

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 engine coolant temperature is low and normal heater effectiveness is insufficient.

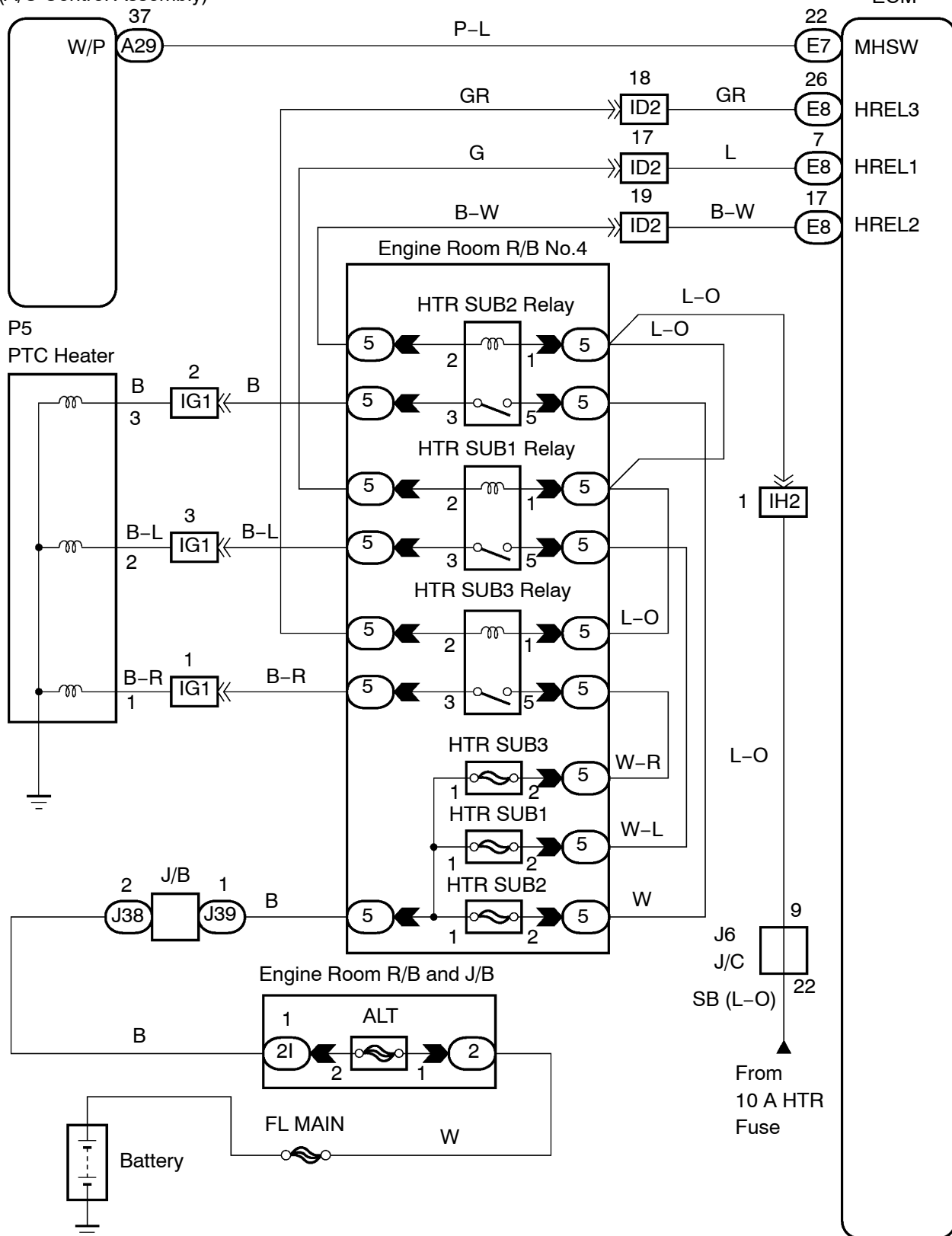
The A/C amplifier switches the circuit in the PTC relay and operates the PTC heater when the operating conditions (cooling water temperature is below 55°C (131°F), setting temperature is "MAX. HOT", air outlet damper position is FOOT or FOOT/DEF and blower switch is not OFF) are met.

[illegible]

1CD-FTV:

Air Conditioning Amplifier
(A/C Control Assembly)

ECM



C

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INSPECTION PROCEDURE

1 INSPECT FUSE(HTR SUB1, HTR SUB2, HTR SUB3)

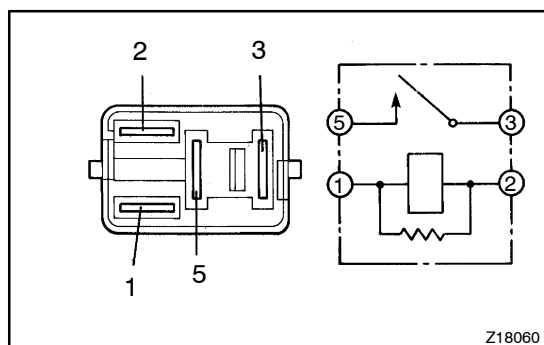
- (a) Remove the HTR SUB1, HTR SUB2 and HTR SUB3 fuses from the engine room R/B No.4.
 (b) Measure the resistance according to the value(s) in the table below.

Standard:

Tester item	Condition	Specified condition
HTR SUB1 fuse	Always	Below 1 Ω
HTR SUB2 fuse	Always	Below 1 Ω
HTR SUB3 fuse	Always	Below 1 Ω

NG
CHECK FOR SHORT IN ALL HARNESS AND COMPONENTS CONNECTED TO FAILURE FUSE
OK

2 INSPECT PTC HEATER RELAY(HTR SUB1, HTR SUB2, HTR SUB3)



- (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)

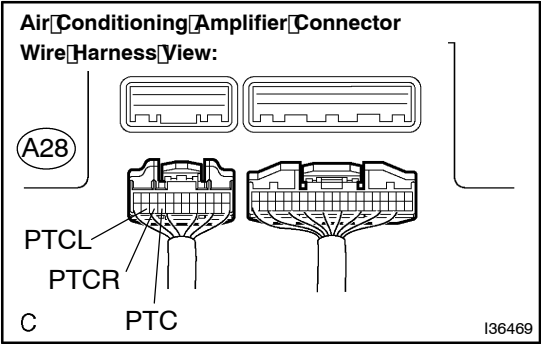
NG
REPLACE PTC HEATER RELAY
OK

3 CONFIRM ENGINE TYPE

Result:
A: 1AZ-FE engine
B: 1CD-FTV engine
B
Go to step 6
A

4

CHECK HARNESS AND CONNECTOR (SEE PAGE 01-32)



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

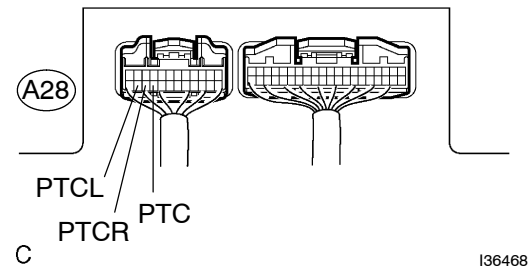
Standard:

Tester connection	Condition	Specified condition
A28-21 (PTC) - Body ground	Ignition switch ON	10 to 14 V
A28-22 (PTCR) - Body ground	Ignition switch ON	10 to 14 V
A28-23 (PTCL) - Body ground	Ignition switch ON	10 to 14 V

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

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

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

Standard:

Tester connection	Condition	Specified condition
A28-21 (PTC) – Body ground	Ignition switch: ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131°F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1 V → 10 to 14 V
A28-22 (PTCR) – Body ground	Ignition switch: ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131°F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1 V → 10 to 14 V
A28-23 (PTCL) – Body ground	Ignition switch: ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131°F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1 V → 10 to 14 V

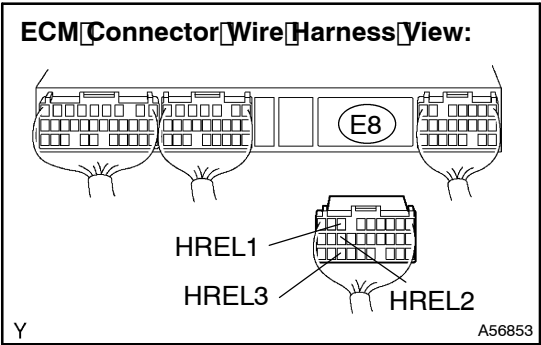
HINT:

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

NG**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PUB. NO. RM864E ON PAGE 55-96)****OK****Go to step 10**

6

CHECK HARNESS AND CONNECTOR (SEE PAGE 01-32)



- (a) Disconnect the connector from the ECM.
- (b) Measure the voltage according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
E8-7 (HREL1) – Body ground	Ignition switch ON	10 to 14 V
E8-17 (HREL2) – Body ground	Ignition switch ON	10 to 14 V
E8-26 (HREL3) – Body ground	Ignition switch ON	10 to 14 V

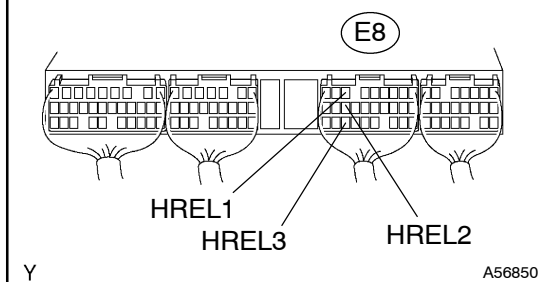
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REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

7 INSPECT ECM

ECM Connector Wire Harness View:



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

Standard:

Tester connection	Condition	Specified condition
E8-7 (HREL1) - Body ground	Ignition switch: ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131°F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1 V → 10 to 14 V
E8-17 (HREL2) - Body ground	Ignition switch: ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131°F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1 V → 10 to 14 V
E8-26 (HREL3) - Body ground	Ignition switch: ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131°F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1 V → 10 to 14 V

HINT:

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

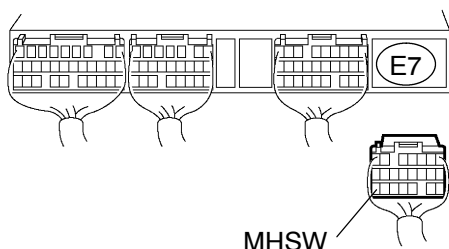
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REPAIR OR REPLACE HARNESS OR CONNECTOR

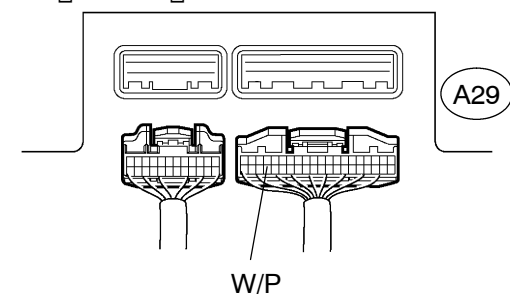
OK

8 CHECK HARNESS AND CONNECTOR (ECM – AIR CONDITIONING AMPLIFIER) (SEE PAGE 01-32)

ECM Connector Wire Harness View:



Air Conditioning Amplifier Connector Wire Harness View:



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- Disconnect the connectors from the ECM and A/C amplifier.
- Measure the resistance according to the value(s) in the table below.

Standard:

Tester connection	Condition	Specified condition
A29-37 (W/P) – E7-22 (MHSW)	Always	Below 1 Ω
A29-37 (W/P) – Body ground	Always	10 k Ω or higher

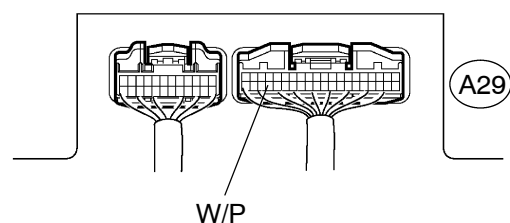
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REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

9 INSPECT AIR CONDITIONING AMPLIFIER (MHSW – BODY GROUND)

Air Conditioning Amplifier Connector Wire Harness View:



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

Standard:

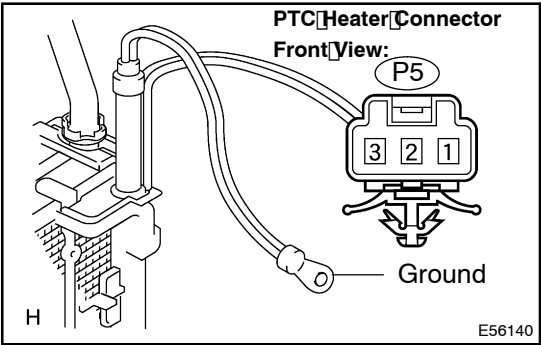
Tester connection	Condition	Specified condition
A29-37 (W/P) – Body ground	Ignition switch: ON Set temperature: Max. hot Ventilator mode: FOOT Coolant temperature: 55°C (131°F) or lower Blower switch: OFF → LO (after 30 sec.)	Below 1 V → 10 to 14 V

NG

**REPLACE AIR CONDITIONING AMPLIFIER
(SEE PUB. NO. RM864E ON PAGE 55-96)**

OK

10 INSPECT PTC HEATER



- (a) Disconnect the connector from the PTC heater.
- (b) Measure the resistance according to the value(s) in the table below.
- Standard:**

Tester connection	Condition	Specified condition
P5-1 - Ground	Always	Below 1 Ω
P5-2 - Ground	Always	Below 1 Ω
P5-3 - Ground	Always	Below 1 Ω

NG REPLACE PTC HEATER

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE
(SEE PAGE 05-862)