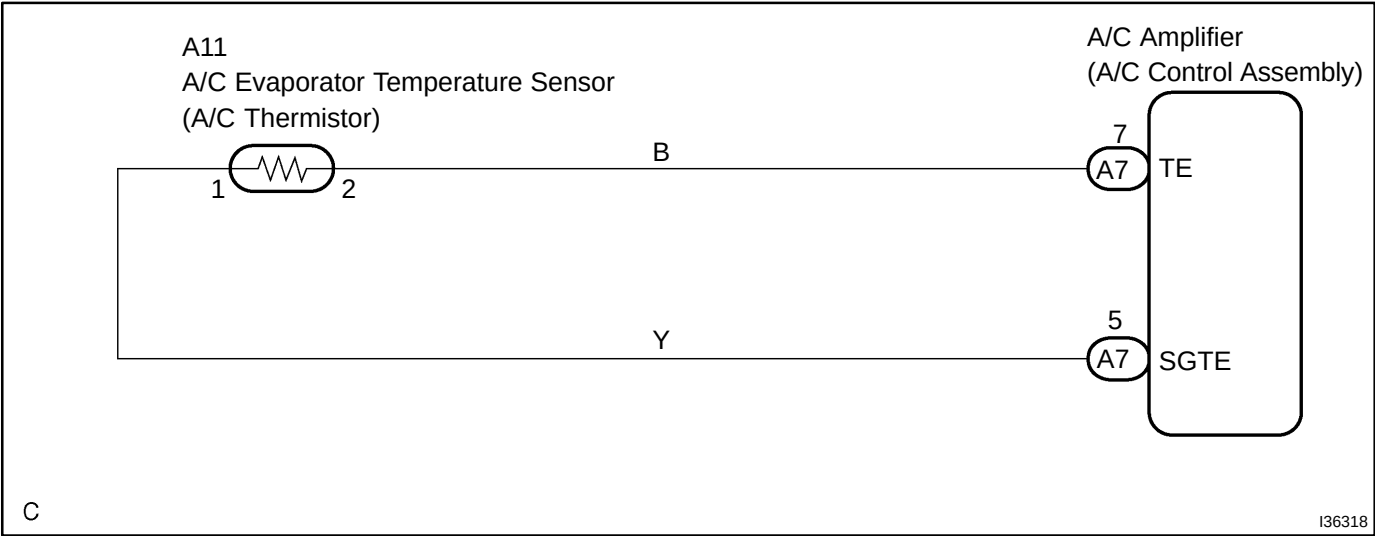
CIRCUIT DESCRIPTION

The A/C evaporator temperature sensor (A/C thermistor) is installed on the evaporator in the air conditioner unit to detect the cooled air temperature that has passed through the evaporator and control the air conditioning . It sends appropriate signals to the A/C amplifier. The resistance of the A/C evaporator temperature sensor (A/C thermistor) changes in accordance with the cooled air temperature that has passed through the evaporator. As the temperature decreases, the resistance increases. As the temperature increases, the resistance decreases.

The A/C amplifier assy applies voltage (5V) to the A/C evaporator temperature sensor (A/C thermistor) and reads voltage changes as the resistance of the A/C evaporator temperature sensor (A/C thermistor) changes. This sensor is used for frost prevention.

DTC No.	Detection Item	Trouble Area
B1413	Open or short in evaporator temperature sensor circuit.	• A/C evaporator temperature sensor (A/C thermistor) • Harness or connector between A/C evaporator temperature sensor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
----------	---------------------------------------

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
EVAP TEMP	Evaporator temperature sensor / min.: -29.7°C (-21.46°F) max.: 59.55°C (139.19°F)	Actual evaporator temperature is displayed	Open in the circuit: -29.7°C (-21.46°F) Short in the circuit: 59.55°C (139.19°F)

OK:

The display is as specified in the normal condition.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

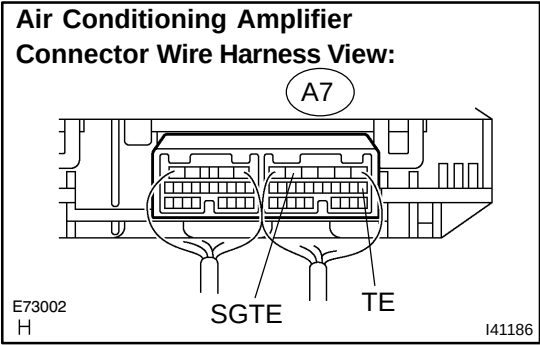
C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2

INSPECT AIR CONDITIONING AMPLIFIER(TE – SG)



- (a)
- Remove the A/C amplifier with connectors still connected.
- (b)
- Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-7 (TE) – A7-5 (SGTE)	Power switch ON (ON) at 0 °C (32 °F)	2.0 to 2.4 V
A7-7 (TE) – A7-5 (SGTE)	Power switch ON (ON) at 15 °C (59 °F)	1.4 to 1.8 V

HINT:
As the temperature increases, the voltage decreases.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

B

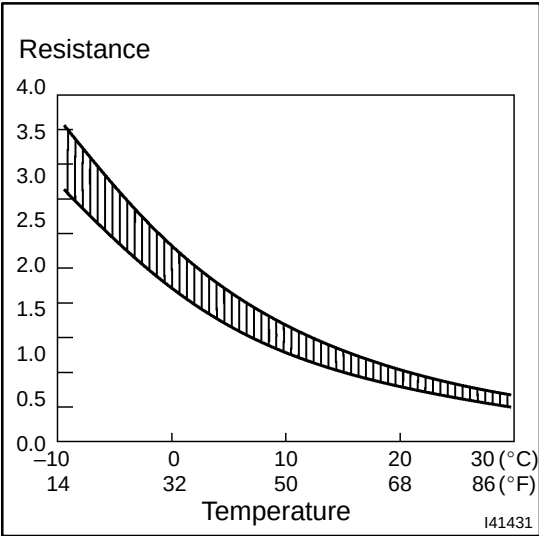
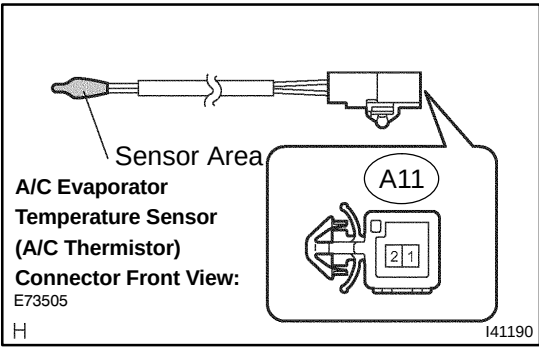
PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)

C

REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)

A

3 INSPECT A/C EVAPORATOR TEMPERATURE SENSOR(A/C THERMISTOR)



- (a) Remove the A/C evaporator temperature sensor (A/C thermistor).
- (b) Disconnect the connector from A/C evaporator temperature sensor (A/C thermistor).
- (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A11-1 – A11-2	-10°C (14°F)	7.30 to 9.10 kΩ
A11-1 – A11-2	-5°C (23°F)	5.65 to 6.95 kΩ
A11-1 – A11-2	0°C (32°F)	4.40 to 5.35 kΩ
A11-1 – A11-2	5°C (41°F)	3.40 to 4.15 kΩ
A11-1 – A11-2	10°C (50°F)	2.70 to 3.25 kΩ
A11-1 – A11-2	15°C (59°F)	2.14 to 2.58 kΩ
A11-1 – A11-2	20°C (68°F)	1.71 to 2.05 kΩ
A11-1 – A11-2	25°C (77°F)	1.38 to 1.64 kΩ
A11-1 – A11-2	30°C (86°F)	1.11 to 1.32 kΩ

NOTICE:

- Even slightly touching the sensor may change the resistance value. Be sure to hold the connector of the sensor.
- When measuring, the sensor temperature must be the same as the ambient temperature.

HINT:

As the temperature increases, the resistance decrease (see the graph below).

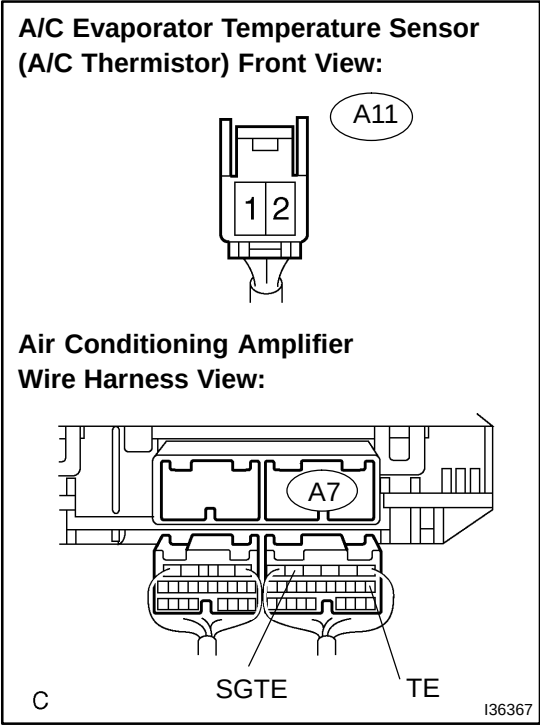
NG

REPLACE A/C EVAPORATOR TEMPERATURE SENSOR(A/C THERMISTOR)

OK

4

CHECK HARNESS AND CONNECTOR(A/C EVAPORATOR TEMPERATURE SENSOR(A/C THERMISTOR) – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector from A/C evaporator temperature sensor (A/C thermistor) and A/C amplifier.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-7 (TE) – A11-2	Always	Below 1 Ω
A7-5 (SGTE) – A11-1	Always	Below 1 Ω
A7-7 (TE) – Body ground	Always	10 kΩ or higher
A7-5 (SGTE) – Body ground	Always	10 kΩ or higher

NG

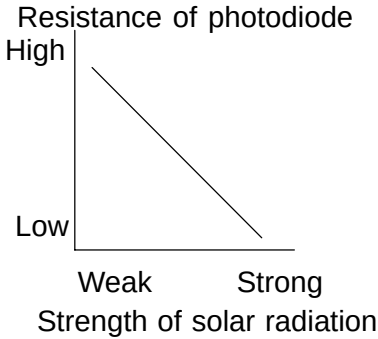
REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1421	SOLAR SENSOR CIRCUIT (PASSENGER SIDE)
-----	-------	---------------------------------------

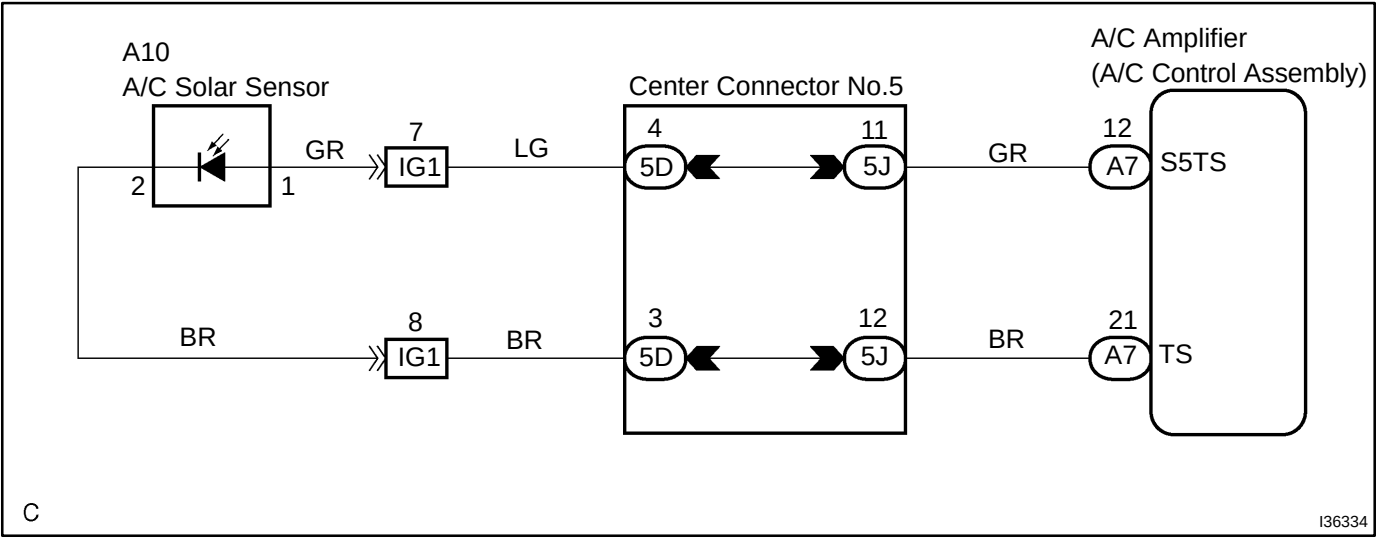
CIRCUIT DESCRIPTION



The A/C solar sensor is installed in the upper part of the instrument panel to detect the amount of solar sensor radiation with photodiode to control the heater and air conditioner "AUTO" function. It sends appropriate signals to the A/C amplifier. The output voltage of the A/C solar sensor changes in accordance with the amount of solar radiation. As the amount increases, the voltage increases. As the amount decreases, the voltage decreases. The A/C amplifier reads voltage output from the A/C solar sensor.

DTC No.	Detection Item	Trouble Area
B1421	Open or short in solar sensor circuit. (If the check is performed in a dark place, DTC B1424/24 may be displayed.)	• A/C solar sensor • Harness or connector between A/C solar sensor and A/C amplifier or body ECU • A/C amplifier

WIRING DIAGRAM



C

I36334

INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
----------	---------------------------------------

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
SOLAR SENS-D	Solar sensor (Driver side) / min.: 0 max.: 255	Increases as brightness increases	Open in the circuit: 0 Short in the circuit: 255

OK:

The display is as specified in the normal condition.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

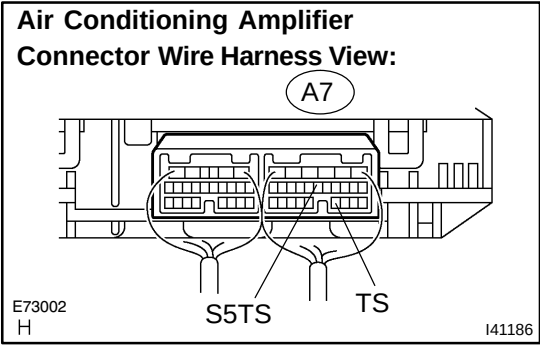
**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2 INSPECT AIR CONDITIONING AMPLIFIER(S5TS – TS)



- (a) Remove the air A/C amplifier with connectors still connected.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-12 (S5TS) – A7-21 (TS)	Power switch ON (ON) Sensor is subject to electric light	0.8 to 4.3 V
A7-12 (S5TS) – A7-21 (TS)	Power switch ON (ON) Sensor is covered with a cloth	Below 0.8 V

HINT:

- As the inspection light is moved away from the sensor, the voltage increases.
- Use an incandescent lamp for inspection. Bring it within 30 cm (11.8 in.) of the A/C solar sensor (cooler (solar sensor) thermistor).

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

B

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)

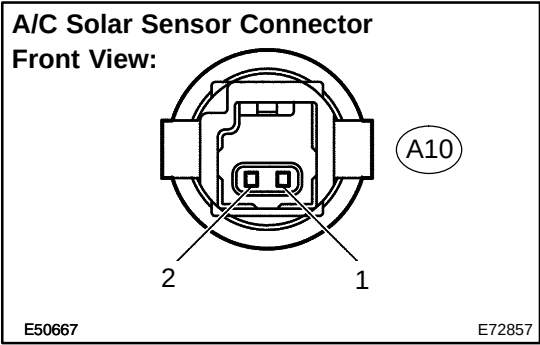
C

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

A

3

INSPECT A/C SOLAR SENSOR



- (a) Remove the A/C solar sensor.
- (b) Disconnect the connector from the A/C solar sensor.
- (c) Measure the resistance according to the value(s) in the table below.
- (d) Connect the positive (+) lead from the ohmmeter to terminal 2 and negative (–) lead to terminal 1 of the A/C solar sensor.

Standard:

Tester connection	Condition	Specified condition
A10-1 – A10-2	Sensor is subject to electric light	Except $\infty \Omega$
A10-1 – A10-2	Sensor is covered with a cloth	$\infty \Omega$ (No continuity)

NOTICE:

The connection procedure for using a digital tester such as an TOYOTA electrical tester is shown above. When using an analog tester, connect the positive (+) lead to terminal 1 and negative (–) lead to terminal 2 of the A/C solar sensor.

HINT:

- As the inspection light is moved away from the sensor, the voltage increases.
- Use an incandescent lamp for inspection. Bring it within 30 cm (11.8 in.) of the A/C solar sensor.

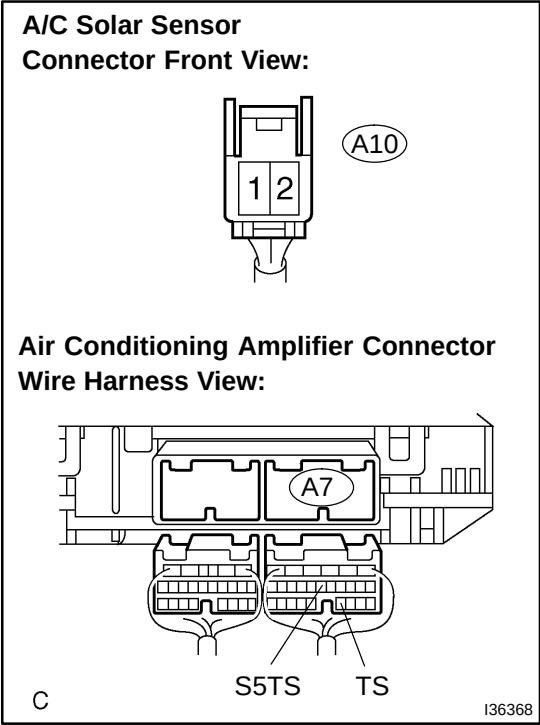
NG

REPLACE A/C SOLAR SENSOR

OK

4

CHECK HARNESS AND CONNECTOR(A/C SOLAR SENSOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector from the A/C solar sensor.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-12 (S5TS) – A10-1	Always	Below 1 Ω
A7-21 (TS) – A10-2	Always	Below 1 Ω
A7-12 (S5TS) – Body ground	Always	10 kΩ or higher
A7-21 (TS) – Body ground	Always	10 kΩ or higher

NG

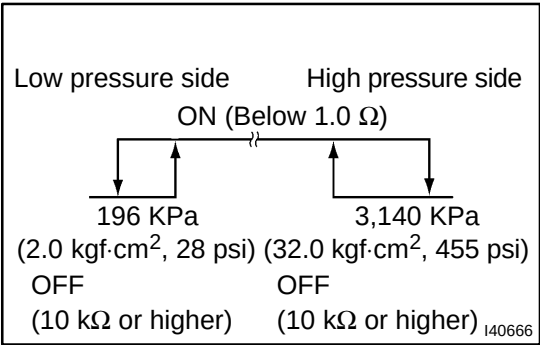
REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1423	PRESSURE SWITCH CIRCUIT
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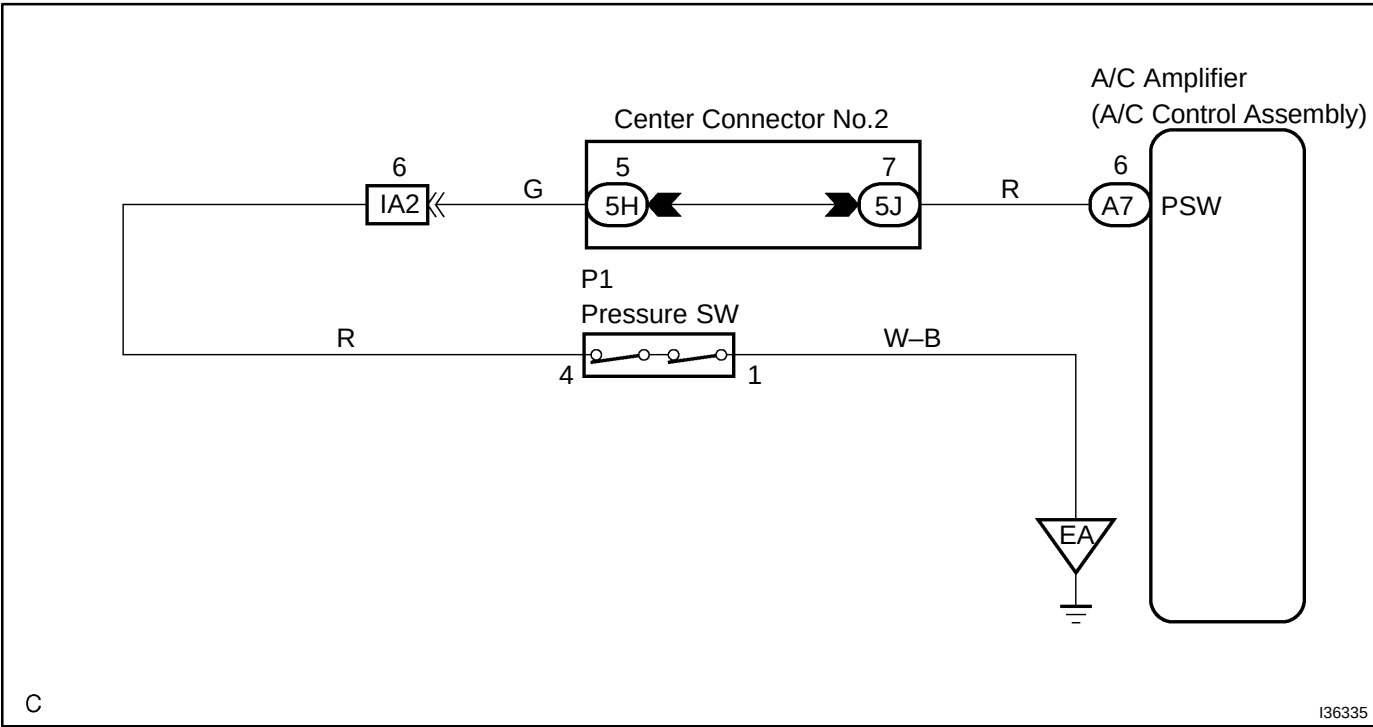
CIRCUIT DESCRIPTION



The pressure switch to detect the refrigerant pressure is located in the sight glass side of the pipe on the high-pressure side. This DTC is output when the refrigerant pressure is either significantly low (below 196 kPa (2.0 kgf/cm², 28 psi) or significantly high (over 3,140 kPa (32.0 kgf/cm², 455 psi). Then the pressure switch sends appropriate signals to the A/C amplifier. The pressure switch has built-in switches to detect high and low pressure and is turned off when either is determined to be defective. The A/C amplifier continuously monitors the pressure switch signal after the power switch is turned on. it stops compressor control and output the DTC when it detects the signal indicating that the switch is turned off.

DTC No.	Detection Item	Trouble Area
B1423	• Open in pressure sensor circuit. • Abnormal refrigerant pressure. below 196 kPa (2.0 kgf/cm², 28 psi) over 3,140 kPa (32.0 kgf/cm², 455 psi)	• Pressure switch • Harness or connector between pressure switch and body ground • Multiplex communication circuit • Refrigerant pipe line • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT REFRIGERANT PRESSURE

- Set the manifold gauge.
- Read the manifold gauge pressure when these conditions are established.

Test conditions:

- Temperature at the air inlet with the switch set at RECIRC is 30 to 35°C (86 to 95°F)
- Power switch ON (ON)
- Blower speed control switch at "HI" position
- Temperature control dial at "COOL" position
- Air conditioning switch ON
- Fully open doors

Standard:

Pressure on high pressure side:

1.37 to 1.57 MPa (13.9 to 16.0 kgf·cm², 198 to 228 psi)

HINT:

If the refrigerant pressure is below 196 KPa (2.0 kgf·cm², 28 psi), the refrigerant amount in the air conditioning cycle may have decreased significantly for reasons such as a gas leakage.

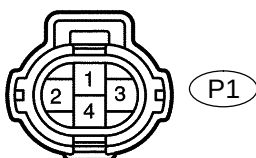
NG

INSPECT AND REPAIR AIR CONDITIONING CYCLE (SEE PAGE 55-12)

OK

2 CHECK AIR CONDITIONING OPERATION

**Pressure Switch Connector
Front View:**



140669

- Disconnect the connector from pressure switch.
- Connect terminals 1 and 4 of the connector of the pressure switch on the vehicle wire harness side using a service wire.
- Power switch ON (ON).
- Turn the air conditioning switch on and check that the compressor is operated.
- Check that the compressor is not operated when disconnecting terminals 1 and 4 (that were connected in the prior step).

OK:

Terminals 1 and 4 connected: the compressor is operated

Terminals 1 and 4 disconnected: the compressor is not operated

NG

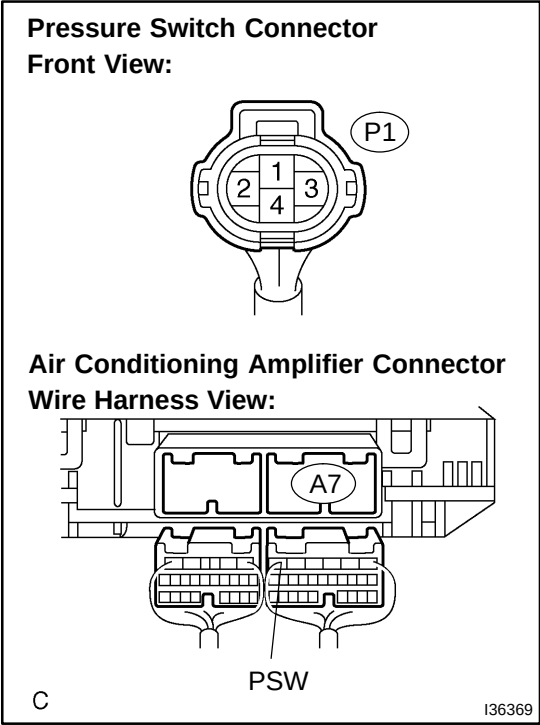
Go to step 3

OK

REPLACE PRESSURE SWITCH (COOLER CONDENSER ASSY)

3

CHECK HARNESS AND CONNECTOR(PRESSURE SWITCH – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector from pressure switch.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-6 (PSW) – P1-4	Always	Below 1 Ω
P1-1 – Body ground	Always	Below 1 Ω
A7-6 (PSW) – Body ground	Always	10 kΩ or higher

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

A

REPAIR OR REPLACE HARNESS OR CONNECTOR

B

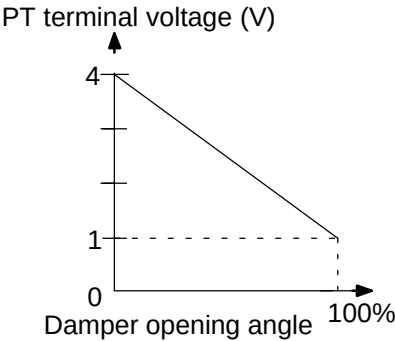
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)

C

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1431	AIR MIX DAMPER POSITION SENSOR CIRCUIT (PASSENGER SIDE)
-----	-------	--

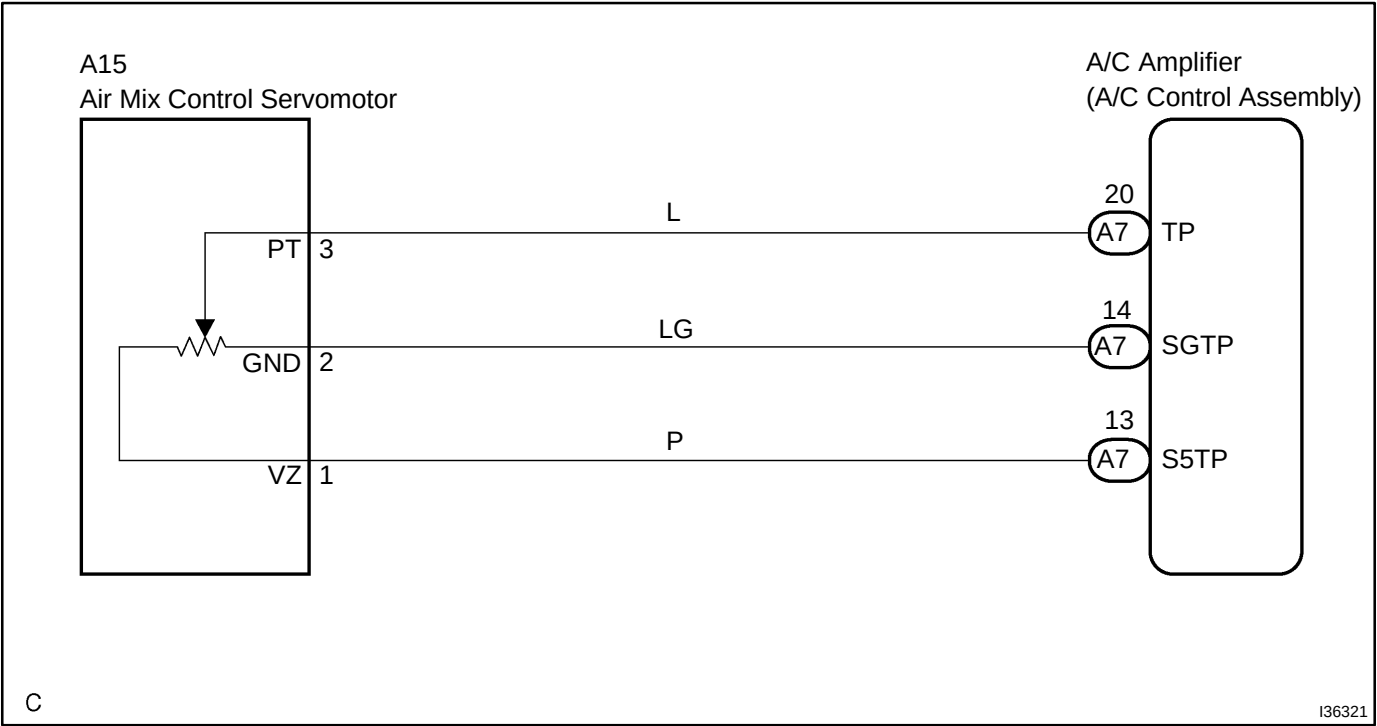
CIRCUIT DESCRIPTION



This sensor detects the position of the air mix control servomotor (air mix damper) and sends the appropriate signals to the A/C amplifier. The position sensor is built in the air mix control servomotor. The position sensor resistance changes as the air mix control servomotor arm moves. It outputs voltage (5V) that is input to terminal 1 (VZ) and terminal 3 (PT) via the variable resistor, and then to the A/C amplifier. The A/C amplifier reads the arm position with the input voltage from the position sensor.

DTC No.	Detection Item	Trouble Area
B1431	Open or short in power source circuit in air mix damper position sensor circuit.	• Air mix control servomotor (air mix damper position sensor) • Harness or connector between Air mix control servomotor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
---	--------------------------------

- (a) Connect the hand-held tester to DLC3.
- (b) Turn the power switch ON and push the hand-held tester main switch ON.
- (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/M DAMP POS-D	Air mix damper position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. COOL": -10.0% Damper is at "MAX. HOT": 100.0% or 71.0%	-
A/M DAMP TARG-D	Air mix damper target position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. COOL": -10.0% Damper is at "MAX. HOT": 100.0% or 71.0%	-

OK:
The displayed is as specified in the normal condition.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

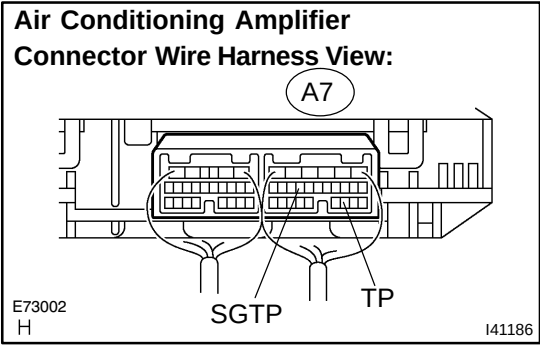
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)

C

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

A

2 INSPECT AIR CONDITIONING AMPLIFIER(TP – SGTP)



- (a) Remove the A/C amplifier with connectors still connected.
- (b) Change the set temperature to activate the air mix servo-motor.
- (c) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-20 (TP) – A7-14 (SGTP)	Power switch ON (ON) MAX. Hot Position	0.97 to 1.03 V
A7-20 (TP) – A7-14 (SGTP)	Power switch ON (ON) MAX. Cool Position	3.97 to 4.03 V

HINT:
As the set temperature increases, the voltage decreases gradually without interruption.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

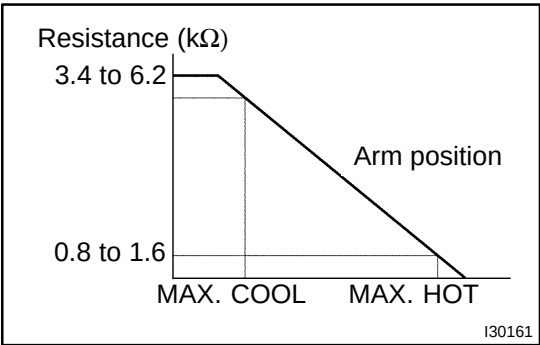
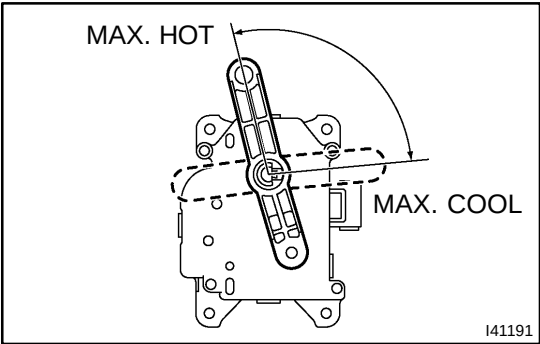
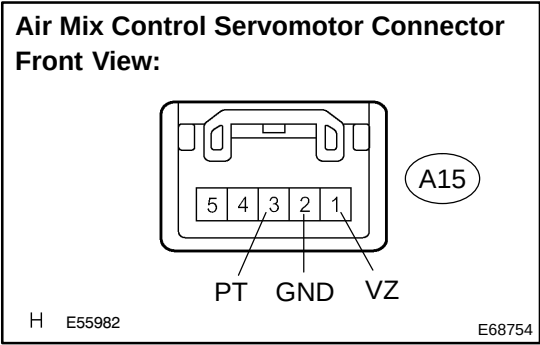
C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

3

INSPECT AIR MIX CONTROL SERVOMOTOR



OK

- (a) Remove the air mix control servomotor.
- (b) Disconnect the connector from air mix control servomotor.
- (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A15-1 (VZ) – A15-2 (GND)	Always	4.2 to 7.8 kΩ

- (d) Measure the resistance according to the value(s) in the table below.

HINT:
See page 05-1320 for the operation procedure for air mix control servomotor.

Standard:

Tester connection	Condition	Specified condition
A15-3 (PT) – A15-2 (GND)	Max. Cool Position	3.6 to 6.7 kΩ
A15-3 (PT) – A15-2 (GND)	Max. Hot Position	0.8 to 1.6 kΩ

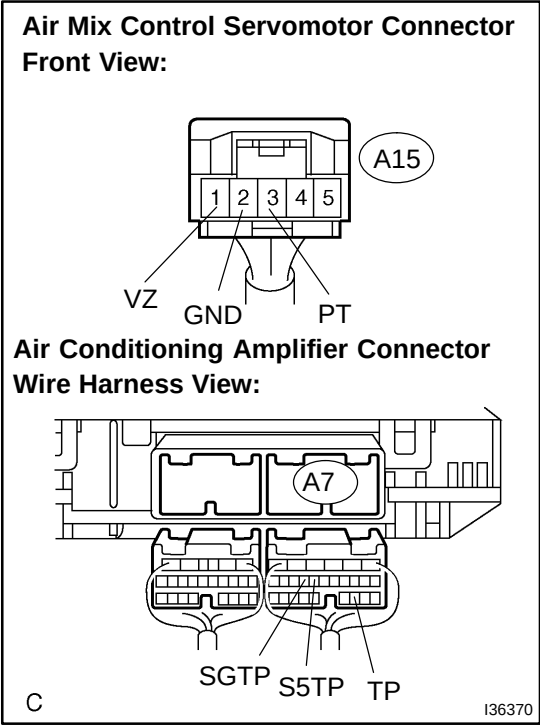
- (e) As the air mix control servomotor moves from cool side to hot side, the resistance decreases gradually without interruption.

NG

REPLACE AIR MIX CONTROL SERVOMOTOR

4

CHECK HARNESS AND CONNECTOR(AIR MIX CONTROL SERVOMOTOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector air mix control servomotor.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-20 (TP) – A15-3 (PT)	Always	Below 1 Ω
A7-14 (SGTP) – A15-2 (GND)	Always	Below 1 Ω
A7-13 (S5TP) – A15-1 (VZ)	Always	Below 1 Ω
A7-20 (TP) – Body ground	Always	10 kΩ or higher
A7-14 (SGTP) – Body ground	Always	10 kΩ or higher
A7-13 (S5TP) – Body ground	Always	10 kΩ or higher

NG

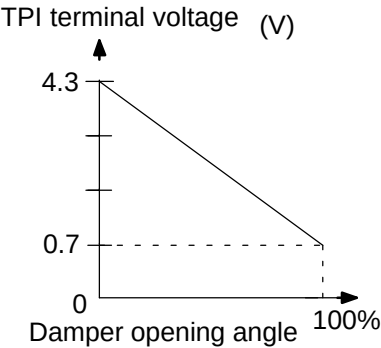
REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1432	AIR INLET DAMPER POSITION SENSOR CIRCUIT
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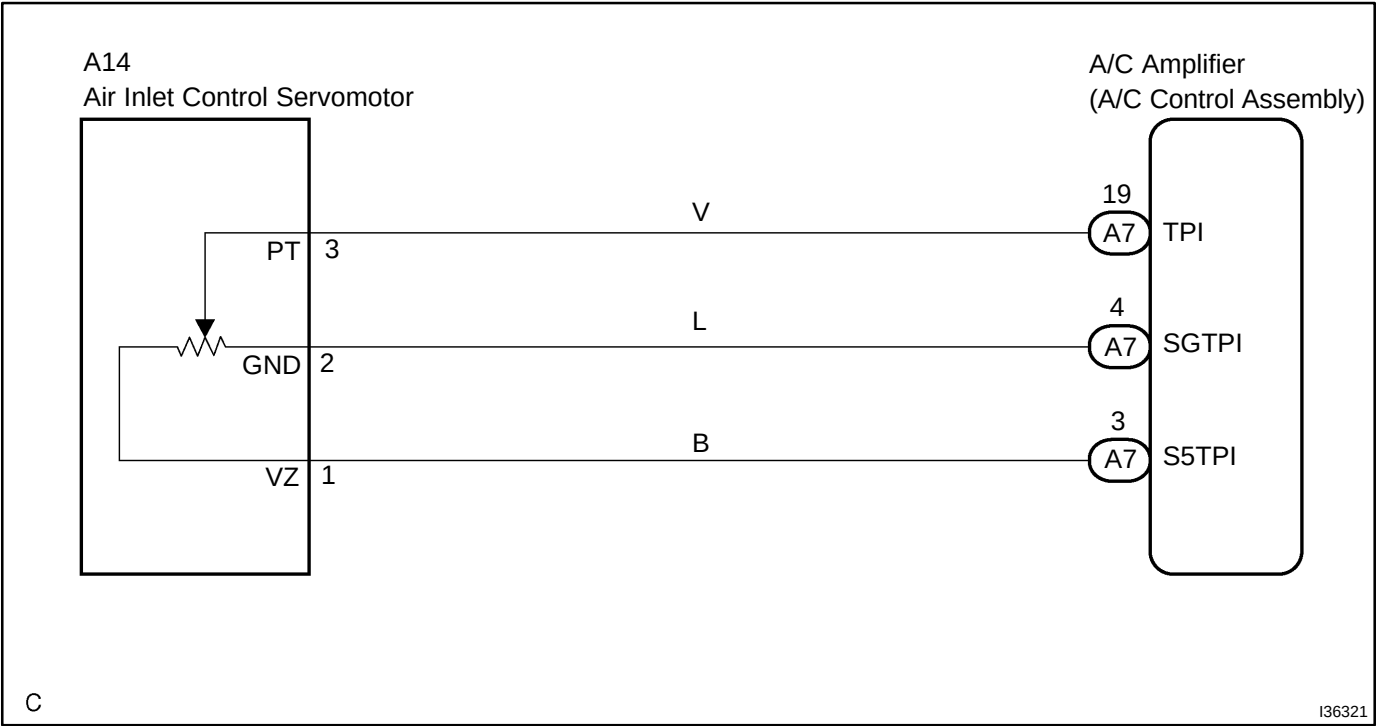
CIRCUIT DESCRIPTION



This sensor detects the position of the air inlet control servomotor and sends the appropriate signals to the A/C amplifier. The position sensor is built in the air inlet control servomotor. The position sensor's resistance changes as the air inlet control servomotor arm moves. It outputs voltage (5V) that is input to terminal 3 (VZ) and terminal 3 (PT) via the variable resistor, and then to the A/C amplifier. The A/C amplifier reads the arm position with the input voltage from the position sensor.

DTC No.	Detection Item	Trouble Area
B1432	Open or short in power source circuit in air inlet damper position sensor circuit.	• Air inlet control servomotor (air inlet damper position sensor) • Harness or connector between air inlet control servomotor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
----------	---------------------------------------

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/I DAMP POS	Air inlet damper position / min.: -14% max.: 113.5%	Damper is at "RECIRCULATION": -1.0% Damper is at "FRESH": 110.0% Damper is at "HALF-RECIRCULATION": 20.0 to 102.0%	Open in the circuit: 50.0%
A/I DAMP TARG	Air inlet damper target position / min.: -14% max.: 113.5%	Damper is at "RECIRCULATION": -1.0% Damper is at "FRESH": 110.0% Damper is at "HALF-RECIRCULATION": 20.0 to 102.0%	Open in the circuit: 50.0%

OK:

The displayed is as specified in the normal condition.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

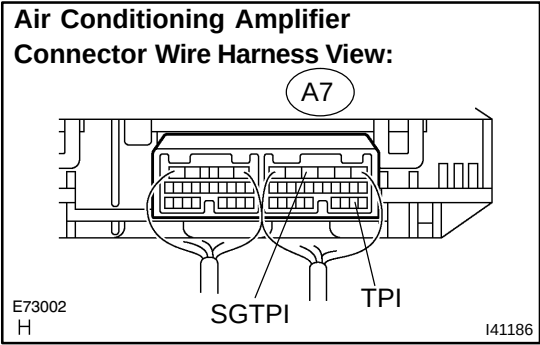
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)

C

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

A

2 INSPECT AIR CONDITIONING AMPLIFIER(TPI – SGTPI)



- (a) Remove A/C amplifier with connectors still connected.
- (b) Change the set REC/FRS to activate the air inlet servo-motor.
- (c) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-19 (TPI) – A7-4 (SGTPI)	Power switch ON (ON) RECIRC position	3.5 to 4.5 V
A7-19 (TPI) – A7-4 (SGTPI)	Power switch ON (ON) FRESH position	0.5 to 1.8 V

HINT:
As the air inlet servomotor is moved from REC side to FRS side, the voltage decreases gradually without interruption.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

B

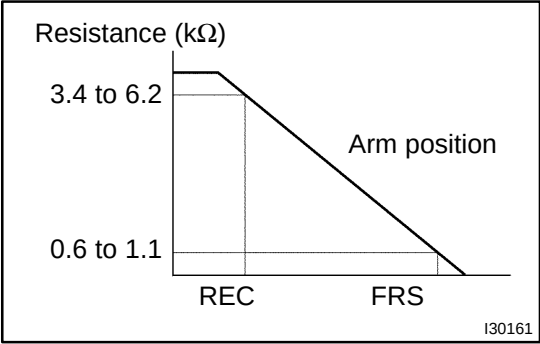
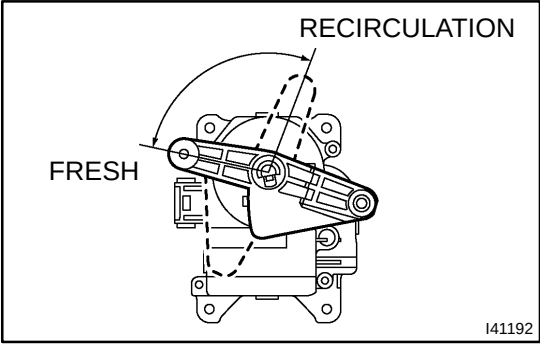
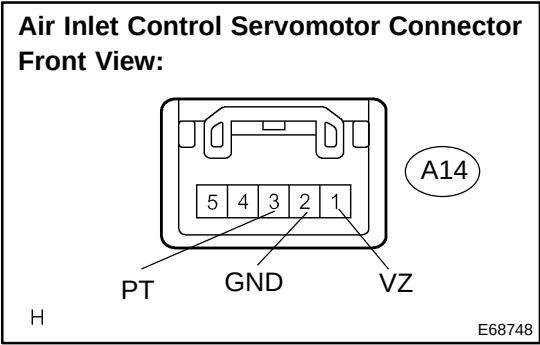
**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

3 INSPECT AIR INLET CONTROL SERVOMOTOR



OK

- (a) Remove the air inlet control servomotor.
- (b) Disconnect the connector from air inlet control servomotor.
- (c) Measure resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A14-1 (VZ) – A14-2 (GND)	Always	4.2 to 7.8 kΩ

- (d) Measure the resistance according to the value(s) in the table below.

HINT:

See page 05-1325 for the operation procedure of the air inlet control servomotor.

Standard:

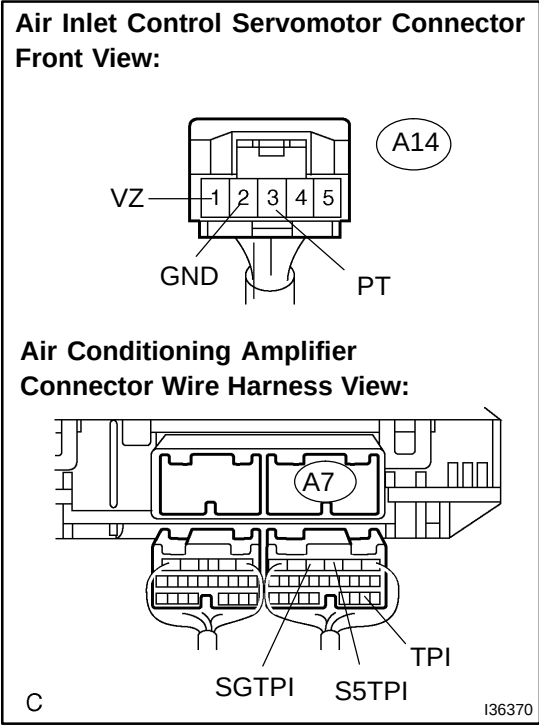
Tester connection	Condition	Specified condition
A14-3 (PT) – A14-2 (GND)	RECIRCULATION position	3.4 to 6.2 kΩ
A14-3 (PT) – A14-2 (GND)	FRESH position	0.6 to 1.1 kΩ

- (e) As the air inlet control servomotor moves from fresh to recirculation, the resistance decreases gradually without interruption.

NG REPLACE AIR INLET CONTROL SERVOMOTOR

4

CHECK HARNESS AND CONNECTOR(AIR INLET CONTROL SERVOMOTOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector from air inlet control servomotor.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-19 (TPI) – A14-3 (PT)	Always	Below 1 Ω
A7-4 (SGTPI) – A14-2 (GND)	Always	Below 1 Ω
A7-3 (S5TPI) – A14-1 (VZ)	Always	Below 1 Ω
A7-19 (TPI) – Body ground	Always	10 kΩ or higher
A7-4 (SGTPI) – Body ground	Always	10 kΩ or higher
A7-3 (S5TPI) – Body ground	Always	10 kΩ or higher

NG

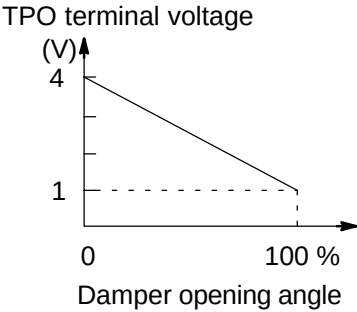
REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1433	AIR OUTLET DAMPER POSITION SENSOR CIRCUIT
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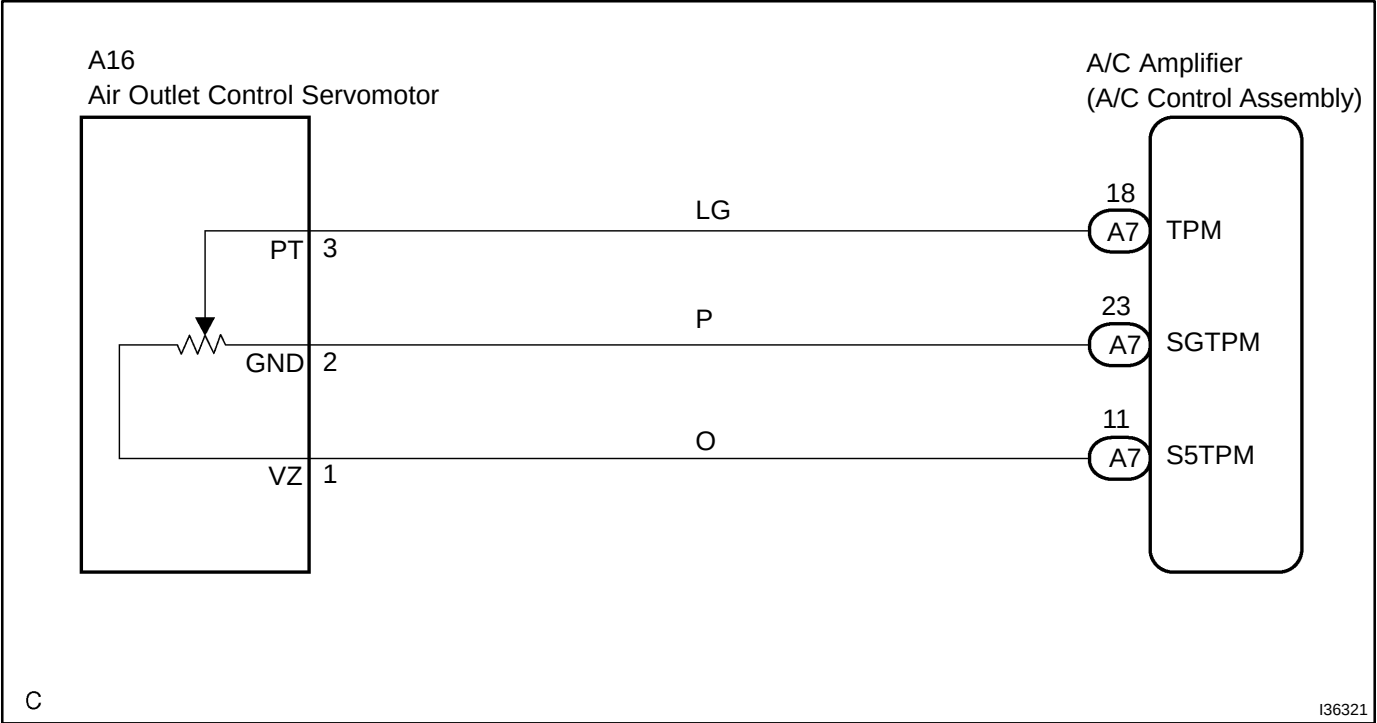
CIRCUIT DESCRIPTION



This sensor detects the position of the air outlet control servomotor and sends the appropriate signals to the A/C amplifier. The position sensor is built in the air outlet control servomotor. The potentiometer's resistance changes as the air outlet control servomotor arm moves. It outputs voltage (5V) that is input to terminal 1 (VZ) and terminal 3 (PT) via the variable resistor, and then to the A/C amplifier. The A/C amplifier reads the arm position with the input voltage from the potentiometer.

DTC No.	Detection Item	Trouble Area
B1433	Open or short in power source circuit in air outlet damper position sensor circuit.	• Air outlet control servomotor (air outlet damper position sensor) • Harness or connector between air outlet control servomotor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE ON HAND-HELD TESTER

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the items below in the DATA LIST, and read the displays on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/O DAMP POS	Air outlet damper position / min.: -14% max.: 113.5%	Damper is at "FACE": -10.0% Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0% Damper is at "DEF": 110.0%	Open in the circuit: 50.0%
A/O DAMP TARG	Air outlet damper target position / min.: -14% max.: 113.5%	Damper is at "FACE": -10.0% Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0% Damper is at "DEF": 110.0%	Open in the circuit: 50.0%

OK:**The displayed is as specified in the normal condition.****Result:**

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

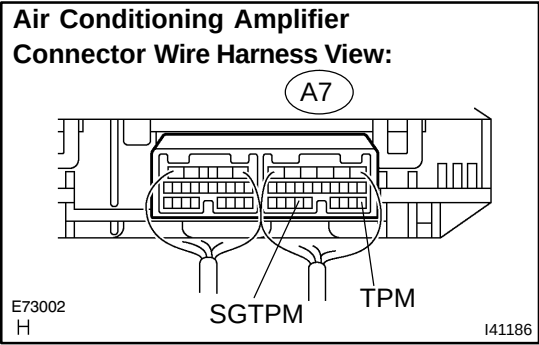
**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2 INSPECT AIR CONDITIONING AMPLIFIER(TPM – SGTPM)



- (a) Remove the A/C amplifier with connectors still connected.
- (b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-18 (TPM) – A7-23 (SGTPM)	Power switch ON (ON) FACE position	3.97 to 4.07 V
A7-18 (TPM) – A7-23 (SGTPM)	Power switch ON (ON) DEF position	0.97 to 1.03 V

HINT:
As the air outlet servomotor is moved from FACE side to DEF side, the voltage decreases gradually without interruption.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

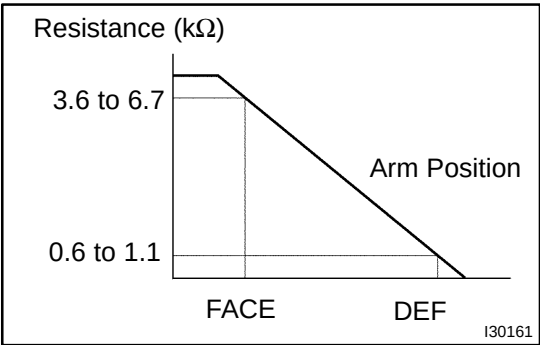
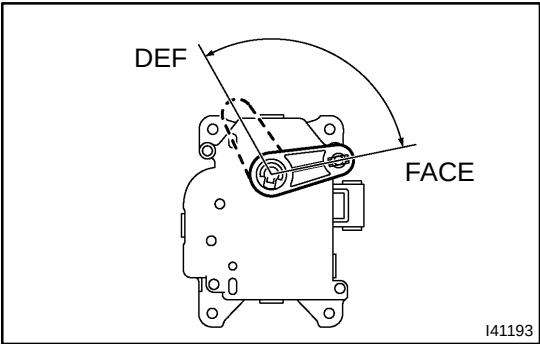
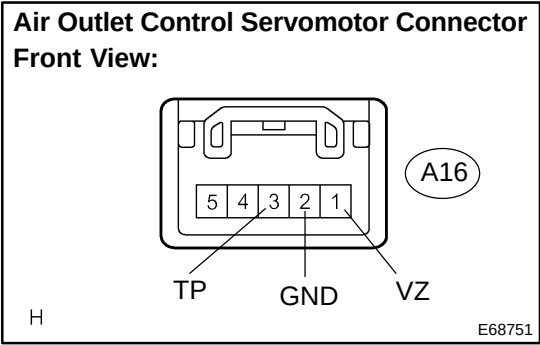
C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

3

INSPECT AIR OUTLET CONTROL SERVOMOTOR



- (a) Remove the air outlet control servomotor.
- (b) Disconnect the connector from air inlet control servomotor.
- (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A16-1 (VZ) – A16-2 (GND)	Always	4.2 to 7.2 kΩ

- (d) Measure the resistance according to the value(s) in the table below.

HINT:

See page 05-1330 for operation procedure for air outlet control servomotor.

Standard:

Tester connection	Condition	Specified condition
A16-3 (PT) – A16-2 (GND)	DEF position	0.6 to 1.1 kΩ
A16-3 (PT) – A16-2 (GND)	FACE position	3.6 to 6.7 kΩ

HINT:

As the air outlet control servomotor moved from DEF side to FACE side, the resistance decreases gradually without interruption.

OK

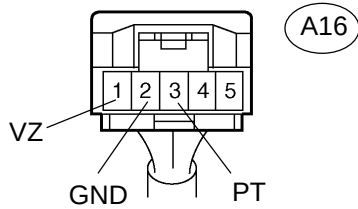
NG

REPLACE AIR OUTLET CONTROL SERVOMOTOR

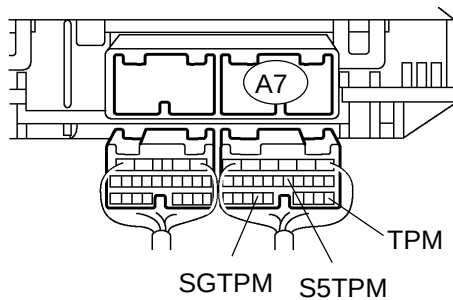
4

CHECK HARNESS AND CONNECTOR(AIR OUTLET CONTROL SERVOMOTOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)

Air Outlet Control Servomotor Connector
Front View:



Air Conditioning Amplifier
Connector Wire Harness View:



- (a) Disconnect the connector from air outlet control servomotor.
- (b) Measure the resistance according to the value(s) in the table below.

Tester connection	Condition	Specified condition
A7-18 (TPM) – A16-3 (PT)	Always	Below 1 Ω
A7-23 (SGTPM) – A16-2 (GND)	Always	Below 1 Ω
A7-11 (S5TPM) – A16-1 (VZ)	Always	Below 1 Ω
A7-18 (TPM) – Body ground	Always	10 k Ω or higher
A7-23 (SGTPM) – Body ground	Always	10 k Ω or higher
A7-11 (S5TPM) – Body ground	Always	10 k Ω or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

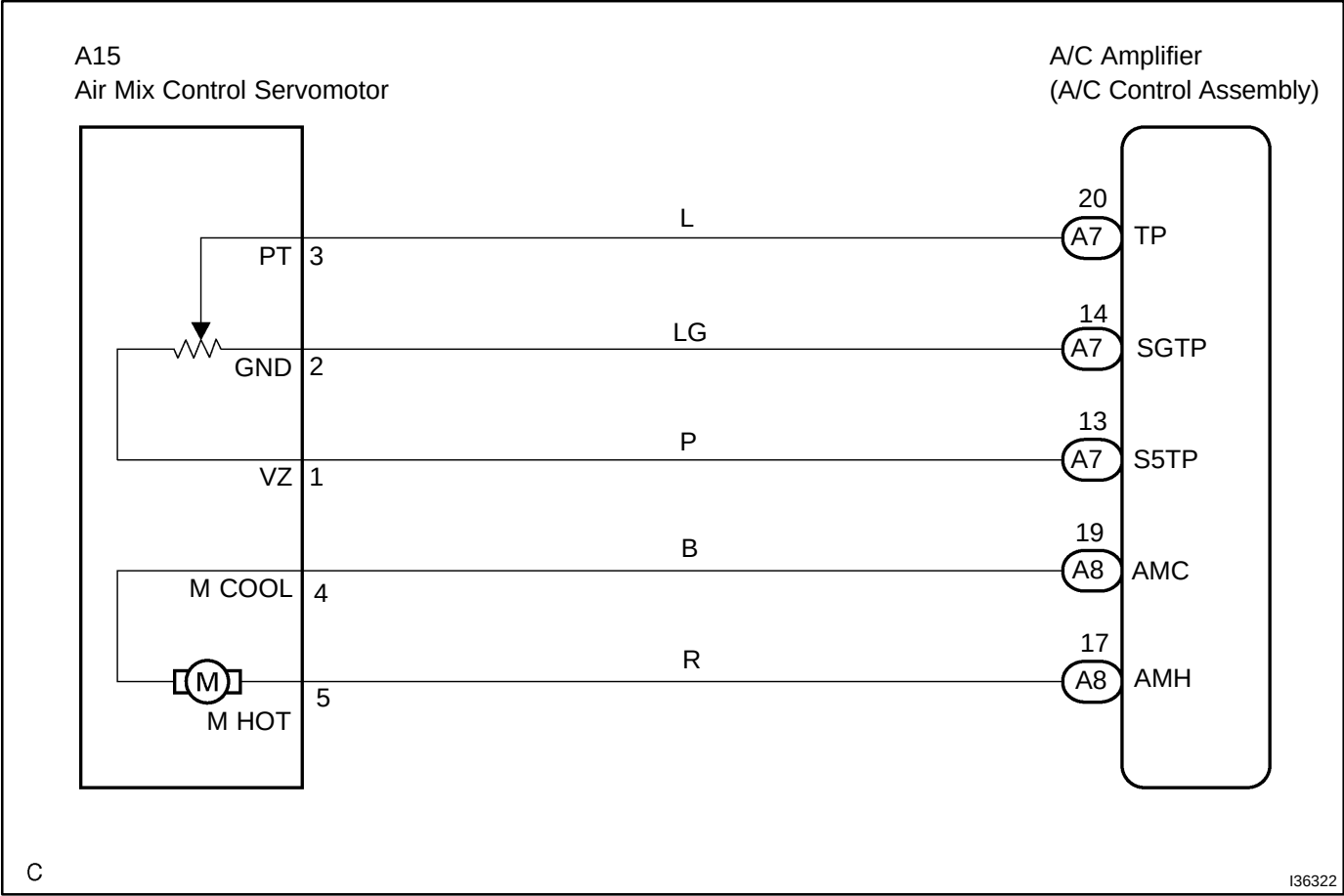
DTC	B1441	AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (PASSENGER SIDE)
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CIRCUIT DESCRIPTION

The air mix control servomotor (air mix damper servo sub-assy) is controlled by the A/C amplifier. The air mix control servomotor moves the air mix damper by rotating (normal, reverse) the motor with electrical power from the A/C amplifier. This adjusts the mix ratio of the air that passes through the evaporator and heater core and controls the air-flow temperature. Air flow temperature changes when moving the air mix damper to the target point. The target point can be detected with the air mix damper position sensor.

DTC No.	Detection Item	Trouble Area
B1441	Air mix damper position sensor value does not change even if air conditioner amplifier assy operates air mix servomotor.	• Air mix control servomotor • Harness or connector between air mix control servomotor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
----------	---------------------------------------

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/M DAMP POS-D	Air mix damper position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. COOL": -10.0%	—
A/M DAMP TARG-D	Air mix damper target position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. COOL": -10.0%	—

OK:

When the target position is at the "MAX. COOL" (-10.0%), the actual opening angle is 19.0% or less.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2 READ VALUE ON HAND-HELD TESTER

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/M DAMP POS-D	Air mix damper position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. HOT": 100.0% or 71.0%	—
A/M DAMP TARG-D	Air mix damper target position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. HOT": 100.0% or 71.0%	—

OK:

When the target position is at the "MAX. HOT" (100.0%), the actual opening angle is 81.0% or more.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)

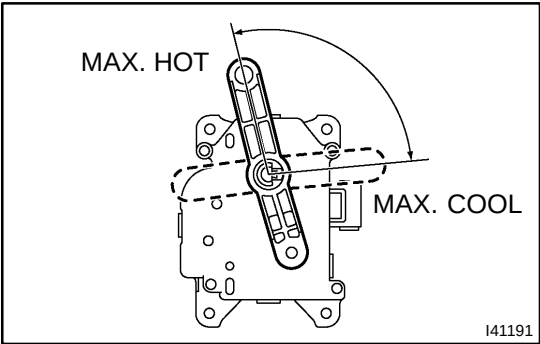
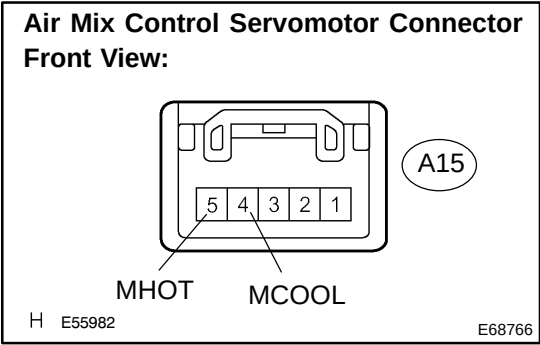
C

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

A

3

INSPECT AIR MIX CONTROL SERVOMOTOR



- (a) Remove the air mix control servomotor.
- (b) Disconnect the connector from air mix control servomotor.
- (c) Connect the positive (+) lead from the battery to terminal 5 and negative (–) lead to terminal 4, then check that lever turns to "MAX. HOT" position smoothly.
- (d) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A15-3 (PT) – A15-2 (GND)	Max. Hot Position	0.8 to 1.6 kΩ

- (e) Connect the positive (+) lead from the battery to terminal 4 and negative (–) lead to terminal 5, then check that lever turns to "MAX. COOL" position smoothly.
- (f) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A15-3 (PT) – A15-2 (GND)	Max. Cool Position	3.6 to 6.7 kΩ

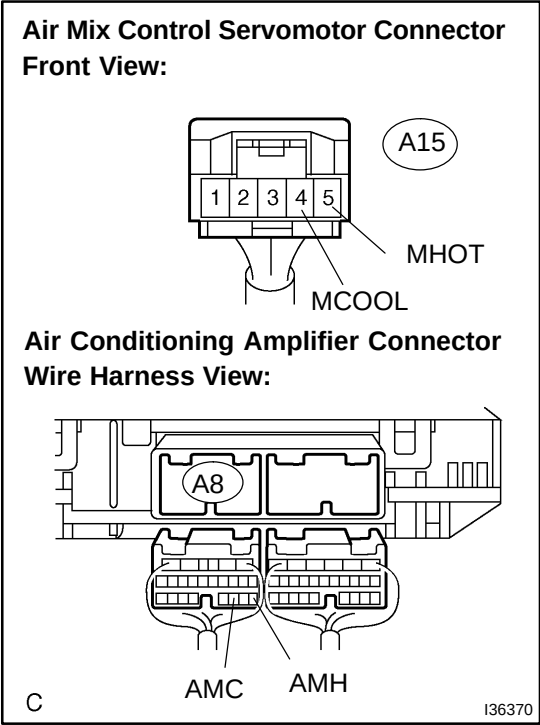
NG

REPLACE AIR MIX CONTROL SERVOMOTOR

OK

4

CHECK HARNESS AND CONNECTOR(AIR MIX CONTROL SERVOMOTOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector from air mix control servomotor.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A8-19 (AMC) – A15-4 (MCOOL)	Always	Below 1 Ω
A8-17 (AMH) – A15-5 (MHOT)	Always	Below 1 Ω
A8-19 (AMC) – Body ground	Always	10 kΩ or higher
A8-17 (AMH) – Body ground	Always	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1442	AIR INLET DAMPER CONTROL SERVOMOTOR CIRCUIT
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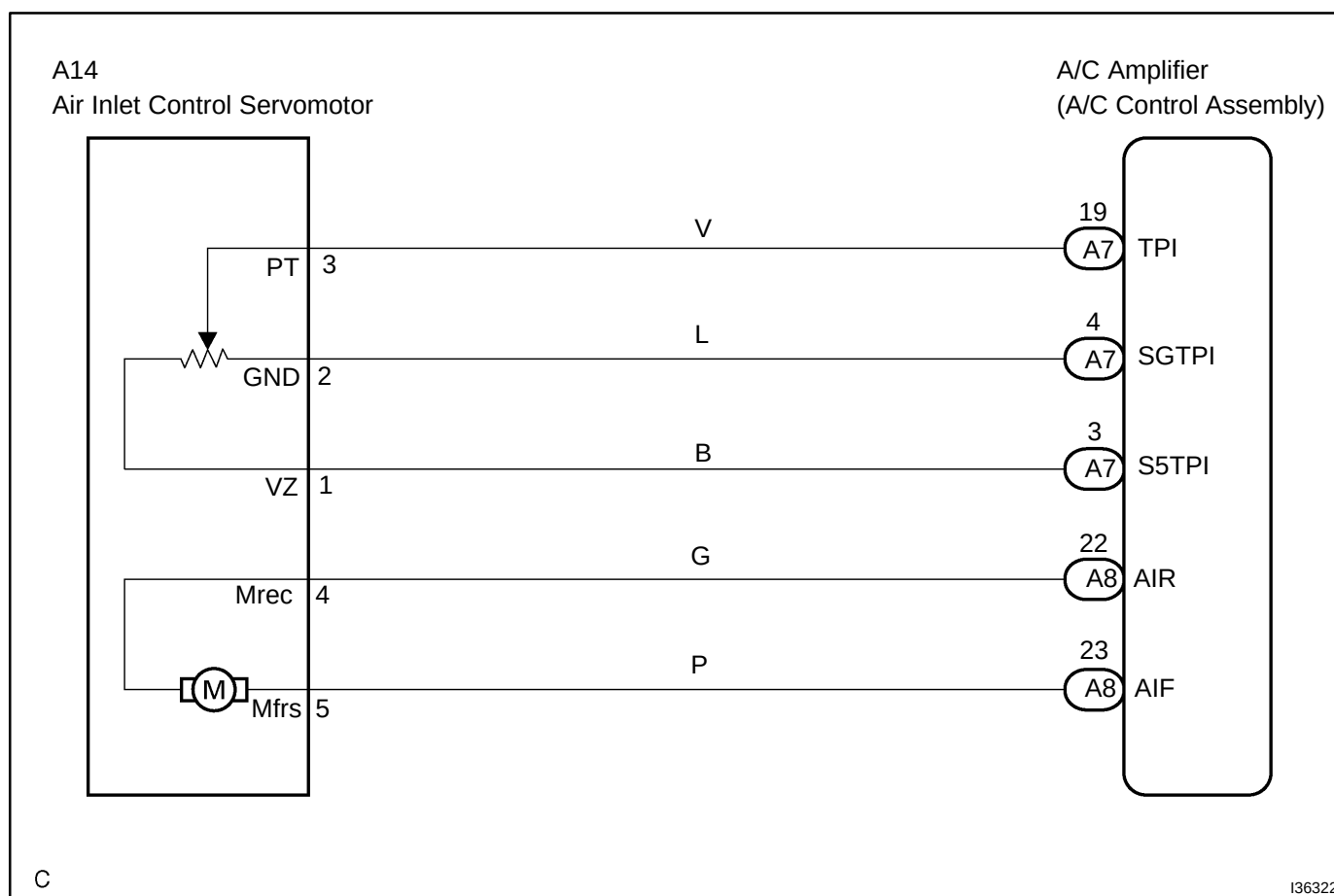
CIRCUIT DESCRIPTION

The air inlet control servomotor is controlled by the A/C amplifier and moves the air inlet control servomotor to the desired position.

The air inlet control servomotor switches between "RECIRCULATION" and "FRESH" by rotating the motor (normal, reverse) with electrical power from the A/C amplifier. This controls intake air and switches "RECIRCULATION", "FRESH" and "HALF-RECIRCULATION".

DTC No.	Detection Item	Trouble Area
B1442	Air outlet damper position sensor valve does not change even if air conditioner amplifier operated air outlet damper control servo motor.	• Air inlet control servomotor • Harness or connector between air inlet control servomotor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
----------	---------------------------------------

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/I DAMP POS	Air inlet damper position / min.: -14% max.: 113.5%	Damper is at "RECIRCULATION": -1.0% Damper is at "HALF-RECIR- CULATION": 20.0 to 102.0%	Open in the circuit: 50.0%
A/I DAMP TARG	Air inlet damper target position / min.: -14% max.: 113.5%	Damper is at "RECIRCULATION": -1.0% Damper is at "HALF-RECIR- CULATION": 20.0 to 102.0%	Open in the circuit: 50.0%

OK:

When the target position is at the "RECIRCULATION" (-1.0%), the actual opening angle is 19.0% or less.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2 READ VALUE ON HAND-HELD TESTER

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/I DAMP POS	Air inlet damper position / min.: -14% max.: 113.5%	Damper is at "FRESH": 110.0% Damper is at "HALF-RECIR- CULATION": 20.0 to 102.0%	Open in the circuit: 50.0%
A/I DAMP TARG	Air inlet damper target position / min.: -14% max.: 113.5%	Damper is at "FRESH": 110.0% Damper is at "HALF-RECIR- CULATION": 20.0 to 102.0%	Open in the circuit: 50.0%

OK:

When the target position is at the "FRESH" (110.0%), the actual opening angle is 81.0% or more.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

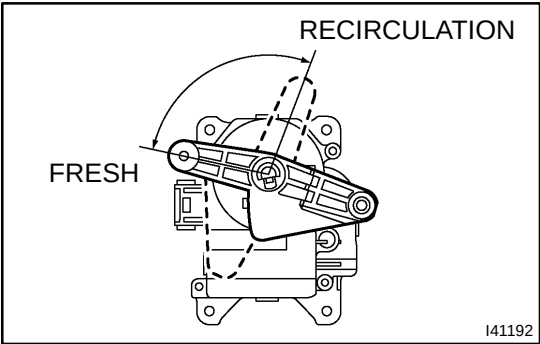
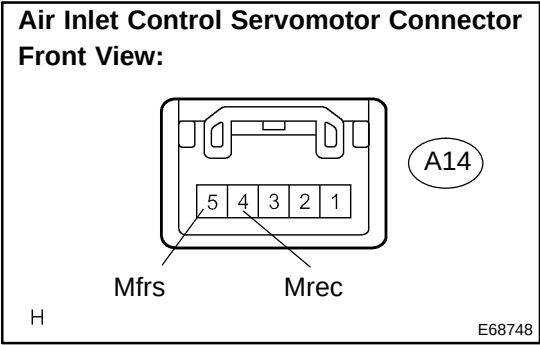
C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

3

INSPECT AIR INLET CONTROL SERVOMOTOR



- (a) Remove the damper air inlet servomotor.
- (b) Disconnect the connector from air inlet control servomotor.
- (c) Connect the positive (+) lead from the battery to terminal 5 and negative (–) lead to terminal 4 then check that the lever turns to "FRESH" position smoothly.
- (d) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A14-3 (PT) – A14-2 (GND)	FRESH position	0.6 to 1.1 kΩ

- (e) Connect the positive (+) lead from the battery to terminal 4 and negative (–) lead to terminal 5 then check that the lever turns to "RECIRCULATION" position smoothly.
- (f) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A14-3 (PT) – A14-2 (GND)	RECIRCULATION position	3.4 to 6.2 kΩ

NG

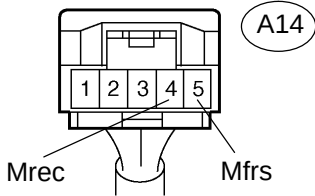
REPLACE AIR INLET CONTROL SERVOMOTOR

OK

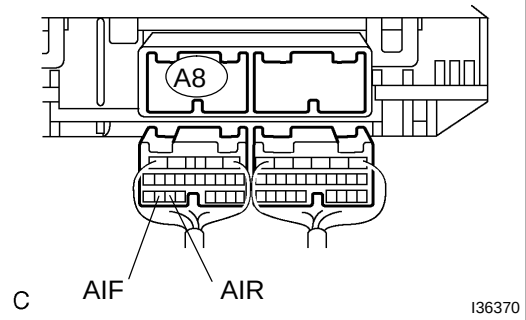
4

CHECK HARNESS AND CONNECTOR(AIR INLET CONTROL SERVOMOTOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)

Air Inlet Control Servomotor Connector
Front View:



Air Conditioning Amplifier
Connector Wire Harness View:



- (a) Disconnect the connector from air inlet control servomotor.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A8-22 (AIR) – A14-4 (Mrec)	Always	Below 1 Ω
A8-23 (AIF) – A14-5 (Mfrs)	Always	Below 1 Ω
A8-22 (AIR) – Body ground	Always	10 kΩ or higher
A8-23 (AIF) – Body ground	Always	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

DTC	B1443	AIR OUTLET DAMPER CONTROL SERVOMOTOR CIRCUIT
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CIRCUIT DESCRIPTION

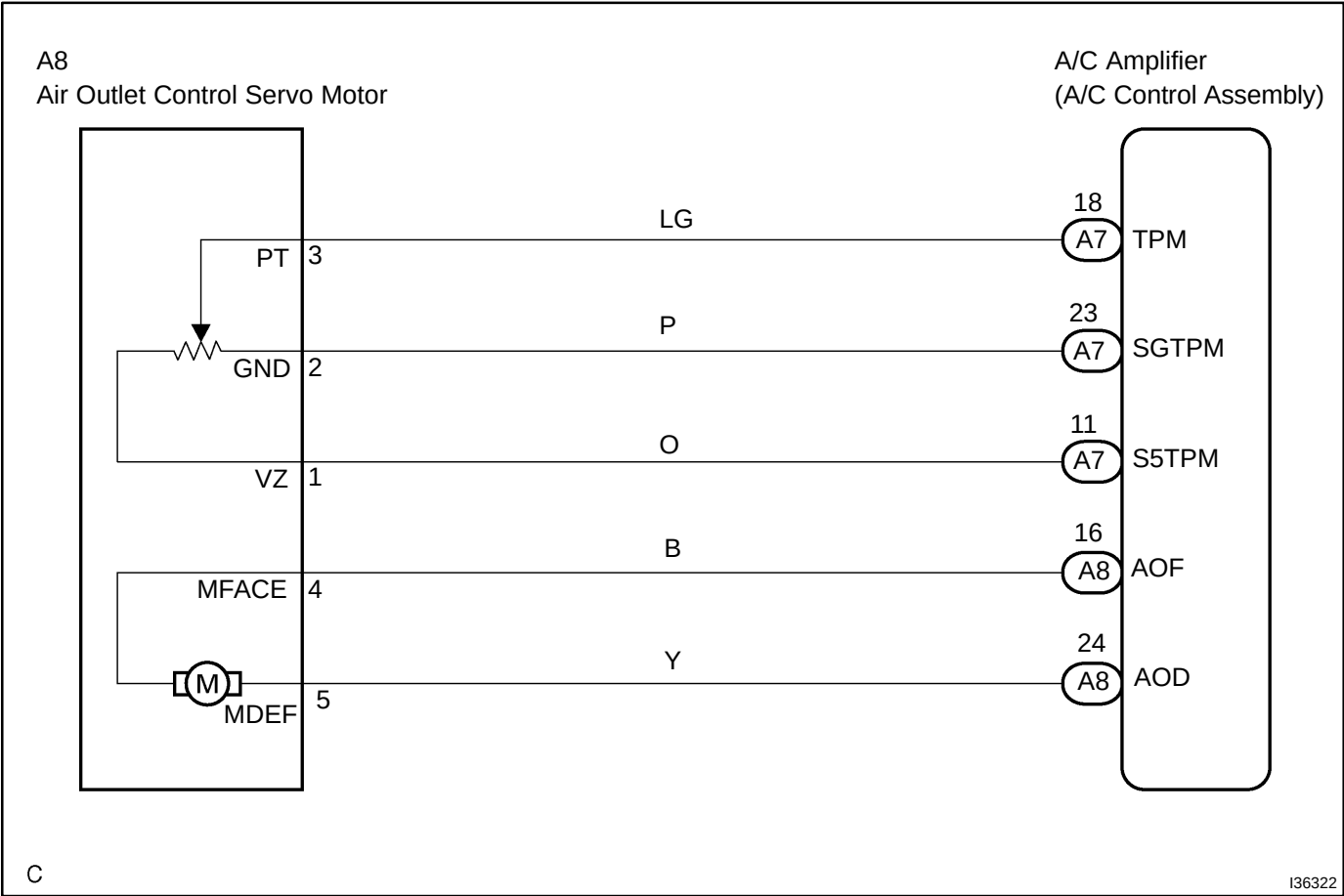
This circuit turns the servomotor and changes each damper position by receiving the signals from the A/C amplifier assy.

The air outlet damper servo switches the air outlet by rotating the motor (normal, reverse) with electrical power from the A/C amplifier.

When the AUTO switch is on, the A/C amplifier changes the mode between "FACE", "BI-LEVEL" and "FOOT" according to the temperature setting.

DTC No.	Detection Item	Trouble Area
B1443	Air outlet damper position sensor valve does not change even if air conditioner amplifier operated air outlet damper control servo motor.	• Air outlet control servomotor • Harness or connector between air outlet control servomotor and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE ON HAND-HELD TESTER

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/O DAMP POS	Air outlet damper position / min.: -14% max.: 113.5%	Damper is at "FACE": -10.0% Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% (33.5%)*1 Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0%	Open in the circuit: 50.0%
A/O DAMP TARG	Air outlet damper target position / min.: -14% max.: 113.5%	Damper is at "FACE": -10.0% Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% (33.5%)*1 Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0%	Open in the circuit: 50.0%

OK:**When the target position is at the "FACE" (-10.0%), the actual opening angle is 19.0% or less.****Result:**

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

2 READ VALUE ON HAND-HELD TESTER

- (a) Connect the hand-held tester to DLC3.
 (b) Turn the power switch ON and push the hand-held tester main switch ON.
 (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
A/O DAMP POS	Air outlet damper position / min.: -14% max.: 113.5%	Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% (33.5%)*1 Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0% Damper is at "DEF": 110.0%	Open in the circuit: 50.0%
A/O DAMP TARG	Air outlet damper target position / min.: -14% max.: 113.5%	Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% (33.5%)*1 Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0% Damper is at "DEF": 110.0%	Open in the circuit: 50.0%

OK:**When the target position is at the "DEF" (110.0%), the actual opening angle is 81.0% or more.****Result:**

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

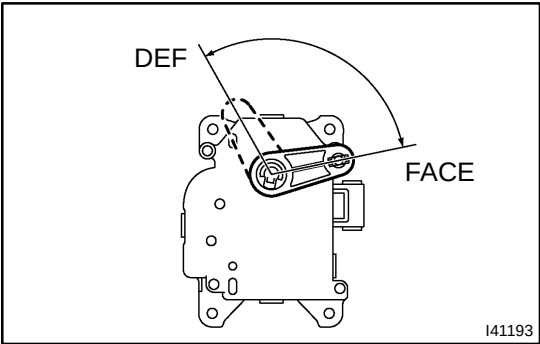
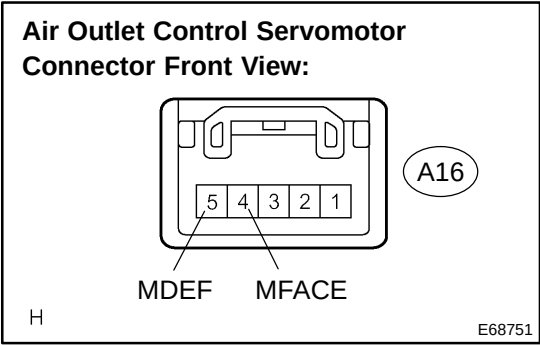
**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

A

3 INSPECT AIR OUTLET CONTROL SERVOMOTOR



- (a) Remove the air outlet control servomotor.
- (b) Disconnect the connector from air outlet control servomotor.
- (c) Connect the positive (+) lead from the battery to terminal 4 and negative (–) lead to terminal 5 then check that the lever turns to "FACE" position smoothly.
- (d) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A8-3 (PT) – A8-2 (GND)	FACE position	3.6 to 6.7 kΩ

- (e) Connect the positive (+) lead from the battery to terminal 5 and negative (–) lead to terminal 4 then check that the lever turn to "DEF" position smoothly.
- (f) Measure the resistance according to the value(s) in the table below.

Standard:

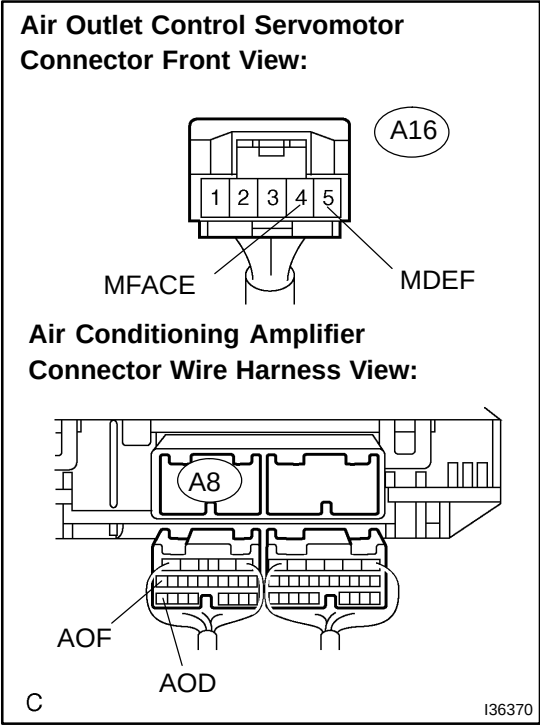
Tester connection	Condition	Specified condition
A8-3 (PT) – A8-2 (GND)	DEF position	0.6 to 1.1 kΩ

NG REPLACE AIR OUTLET CONTROL SERVOMOTOR

OK

4

CHECK HARNESS AND CONNECTOR(AIR OUTLET CONTROL SERVOMOTOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



- (a) Disconnect the connector from air outlet control servomotor and air conditioning amplifier.
- (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A8-16 (AOF) – A16-4 (MFACE)	Always	Below 1 Ω
A8-24 (AOD) – A16-5 (MDEF)	Always	Below 1 Ω
A8-16 (AOF) – Body ground	Always	10 kΩ or higher
A8-24 (AOD) – Body ground	Always	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

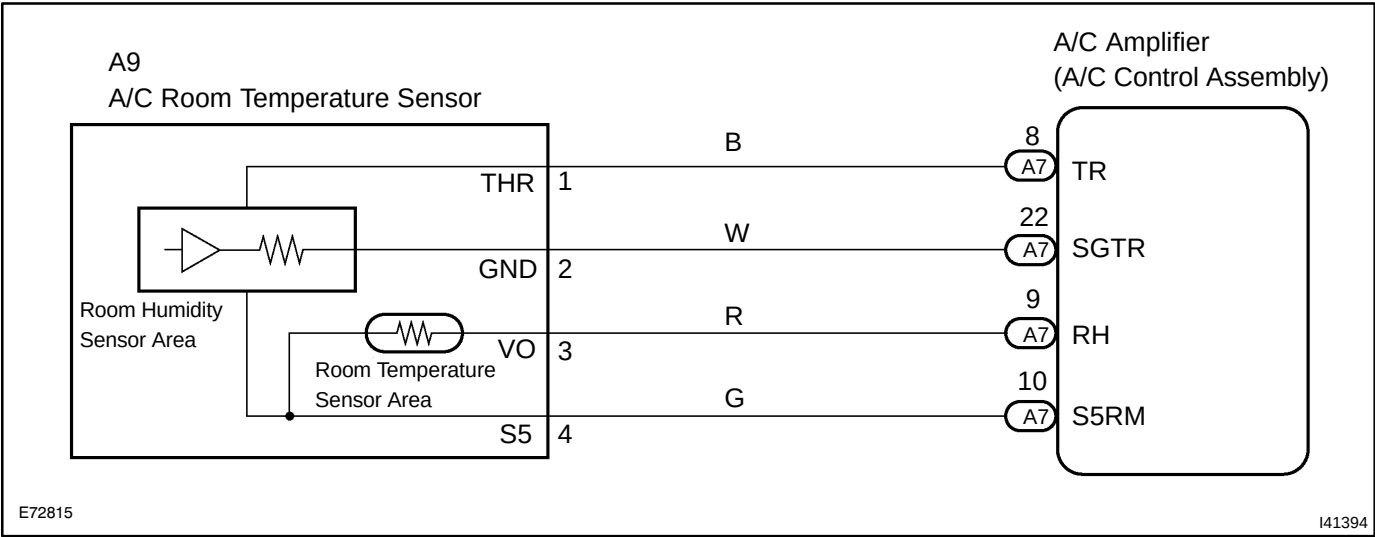
DTC	B1462	ROOM HUMIDITY SENSOR CIRCUIT
-----	-------	------------------------------

CIRCUIT DESCRIPTION

The A/C room humidity sensor detects room humidity. The voltage of the A/C room humidity sensor changes in accordance with room humidity. The A/C amplifier reads changes in the A/C room humidity sensor. The A/C room humidity sensor is integrated with A/C room temperature sensor.

DTC No.	Detection item	Trouble Area
B1462	Open or short in room humidity sensor circuit	• A/C room humidity sensor (A/C room temperature sensor) • Harness or connector between A/C room humidity sensor (A/C room temperature sensor) and A/C amplifier • A/C amplifier

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE ON HAND-HELD TESTER
---	--------------------------------

- (a) Connect the hand-held tester to DLC3.
- (b) Turn the power switch ON and push the hand-held tester main switch ON.
- (c) Select the item below in the DATA LIST, and read the display on the hand-held tester.

DATA LIST / AIR CONDITIONER:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
HUMIDITY SENS	Humidity sensor / min.: 0% max.: 100%	Actual room humidity is displayed	–

OK:
The displayed is as specified in the normal condition.

Result

NG	A
OK (Checking from the PROBLEM SYMPTOM TABLE)	B
OK (Checking from the DTC)	C

B

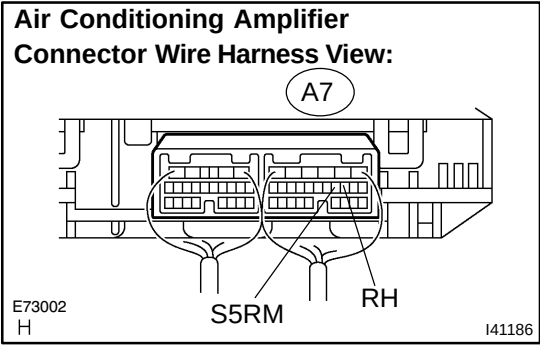
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)

C

REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

A

2 INSPECT AIR CONDITIONING AMPLIFIER(RH-S5RH)



- (a) Remove the A/C amplifier with connectors still connected.
- (b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-9 (RH) – A7-10 (S5RM)	Power switch ON at 25 °C (77 °F)	1.8 to 2.2 V
A7-9 (RH) – A7-10 (S5RM)	Power switch ON at 40 °C (104 °F)	1.2 to 1.6 V

HINT:
As the temperature increases, the voltage decreases.

Result:

NG	A
OK (Checking from the PROBLEM SYMPTOMS TABLE)	B
OK (Checking from the DTC)	C

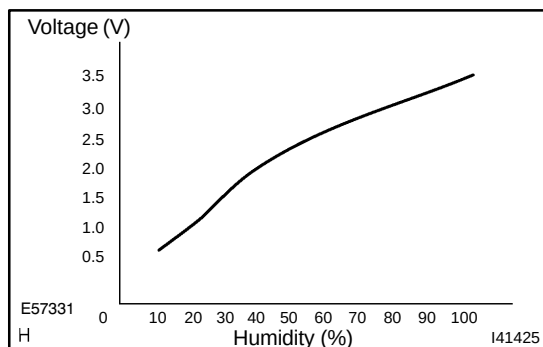
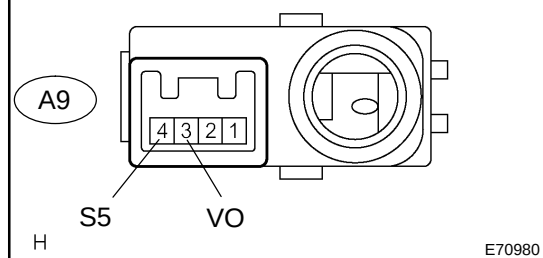
B

**PROCEED TO NEXT CIRCUIT INSPECTION
SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

C

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)**

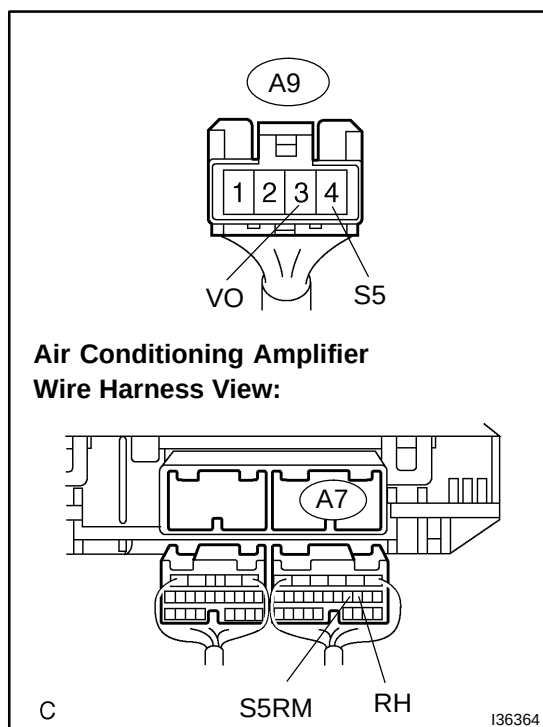
A

3 INSPECT A/C ROOM TEMPERATURE SENSOR (HUMIDITY SENSOR)**A/C Room Temperature Sensor
Connector Front View:**

- Remove the A/C room temperature sensor.
- Disconnect the connector from A/C room temperature sensor.
- Measure the resistance according to the value(s) in the table below.

Standard:**at 25°C (77°F) Humidity 40%: 1.61 to 2.24 V****at 25°C (77°F) Humidity 60%: 2.26 to 2.66 V****HINT:**

As the humidity increases, the resistance decreases (see the graph below).

NG**REPLACE A/C ROOM TEMPERATURE SENSOR****OK****4 CHECK HARNESS AND CONNECTOR(A/C ROOM HUMIDITY SENSOR – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)****Air Conditioning Amplifier
Wire Harness View:**

- Disconnect the connector from A/C room temperature sensor and air conditioning amplifier.
- Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-9 (RH) – A9-3 (VO)	Always	Below 1 Ω
A7-10 (S5RM) – A9-4 (S5)	Always	Below 1 Ω
A7-9 (RH) – Body ground	Always	10 kΩ or higher
A7-10 (S5RM) – Body ground	Always	10 kΩ or higher

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK****REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)**

DTC	B1471	A/C INVERTER HIGH VOLTAGE POWER RESOURCE SYSTEM MALFUNCTION
------------	--------------	--

CIRCUIT DESCRIPTION

The A/C inverter assy monitors the power voltage from the main battery in the self circuit. It stops compressor control and outputs the DTC when the monitored voltage is outside the specified range.

The output DTC is memorized as previous trouble. Compressor control may not resume unless the power switch is turned off.

HINT:

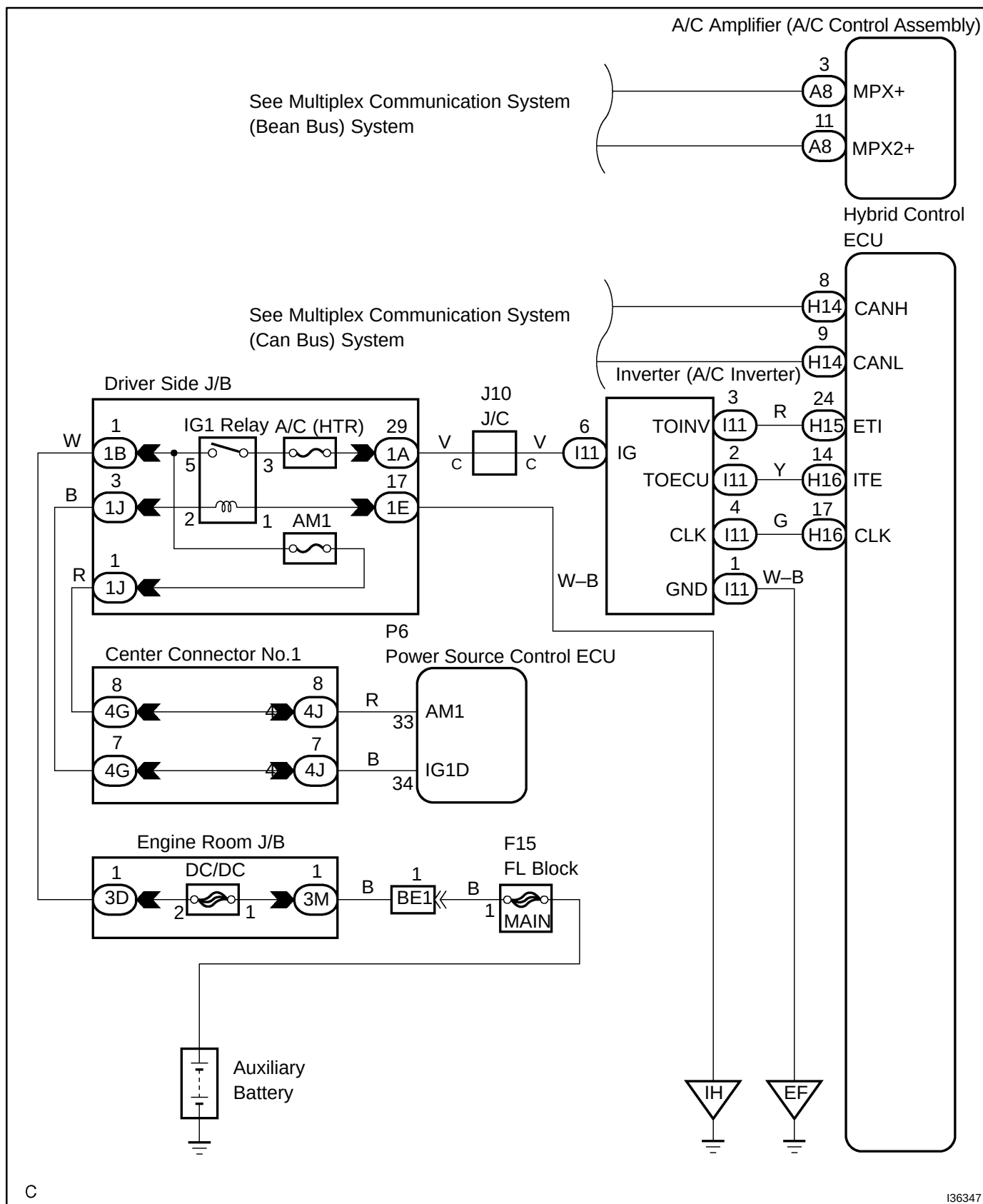
The hybrid control system and air conditioning system output DTCs separately. Inspect DTCs following the flow chart for the hybrid control system first if any DTCs from those systems are output simultaneously.

DTC No.	Detection item	Trouble Area
B1471	Open or short in A/C inverter high voltage power resource system	- Hybrid control ECU - A/C inverter (w/converter inverter assy)

NOTICE:

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

WIRING DIAGRAM



INSPECTION PROCEDURE**1 CHECK DIAGNOSTIC TROUBLE CODE**

- (a) Check if DTCs for the hybrid control system are output using intelligent tester II.

OK:

DTCs are not output in the hybrid control system.

NG

**GO TO HYBRID CONTROL SYSTEM
(SEE PAGE 05-440)**

OK

REPLACE A/C INVERTER ASSY**NOTICE:**

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

DTC	B1472	A/C INVERTER HIGH VOLTAGE OUTPUT SYSTEM MALFUNCTION
------------	--------------	--

CIRCUIT DESCRIPTION

The high voltage is output from the A/C inverter assy to the electric inverter compressor for driving the motor. Compressor control is stopped and the DTC is output if there is an open or short to ground in the output circuit.

The output DTC is memorized as previous trouble. Compressor control remains stopped unless the past and current DTCs are cleared by intelligent tester II.

CAUTION:

Wear insulated gloves and pull out the service plug grip before inspection as procedures may require disconnecting high-voltage connectors.

HINT:

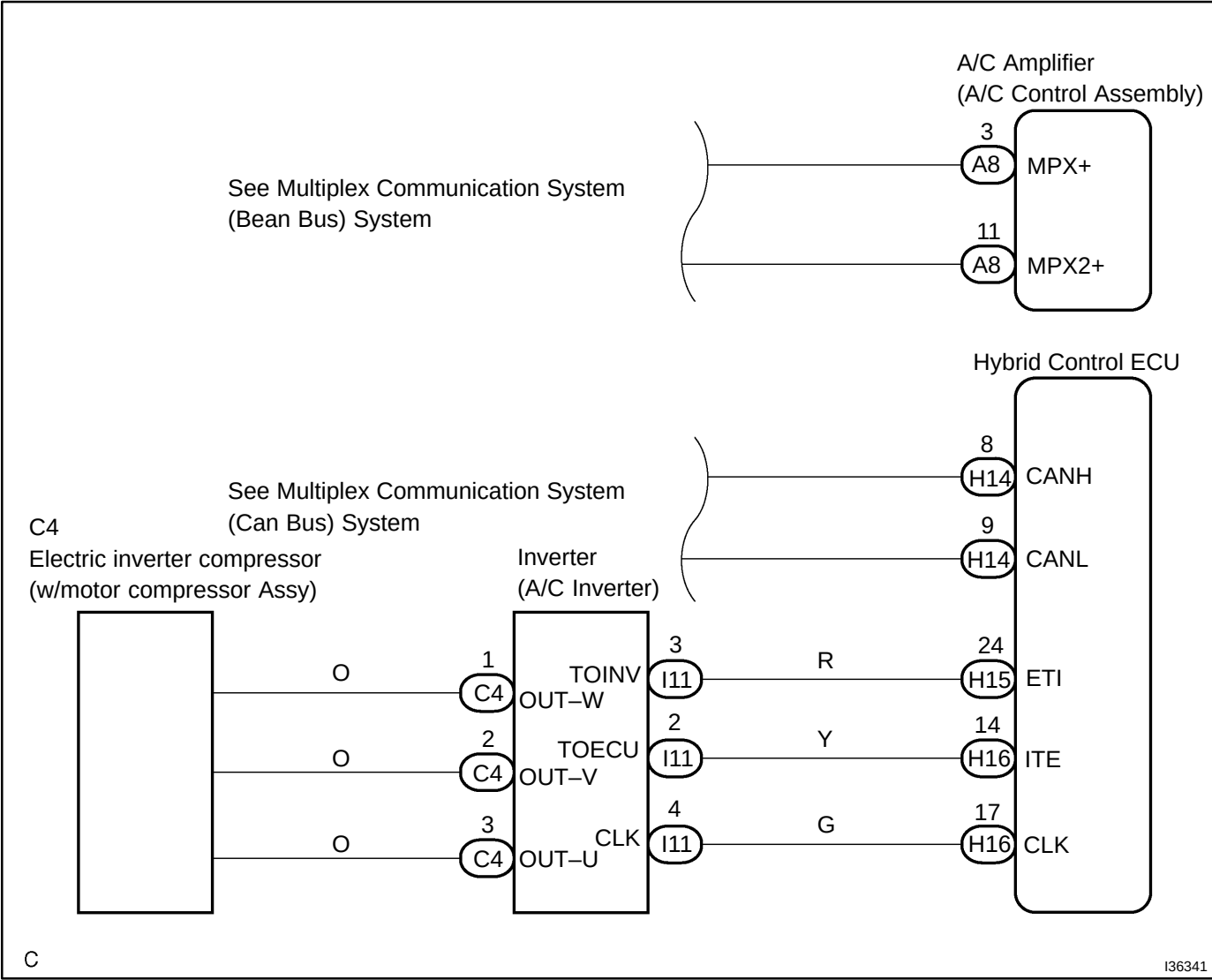
The hybrid vehicle system and air conditioning system output DTCs separately. Inspect DTCs following the flow chart for the hybrid system first if any DTCs from those systems are output simultaneously.

DTC No.	Detection item	Trouble Area
B1472	Open or short in A/C inverter high voltage output system	• Hybrid control ECU • Electric inverter compressor (w/motor compressor assy) • A/C inverter (w/converter inverter assy)

NOTICE:

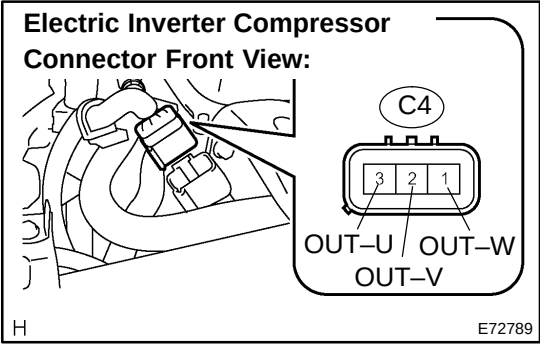
The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT ELECTRIC INVERTER COMPRESSOR



- (a) Remove the service plug grip.
- CAUTION:**
Because the compressor has a high-voltage circuit, wear insulated gloves and pull out the service plug to cut the high-voltage circuit before inspection.
- (b) Disconnect the electric inverter compressor connector.
- (c) Measure the resistance according to the value(s) in the table below immediately after the compressor is stopped.

Standard:

Tester connection	Condition	Specified condition
C4-1 (OUT-W) – C4-2 (OUT-V)	Always	0.5 to 0.8 Ω
C4-1 (OUT-W) – C4-3 (OUT-U)	Always	0.5 to 0.8 Ω
C4-2 (OUT-V) – C4-3 (OUT-U)	Always	0.5 to 0.8 Ω

NG

REPLACE ELECTRIC INVERTER COMPRESSOR

OK

REPLACE A/C INVERTER ASSY

NOTICE:
The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

DTC	B1473	A/C INVERTER START-UP SIGNAL SYSTEM MALFUNCTION
------------	--------------	--

CIRCUIT DESCRIPTION

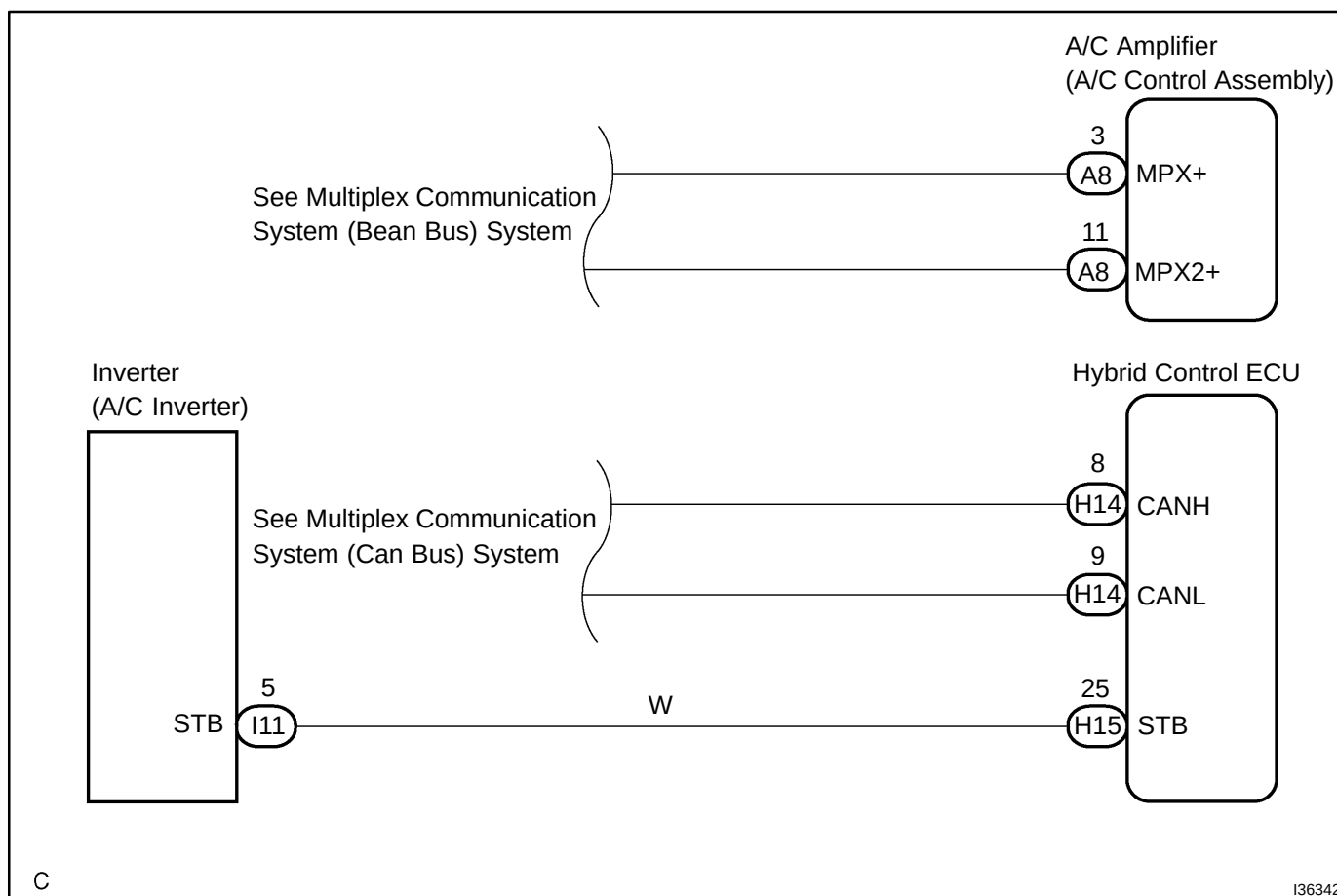
The inverter activation signal is sent to the A/C inverter assy from the hybrid control ECU. Compressor control is stopped and the DTC is output if there is an open or short in the signal circuit.

DTC No.	Detection item	Trouble Area
B1473	Open or short in A/C inverter start-up signal system	• Harness or connector between hybrid control ECU and A/C inverter (w/converter inverter assy) • A/C inverter (w/converter inverter assy) • Hybrid control ECU

NOTICE:

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK DIAGNOSTIC TROUBLE CODE

- (a) Check if DTCs for the hybrid control system are output using intelligent tester II.

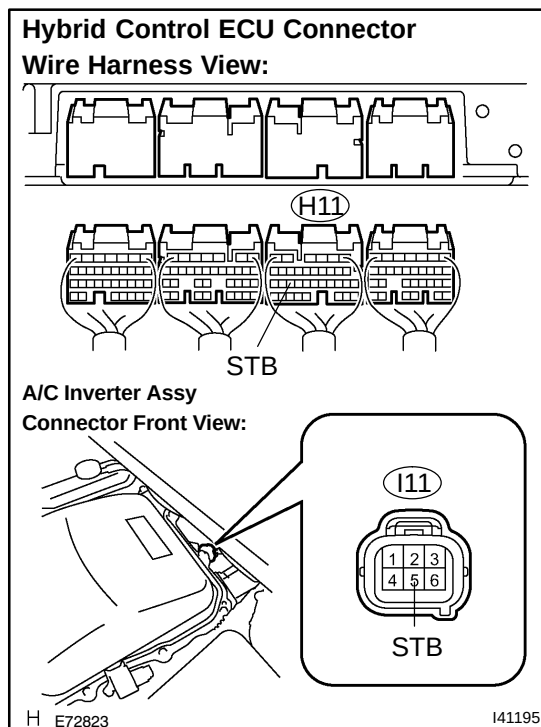
OK:

DTCs are not output in the hybrid control system.

NG

**GO TO HYBRID CONTROL SYSTEM
(SEE PAGE 05-440)**

OK

2 CHECK HARNESS AND CONNECTOR (HYBRID CONTROL ECU – A/C INVERTER ASSY) (SEE PAGE 01-47)

- (a) Disconnect the hybrid control ECU connector.
 (b) Disconnect the A/C inverter assy connector.
 (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
H11-25 (STB) – I11-5 (STB)	Always	0.5 to 0.8 Ω
H11-25 (STB) – Body ground	Always	10 k Ω or higher

NG

**REPAIR OR REPLACE HARNESS OR
CONNECTOR**

OK

REPLACE A/C INVERTER ASSY**NOTICE:**

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

DTC	B1475	A/C INVERTER COOLING/HEATING SYSTEM MALFUNCTION
------------	--------------	--

CIRCUIT DESCRIPTION

The A/C inverter in the A/C inverter assy monitors the cooling water temperature with the temperature sensor. It stops compressor control and outputs the DTC when the monitored temperature is outside specified range (too high or too low).

The hybrid system and the air conditioning system monitor the cooling water temperature separately. If DTCs referring to an inverter cooling system malfunction are output simultaneously, there may be trouble such as insufficient cooling water.

If DTCs are output only for the air conditioning system, there may be an open or short in the temperature sensor circuit in the inverter.

DTC No.	Detection item	Trouble Area
B1475	Cooling water temperature in the inverter is outside the specified range (temperature is too high), or there is an open or short to ground in the temperature sensor circuit.	• A/C inverter (w/converter inverter assy)

INSPECTION PROCEDURE

1	CHECK COOLING WATER
----------	----------------------------

NOTICE:

Even if DTCs are output only for the air conditioning system, inspect the cooling system first and check that it is normal as there may be trouble such as insufficient cooling water.

NG

ADD COOLING WATER

OK

2	CHECK DIAGNOSTIC TROUBLE CODE
----------	--------------------------------------

- (a) Check if DTCs for the hybrid control system are output using intelligent tester II.

OK:

DTCs are not output in the hybrid control system.

NG

GO TO HYBRID CONTROL SYSTEM
(SEE PAGE 05-440)

OK

REPLACE A/C INVERTER ASSY

NOTICE:

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

DTC	B1476	A/C INVERTER LOAD SYSTEM MALFUNCTION
------------	--------------	---

CIRCUIT DESCRIPTION

The A/C inverter assy stops compressor control and outputs the DTC if the rotation load is too great or too small while controlling motor rotation in the A/C inverter assy.

HINT:

Possible reasons could be as follows: Load is low when the refrigerant gas leaks, or load is too great when refrigerant gas is excessively charged, insufficient cooling performance due to condenser fan circuit trouble, or the compressor locked up.

DTC No.	Detection item	Trouble Area
B1476	Motor's rotation load while the compressor is operating is too great or too small.	• Volume of refrigerant • Electric inverter compressor (w/motor compressor assy) • Cooling fan circuit

INSPECTION PROCEDURE

1	CHECK COOLER CONDENSOR ASSY
----------	------------------------------------

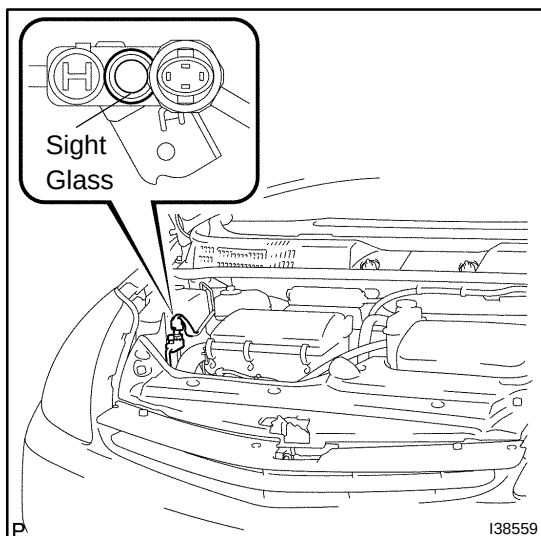
- Turn the power switch off and on (READY).
- Set the A/C temperature setting to "MAX. COOL" and the blower to "LO", and turn the A/C switch on.
- Check operation of the condenser fan.

Standard: The condenser fan rotates.

NG

**INSPECT COOLING FAN SYSTEM
(SEE PAGE 16-9)**

OK

2 CHECK HFC-134A (R134A)

- (a) Inspect refrigerant volume.
- (1) Check the sight glass of the cooler unit refrigerant liquid pipe E.
 - (2) Set the vehicle according to the conditions below.

Item	Condition
All Doors	Fully open
Temperature setting	Max. Cool
Blower Speed	HI
A/C	ON

- (3) Check the sight glass.

Item	Symptom	Amount of refrigerant	Corrective Actions
1	Bubbles exist	Insufficient*	(1) Check for gas leakage and repair if necessary (2) Add refrigerant until bubbles disappear
2	No bubbles exist (DTC 76 is output)	Empty, insufficient or excessive	Refer to 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Add refrigerant until bubbles disappear
4	Considerable temperature difference between compressor inlet and outlet.	Proper or excessive	Refer to 5 and 6
5	Immediately after air conditioning is turned off, refrigerant remains clear	Excessive	(1) Discharge refrigerant (2) Remove air and supply proper amount of purified refrigerant
6	Immediately after air conditioning is turned off, refrigerant foams and then becomes clear	Proper	—

*: Bubbles in the sight glass with room temperature higher than usual can be considered normal if cooling is sufficient.

NG**CHARGE REFRIGERANT (SEE PAGE 55-12)****OK****REPLACE ELECTRIC INVERTER COMPRESSOR****NOTICE:**

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

DTC	B1477	A/C INVERTER LOW VOLTAGE POWER RESOURCE SYSTEM MALFUNCTION
------------	--------------	---

CIRCUIT DESCRIPTION

The A/C inverter assy monitors the controlling power voltage in the self circuit. It stops compressor circuit and outputs the DTC when the monitored voltage is outside the specified range.

The output DTC is memorized as previous trouble. The compressor control may not resume unless the power switch is turned off.

DTC No.	Detection item	Trouble Area
B1477	An open or short to ground in the inverter's controlling power voltage circuit.	• A/C inverter (w/converter inverter assy)

INSPECTION PROCEDURE

1	CHECK DIAGNOSTIC TROUBLE CODE
----------	--------------------------------------

- (a) Check if DTCs for the hybrid control system are output using intelligent tester II.

OK:

DTCs are not output in the hybrid control system.

NG

**GO TO HYBRID CONTROL SYSTEM
(SEE PAGE 05-440)**

OK

REPLACE A/C INVERTER

NOTICE:

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

DTC	B1498	COMMUNICATION MALFUNCTION (A/C INVERTER LOCAL)
------------	--------------	---

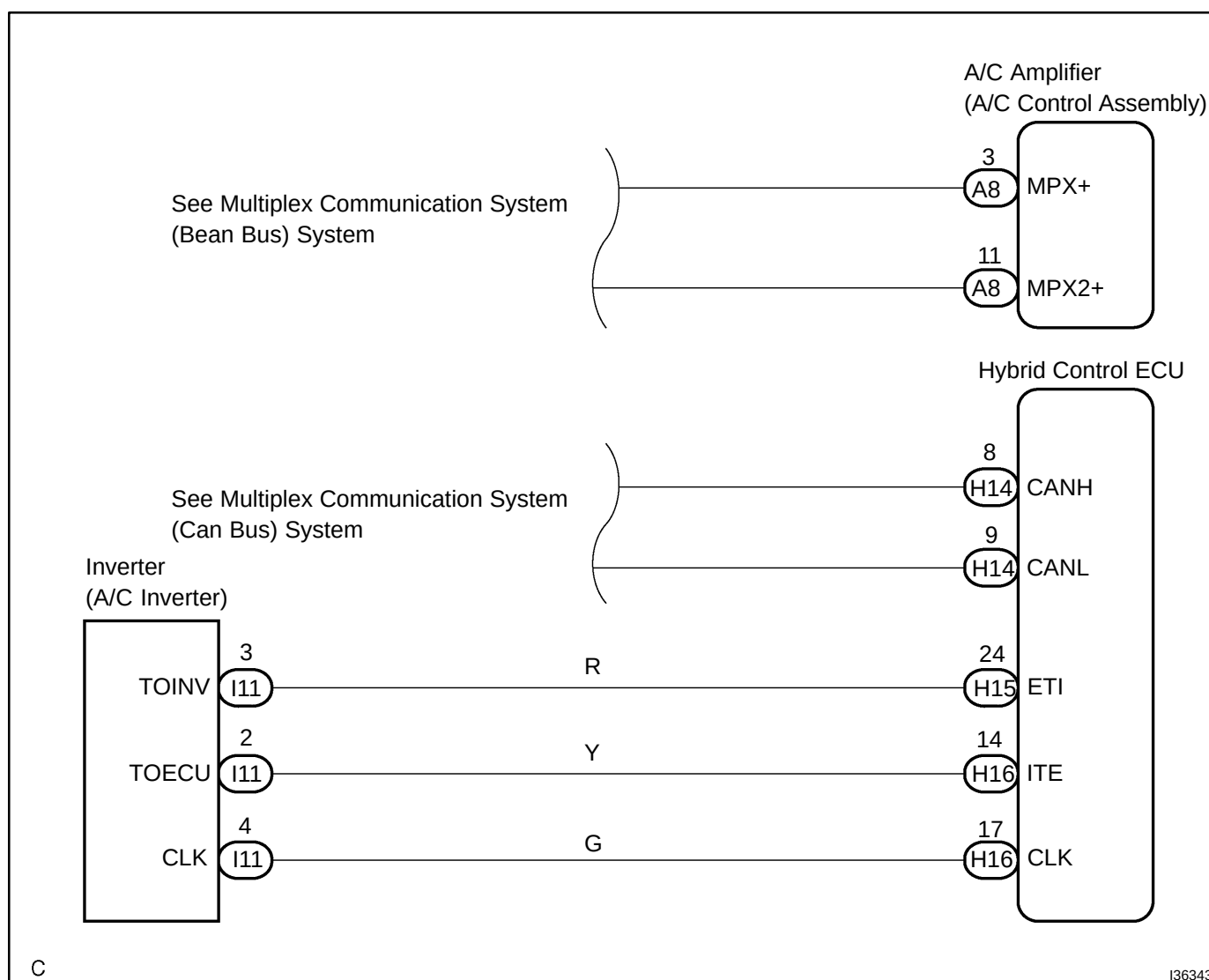
CIRCUIT DESCRIPTION

The hybrid control ECU and A/C inverter assy transmit information to one another via communication line. Compressor control is stopped and the DTC is output if communication information is cut off or abnormal information occurs.

The output DTC is memorized as previous trouble.

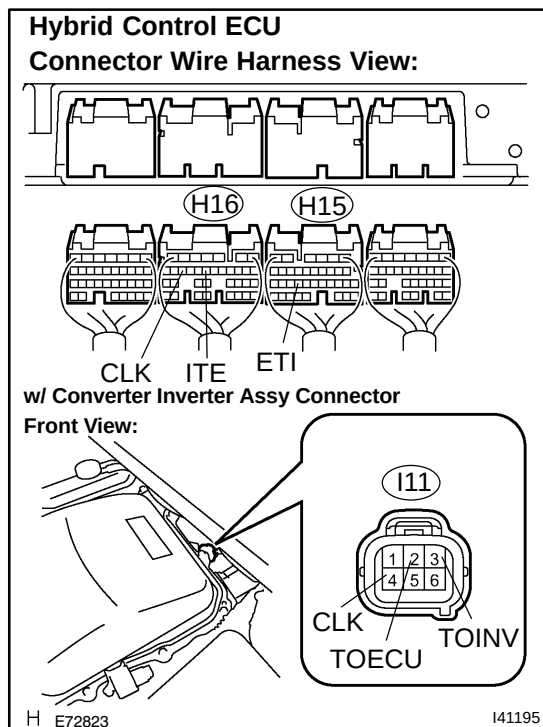
DTC No.	Detection item	Trouble Area
B1498	Communication line error or open between the hybrid control ECU and the A/C inverter (w/converter inverter assy)	• Harness or connector between hybrid control ECU and A/C inverter (w/converter inverter assy) • Hybrid control ECU • A/C inverter (w/converter inverter assy)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK HARNESS AND CONNECTOR (HYBRID VEHICLE CONTROL ECU AND W/ CONVERTER INVERTER ASSY)
----------	--



- (a) Disconnect the hybrid control ECU connector.
- (b) Disconnect the A/C inverter connector.
- (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
H15-24 (ETI) – I11-3 (TOINV)	Always	Below 1 Ω
H16-14 (ITE) – I11-2 (TOECU)	Always	Below 1 Ω
H16-17 (CLK) – I11-4 (CLK)	Always	Below 1 Ω
H15-24 (ETI) – Body ground	Always	10 kΩ or higher
H16-14 (ITE) – Body ground	Always	10 kΩ or higher
H16-17 (CLK) – Body ground	Always	10 kΩ or higher

NG

REPAIR OR CONNECTOR	REPLACE HARNESS OR CONNECTOR
------------------------	---------------------------------

OK

2	CHECK DIAGNOSTIC TROUBLE CODE
----------	--------------------------------------

- (a) Connect the hybrid control ECU connector.
- (b) Connect the A/C inverter connector.
- (c) Check if DTCs for the hybrid control system are output using intelligent tester II.

OK:**DTCs are not output in the hybrid control system.**

NG

GO TO HYBRID CONTROL SYSTEM (SEE PAGE 05-440)
--

OK

REPLACE A/C INVERTER

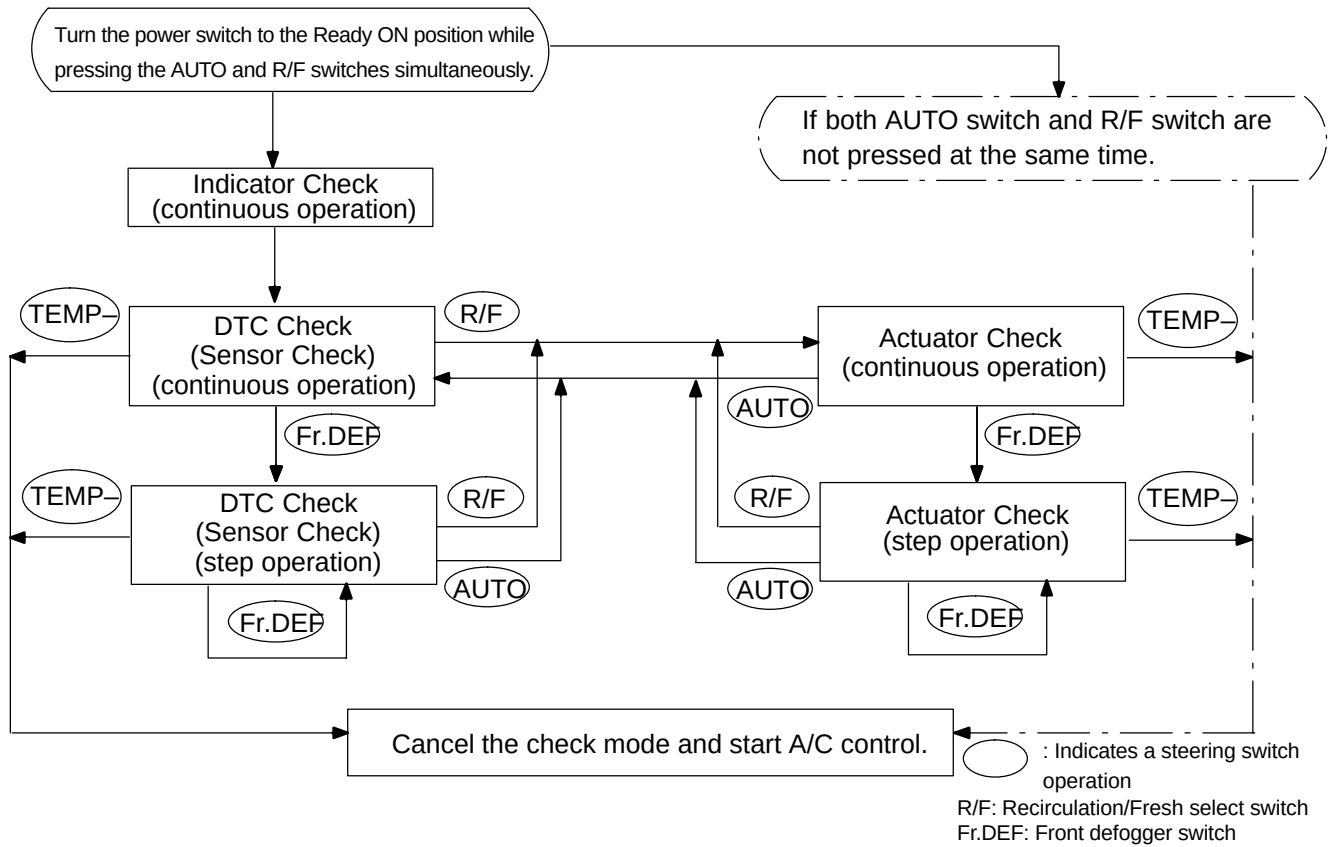
NOTICE:

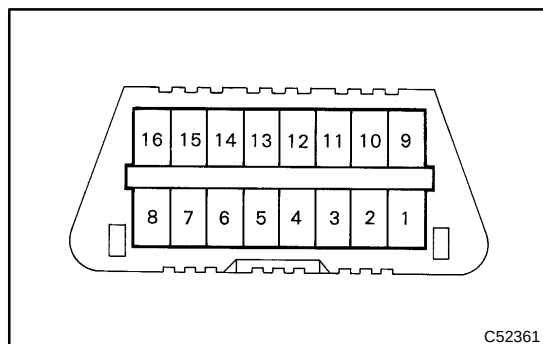
The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

CHECK MODE PROCEDURE

1. LIST OF OPERATION METHODS

By operating each of the A/C control switches as shown in the diagram below, it is possible to enter the diagnostic check mode.





2. CHECK THE DLC3

(a) Check the DLC3:

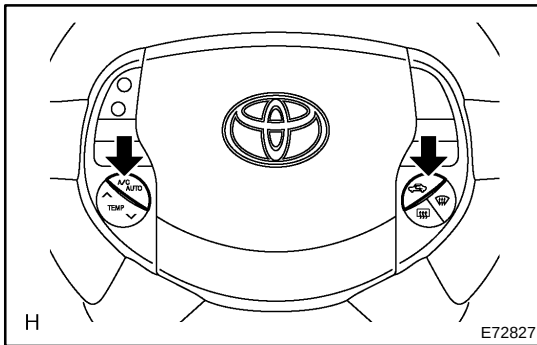
The air conditioning amplifier uses CAN and ISO 9141-2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141-2 format.

Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) – SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) – Body ground	Chassis ground	Always	Below 1 Ω
SG (5) – Body ground	Signal ground	Always	Below 1 Ω
BAT (16) – Body ground	Battery positive	Always	11 to 14 V
CANH (6) – CANL (14)	HIGH-level CAN bus line	Power switch off	54 to 67 Ω
CANH (6) – Battery positive	HIGH-level CAN bus line	Power switch off	1 M Ω or higher
CANH (6) – CG (4)	HIGH-level CAN bus line	Power switch off	3 K Ω or higher
CANL (14) – Battery positive	LOW-level CAN bus line	Power switch off	1 M Ω or higher
CANL (14) – CG (4)	LOW-level CAN bus line	Power switch off	3 K Ω or higher

HINT:

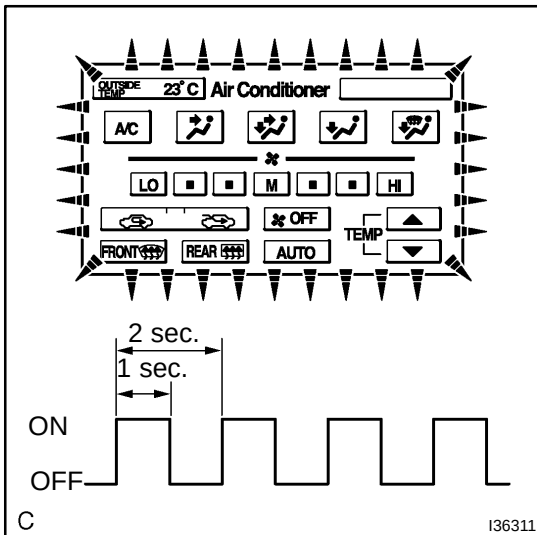
If the display shows "UNABLE TO CONNECT TO VEHICLE" after connecting the hand-held tester cable to the DLC3 and turning the ignition switch to the ON position, there is a problem either with the vehicle or the tester.

- If communication is normal when connecting the tester to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when connecting the tester to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's operator's manual.



3. INDICATOR CHECK

- (a) Turn the power switch off.
- (b) While pressing both the AUTO and R/F (Recirculation/Fresh) switches on the steering switch, turn the power switch on (READY) from off.



- (c) The indicator check is automatically performed when activating panel diagnosis. Check that all indicators and setting displays come on and go off 4 times at 1 second intervals.

Check that the buzzer sounds when the indicators come on.

HINT:

The sensor check is automatically started when the indicator check is completed.

- (d) Push the "TEMP DOWN" switch to finish panel diagnosis.

CUSTOMIZE PARAMETERS

HINT:

The followings are the possible items to be customized.

NOTICE:

- After confirming whether the items of the customer's request are applicable or not for the customized items, perform the customize operation.
- Be sure to record the current value before customizing.
- In case of performing the troubleshooting, pay attention as there is a possibility that the function is OFF by customizing. (Example: In case of the symptom in which "The wireless operation does not function" is displayed, check that the wireless operation is not OFF by customizing, then perform the troubleshooting.)

AIR CONDITIONER

DISPLAY(ITEM)	DEFAULT	CONTENTS	SETTING
SET TEMP SHIFT (Set Temperature Shift)	NORMAL	To control with the shifted temperature against the display temperature.	+2C / +1C / NORMAL -1C / -2C
AIR INLET MODE (Air Inlet Mode)	AUTO	In case of turning the A/C ON when you desire to make the compartment cool down quickly, this is the function to change the mode automatically to RECIRCULATED mode.	MANUAL / AUTO
COMPRESSOR MODE (Compressor Mode)	AUTO	Function to turn the A/C ON automatically by pressing the AUTO button when the blower is ON and the A/C is OFF.	MANUAL / AUTO
COMPRS/DEF OPER (Compressor/Air inlet DEF operation)	LINK	Function to turn the A/C ON automatically linking with the FRONT DEF button when the A/C is OFF.	NORMAL / LINK
FOOT/DEF MODE (Foot/DEF auto mode)	ON	Function to turn the air flow from FOOT/DEF to ON automatically when AUTO MODE is ON.	OFF / ON
AUTO BLOW UP (Foot/DEF automatic blow up function)	ON	Function to switch the blower level automatically when the defroster is ON.	OFF / ON
FOOT AIR LEAK (Foot air leak)	ON	Function to cut off the airstream felt underfoot while the vehicle is moving	OFF / ON
AMBINT TMP SFT (Ambient Temperature Shift)	NORMAL	To control with the shifted ambient temperature against the display ambient temperature.	+3C / +2C / +1C NORMAL / -1C / -2C / -3C

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

From the DATA LIST displayed on the hand-held tester, you can read the value of the display, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one way to shorten labor time.

- Connect the hand-held tester to the DLC3.
- Turn the power switch to the ON position.
- From the display on the tester, select the "DATA LIST".

DATA LIST / AIR CONDITIONER:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
ROOM TEMP	Room temperature sensor / min.: -6.5°C (20.3°F) max.: 57.25°C (135.05°F)	Actual room temperature is displayed	Open in the circuit: -6.5°C (20.3°F) Short in the circuit: 57.25°C (135.05°F)
AMBI TEMP SENS	Ambient temperature sensor / min.: -23.3°C (-9.94°F) max.: 65.95°C (150.71°F)	Actual ambient temperature is displayed	Open in the circuit: -23.3°C (-9.94°F) Short in the circuit: 65.95°C (150.71°F)
EVAP TEMP	Evaporator temperature sensor / min.: -29.7°C (-21.46°F) max.: 59.55°C (139.19°F)	Actual evaporator temperature is displayed	Open in the circuit: -29.7°C (-21.46°F) Short in the circuit: 59.55°C (139.19°F)
SOLAR SENS-D	Solar sensor (Driver side) / min.: 0 max.: 255	Increases as brightness increases	Open in the circuit: 0 Short in the circuit: 255
COOLANT TEMP	Engine coolant temperature / min.: 1.3°C (34.34°F) max.: 90.55°C (194.99°F)	Actual engine coolant temperature is displayed while the engine is warmed up	—
SET TEMP-D	Set temperature (Driver side) / min.: 0 max.: 255	The same contents as a setting temperature display part are displayed	—
ESTIMATE TEMP-D	Estimated temperature (Driver side) / min.: -358.4°C (-613.12°F) max.: 358.4°C (677.12°F)	Damper is at "MAX. COOL": -358.4°C (-613.12°F) Damper is at "MAX. HOT": 358.4°C (677.12°F)	—
A/M DAMP POS-D	Air mix damper position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. COOL": -10.0% Damper is at "MAX. HOT": 100.0% or 71.0%	—
A/O DAMP POS	Air outlet damper position / min.: -14% max.: 113.5%	Damper is at "FACE": -10.0% Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0% Damper is at "DEF": 110.0%	Open in the circuit: 50.0%
A/I DAMP POS	Air inlet damper position / min.: -14% max.: 113.5%	Damper is at "RECIRCULATION": -1.0% Damper is at "FRESH": 110.0% Damper is at "HALF-RECIRCULATION": 20.0 to 102.0%	Open in the circuit: 50.0%

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
A/M DAMP TARG-D	Air mix damper target position (Driver side) / min.: -14% max.: 113.5%	Damper is at "MAX. COOL": -10.0% Damper is at "MAX. HOT": 100.0% or 71.0%	—
A/O DAMP TARG	Air outlet damper target position / min.: -14% max.: 113.5%	Damper is at "FACE": -10.0% Damper is at "FACE/FOOT": 12.0% Damper is at "FOOT" (Manual): 33.5% or 69.0% Damper is at "FOOT" (Auto): 49.0% or 69.0 % Damper is at "FACE/DEF": 69.0% or 95.0% Damper is at "DEF": 110.0%	Open in the circuit: 50.0%
A/I DAMP TARG	Air inlet damper target position / min.: -14% max.: 113.5%	Damper is at "RECIRCULATION": -1.0% Damper is at "FRESH": 110.0% Damper is at "HALF-RECIRCULATION": 20.0 to 102.0%	Open in the circuit: 50.0%
HAND FREE TEL	Hands free telephone / OFF, ON	—	—
BLOWER LEVEL	Blower motor speed level / min.: Level 0 max.: 31	Increases in the range between 0 and 31 as the speed increases.	—
AMBI TEMP	Adjusted ambient temperature / min.: -30.8°C (-23.44°F) max.: 50.8°C (123.44°F)	—	—
SET TEMP SHIFT	Shift set temperature /+2C, +1C, NORMAL, -1C, -2C	Customized value will be displayed	—
AIR INLET MODE	Air inlet mode / AUTO, MANUAL	Customized value will be displayed	—
COMPRESSOR MODE	Compressor mode / AUTO, MANUAL	Customized value will be displayed	—
COMPRS/DEF OPER	Compressor / DEF operation mode / LINK, NORMAL	Customized value will be displayed	—
FOOT AIR LEAK	Foot air leak / ON, OFF	Customized value will be displayed	—
AUTO BLOW UP	Foot / DEF automatic blow up function / ON, OFF	Customized value will be displayed	—
FOOT/DEF MODE	Foot / DEF auto mode / ON, OFF	Customized value will be displayed	—
AMBIENT TMP SFT	Ambient temperature shift / +3C, +2C, +1C, NORMAL, -1C, 2C, 3C	Customized value will be displayed	—
DESTINATION	Destination/ DOMEST, USA, EUROPE, AUSTRAL, MIDEAST, NO INFO	Changes with destinations	—
DESTINATION	Destination/ DOMEST, USA, EUROPE, AUSTRAL, MIDEAST, NO INFO	Changes with destinations	—
HUMIDITY SENS	Humidity sensor / min.: 0% max.: 100%	Actual room humidity is displayed	—
COMPRS SPD	Compressor speed / min.: 0 rpm max.: 65,535 rpm	Displays actual rotation speed in the range between 0 rpm and 7,500 rpm	—
COMPRS TARG SPD	Compressor target speed / min.: 0 rpm max.: 65,535 rpm	Displays target rotation speed in the range between 0 rpm and 7,500 rpm	—
#CODES	Number of trouble codes / min.: 0 max.: 255	Number of DTCs will be displayed	—

2. ACTIVE TEST

HINT:

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

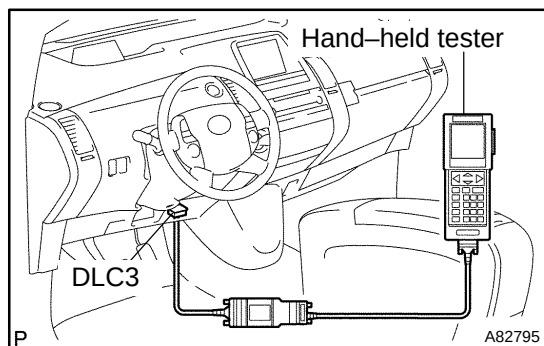
It is possible to display the DATA LIST on the hand-held tester during the ACTIVE TEST.

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the power switch to the ON position.
- (c) From the display on tester, perform the "ACTIVE TEST".

ACTIVE TEST / AIR CONDITIONER:

Item	Test Details / Display (Range)	Diagnostic Note
BLOWER MOTOR	Blower motor / min.: 0 max.: 31	–
AIR MIX DAMP-D	Air mix damper (Driver side) / min.: -14% max.: 113.5%	–
A/O MODE DAMP-D	Air outlet damper position (Driver side) / min.: -14% max.: 113.5%	–
A/I DAMP-LINEAR	Air inlet damper position (linear) / min.: -14% max.: 113.5%	–
Comprs Targ Spd	Compressor target speed / min.: 0 max.: 255	–
DEFOGGER RLY-R	Defogger relay (Rear) / OFF, ON	–
WATER PUMP RLY	Water pump / OFF, ON	–
ELECTRICAL FAN	Electrical fan / OFF, ON	–
DEFOGGER RLY-R	Defogger relay (Rear) / OFF, ON	–
A/C MAG CLUTCH	Magnetic Clutch Relay / OFF, ON	–
WATER PUMP RLY	Water pump / OFF, ON	–
ELECTRICAL FAN	Electrical fan / OFF, ON	–

DTC CHECK/CLEAR



1. DTC CHECK USING HAND-HELD TESTER

- (a) Hook up the hand-held tester to the DLC3.
- (b) Power switch ON (ready).
- (c) Read the DTC following the prompts on the tester screen. Please refer to the intelligent tester II operator's manual for further details.
- (d) Clear the DTCs.

HINT:

After repairing the malfunctions, clear the DTC.

- (1) Connect the hand-held tester to DLC3.
- (2) Turn the ignition switch to the ON position.
- (3) Erase the DTCs following the prompts on the tester screen.

HINT:

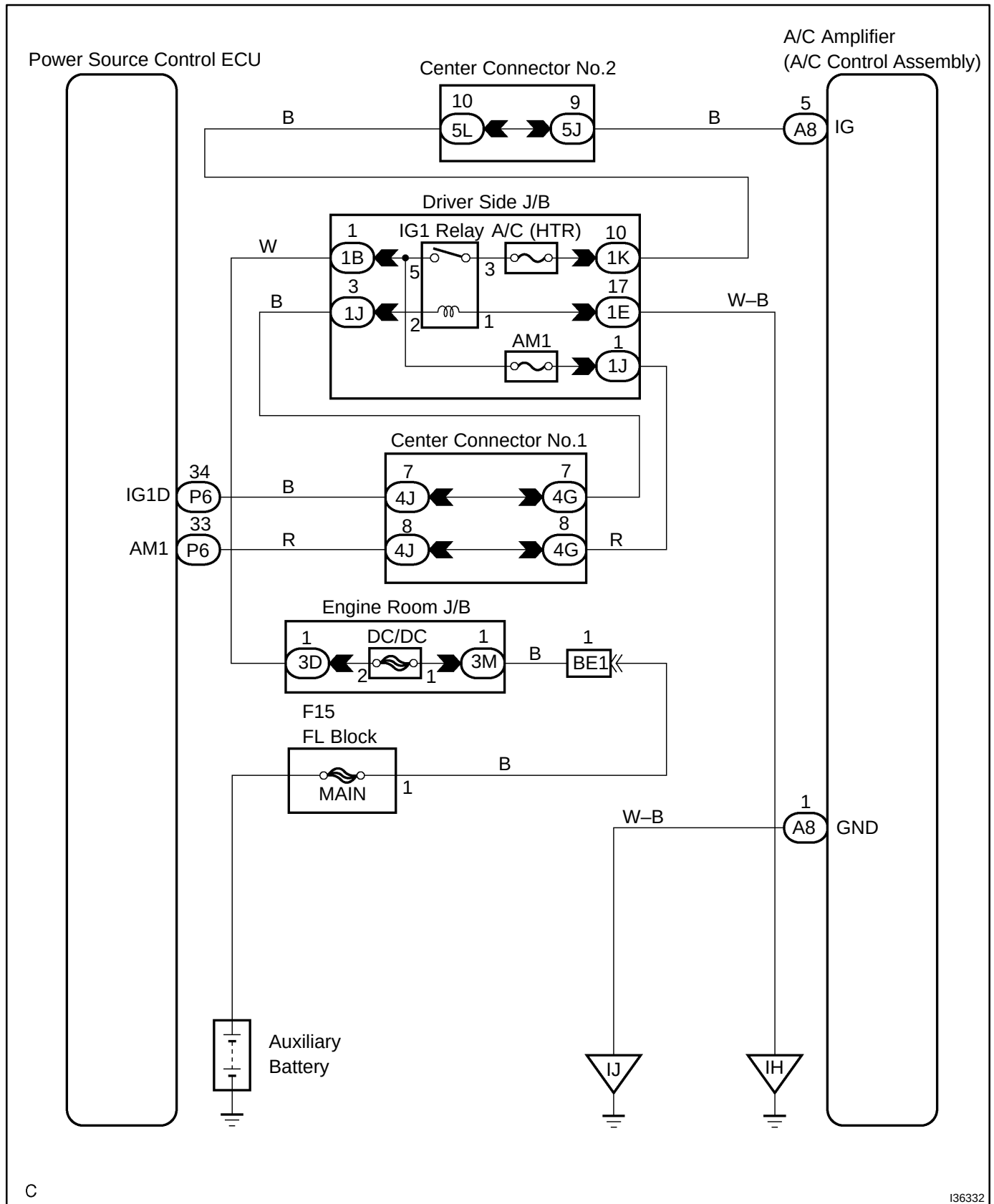
Refer to the hand-held tester operator's manual for further details.

IG POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the main power source supplied to the A/C amplifier when the power switch is turned to the ON position. The power source supplied is used for operating the A/C amplifier and servomotor, etc.

WIRING DIAGRAM



cardiagn.com

INSPECTION PROCEDURE

1 INSPECT FUSE(A/C (HTR))

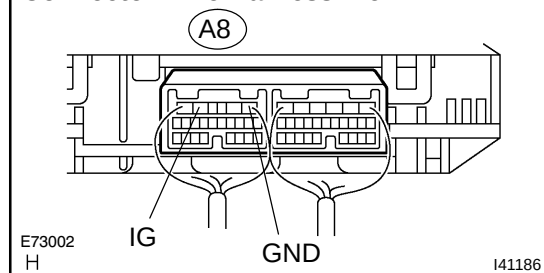
- (a) Remove the A/C (HTR) fuse from the driver side J/B.
 (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester item	Condition	Specified condition
A/C (HTR) fuse	Always	Below 1 Ω

NG

CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FAILURE FUSE (A/C (HTR))

OK**2 INSPECT AIR CONDITIONING AMPLIFIER(IG – BODY GROUND)**
**Air Conditioning Amplifier
 Connector Wire Harness View:**


- (a) Remove the A/C amplifier assy with connectors still connected.
 (b) Measure voltage according to the value(s) in the table below.

Standard:

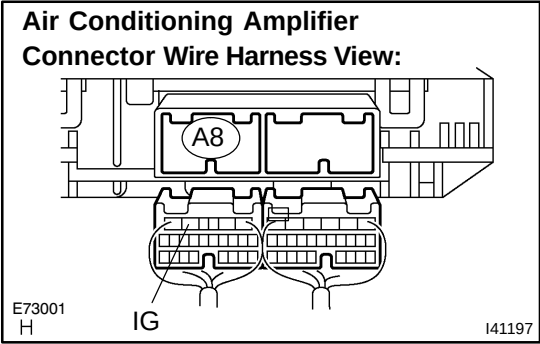
Tester connection	Condition	Specified condition
A8-5 (IG) – A8-1 (GND)	Power switch ON	10 to 14 V

NG**Go to step 3****OK**

**PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE
 (SEE PAGE 05-1268)**

3

CHECK HARNESS AND CONNECTOR(AIR CONDITIONING AMPLIFIER ASSY – BATTERY) (SEE PAGE 01-47)



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

Standard:

Tester connection	Condition	Specified condition
A8-5 (IG) – Body ground	Power switch ON	10 to 14 V

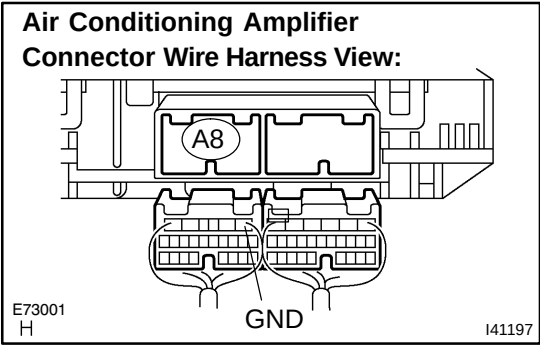
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4

CHECK HARNESS AND CONNECTOR(AIR CONDITIONING AMPLIFIER – BODY GROUND) (SEE PAGE 01-47)



- (a) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A8-1 (GND) – Body ground	Always	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

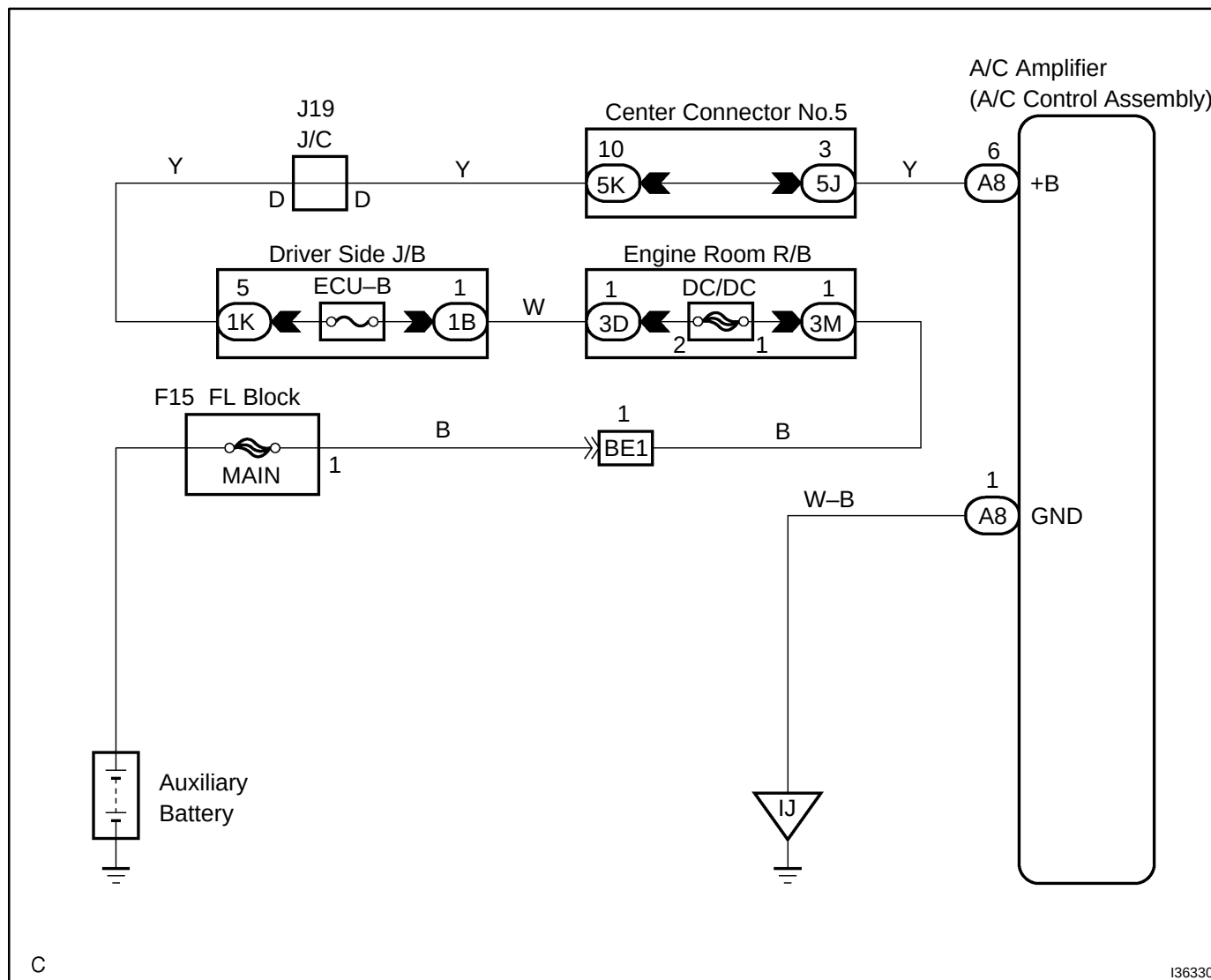
REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

BACK-UP POWER SOURCE CIRCUIT

CIRCUIT DESCRIPTION

This is the back-up power source circuit for the A/C amplifier. Power is supplied even when turning the power switch off and is used for diagnostic trouble code memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT FUSE(ECU-B)

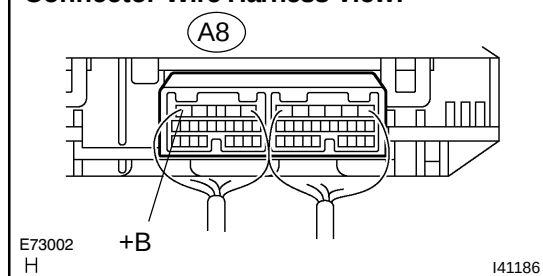
- (a) Remove the ECU-B fuse from the driver side J/B.
 (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester item	Condition	Specified condition
ECU-B fuse	Always	Below 1 Ω

NG

CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FAILURE FUSE(ECU-B FUSE)

OK**2 INSPECT AIR CONDITIONING AMPLIFIER(+B – BODY GND)**
**Air Conditioning Amplifier
 Connector Wire Harness View:**


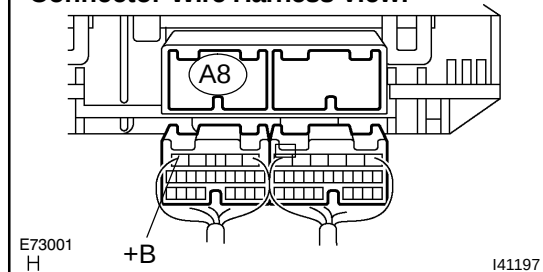
- (a) Remove the A/C amplifier assy with connectors still connected.
 (b) Measure voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A8-6 (+B) – Body ground	Always	10 to 14 V

NG**Go to step 3****OK**

**PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE
 (SEE PAGE 05-1268)**

3 CHECK HARNESS AND CONNECTOR(AIR CONDITIONING AMPLIFIER – BODY GROUND) (SEE PAGE 01-47)
**Air Conditioning Amplifier
 Connector Wire Harness View:**


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

Standard:

Tester connection	Condition	Specified condition
A8-6 (+B) – Body ground	Always	10 to 14 V

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR (ECU – A/C AMPLIFIER)

OK

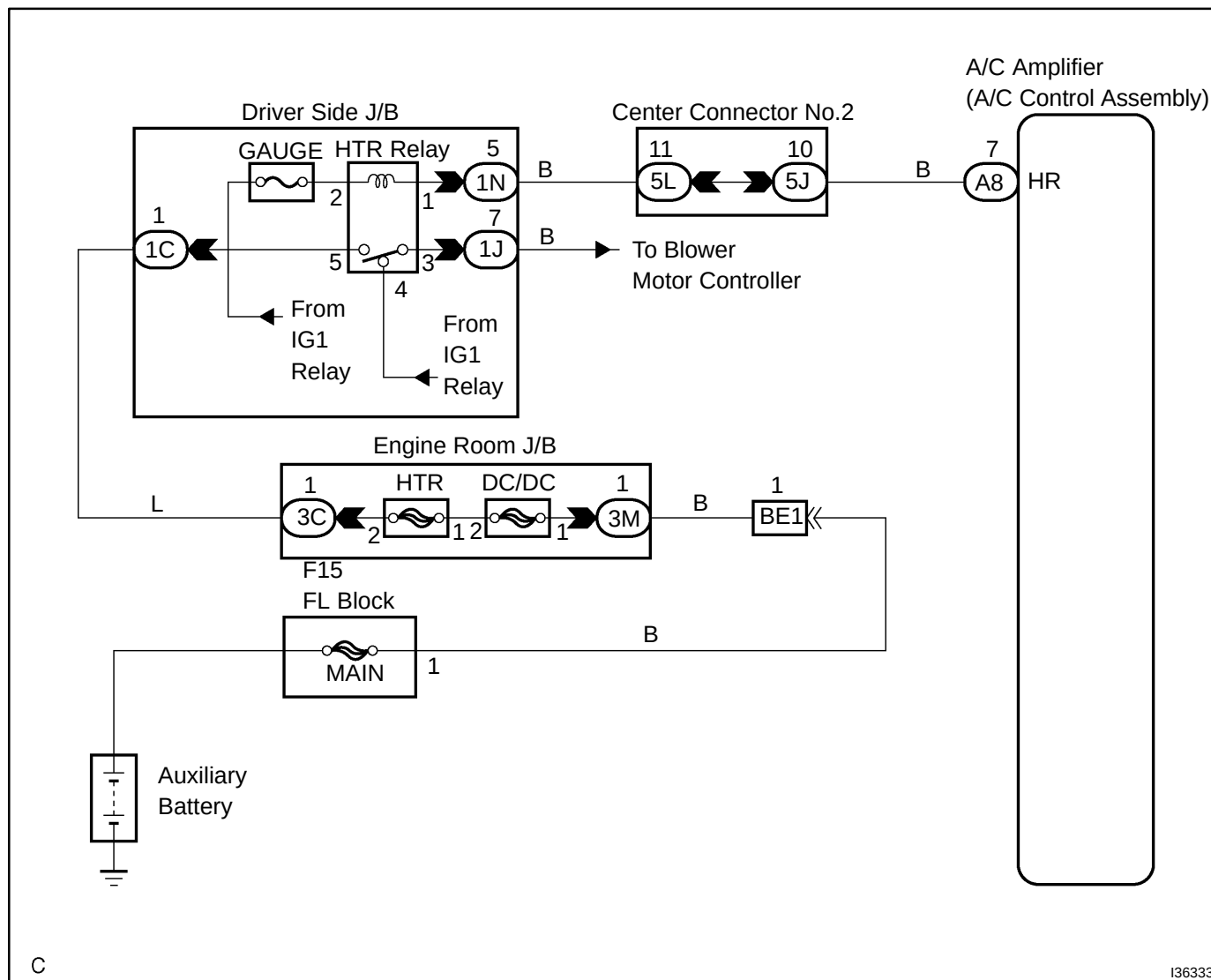
REPLACE AIR CONDITIONING AMPLIFIER (SEE PAGE 55-47)

HEATER RELAY CIRCUIT

CIRCUIT DESCRIPTION

The heater relay is turned on by signals from the A/C amplifier. It supplies power to the blower motor controller.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK FUSE(HTR)

- (a) Remove the HTR fuse from the engine room J/B.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

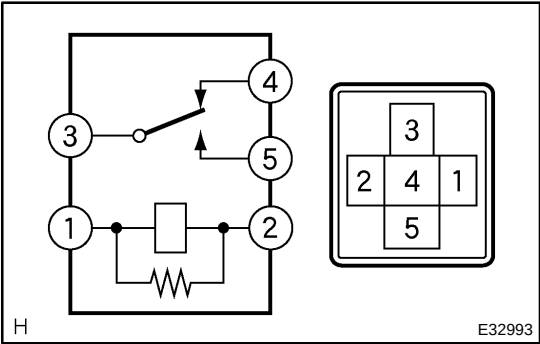
Tester item	Condition	Specified condition
HTR fuse	Always	Below 1 Ω

NG

CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FAILURE FUSE(HTR FUSE)

OK

2 INSPECT HEATER RELAY



- (a) Measure the resistance according to the value(s) in the table below.

Standard:

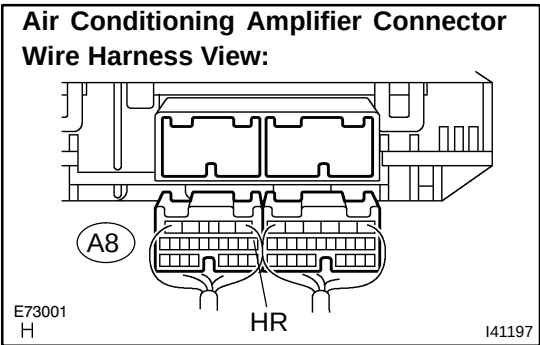
Tester connection	Condition	Specified condition
3 – 5	Always	10 kΩ or higher
3 – 5	When battery voltage applied to terminals 1 and 2	Below 1 Ω
3 – 4	Always	Below 1 Ω
3 – 5	When battery voltage applied to terminals 1 and 2	10 kΩ or higher

NG

REPLACE HEATER RELAY

OK

3 CHECK HARNESS AND CONNECTOR(BATTERY – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-47)



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

Tester connection	Condition	Specified condition
A8-7 (HR) – Body ground	Power switch ON	10 to 14 V

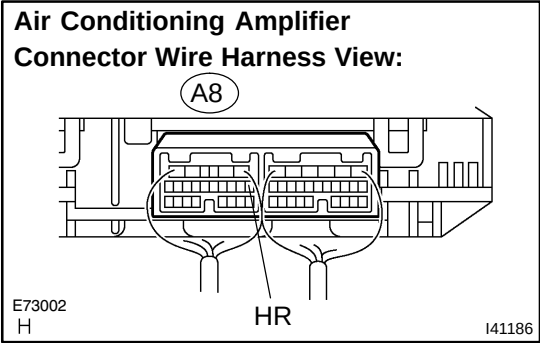
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4

CHECK HARNESS AND CONNECTOR(AIR CONDITIONING AMPLIFIER – BATTERY) (SEE PAGE 01-47)



- (a) Remove the A/C amplifier with connectors still connected.
- (b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Standard
A7-7 (HR) – Body ground	Power switch position OFF Blower switch position OFF	Below 1 V
A7-7 (HR) – Body ground	Power switch position ON Blower switch position ON	Below 1 V
A7-7 (HR) – Body ground	Power switch position ON Blower switch position OFF	10 to 14 V

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)

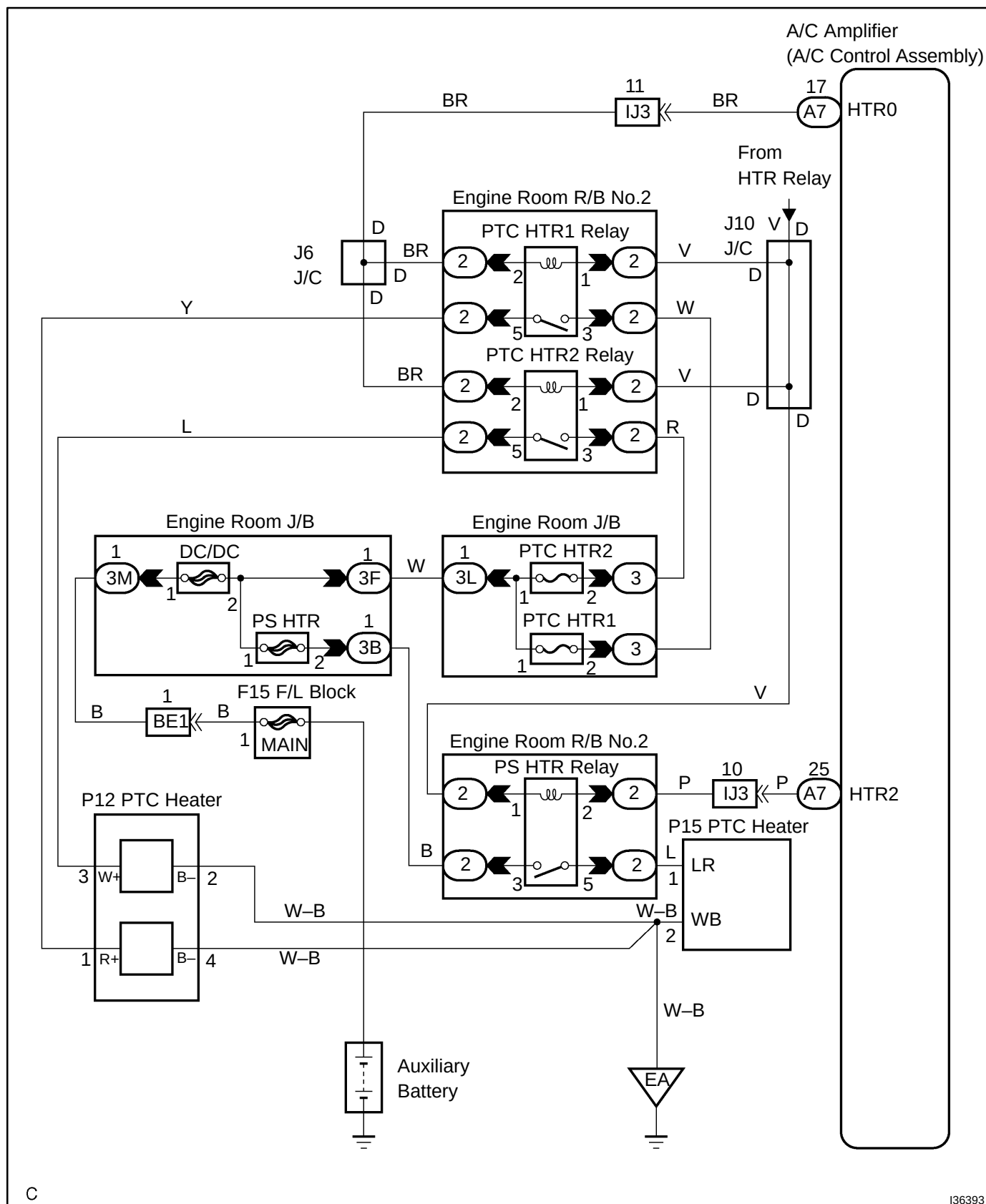
PTC HEATER CIRCUIT

CIRCUIT DESCRIPTION

The PTC heater is installed in the radiator in the heater unit on the driver and passenger's FOOT sides and operates when cooling water temperature is low and normal heater effectiveness is insufficient.

The air conditioner amplifier assy switches the circuit in the PTC relay and operates the PTC heater when the operating conditions (cooling water temperature is Below 55°C (131°F), setting temperature is MAX. HOT, air outlet damper position is FOOT or FOOT/DEF and blower switch in not OFF) are met.

WIRING DIAGRAM



C

I36393

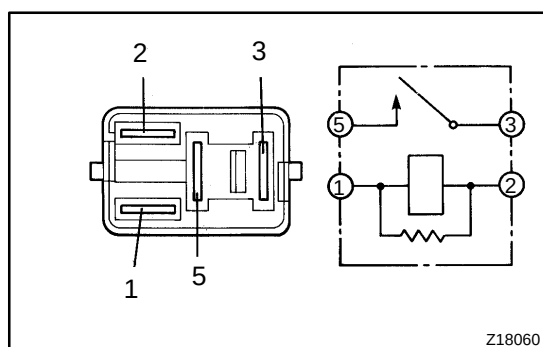
INSPECTION PROCEDURE

1 INSPECT FUSE(PTC HTR1 (30A), PTC HTR2 (30A))

- (a) Remove the PTC HTR1 (30A) and PTC HTR2 (30A) fuse from the engine room J/B.
 (b) Measure the resistance according to the value(s) in the table below.

Standard:

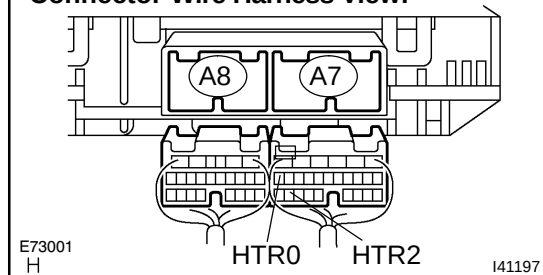
Tester item	Condition	Specified condition
PTC HTR1 (30A) fuse	Always	Below 1 Ω
PTC HTR2 (30A) fuse	Always	Below 1 Ω

NG**CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED FAILURE FUSE****OK****2 INSPECT PTC HEATER RELAY(PTC HTR1, PTC HTR2)**

- (a) Remove the PTC heater relay from the engine room R/B.
 (b) Measure the resistance according to the value(s) in the table below

Standard:

Tester connection	Condition	Specified condition
3 – 5	Always	10 k Ω or higher
3 – 5	When battery voltage applied to terminals 1 and 2	Below 1 Ω (When battery voltage applied to terminals 1 and 2)

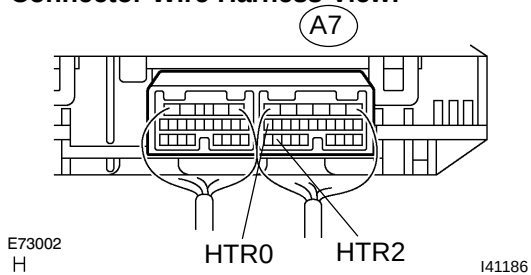
NG**REPLACE PTC HEATER RELAY****OK****3 CHECK HARNESS AND CONNECTOR****Air Conditioning Amplifier
Connector Wire Harness View:**

- (a) Disconnect the connectors from air conditioning amplifier.
 (b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-17 (HTR0) – Body ground	Power switch ON	10 to 14 V
A7-25 (HTR2) – Body ground	Power switch ON	10 to 14 V

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK**

4 INSPECT AIR CONDITIONING AMPLIFIER ASSY**Air Conditioning Amplifier
Connector Wire Harness View:**

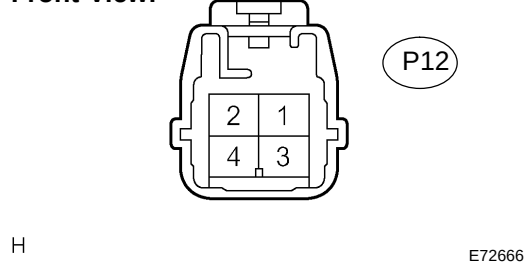
- (a) Connect the connectors.
- (b) Measure voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A7-17 (HTR0) – Body ground	Power switch READY ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131 °F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1V → 10 to 14 V
A7-25 (HTR2) – Body ground	Power switch READY ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131 °F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1V → 10 to 14 V

HINT:

- PTC operation may stop when the electric load on the vehicle is high. Perform the inspection under conditions with low electric load (such as with headlights turned OFF).
- since the two PTC heaters are gradually turned to the ON position, perform the inspection 30 seconds after the blower switch is turned to the LO position.

NG**REPLACE AIR CONDITIONING AMPLIFIER ASSY (SEE PAGE 55-47)****OK****5 INSPECT PTC HEATER ASSY****PTC Heater Assy Connector
Front View:**

- (a) Disconnect the connector from the PTC heater assy.
- (b) Check the continuity between each terminal.

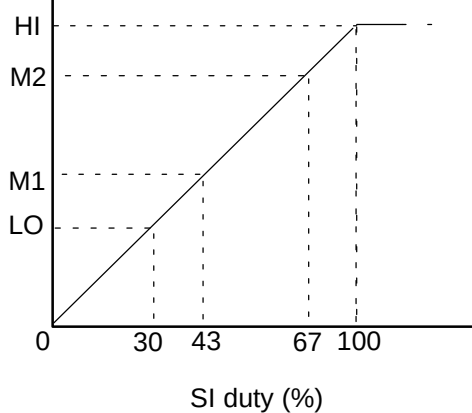
Standard:

Tester connection	Condition	Specified condition
P12-1 – P12-2	Always	Continuity (0.5 kΩ or higher)
P12-3 – P12-4	Always	Continuity (0.5 kΩ or higher)

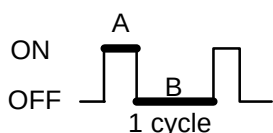
NG**REPLACE PTC HEATER ASSY****OK****REPAIR OR REPLACE HARNESS OR CONNECTOR**

BLOWER MOTOR CIRCUIT

Blower Level



$$\text{Duty Ratio} = \frac{A}{A + B} \times 100 (\%)$$



CIRCUIT DESCRIPTION

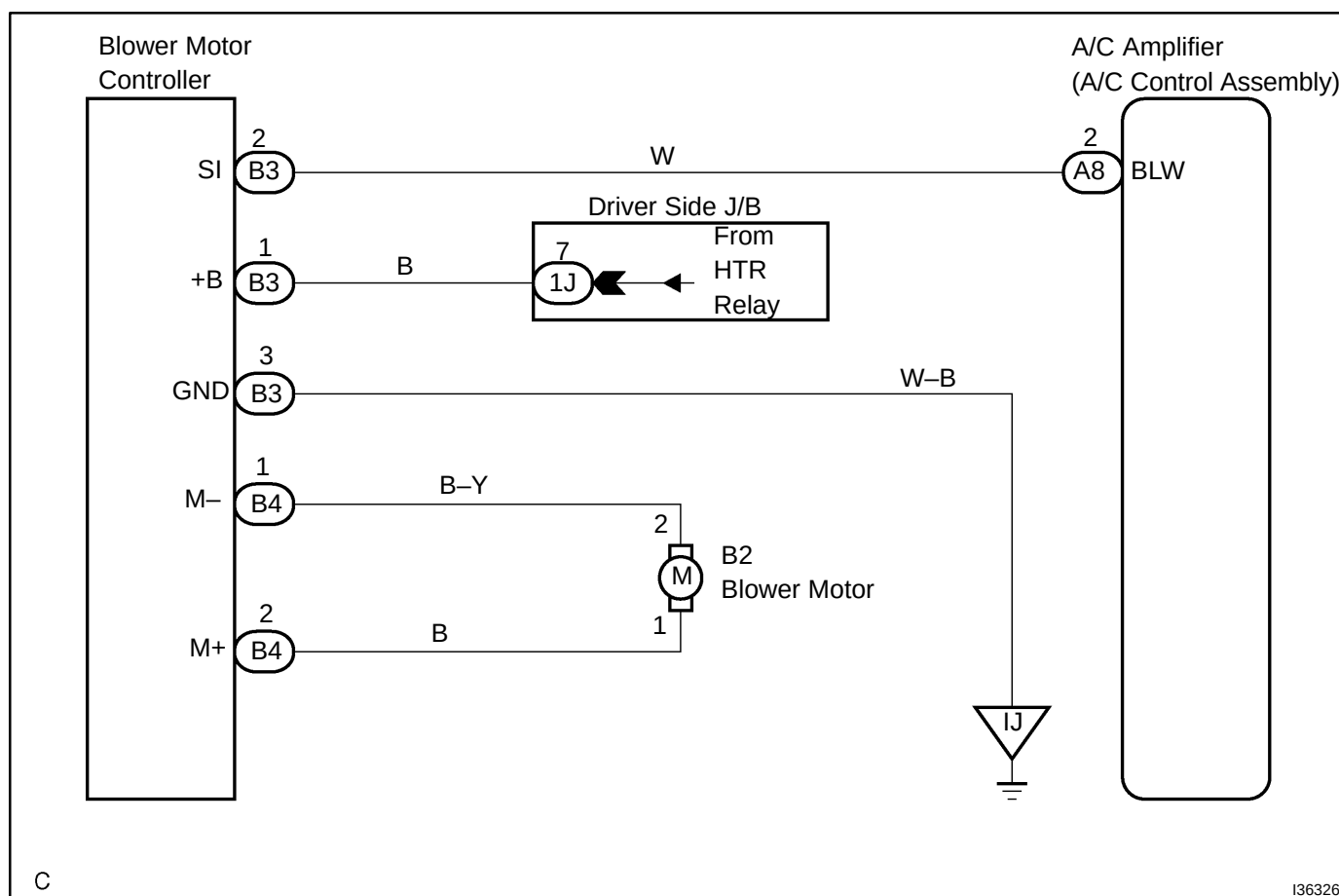
The blower motor is operated by signals from the A/C amplifier assy. Blower motor speed signals are transmitted by changes in the duty ratio.

Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, A is the period of continuity in one cycle, and B is the period of non-continuity.

The blower motor controller controls the blower motor speed. The blower motor controller reads the signal from the A/C amplifier and controls rotation and speed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 PERFORM ACTIVE TEST USING INTELLIGENT TESTER II

- (a) Connect the intelligent tester II to DLC3.
- (b) Turn the power switch ON and push the intelligent tester II main switch ON.
- (c) Select the item below in the ACTIVE TEST and then check that the relay operates.

ACTIVE TEST / AIR CONDITIONER:

Item	Test Details/Display (Range)	Diagnostic Note
Blower Motor (Blower Motor)	Blower motor / min.: 0 max.: 31	–

Result:

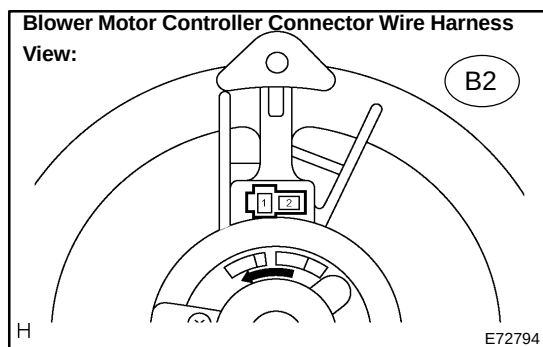
OK	A
NG (Blower motor does not operate)	B
NG Blower motor operate but does not change speed)	C

B Go to step 2

C Go to step 6

A

**PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-1268)**

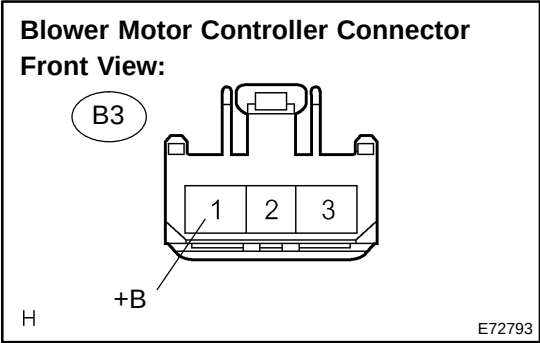
2 INSPECT BLOWER W/FAN MOTOR SUB-ASSY

- (a) Remove the cooling unit motor sub-assy w/fan.
- (b) Connect positive (–) lead connected to terminal 1 of blower motor connector, negative (+) lead to terminal 2.
Standard: Blower motor operates smoothly.

NG REPLACE BLOWER W/FAN MOTOR SUB-ASSY

OK

3	CHECK HARNESS AND CONNECTOR(BLOWER MOTOR CONTROLLER – BATTERY) (SEE PAGE 01-47)
----------	--



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

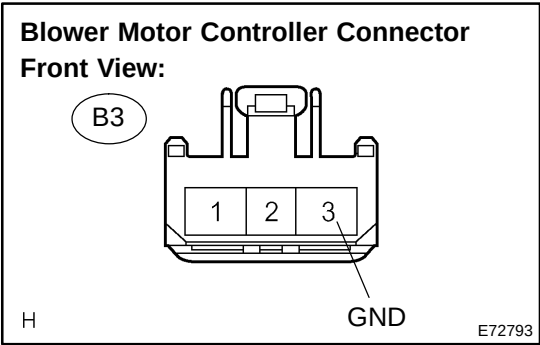
Standard:

Tester connection	Condition	Specified condition
B3-1 (+B) – Body ground	Always	10 to 14 V

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4	CHECK HARNESS AND CONNECTOR(BLOWER MOTOR CONTROLLER – BODY GROUND) (SEE PAGE 01-47)
----------	--



(a) Measure the resistance according to the value(s) in the table below.

Standard:

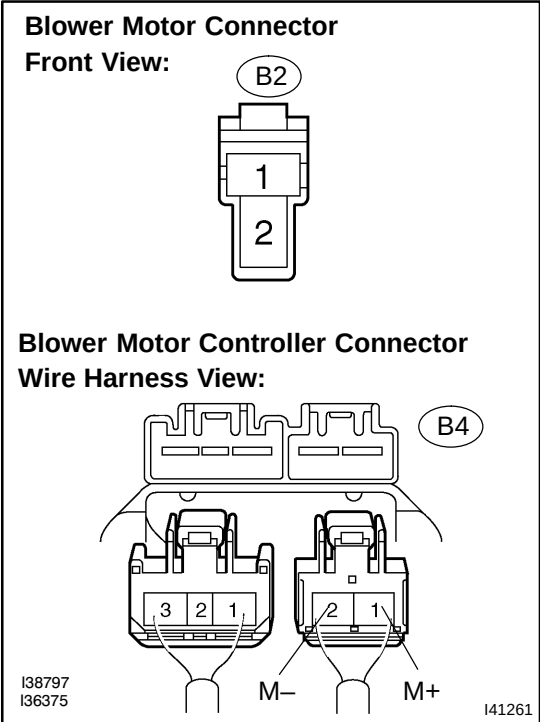
Tester connection	Condition	Specified condition
B3-3 (GND) – Body ground	Always	Below 1 Ω

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5

CHECK HARNESS AND CONNECTOR(BLOWER MOTOR – BLOWER MOTOR CONTROLLER) (SEE PAGE 01-47)



(a) Measure the resistance according to the value(s) in the table below.

Tester connection	Condition	Specified condition
B4-1 (M+) – B2-2	Always	Below 1 Ω
B4-2 (M-) – B2-1	Always	Below 1 Ω
B4-1 (M+) – Body ground	Always	10 kΩ or higher
B4-2 (M-) – Body ground	Always	10 kΩ or higher

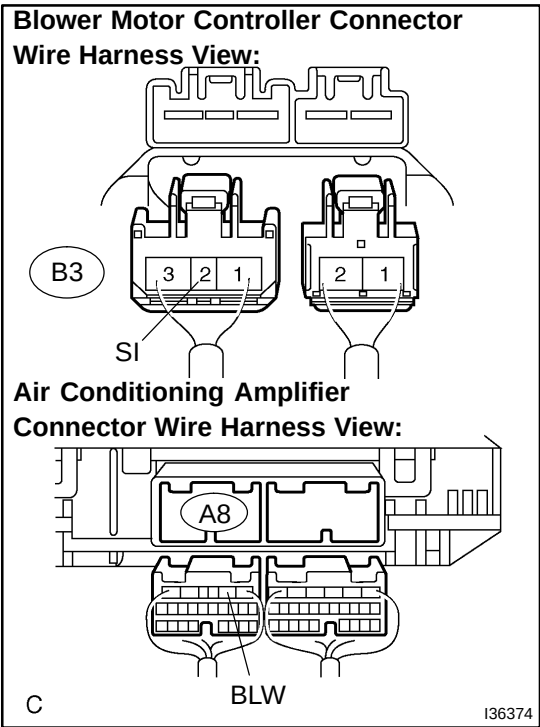
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6

CHECK HARNESS AND CONNECTOR(BLOWER MOTOR CONTROLLER – A/C AMPLIFIER) (SEE PAGE 01-47)



(a) Measure the resistance according to the value(s) in the table below.

Standard:

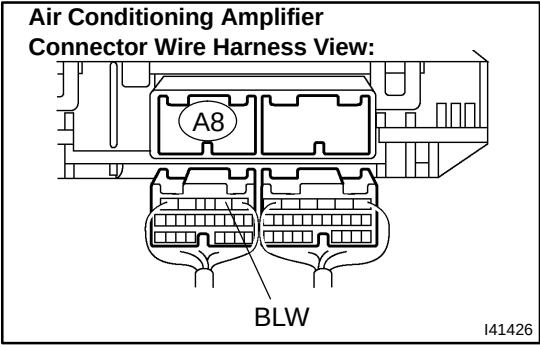
Tester connection	Condition	Specified condition
A8-2 (BLW) – B3-2 (SI)	Always	Below 1 Ω
A8-2 (BLW) – Body ground	Always	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7 INSPECT BLOWER MOTOR CONTROLLER



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

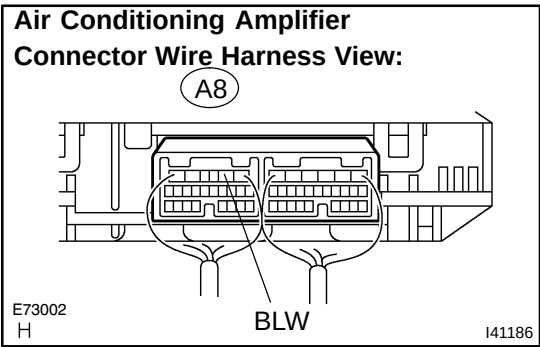
Standard:

Tester connection	Condition	Specified condition
B3-1 (+B) – Body ground	Always	10 to 14 V

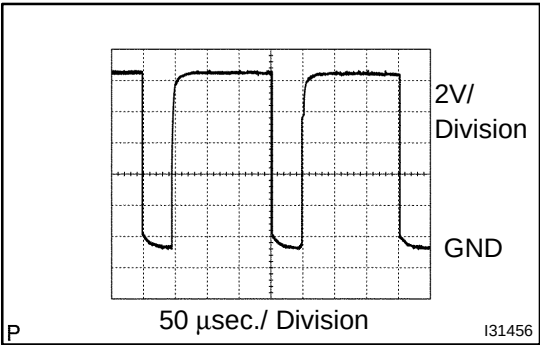
NG REPLACE BLOWER MOTOR CONTROLLER

OK

8 INSPECT AIR CONDITIONING AMPLIFIER(BLW – BODY GROUND)



- (a) Remove A/C amplifier with connectors still connected.
(b) Turn the power switch to the ON position.
(c) Blower switch is on (Lo).



- (d) Measure the waveform between terminal BLW (A8-2) of A/C amplifier and body ground.

OK:

Waveform operate as shown in the illustration.

HINT:

- The correct waveform is shown in the illustration.
- Waveform cycle varies with the blower level.

NG REPLACE AIR CONDITIONING AMPLIFIER
(SEE PAGE 55-47)

OK

REPLACE BLOWER MOTOR CONTROLLER

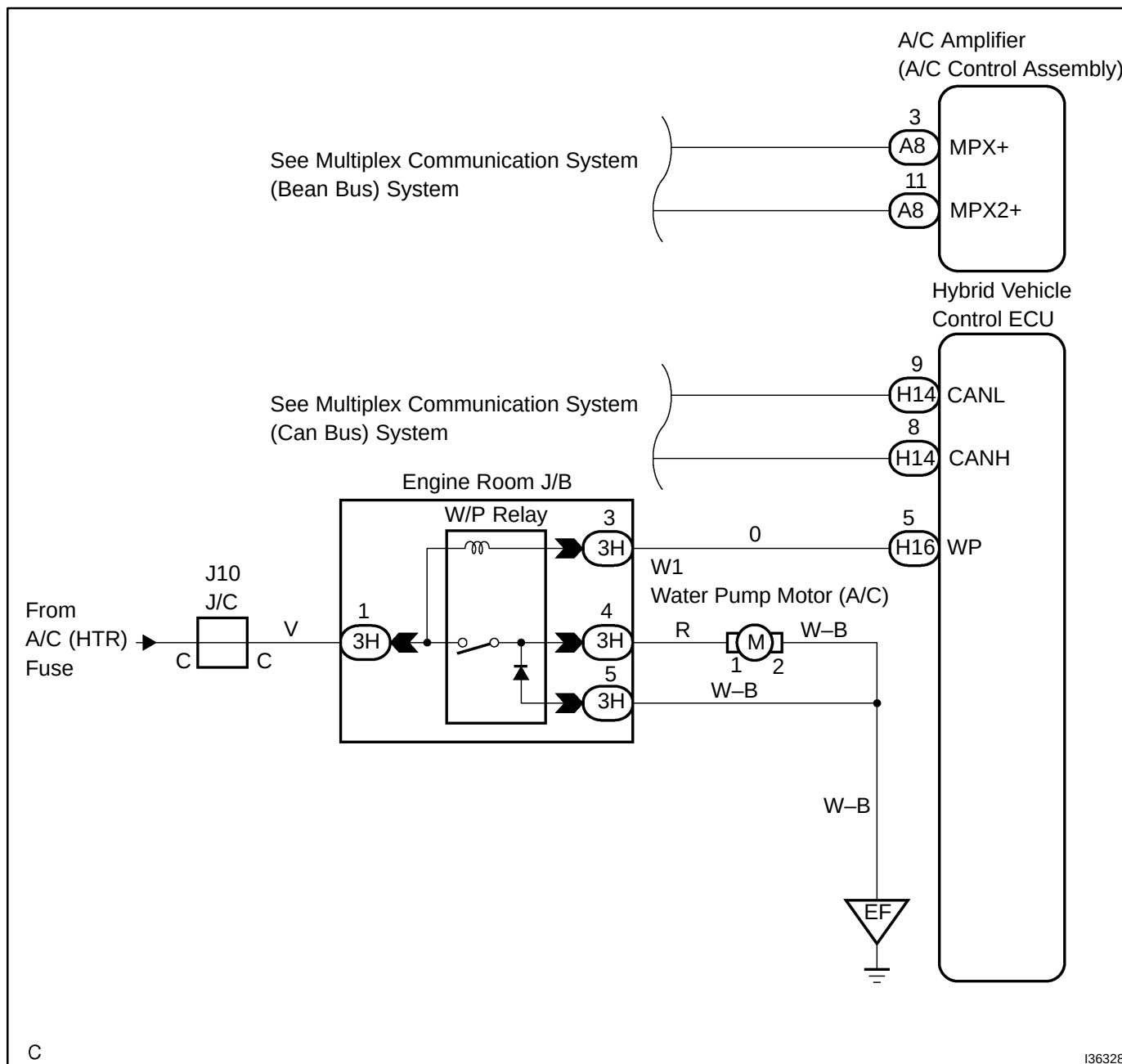
HEATER WATER PUMP CIRCUIT

CIRCUIT DESCRIPTION

The heater water pump assy sends engine coolant to the heater core assy while the engine is stopped to prevent heater effectiveness from becoming low.

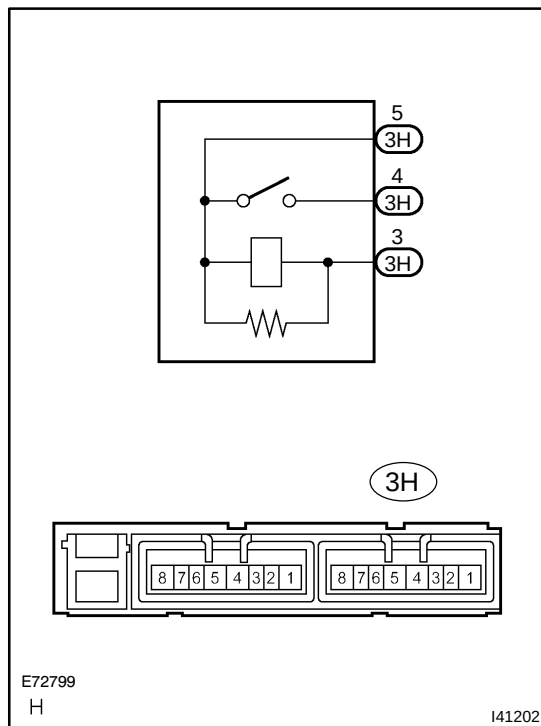
Directed by the air conditioner amplifier assy, Hybrid control ECU operates the water pump relay and drives the heater water pump assy.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT INTEGRATION RELAY



- (a) Remove the integration relay from the engine room J/B.

NOTICE:

As the integration relay is connected to the relays and fuses in the other systems, remove it with the power switch off. (A DTC may be output if the power switch is on.)

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

Standard:

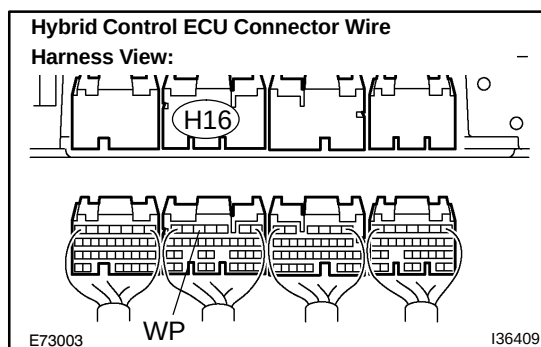
Terminal No.	Condition	Specified condition
3H-4 – 3H-5	Always	Below 1 Ω
3H-4 – 3H-5	When battery voltage applied to terminals 3h-5 and 3H-3	Below 1 Ω

NG

REPLACE INTEGRATION RELAY

OK

2 CHECK HARNESS AND CONNECTOR (SEE PAGE 01-47)



- (a) Install the integration relay.
 (b) Disconnect the connectors from the hybrid vehicle control ECU.
 (c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
H16-5 (WP) – Body ground	Power switch ON	10 to 14 V

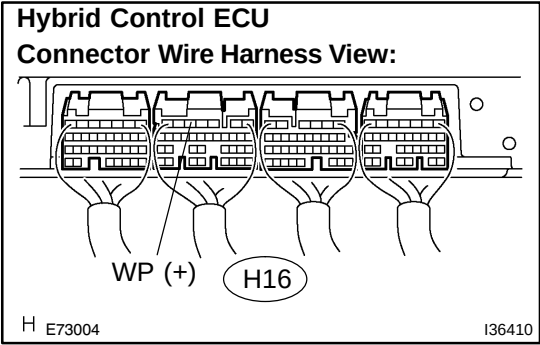
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3

INSPECT HYBRID VEHICLE CONTROL ECU



- (a) Connect the hybrid vehicle control ECU connectors.
- (b) Measure voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
H16-5 (WP) – Body ground	Not operate the heater water pump	10 to 14 V
H16-5 (WP) – Body ground	Operate the heater water pump	Below 1 V

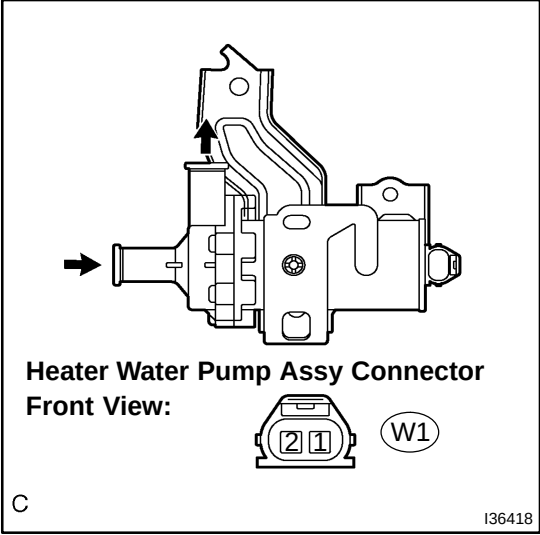
NG

REPLACE HYBRID VEHICLE CONTROL ECU

OK

4

INSPECT HEATER WATER PUMP ASSY



- (a) Remove the heater water pump.
- (b) Connect positive (+) lead to terminal 1 of the heater water pump connector and negative (–) lead to terminal 2.

Standard: Heater water pump operates smoothly.

NOTICE:
Complete operation within 10 seconds if there is no water in the heater water pump.

NG

REPLACE HEATER WATER PUMP ASSY

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

DTC	P3009-611	HIGH VOLTAGE POWER SHORT CIRCUIT
------------	------------------	---

CIRCUIT DESCRIPTION

The DTC is output if there is insulation trouble with the high-voltage circuits in the air conditioning system. Insulation trouble with the electric inverter compressor or A/C inverter Assy may be the cause. Any oil other than ND-OIL 11 may have entered the refrigeration cycle.

The motor driven with high-voltage is built into the electrical compressor and is cooled directly with refrigerant. Compressor oil (ND-OIL 11) with high insulation performance is used because a leakage of electrical power may occur if regular compressor oil (ND-OIL 8) is used.

NOTICE:

- Electrical insulation performance may decrease significantly if even a small amount of oil other than ND-OIL 11 is used (or enters) in the refrigeration cycle, causing the DTC to be output.
- If other is accidentally used and a DTC is output, collect the oil in the refrigeration cycle into the compressor and replace it with ND-OIL 11 to increase the ND-OIL 11 ration amount.
- Replace the main components (evaporator, condenser, and compressor) if a large amount of oil other than ND-OIL 11 enters the system. Failing to do so may cause electrical insulation performance to remain low, causing the DTC to be output.

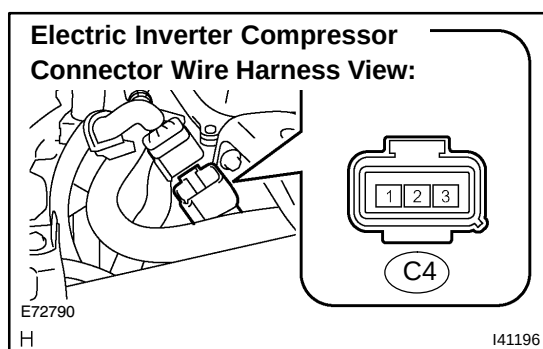
CAUTION:

Wear insulated gloves and pull out the service plug grip before inspection as procedures may require disconnecting high-voltage connectors.

DTC No.	Detection item	Trouble Area
P3009-611	High voltage system insulation malfunction.	• Electric inverter compressor (w/motor compressor Assy) • A/C inverter (w/converter inverter Assy) • Compressor oil

INSPECTION PROCEDURE

1 INSPECT A/C INVERTER



- (a) Remove the service plug grip.

CAUTION:

Because the compressor has a high-voltage circuit, wear insulated gloves and pull out the service plug to cut the high-voltage circuit before inspection.

- (b) Disconnect the electric inverter compressor connector.
 (c) Measure the resistance according to the value(s) in the table below immediately after the compressor is stopped.

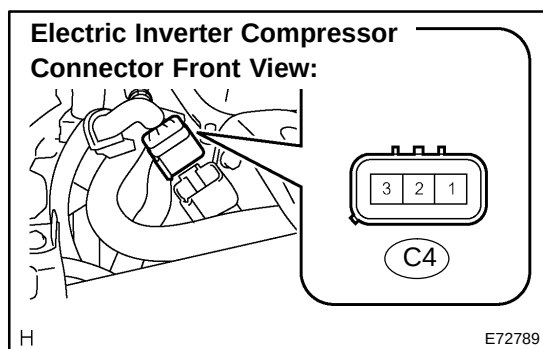
Standard:

Tester connection	Condition	Specified condition
C4-1 – Body ground	Always	2 MΩ or higher
C4-2 – Body ground	Always	2 MΩ or higher
C4-3 – Body ground	Always	2 MΩ or higher

NG

REPLACE A/C INVERTER

OK

2 INSPECT ELECTRIC INVERTER COMPRESSOR

(a) Remove the service plug grip.

CAUTION:

Because the compressor has a high-voltage circuit, wear insulated gloves and pull out the service plug to cut the high-voltage circuit before inspection.

(b) Disconnect the electric inverter compressor connector.

(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
C4-1 – Body ground	Always	2 MΩ or higher
C4-2 – Body ground	Always	2 MΩ or higher
C4-3 – Body ground	Always	2 MΩ or higher

NG**REPLACE ELECTRIC INVERTER COMPRESSOR****NOTICE:**

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

OK

3 INSPECT ELECTRIC INVERTER COMPRESSOR

- (a) Connect the electric inverter compressor connector
- (b) Install the service plug grip.

CAUTION:

Because the compressor has a high-voltage circuit, wear insulated gloves and pull out the service plug to cut the high-voltage circuit before inspection.

- (c) Turn the power switch on.
- (d) Set the A/C setting temperature to 25°C (77°F) and the blower switch LO and then operate the compressor for 10 minutes to circulate the refrigerant cycle with refrigerant and collect as much compressor oil remaining in each component into the compressor as possible.

HINT:

Inspect with sufficient oil in the compressor since the insulation resistance of the compressor changes depending on the amount of oil in the compressor.

- (e) Turn the power switch off, and leave the vehicle for a night to cool down the compressor's internal temperature.

NOTICE:

Do not operate the compressor before inspection.

HINT:

- Leave the vehicle until the compressor temperature decreases below ambient temperature. (As the compressor temperature decreases below the temperature of the condenser and evaporator, more oil can be stored in the compressor.)
- If there is significant difference in temperature between day and night time, it will take approximately 4 hours to cool down the compressor.

- (f) Remove the service plug grip.

CAUTION:

Because the compressor has a high-voltage circuit, wear insulated gloves and pull out the service plug to cut the high-voltage circuit before inspection.

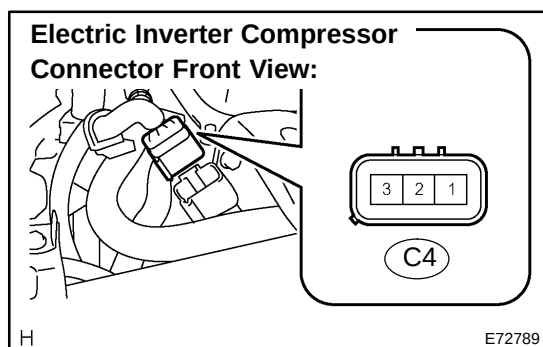
- (g) Disconnect the electric inverter compressor connector.
- (h) Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
C4-1 – Body ground	Always	3 MΩ or higher
C4-2 – Body ground	Always	3 MΩ or higher
C4-3 – Body ground	Always	3 MΩ or higher

NOTICE:

If the results are out of the specified range, replace the compressor without operating.

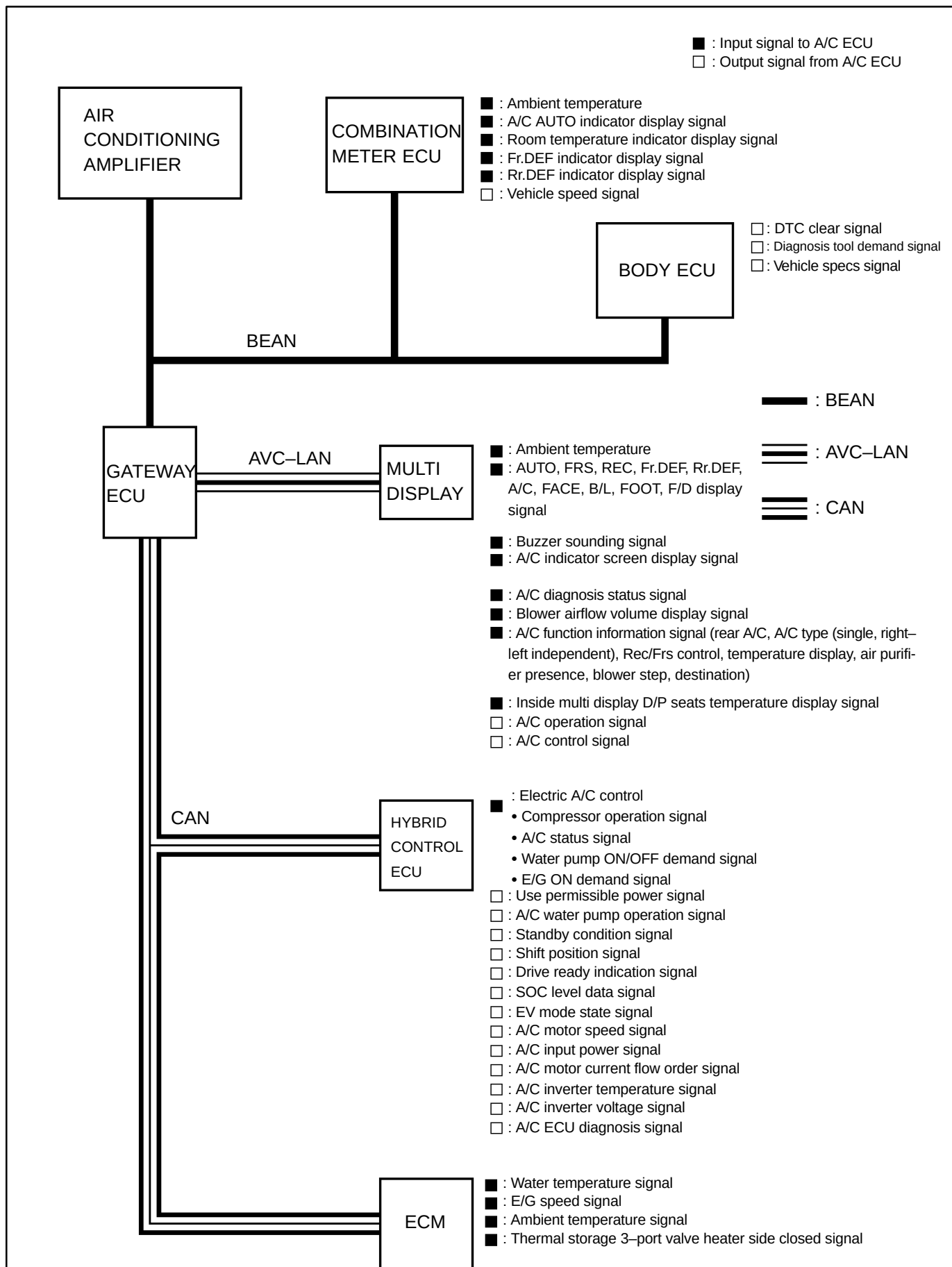


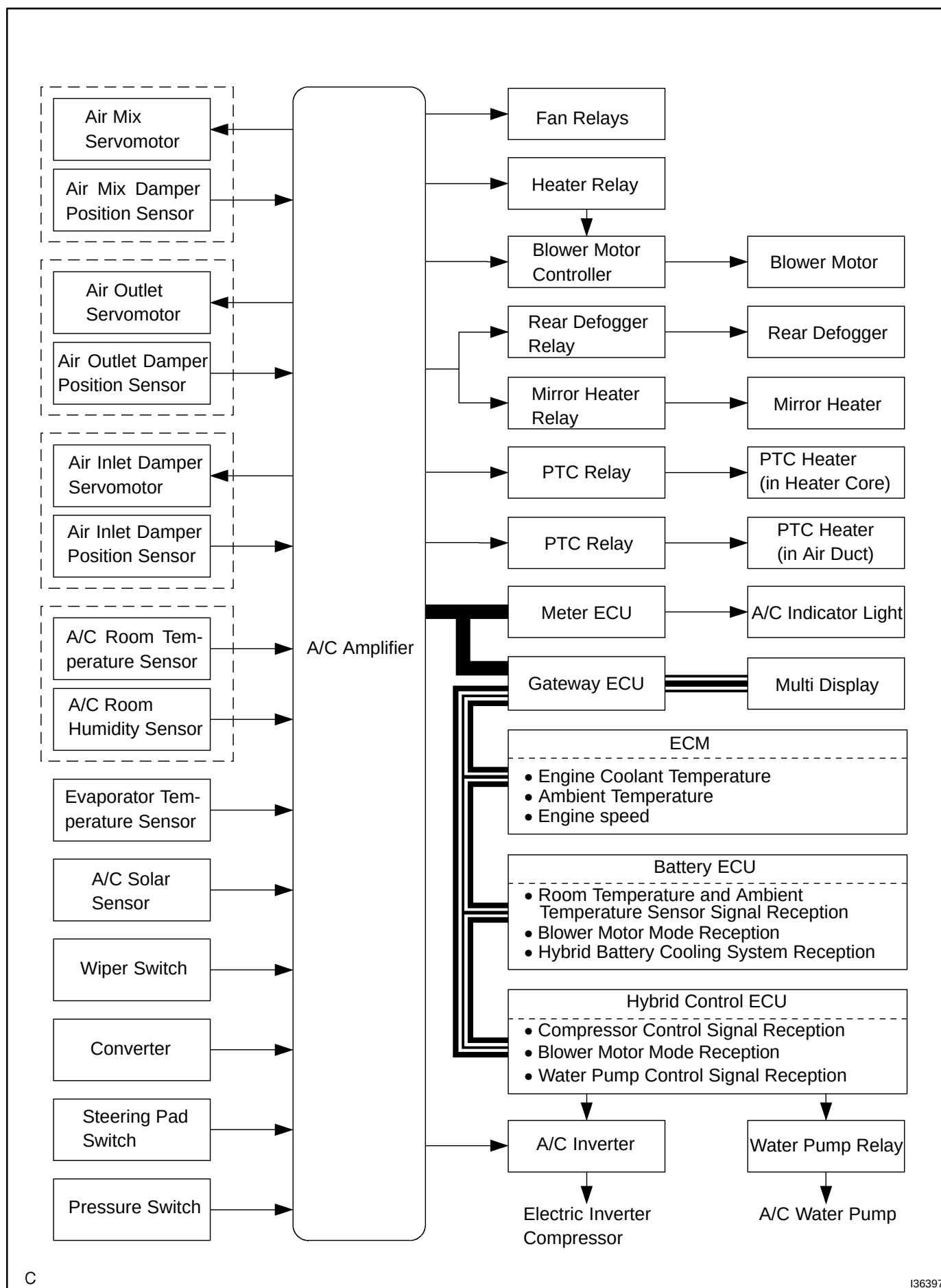
NG**REPLACE ELECTRIC INVERTER COMPRESSOR****NOTICE:**

The A/C inverter is integrated with the inverter assy. It is necessary to replace the PCU box assy if the A/C inverter (inverter assy) needs to be replaced because the A/C inverter (inverter assy) cannot be replaced alone.

OK**SYSTEM OK**

SYSTEM DIAGRAM





C

I36397

CUSTOMER PROBLEM ANALYSIS CHECK

AIR CONDITIONING SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		VIN	
		Production Date	
		Licence Plate No.	
Date Vehicle Brought In	/ /	Odometer Reading	km miles

Date of Problem Occurrence	/ /
How Often does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)
Weather	☐ Fine ☐ Cloudy ☐ Snowy ☐ Various / Other
Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F °C)

Symptoms	Air Flow Control Faulty	☐ Blower motor does not operate ☐ Blower motor speed does not change (Always Hi, Always Med, Always Lo)
	Temperature Control Faulty	☐ Cabin temperature does not go down ☐ Cabin temperature does not rise ☐ Response is slow
	Air Inlet Control Faulty	☐ Cannot change between FRS and REC (Always Fresh or Always Recirculating)
	Vent Control Faulty	☐ Mode does not change ☐ Unable to enter the desired mode

DTC Check	1st Time	☐ Normal System Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal System Code ☐ Malfunction Code (Code)

DESCRIPTION

1. GENERAL

The following changes have been made to the air conditioning system on the '04 Prius:

- An ES18 type Electric Inverter Compressor has been newly adopted. This compressor is driven by an alternating current provided by the A/C inverter, which is built into the inverter of the hybrid system. As a result, the air conditioning system is actuated without depending on the operation of the engine, thus realizing a comfortable air conditioning system and low fuel consumption.
- A blower motor controller, which regulates the speed of the blower motor by controlling the output voltage in accordance with the duty cycle signal provided by the A/C amplifier, has been newly adopted. As a result, the power loss associated with the heat generation of the conventional blower linear controller has been reduced, thus realizing low fuel consumption.
- A humidity sensor function has been added to the room temperature sensor in order to optimize the amount of dehumidification effort during the operation of the air conditioning system.
- A compact, lightweight and highly efficient RS (Revolutionary Slim) evaporator has been adopted.
- A compact, lightweight and highly efficient MF-IV (Multi Flow-IV) condenser has been adopted.
- A compact, lightweight, and highly efficient electrical water pump has been adopted in order to ensure the proper heater performance while the engine is stopped.
- Fuzzy control has been adopted for calculating the required outlet air temperature (TAO: Temperature Air Outlet) and the blower volume in the automatic air conditioning control system. Accordingly, the air conditioning ECU is able to calculate the outlet air temperature, blower volume, air outlet, and compressor speed that is suited to the operating environment. As a result, the comfort level of the occupants has been improved.
- On the previous model, the air conditioning was controlled at the heater control panel. This control operation has been changed to the air conditioner screen display on the multi display and the steering pad switch, in order to improve the case of use.

2. AIR CONDITIONING OPERATION

- On the '03 Prius, the air conditioning was controlled at the air conditioning control panel. On the '04 Prius, this control operation has been changed to the switches that appear on the air conditioning screen display of the multi display and the switches provided on the steering pad.
- In addition to the air conditioning screen display, the operating conditions of the AUTO, RECIRCULATION, front DEF, and rear DEF switches are indicated by the indicator lights in the combination meter.

3. HEATER CORE AND PTC HEATER

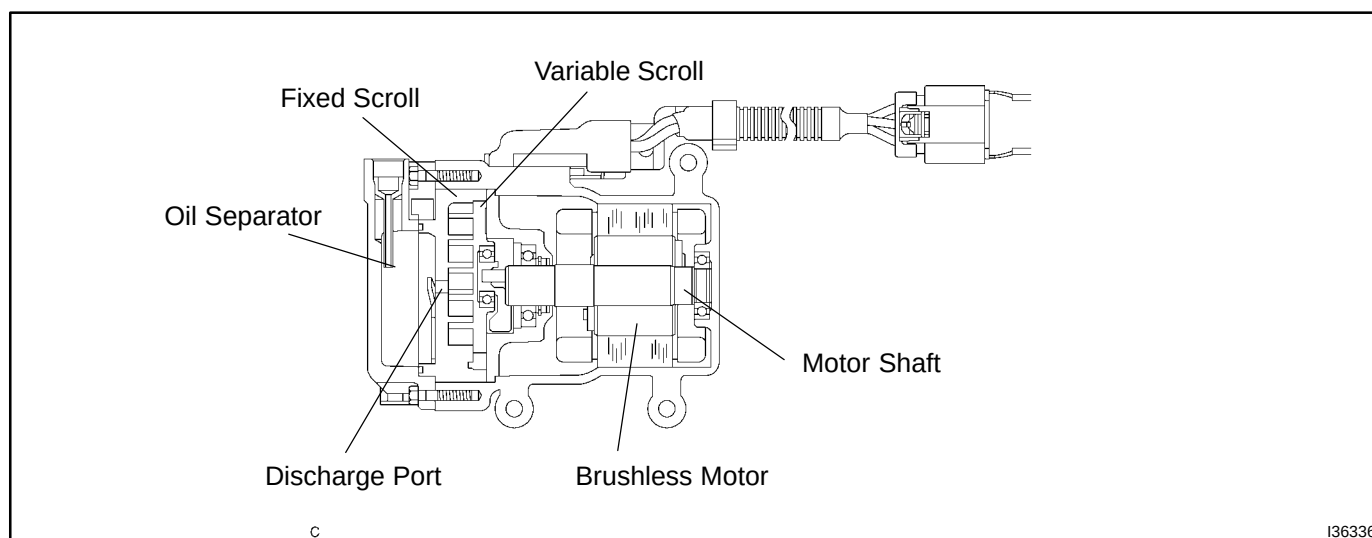
- A compact, lightweight, and highly efficient straight flow (full-path flow) aluminum heater core is used. A PTC (Positive Temperature Coefficient) heater has been built into the heater core tube.
- The PTC heater contains electrodes that are interposed with a PTC element, to which current is applied in order to warm the air that passes through the fine. For details, PTC heater control on see page [05-1372](#).
- PTC heater has been provided in the air duct at the footwell outlet in front of the air conditioning unit. This PTC heater, which is a honeycombshaped PTC thermistor, directly warms the air that flows in the duct.

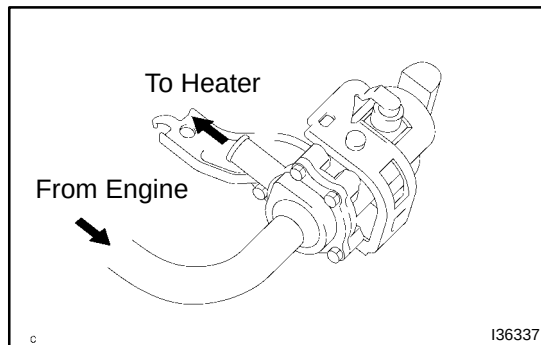
4. COMPRESSOR

- Instead of the SCS06 scroll compressor that is actuated by the engine on the previous Prius, the new Prius has newly adopted and ES18 Electric Inverter Compressor that is actuated by a built-in electric motor. Except for the portion that is actuated by the electric motor, the basic construction and operation of this compressor are the same as in the scroll compressor used on the previous Prius.
- The electric motor is actuated by the alternating current power (201.6 V) supplied by the A/C inverter, which is integrated in the hybrid system inverter. As a result, the air conditioning control system on the '04 Prius is actuated without depending on the operation of the engine, thus realizing a comfortable air conditioning system and low fuel consumption.
- Due to the adoption of an electric inverter compressor, the compressor speed can be controlled at the required speed calculated by the A/C amplifier. Thus, the cooling and dehumidification performance and power consumption have been optimized.
- Low-moisture permeation hoses have been adopted for the suction and discharge hoses at the compressor in order to minimize the entry of moisture into the refrigeration cycle.
- The compressor uses high-voltage alternating current. If a short or open circuit occurs in the compressor wiring harness, the hybrid control ECU will cut off the A/C inverter circuit in order to stop the power supply to the compressor.
- For details on the Electric Inverter Compressor control effected by the A/C amplifier.
- The Electric Inverter Compressor consists of a spirally wound fixed scroll and variable scroll that form a pair, a brushless motor, an oil separator, and a motor shaft.
- The fixed scroll is integrated with the housing. Because the rotation of the shaft causes the variable scroll to revolve while maintaining the same posture, the volume of the space that is partitioned by both scrolls varies to perform the suction, compression, and the discharge of the refrigerant gas.
- Locating the suction port directly above the scrolls enables direct suction, thus realizing improved suction efficiency.
- Containing a built-in oil separator, this compressor is able to separate the compressor oil that is inter-mixed with the refrigerant and circulates in the refrigeration cycle, thus realizing a reduction in the oil circulation rate.

HINT:

In order ensure the proper insulation of the internal high-voltage portion of the compressor and the compressor housing, the '04 Prius has adopted a compressor oil (ND-OIL11) with a high level of insulation performance. Therefore, never use a compressor oil other than the ND-OIL11 type compressor oil or its equivalent.





5. WATER PUMP

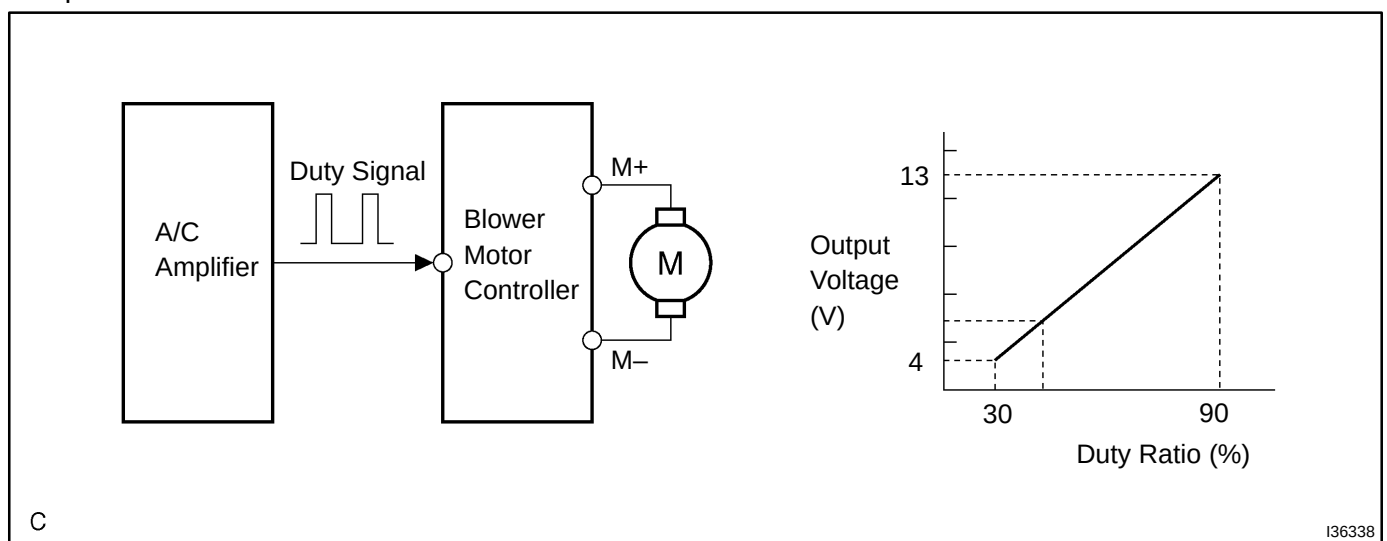
- Same as the '03 Prius, an electrical water pump has been adopted. This provides a stable heater performance even if the engine is stopped because of a function of the THS-II.
- The '04 Prius has adopted a new type of electrical water pump in which the water flow resistance has been reduced. As a result, the bypass valve that was used on the '03 Prius has been discontinued.

6. ROOM TEMPERATURE SENSOR AND HUMIDITY SENSOR

- A humidity sensor function has been added to the room temperature sensor. By enabling the detection of humidity in the vehicle interior, this function optimizes the amount of dehumidification effort during the operation of the air conditioning system. As a result, the power consumption of the compressor has been reduced and a comfortable level of humidity has been realized in the vehicle interior.
- The humidity-sensing resistance film that is built into the humidity sensor absorbs and releases the humidity in the vehicle interior. During the absorption and releasing processes, the humidity-sensing resistance film expands (during the absorption of humidity) and contracts (during drying). The clearance between the carbon particles in the humidity-sensing resistance film expands and contracts during absorption and drying, thus changing the resistance between the electrodes. The A/C amplifier determines the humidity in the vehicle interior through the changes in the output voltage of the humidity sensor that are caused by the resistance between the electrodes.

7. BLOWER MOTOR CONTROLLER

The blower pulse controller controls the voltage that is output to the blower motor in accordance with the duty cycle signals that are input by the A/C amplifier. It is characterized by a smaller amount of heat generation than the blower controller used on the previous model. As a result, the power loss associated with the heat generation of the conventional blower linear controller has been reduced, thus realizing low fuel consumption.



8. A/C AMPLIFIER

The air conditioning ECU has the following controls.

Control		Outline
Fuzzy Control		The fuzzy control determines the conformity levels of the temperature deviation, ambient temperature, and solar radiation by defining their respective mathematical functions. In addition, a fuzzy calculation method is used to calculate the required outlet air temperature (TAO) and the blower volume. Based on these calculations, the A/C amplifier effects the respective controls for the outlet air temperature, blower volume, compressor, and air outlet.
Outlet Air Temp. Control	Air Mix Damper Control	In response to the temperature control switch setting, the required outlet air temperature, evaporator temperature sensor, and engine coolant temperature sensor compensations are used by the air mix control damper control to calculate a tentative damper opening angle, through an arithmetic circuit in the air mix damper, to arrive at a target damper opening angle.
Blower Control	Blower Motor Start Up Control	When the blower motor is started up, the A/C amplifier transmits a blower motor actuation signal with a low duty cycle ratio to the blower pulse controller, which applies a low voltage to the blower motor, in order to operate the blower motor for 3 seconds at a low speed. This is designed to protect the blower pulse controller from a sudden start-up voltage surge.
	Manual Control	Sets the blower speed according to operation of the blower switch.
	Automatic Control	Step Less Air Volume Control: - When the AUTO switch located on the steering pad switch is pushed, or the air conditioning screen display of the multi display is touched, the A/C amplifier automatically regulates the duty ratio to the blower pulse controller in accordance with a calculation result by the fuzzy control in order to deliver step less air volume. Warm-up Control: - When the air outlet is in the FOOT, BI-LEVEL, or FOOT/DEF mode, the blower will not operate until the engine coolant temperature increases above a prescribed value. When the temperature increases above a prescribed value, When the temperature increases above a prescribed value, the blower motor operates at the LO speed. Time-Lagged Air Flow Control: 2 types of time-lagged air flow control (in accordance with the detected by the evaporator temperature sensor) help prevent hot air from being emitted from FACE or BI-LEVEL vent. Sunlight Air Flow Control: - Controls the blower speed in accordance with the intensity of the sunlight when the air outlet mode is at FACE or BI-LEVEL. The blower speed can be adjusted in response to the signal received from the solar sensor.
Air Outlet Control	Manual Control	Changes the air outlet in accordance with the selected position of the mode select switch.
	Automatic Control	Mode Damper Switching Servomotor Control: - When the AUTO switch is pushed, automatic control causes the mode servomotor to rotate to a desired position in accordance with the target damper opening, which is based on the calculation of the TAO. Low-Temperature FOOT/DEF Control: - In accordance with the engine coolant temperature, ambient temperature, amount of sunlight, required outlet temperature (TAO), and vehicle speed conditions, this control automatically switches the blower outlet between the FOOT/DEF modes to prevent the window from becoming fogged when the outside air temperature is low.

(Continued)

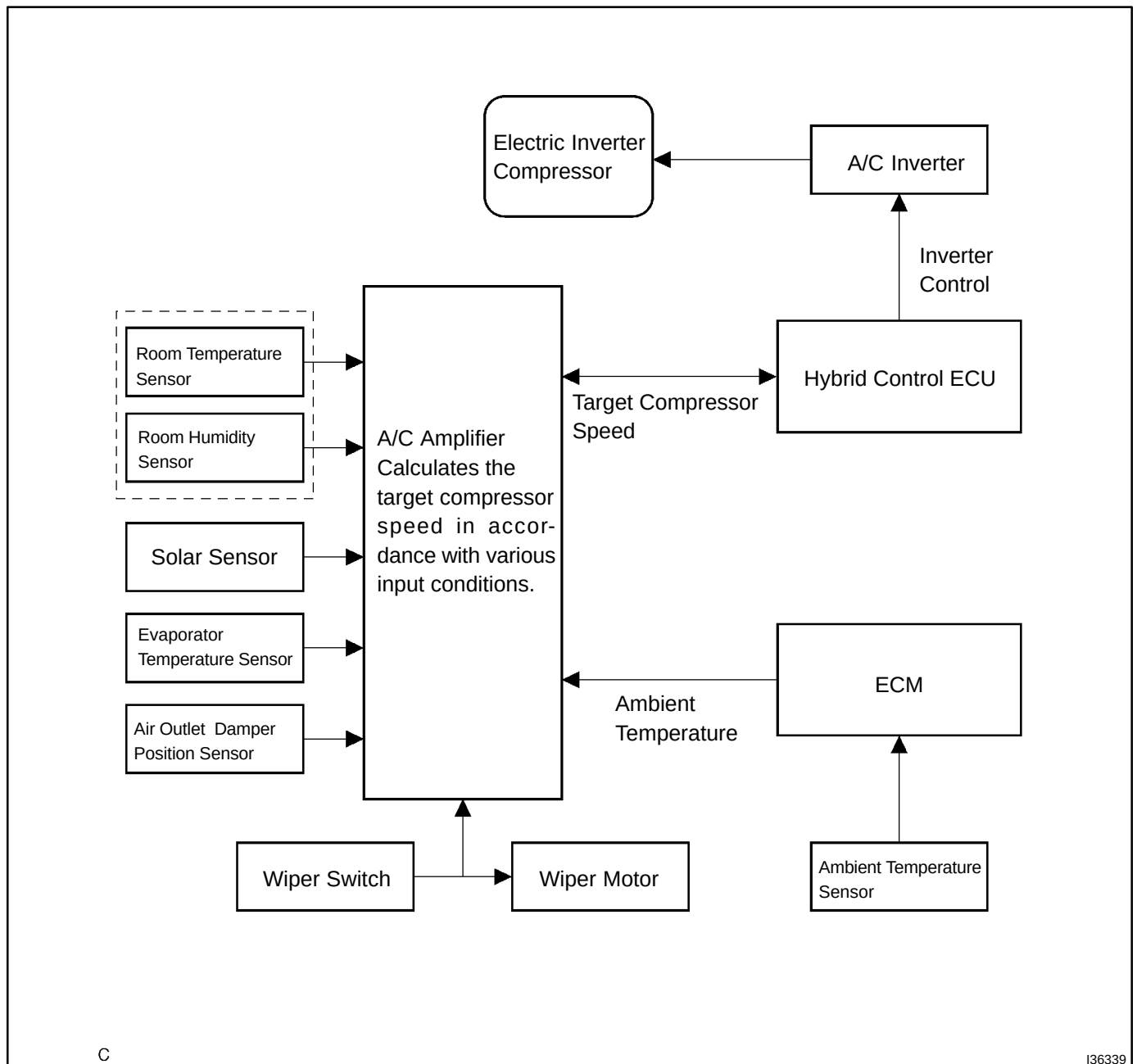
Control		Outline
Air Inlet Control	Manual Control	Drives the air inlet servomotor according to the operation of the air inlet control switch and fixes the dampers in the FRESH or RECIRC position.
	Automatic Control	Automatic RECIRC/FRESH Control: • When the AUTO switch is pressed, the system controls the servo motor in order to achieve the air inlet that has been calculated in accordance with the TAO. DEF Mode Control: • When switching the mode switching switch to DEF mode, A/C amplifier turns MAX mode ON forcibly and switched to FRESH mode. • When switching the mode switching switch to FOOT/DEF mode, A/C amplifier switches to FRESH mode.
2-Way Flow Mode Control		At the time of selecting FRESH mode, A/C amplifier will judge it as 2-way flow mode when the blower outlet is selected to FOOT or FOOT/DEF, the tentative air mix damper opening angle is above the specified value (MAX HOT), and either the blower volume is more than the specified volume or the vehicle speed is less than the specified speed.
Half Inlet Air Mode Control		At the time of selecting FRESH mode, A/C amplifier will judge it as half inlet air mode when the blower outlet mode is selected to FACE or BI-LEVEL and TAO is more than the specified temperature, and operates both outlet air introduction and inlet air circulation at the same time.
Electric Inverter Compressor Control	Compressor Speed Control	• The A/C amplifier calculates target speed of the compressor based on the target evaporator temperature (which is calculated by the room temperature sensor, humidity sensor, ambient temperature sensor, and the solar sensor) and the actual evaporator temperature that is detected by the evaporator temperature sensor in order to control the compressor speed. • The A/C amplifier calculates the target evaporator temperature, which includes corrections based on the vehicle interior humidity (which is obtained from the humidity sensor) and the windshield glass inner surface humidity (which is calculated from the humidity sensor, solar sensor, room temperature sensor, mode damper position, and wiper operation condition). Accordingly, the A/C amplifier controls the compressor speed to an extent that would not inhibit the proper cooling performance or defogging performance.
Electrical Water Pump Control		When the blower motor is ON and the engine has been stopped by the hybrid control, the A/C amplifier turns ON the electric water pump in accordance with the judgment of the air mix damper opening.
Engine Start Request Control		To ensure the proper heater performance when the hybrid system is started at low temperatures, the A/C amplifier transmits an engine start request to the hybrid control ECU in accordance with the TAO, engine coolant temperature sensor signal, and ambient temperature sensor signal.

(Continued)

Control	Outline
PTC Heater Control	When the hybrid system is operating (READY) and the blower motor is turned ON, the A/C amplifier turns on the PTC heater if the conditions listed below are met. Heater core integrated PTC Heater • Air outlet is in the FOOT, FOOT/DEF or DEF mode. • Engine coolant temperature is below specified temperature. • Ambient temperature is below specified temperature. (DEF mode) • Tentative air mix damper opening angle is above the specified value. (MAX HOT) Footwell air duct integrated PTC heater • Air outlet is in the FOOT or FOOT/DEF mode. • Engine coolant temperature is below specified temperature. • Tentative air mix damper opening angle is above the specified value. (MAX HOT)
Electric Cooling Fan Control	The A/C amplifier control the cooling fan in accordance with the vehicle speed signal and compressor speed signal.
Rear Window Defogger Control	Switches the rear defogger and outside rear view mirror heaters, on for 15 minutes when the rear defogger switch is switched on. Switches them off if the switch is pressed while they are operating.
Outer Temperature Indication Control	Based on the signals from the ambient temperature sensor, this control calculates the outside temperature, which is then corrected in the air conditioning ECU, and shown in the multi display.
Self-Diagnosis	Checks the sensor and A/C inverter in accordance with operation of the air conditioning switches, then heater control panel display portion a DTC (Diagnosis Trouble Code) to indicate if there is a malfunction or not. (sensor check function)
	Drives the actuators through a predetermined sequence in accordance with the operation of the air conditioning switches. (actuator check function)

9. ELECTRIC INVERTER COMPRESSOR CONTROL

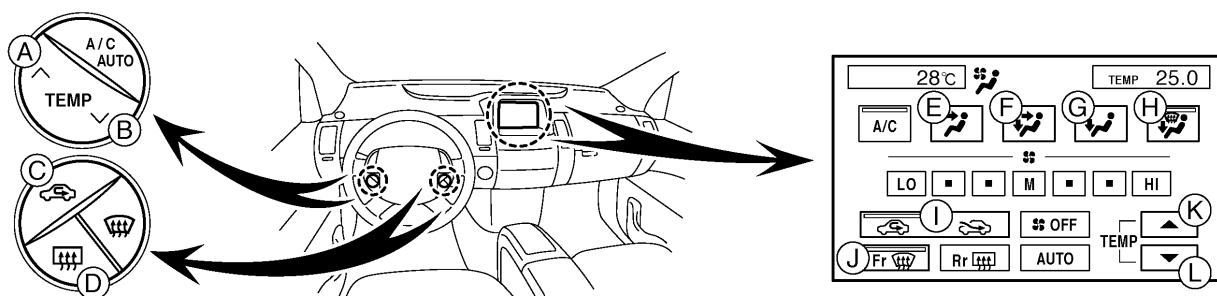
- The A/C amplifier calculates the target compressor speed based on the target evaporator temperature (calculated from the room temperature sensor, humidity sensor, ambient temperature sensor, and solar sensor) and the actual evaporator temperature detected by the evaporator temperature sensor. Then, the A/C amplifier transmits the target speed to the hybrid control ECU. The hybrid control ECU controls the A/C inverter based on the target speed data in order to control the compressor to a speed that suits the operating condition of the air conditioning system.
- The A/C amplifier calculates the target evaporator temperature, which includes corrections based on the vehicle interior humidity (which is obtained from the humidity sensor) and the windshield glass inner surface humidity (which is calculated from the humidity sensor, solar sensor, room temperature sensor, mode damper position, and wiper operation condition). Accordingly, the A/C amplifier controls the compressor speed to an extent that does not inhibit the proper cooling performance or defogging performance. As a result, comfort and low fuel consumption can be realized.



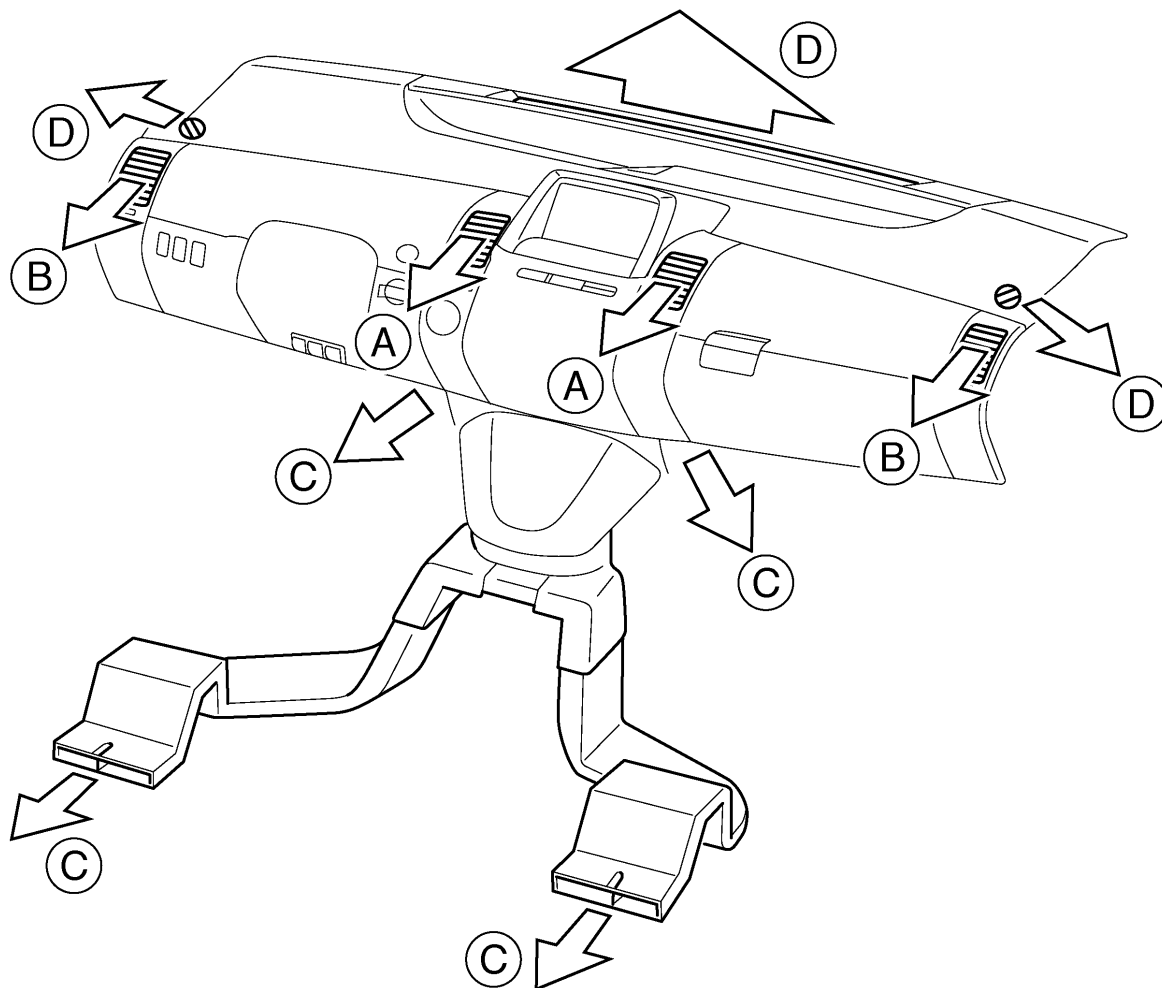
This schematic diagram illustrates the airflow paths within an automotive HVAC system. The system is divided into three main sections: Fresh Air intake, Recirculation Air, and the distribution network. The Fresh Air intake (labeled 1) passes through a Clean Air Filter (2) and a Blower Motor (3). The Recirculation Air (labeled 4) is drawn from the cabin. Both air sources pass through an Evaporator (5) and a Heater Core (6). The air then flows through a series of ducts and registers, including the Side Defroster (7), Center Defroster (8), Side defroster (9), Front Footwell Register Duct (10), Rear Footwell Register Duct (11), Side Register (12), Center Register (13), and Side Register (14). The diagram uses numbered circles (1-14) to indicate specific components and registers, and dashed lines to show the flow paths.

Control Damper	Control Position	Damper Position	Operation
Air Inlet Control Damper	Ⓒ or Ⓘ  Indicator OFF	① ③	Brings in fresh air.
		② ④	Brings in fresh air while circulating internal air
	Ⓒ or Ⓘ  Indicator ON	② ④	Circulates internal air.
Air Mix Control Damper	Ⓐ Ⓑ or Ⓚ Ⓛ	⑤ to ⑥ to ⑦ ⑧ ⑨ ⑩	Varies the mix ratio of warm and cool air in order to regulate the temperature continuously from WARM to COOL.
Mode Control Damper	Ⓓ or Ⓜ (DEF)	⑪ ⑰ ⑱ ⑳	Defrosts the window through the front defroster, side defrosters and side registers.
	Ⓜ (F / D)	⑫ ⑰ ⑱ ⑳ (⑪ ⑮ ⑱ ㉓)*1	Defrosts the window through the front defroster, side defrosters and side registers while warm air is also blown out to warm the footwell area.
	Ⓔ (FOOT)	⑬ ⑱ ⑲ ㉒ (⑫ ⑰ ⑱ ㉓)*1	Air is blown out of the footwell ducts and side registers.
	Ⓕ (B / L)	⑭ ⑰ ⑳ ㉒	Air is blown out of the footwell ducts and center and side registers.
	Ⓖ (FACE)	⑭ ⑮ ㉑ ㉒ (⑭ ⑯ ㉑ ㉒)*2	Air is blown out of the center and side registers.

*2: Early stage of COOL during AUTO



11. AIR OUTLETS AND AIR VOLUME RATIOS



AIR OUTLET MODE		(A) Center Face	(B) Side Face	(C) Foot	(D) Defroster
FACE		○	○	— (○) *1	—
B / L		○	○	○	—
FOOT		—	○	○	○
F / D		—	○	○	○
DEF		—	○	—	○

HINT:

1. (○) indicates airflow and its size indicates the proportion of airflow volume.
2. (—) indicates that air is not blown out.
3. *1: Early stage of COOL during AUTO

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTCs check (sensor check), check the circuit listed for the code in the table below (proceed to the page given for that circuit).

DTC No. (See Page)	Detection Item	Trouble Area	Memory*4
00	Normal	–	–
B1411/11*1 (05-1282)	Open or short in room temperature sensor circuit	• A/C room temperature sensor • Harness or connector between cooler A/C room temperature sensor and A/C amplifier • A/C amplifier	○ (8.5 min. or more)
B1412/12*2 (05-1287)	Open or short in ambient temperature sensor circuit	• A/C ambient temperature sensor • Harness or connector between A/C ambient temperature sensor and ECM • ECM • Multiplex communication circuit • A/C amplifier	○ (8.5 min. or more)
B1413/13 (05-1292)	Open or short in evaporator temperature sensor circuit.	• A/C evaporator temperature sensor (A/C thermistor) • Harness or connector between A/C evaporator temperature sensor and A/C amplifier • A/C amplifier	○ (8.5 min. or more)
B1421/21*3 (05-1297)	Open or short in solar sensor circuit. (If the check is performed in a dark place, DTC B1424/24 may be displayed.)	• A/C solar sensor • Harness or connector between A/C solar sensor and A/C amplifier or body ECU • A/C amplifier	○ (8.5 min. or more)
B1423/23 (05-1302)	• Open in pressure sensor circuit. • Abnormal refrigerant pressure. below 196 kPa (2.0 kgf/cm², 28 psi) over 3,140 kPa (32.0 kgf/cm², 455 psi)	• Pressure switch • Harness or connector between pressure switch and body ground • Multiplex communication circuit • Refrigerant pipe line • A/C amplifier	–
B1431/31 (05-1305)	Open or short in power source circuit in air mix damper position sensor circuit.	• Air mix control servomotor (air mix damper position sensor) • Harness or connector between Air mix control servomotor and A/C amplifier • A/C amplifier	○ (1 min. or more)
B1432/32 (05-1310)	Open or short in power source circuit in air inlet damper position sensor circuit.	• Air inlet control servomotor (air inlet damper position sensor) • Harness or connector between air inlet control servomotor and A/C amplifier • A/C amplifier	○ (1 min. or more)
B1433/33 (05-1315)	Open or short in power source circuit in air outlet damper position sensor circuit.	• Air outlet control servomotor (air outlet damper position sensor) • Harness or connector between air outlet control servomotor and A/C amplifier • A/C amplifier	○ (1 min. or more)
B1441/41 (05-1320)	Air mix damper position sensor value does not change even if air conditioner amplifier assy operates air mix servomotor.	• Air mix control servomotor • Harness or connector between air mix control servomotor and A/C amplifier • A/C amplifier	○ (15 sec.)
B1442/42 (05-1325)	Air inlet damper position sensor value does not change even if A/C control assembly operated air inlet damper control servo motor.	• Air inlet control servomotor • Harness or connector between air inlet control servomotor and A/C amplifier • A/C amplifier	○ (15 sec.)
B1443/43 (05-1330)	Air outlet damper position sensor valve does not change even if air conditioner amplifier operated air outlet damper control servo motor.	• Air outlet control servomotor • Harness or connector between air outlet control servomotor and A/C amplifier • A/C amplifier	○ (15 sec.)

DIAGNOSTICS – AIR CONDITIONING SYSTEM

B1462/62 (05-1335)	Open or short in room humidity sensor circuit	• A/C room humidity sensor (A/C room temperature sensor) • Harness or connector between A/C room humidity sensor (A/C room temperature sensor) and A/C amplifier • A/C amplifier	–
B1471/71 (05-1339)	Open or short in A/C inverter high voltage power resource system	• Hybrid control ECU • A/C inverter (w/converter inverter assy)	–
B1472/72 (05-1342)	Open or short in A/C inverter high voltage output system	• Hybrid control ECU • Electric inverter compressor (w/motor compressor assy) • A/C inverter (w/converter inverter assy)	–
B1473/73 (05-1345)	Open or short in A/C inverter start-up signal system	• Harness or connector between hybrid control ECU and w/converter inverter assy • A/C inverter (w/converter inverter assy) • Hybrid control ECU	–
B1474/74	A/C inverter (w/converter inverter assy) malfunction	• A/C inverter (w/converter inverter assy)	–
B1475/75 (05-1347)	Cooling water temperature in the inverter is outside the specified range (temperature is too high), or there is an open or short to ground in the temperature sensor circuit.	• A/C inverter (w/converter inverter assy)	–
B1476/76 (05-1348)	Motor's rotation load while the compressor is operating is too great or too small.	• Volume of refrigerant • Electric inverter compressor (w/motor compressor assy) • Cooling fan circuit	–
B1477/77 (05-1350)	An open or short to ground in the inverter's controlling power voltage circuit.	• A/C inverter (w/converter inverter assy)	–
B1498/98 (05-1351)	Communication line error or open between the hybrid control ECU and the A/C inverter (w/converter inverter assy)	• Harness or connector between hybrid control ECU and A/C inverter (w/converter inverter assy) • Hybrid control ECU • A/C inverter (w/converter inverter assy)	–
B1499/99 (05-2549)	Multiplex communication circuit	• Open in multiplex communication circuit	–
P3009-611 (05-1353)	High voltage system insulation malfunction.	• Electric inverter compressor (w/motor compressor assy) • A/C inverter (w/converter inverter assy) • Compressor oil	–

HINT:

- *1: If the room temperature is approx. -18.6°C (-3.7°F) or lower, DTC B1411/11 may be output even though the system is normal.
- *2: If the ambient temperature is approx. -52.9°C (-61.4°F) or lower, a malfunction code may be output even though the system is normal.
- *3: If the check is performed in a dark place, DTC B1421/21 or B1424/24 (solar sensor circuit abnormal) could be displayed.
- *4: The A/C amplifier memorizes the DTC of the respective malfunction that has occurred for a period of the time indicated in the brackets.

HOW TO PROCEED WITH TROUBLESHOOTING

The intelligent tester II can be used at step 3, 6, 7, 8, 9, 14.

1

VEHICLE BROUGHT TO WORKSHOP



2

CUSTOMER PROBLEM ANALYSIS (SEE PAGE 05-1265)

(a) Confirm problem symptoms.



3

CHECK AND CLEAR DTCS (SEE PAGE 05-1273)



4

PROBLEM SYMPTOM CONFIRMATION

SYMPTOM DOES NOT OCCUR (GO TO STEP 5)

SYMPTOM OCCURS (GO TO STEP 6)

5

SYMPTOM SIMULATION



6

CHECK BODY MULTIPLEX COMMUNICATION SYSTEM (SEE PAGE 05-2549)

(a) Check for the DTC outputs.

MULTIPLEX DTC OUTPUTS (PROCEED TO "BODY MULTIPLEX COMMUNICATION SYSTEM")

NO MULTIPLEX DTC (GO TO STEP 7)

7

CHECK CAN COMMUNICATION SYSTEM (SEE PAGE 05-2602)

CAN DTC OUTPUTS (PROCEED TO "CAN COMMUNICATION SYSTEM")

NO CAN DTC (GO TO STEP 8)

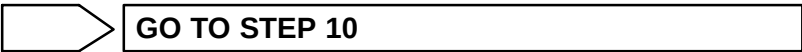
8

DTC CHECK (OTHER THAN MULTIPLEX DTC) (SEE PAGE 05-1273)

MALFUNCTION CODE (GO TO STEP 9)

NORMAL CODE (GO TO STEP 10)

9	DTC CHART (SEE PAGE 05-1280)
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10	PROBLEM SYMPTOMS TABLE (SEE PAGE 05-1268)
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11	TERMINALS OF ECU (SEE PAGE 05-1270)
----	--



12	CIRCUIT INSPECTION (SEE PAGE 05-1282 – 05-1379)
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13	IDENTIFICATION OF PROBLEM
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14	REPAIR OR REPLACE
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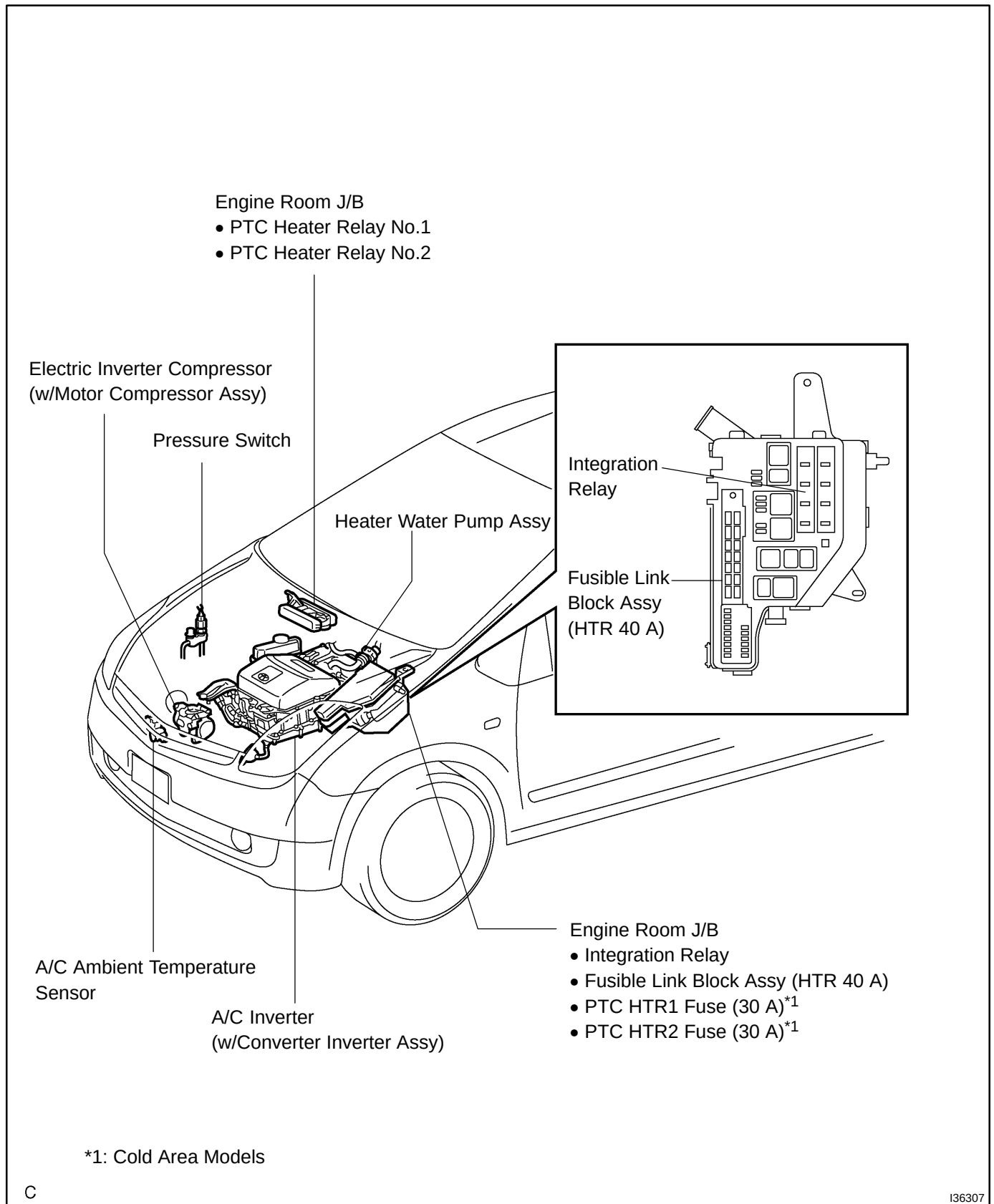
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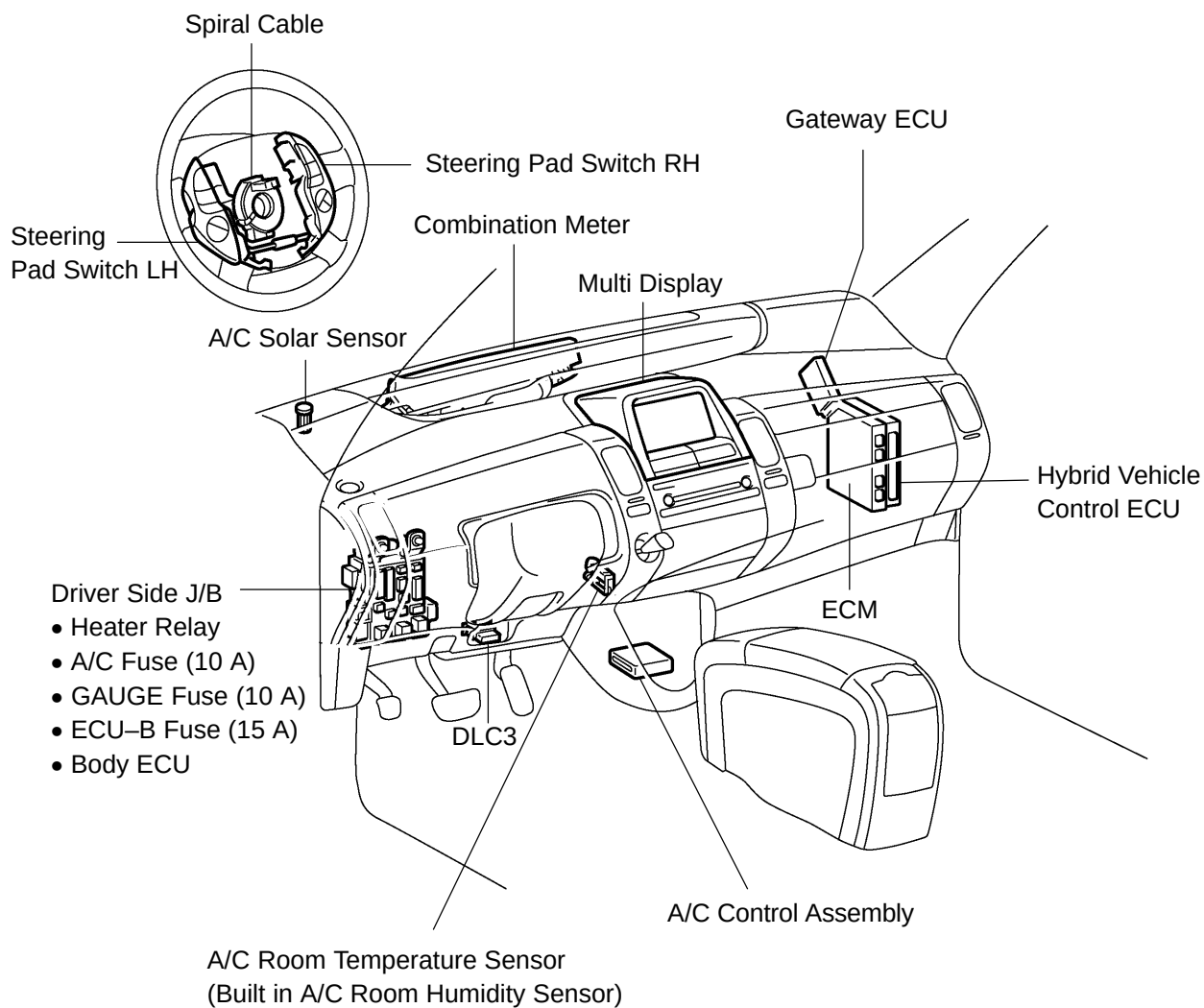


END

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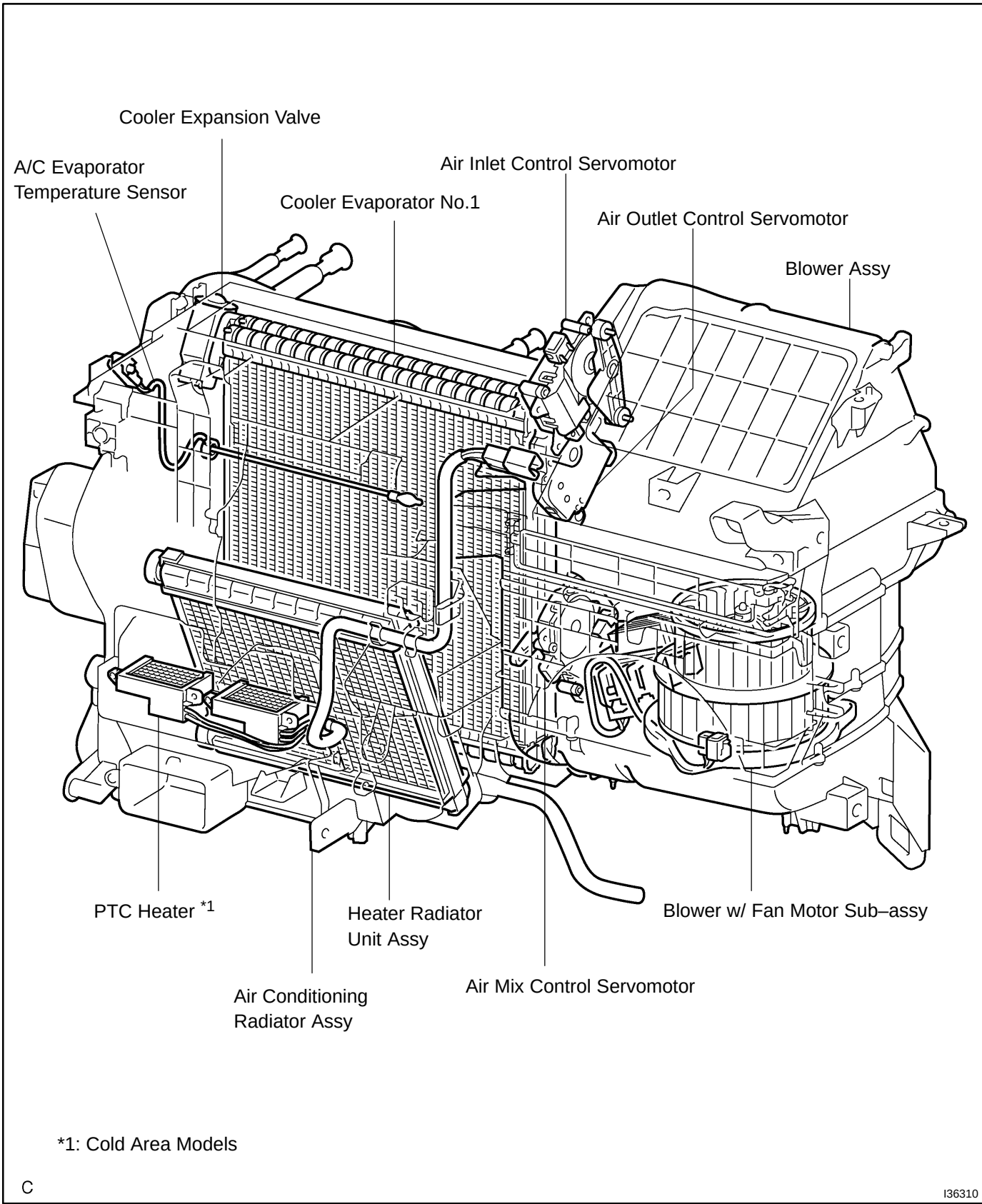
LOCATION





C

I36308



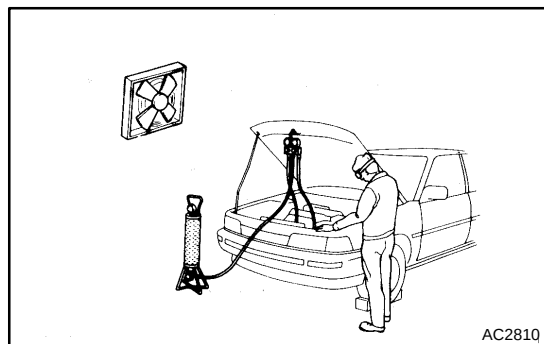
AIR CONDITIONING SYSTEM

05IVC-01

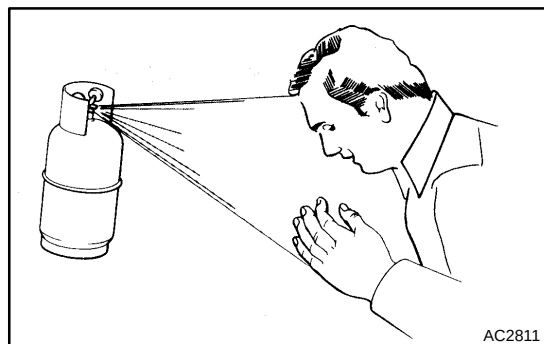
PRECAUTION

CAUTION:

Because the compressor has a high-voltage circuit, wear insulated gloves and pull out the service plug to cut the high-voltage circuit before inspection.



1. **DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR NEAR AN OPEN FLAME**
2. **ALWAYS WEAR EYE PROTECTION**



3. **BE CAREFUL NOT TO GET LIQUID REFRIGERANT IN YOUR EYES OR ON YOUR SKIN**

If liquid refrigerant gets in your eyes or on your skin:

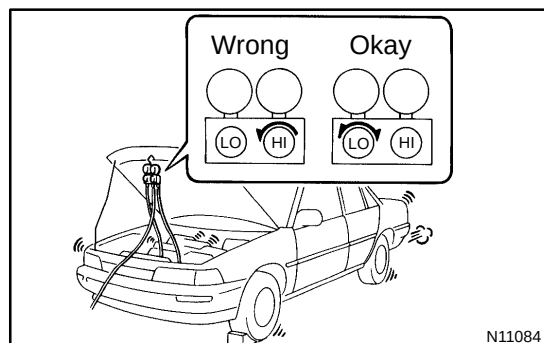
- (a) wash the area with lots of cold water.

CAUTION:

Do not rub your eyes or skin.

- (b) apply clean petroleum jelly to the skin.
- (c) go immediately to a hospital or see a physician for professional treatment.

4. **NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME**
5. **BE CAREFUL NOT TO DROP CONTAINER OR APPLY PHYSICAL SHOCKS TO IT**



6. **DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERANT SYSTEM**

If there is not enough refrigerant in the refrigerant system, oil lubrication will be insufficient and compressor burnout may occur. Necessary care should be taken to avoid this.

7. **DO NOT OPEN HIGH PRESSURE MANIFOLD VALVE WHILE COMPRESSOR IS OPERATING**

Open and close only the low pressure valve. If the high pressure valves are opened, refrigerant flows in the reverse direction causing the charging cylinder to rupture.

8. **BE CAREFUL NOT TO OVERCHARGE SYSTEM WITH REFRIGERANT**

If refrigerant is overcharged, it causes problems such as insufficient cooling, poor fuel economy, engine overheating, etc.

9. NOTICE FOR INITIALIZATION:

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

System Name	see page
Power Window Control System	01-28

10. NOTICES FOR HYBRID SYSTEM ACTIVATION:

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

11. PRECAUTIONS TO BE OBSERVED WHILE SERVISING**NOTICE:**

- For the electric inverter compressor, use the ND-OIL11.
- Electrical insulation performance may decrease significantly if even a small amount of oil other than ND-OIL11 is used (or enters) in the refrigeration cycle, causing the DTC to be output.
- If other oil is accidentally used and a DTC is output, collect the compressor oil in the compressor and replace it with ND-OIL11 to increase the ND-OIL11 ratio amount.
- Replace the main components (evaporator, condenser, and compressor) if a large amount of oil other than ND-OIL11 enters the system. Failing to do so may cause electrical insulation performance to remain low, causing the DTC to be output.

CAUTION:

Wear insulated gloves and pull out the service plug clip before inspection, as some of the procedures require disconnecting the high-voltage connectors (see page 05-1339).

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.
HINT:

Inspect the "Fuse" and "Relay" before confirming the suspected area as shown in the charts below.

Inspect each malfunction circuit in numerical order for the corresponding symptom.

If the malfunction still exist even after checking and confirming that all the circuit are normal, replace the ECU.

Symptom	Suspect Area	See page
Entire A/C system does not operate	1. IG power source circuit 2. A/C amplifier assy	05-1357 05-1270
Air Flow Control : No blower operation	1. Blower motor circuit 2. A/C amplifier assy	05-1379 05-1270
Air Flow Control : No blower control	1. Blower motor circuit 2. A/C amplifier assy	05-1379 05-1270
Air Flow Control : Insufficient air output	1. Blower motor circuit 2. A/C amplifier assy	05-1379 05-1270
Temperature Control : No cool air comes out	1. Volume of refrigerant 2. Refrigerant pressure 3. Pressure switch circuit 4. Air mix damper control servomotor circuit 5. Air mix damper position sensor circuit 6. Room temperature sensor circuit 7. Room humidity sensor circuit 8. Ambient temperature sensor circuit 9. A/C inverter circuit 10. A/C amplifier assy 11. Multiplex communication circuit	55-6 55-6 05-1302 05-1320 05-1305 05-1282 05-1335 05-1287 05-1339 05-1342 05-1345 05-1347 05-1348 05-1350 05-1351 05-1353 05-1270 05-2549
Temperature Control : No warm air comes out	1. Air mix damper control servomotor circuit 2. Air mix damper position sensor circuit 3. Ambient temperature sensor circuit 4. Room temperature sensor circuit 5. Room humidity sensor circuit 6. Evaporator temperature sensor circuit 7. A/C amplifier assy 8. Multiplex communication circuit 9. Heater radiator	05-1320 05-1305 05-1287 05-1282 05-1282 05-1292 05-1270 05-2549 –
Temperature Control : Output air is warmer or cooler than set temperature or response is slow	1. Steering wheel pad switch circuit 2. Room temperature sensor circuit 3. Room humidity sensor circuit 4. Ambient temperature sensor circuit 5. Solar sensor circuit 6. Air mix damper control servomotor circuit 7. Air mix damper position sensor circuit 8. A/C amplifier assy 9. Multiplex communication circuit	05-1366 05-1282 05-1282 05-1287 05-1297 05-1320 05-1305 05-1270 05-2549

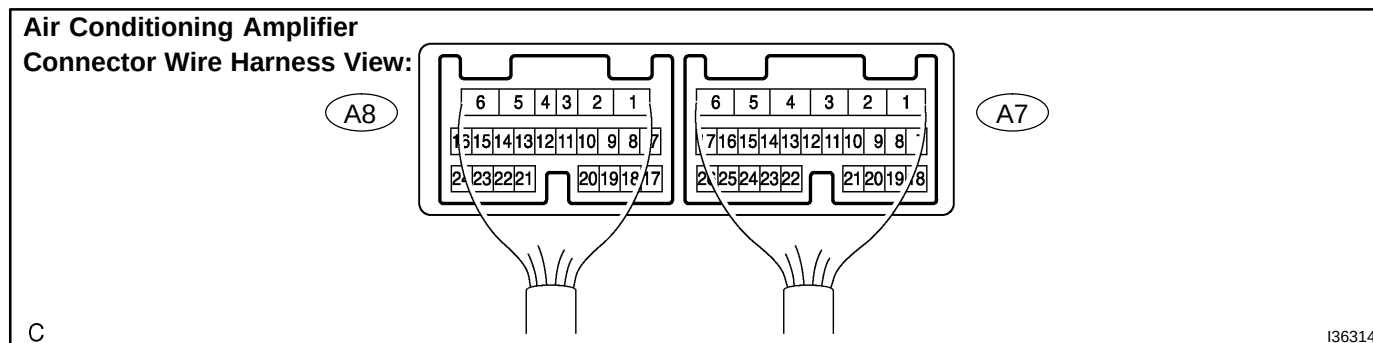
DIAGNOSTICS – AIR CONDITIONING SYSTEM

Temperature Control : No temperature control (only Max. cool or Max. warm)	1. Steering wheel pad switch circuit 2. Air mix damper control servomotor circuit 3. Air mix damper position sensor circuit 4. A/C amplifier assy	05-1366 05-1320 05-1305 05-1270
No air inlet control	1. Air inlet damper control servomotor circuit 2. Air inlet damper position sensor circuit 3. A/C amplifier assy	05-1325 05-1310 05-1270
No air outlet control	1. Air outlet damper control servomotor circuit 2. Air outlet damper position sensor circuit 3. A/C amplifier assy	05-1330 05-1315 05-1270
Engine idle up does not occur, or is continuous	1. A/C inverter circuit 2. A/C amplifier assy 3. Multiplex communication circuit	05-1339 05-1342 05-1345 05-1347 05-1348 05-1350 05-1351 05-1353 05-1270 05-2549
Displayed set temperature value does not match with operation of temperature control switch	1. A/C amplifier assy	05-1270
Brightness does not change when rheostat volume or light control switch is adjusted	1. Illumination light system 2. A/C amplifier assy	– 05-1270
Unable to access the diagnosis mode	1. A/C amplifier assy	05-1270
DTC not recorded. Set mode is cleared when IG switch is turned off	1. Back-up power source circuit 2. A/C amplifier assy	05-1361 05-1270
Unable to control A/C with the steering pad switch	1. Steering pad switch circuit 2. A/C amplifier assy	– 05-1270
Unable to control A/C with the multi-display	1. Multiplex communication circuit 2. Multi-display assy 3. A/C amplifier assy	05-2549 05-1851 05-1270
The heater performance is low (The PTC heater does not function)*1	1. PTC heater circuit 2. Heater water pump circuit 3. A/C amplifier assy 4. Multiplex communication circuit	05-1372 05-1376 05-1270 05-2549

*1: The PTC heater operation may be stopped when an electrical load is large on the entire vehicle.

TERMINALS OF ECU

1. AIR CONDITIONING AMPLIFIER



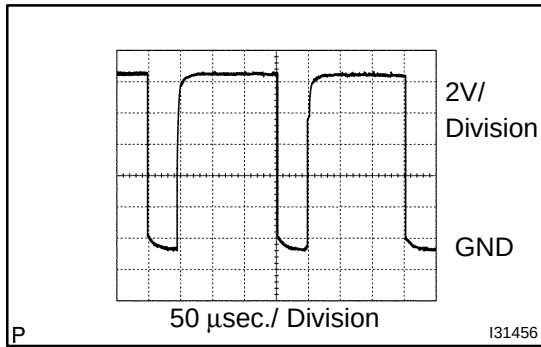
HINT:

Check from the rear of the connector with connected to the air conditioning amplifier.

Symbols (Terminal No.)	Wiring color	Terminal Description	Condition	Specification
AIR (A8-22) – GND (A8-1)	G – W-B	Recirculation/Fresh switch signal	Power switch: ON Recirculation/Fresh switch: FRESH → RECIRC	Below 1.0 → 10 to 14 V
AIF (A8-23) – GND (A8-1)	P – W-B	Recirculation/Fresh switch signal	Power switch: ON Recirculation/Fresh switch: RECIRC → FRESH	Below 1.0 → 10 to 14 V
AOF (A8-16) – GND (A8-1)	B – W-B	Mode switch signal	Power switch: ON Mode switch: DEF → FACE	Below 1.0 → 10 to 14 V
AOD (A8-24) – GND (A8-1)	Y – W-B	Mode switch signal	Power switch: ON Mode switch: FACE → DEF	Below 1.0 → 10 to 14 V
TPI (A7-19) – SGTP (A7-4)	V – L	Recirculation/Fresh switch signal	Power switch: ON Recirculation/Fresh switch: RECIRC → FRESH	4.0 → 1.0 V
TPM (A7-18) – SGTPM (A7-23)	LG – P	Mode switch signal	Power switch: ON Mode switch: FACE → DEF	4.0 → 1.0 V
TP (A7-20) – SGTP (A7-14)	L – LG	Temperature switch signal	Power switch: ON Temperature switch: Max. COOL → Max. HOT	4.0 → 1.0 V
SGTE (A7-5) – Body ground	Y – Body ground	Ground for evaporator temperature sensor	Always	Below 1.0 Ω
TE (A7-7) – SGTE (A7-5)	B – Y	Evaporator temperature sensor signal	Power switch: ON Evaporator temperature: 0 °C (32 °F)	2.0 to 2.4 V
TE (A7-7) – SGTE (A7-5)	B – Y	Evaporator temperature sensor signal	Power switch: ON Evaporator temperature: 15 °C (59 °F)	1.4 to 1.8 V
S5TPI (A7-3) – SGTP (A7-4)	B-L	Power supply for air inlet damper position sensor	Power switch: ON	4.5 to 5.5 V
AMC (A8-19) – GND (A8-1)	B – W-B	Temperature switch	Power switch: ON Temperature switch: Max. HOT → Max. COOL	Below 1.0 → 10 to 14 V
AMH (A8-17) – GND (A8-1)	R – W-B	Temperature switch	Power switch: ON Temperature switch: Max. COOL → Max. HOT	Below 1.0 → 10 to 14 V
SGTP (A7-4) – Body ground	L – Body ground	Ground for air inlet damper position sensor	Always	Below 1.0 Ω
SGTPM (A7-23) – Body ground	P – Body ground	Ground for air outlet damper position sensor	Always	Below 1.0 Ω
SGTP (A7-14) – Body ground	LG – Body ground	Ground for air mix damper position sensor	Always	Below 1.0 Ω

DIAGNOSTICS – AIR CONDITIONING SYSTEM

Symbols (Terminal No.)	Wiring color	Terminal Description	Condition	Specification
S5TPM (A7-11) – SGTPM (A7-23)	O – P	Power supply for air outlet damper position sensor signal	Power switch: ON	4.5 to 5.5 V
S5TP (A7-13) – SGTP (A7-14)	P – LG	Power supply for air mix damper position sensor signal	Power switch: ON	4.5 to 5.5 V
IG (A8-5) – GND (A8-1)	B – W-B	Power switch signal	Power switch: LOCK or ACC → ON	0 → 10 to 14 V
+B (A8-6) – GND (A8-1)	Y – W-B	Back-up power source	Always	10 to 14 V
MPX+ (A8-3) – GND (A8-1)	B – W-B	Terminal for BEAN	Engine idling after engine warmed up	Pulse generation
MPX2+ (A8-11) – GND (A8-1)	GR – W-B	Terminal for BEAN	Engine idling after engine warmed up	Pulse generation
GND (A8-1) – Body ground	W-B – Body ground	Ground for main power supply	Always	Below 1.0 Ω
BLW (A8-2) – GND (A8-1)	W – W-B	Blower switch signal	Power switch: ON Blower switch: ON	Pulse generation (see waveform 1)
S5TS (A7-12) – GND (A8-1)	GR – W-B	Solar sensor	Power switch: ON Solar sensor covered with a cloth → Solar sensor exposed to electric light	Below 0.8 → 0.8 to 4.3 V
HR (A8-7) – GND (A8-1)	B – W-B	Blower switch signal	Power switch: ON Blower switch: OFF → ON	10 to 14 → Below 1.0 V
TR (A7-8) – SGTR (A7-22)	B – W	Room temperature sensor signal	Power switch: ON Cabin temperature: 25 → 40 °C (77 → 104 °F)	1.8 to 2.2 → 1.2 to 1.6 V
SGTR (A7-22) – Body ground	W – Body ground	Ground for room temperature sensor	Always	Below 1.0 Ω
ST1 (A7-2) – SGST (A7-15)	BR-G	Steering pad switch signal	Power switch: ON Steering pad switch: Fr.DEF → Rr.DEF → Recirculation → OFF	Below 0.3 → 0.8 to 1.5 → 2.0 to 2.9 → above 4.6 V
ST2 (A7-1) – SGST (A7-15)	LG-G	Steering pad switch signal	Power switch: ON Steering pad switch: AUTO → TEMP+ → TEMP- → OFF	Below 0.3 → 0.8 to 1.5 → 2.0 to 2.9 → above 4.6 V
SGST (A7-15) – Body ground	G – Body ground	Ground for steering pad switch	Always	Below 1.0 V
PSW (A7-6) – GND (A8-1)	R – W-B	Pressure switch signal	Power switch: ON Refrigerant pressure: Normal → More than 1,520 kPa (15.5 kgf/cm 2,220 psi)	Below 1.0 → 10 to 14 V
RH (A7-9) – GND (A8-1)	R – W-B	Humidity sensor signal	Power switch: ON Room humidity: 40 → 60 %	2.0 → 2.5 V
S5RM (A7-10) – GND (A8-1)	G – W-B	Power supply for humidity sensor	Power switch: ON	4.5 to 5.5 V
HTR0 (A7-17) – GND (A8-1)	BR – W-B	PTC heater signal	Power switch: ON Temperature switch: Max. HOT Coolant temperature: Below 55°C Blower switch: LO → OFF	Below 1.0 → 10 to 14 V
HTR2 (A7-25) – GND (A8-1)	P – W-B	PTC heater signal	Power switch: ON Temperature switch: Max. HOT Coolant temperature: Below 55°C Blower switch: LO → OFF	Below 1.0 → 10 to 14 V
IDH (A8-18) – GND (A8-1)	V – W-B	DC/DC converter signal	Power switch: ON (Voltage normal → over voltage)	10 to 14 → Below 1.0 V



waveform 1:

Measure the waveform between terminal BLW (A8-2) of A/C amplifier and body ground.

OK:

Waveform operate as shown in the illustration.

HINT:

- The correct waveform is shown in the illustration.
- Waveform cycle varies with the blower level.