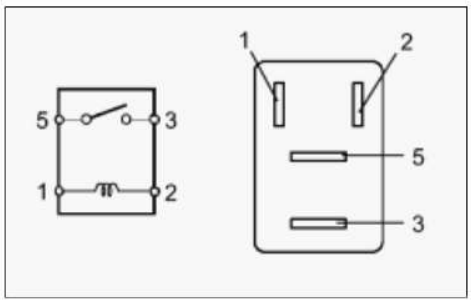
Last Modified: 9-7-2011	6.4 G	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000003QG1004X
Title: 2AR-FE STARTING: ACC RELAY: ON-VEHICLE INSPECTION (2011 RAV4)		

ON-VEHICLE INSPECTION

1. INSPECT ACC RELAY (ACC)



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage not applied to terminals 1 and 2	10 kΩ or higher
	Battery voltage applied to terminals 1 and 2	Below 1 Ω

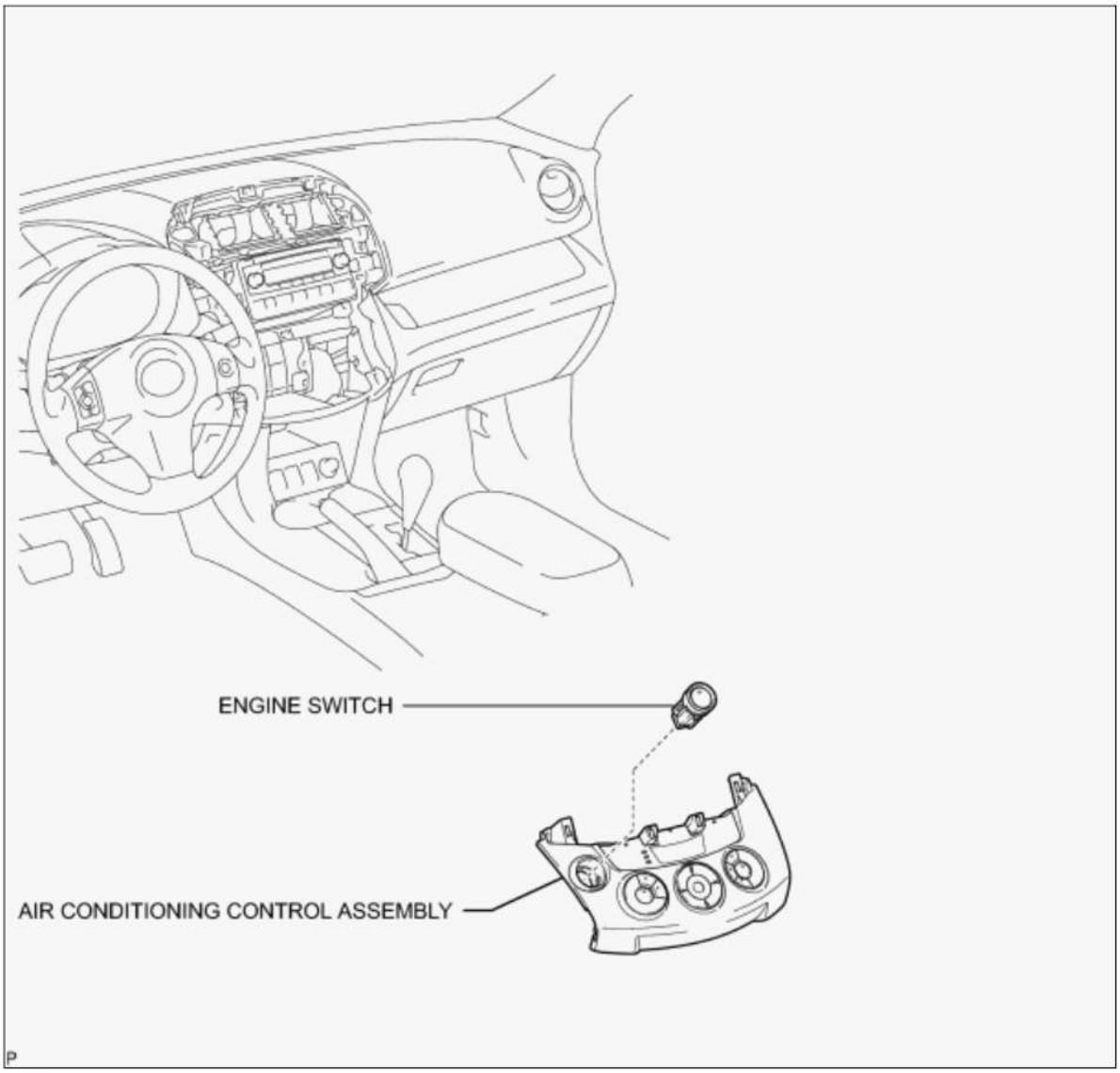
If the result is not as specified, replace the relay.

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Last Modified: 9-7-2011	6.4 K	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000002MDU00WX
Title: 2AR-FE STARTING: ENGINE SWITCH: COMPONENTS (2011 RAV4)		

COMPONENTS

ILLUSTRATION



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Last Modified: 9-7-2011	6.4 G	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000002MDT00WX
Title: 2AR-FE STARTING: ENGINE SWITCH: INSPECTION (2011 RAV4)		

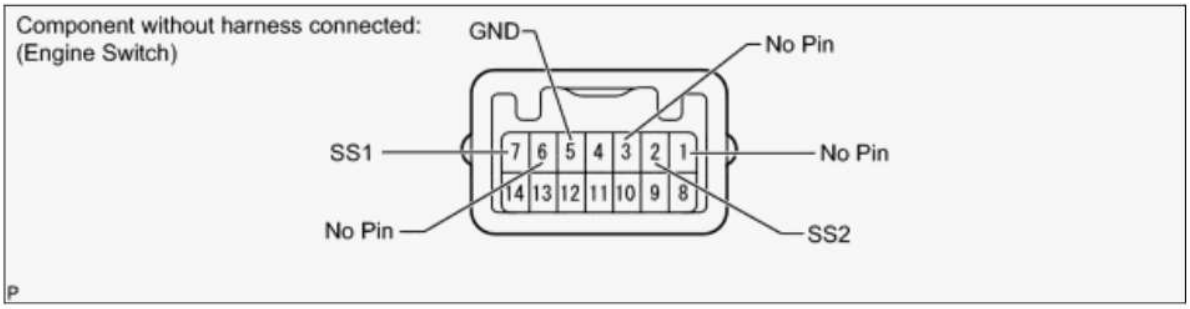
INSPECTION

1. INSPECT ENGINE SWITCH

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

Standard Resistance:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
7 (SS1) - 5 (GND)	Not pushed	10 kΩ or higher
2 (SS2) - 5 (GND)	Not pushed	10 kΩ or higher
7 (SS1) - 5 (GND)	Pushed	Below 1 Ω
2 (SS2) - 5 (GND)	Pushed	Below 1 Ω



If the result is not as specified, replace the engine switch assembly.

(b) Apply battery voltage between the terminals of the switch, and check the illumination condition of the switch.

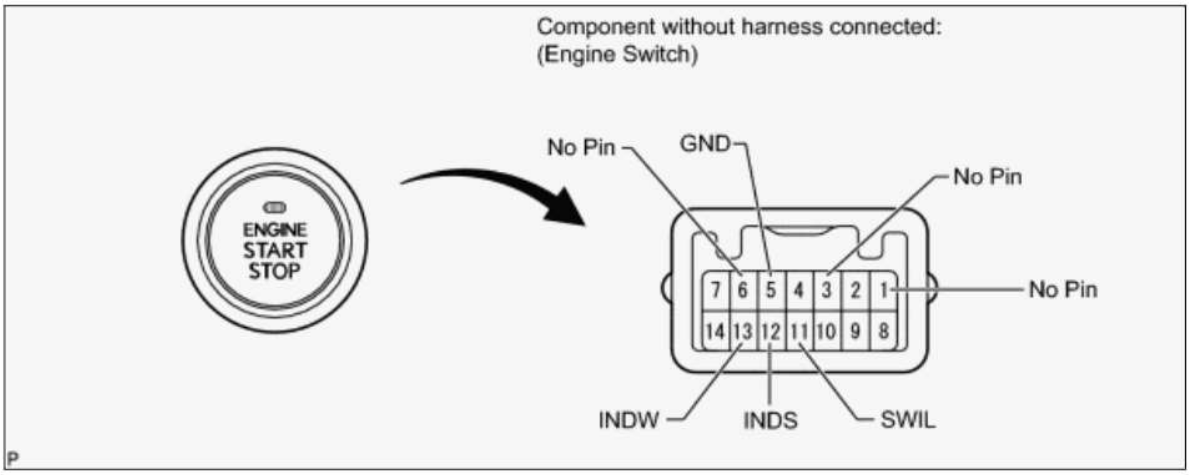
HINT:

- If the positive (+) lead and the negative (-) lead are incorrectly connected, the engine switch indicator will not illuminate.
- If the voltage is too low, the indicator will not illuminate.

OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
Battery positive (+) → Terminal 11 (SWIL) Battery negative (-) → Terminal 5 (GND)	Illuminates (illumination of lettering)
Battery positive (+) → Terminal 12 (INDS) Battery negative (-) → Terminal 5 (GND)	Illuminates (green)
Battery positive (+) → Terminal 13 (INDW) Battery negative (-) → Terminal 5 (GND)	Illuminates (amber)

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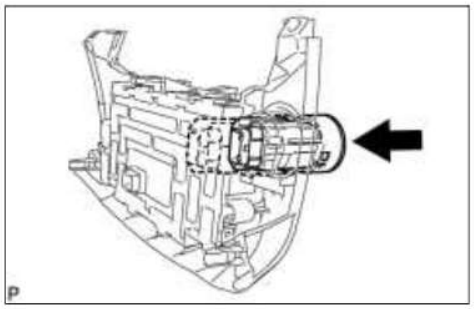
If the result is not as specified, replace the engine switch assembly.

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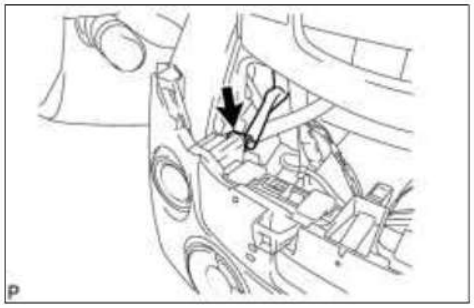
Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000002MDS00YX
Title: 2AR-FE STARTING: ENGINE SWITCH: INSTALLATION (2011 RAV4)		

INSTALLATION

1. INSTALL ENGINE SWITCH



(a) Attach the 2 claws to install the engine switch.



(b) Connect the switch connector.

2. INSTALL AIR CONDITIONING CONTROL ASSEMBLY

(a) Install the air conditioning control INFO .

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

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Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000002MDV00YX
Title: 2AR-FE STARTING: ENGINE SWITCH: REMOVAL (2011 RAV4)		

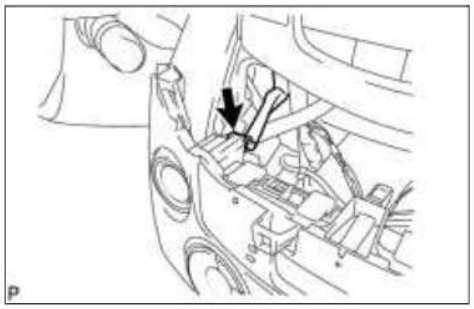
REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

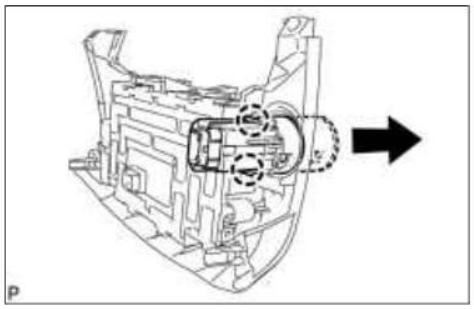
2. REMOVE AIR CONDITIONING CONTROL ASSEMBLY

(a) Remove the air conditioning control INFO .

3. REMOVE ENGINE SWITCH



(a) Disconnect the switch connector.



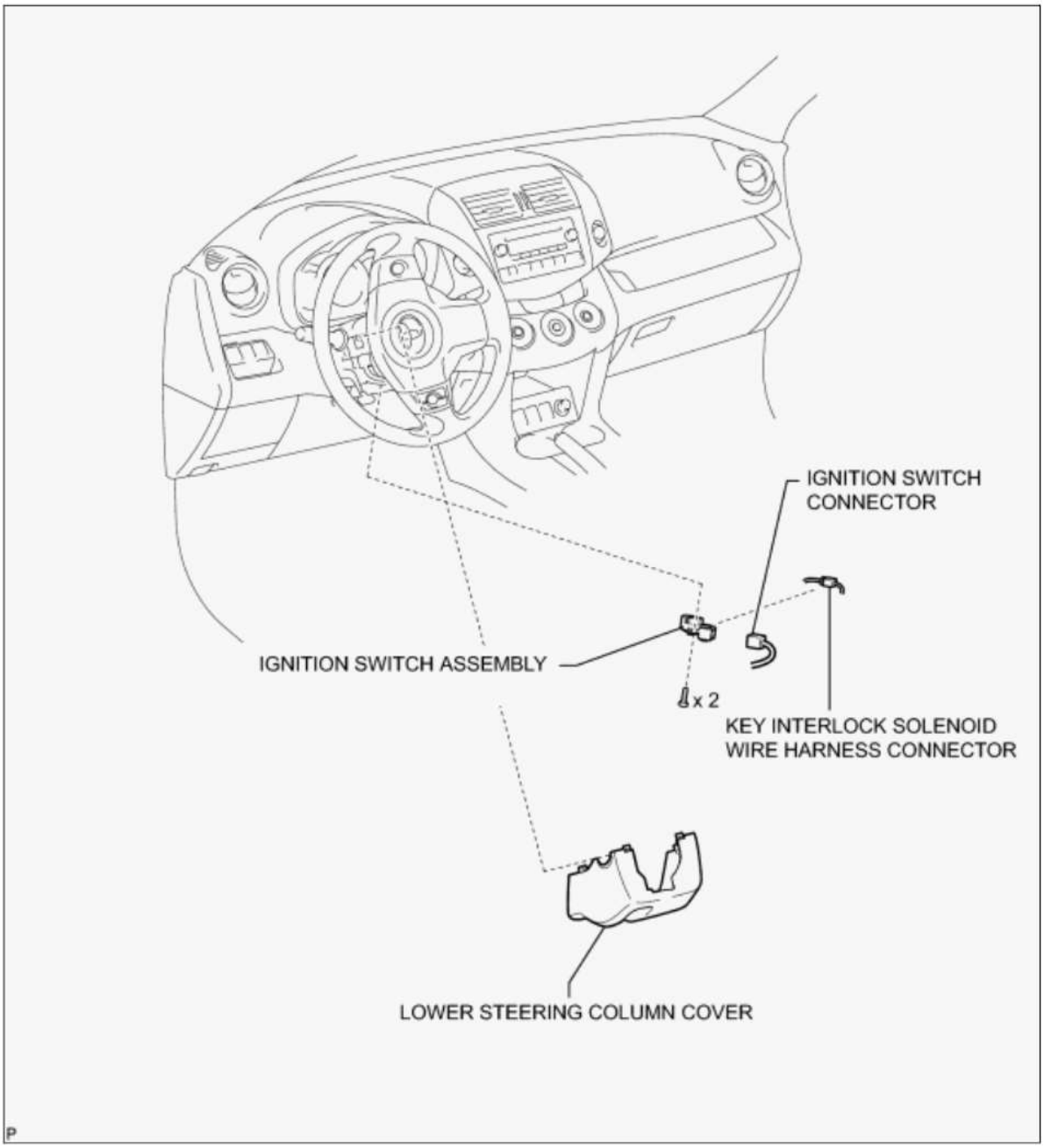
(b) Detach the 2 claws and remove the engine switch.

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Last Modified: 9-7-2011	6.4 K	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000001E69018X
Title: 2AR-FE STARTING: IGNITION SWITCH: COMPONENTS (2011 RAV4)		

COMPONENTS

ILLUSTRATION



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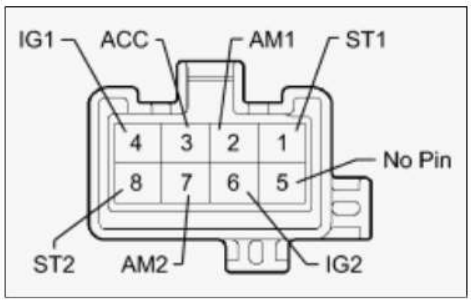
Last Modified: 9-7-2011	6.4 G	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YK0030X
Title: 2AR-FE STARTING: IGNITION SWITCH: INSPECTION (2011 RAV4)		

INSPECTION

1. INSPECT IGNITION SWITCH ASSEMBLY

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

Standard Resistance:



TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
-	LOCK	10 kΩ or higher
2 (AM1) - 3 (ACC)	ACC	Below 1 Ω
2 (AM1) - 3 (ACC) 2 (AM1) - 4 (IG1) 6 (IG2) - 7 (AM2)	ON	Below 1 Ω
1 (ST1) - 2 (AM1) 1 (ST1) - 4 (IG1) 6 (IG2) - 7 (AM2) 6 (IG2) - 8 (ST2)	START	Below 1 Ω

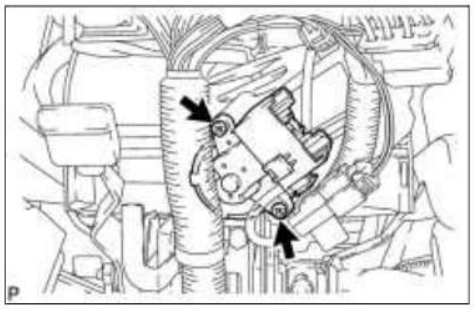
If the result is not as specified, replace the ignition switch assembly.

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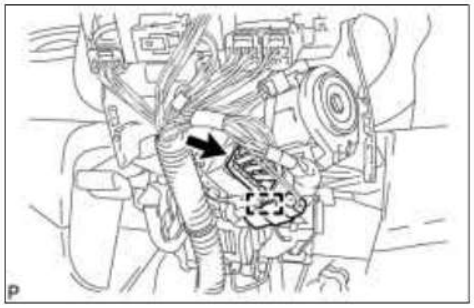
Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YJZ01KX
Title: 2AR-FE STARTING: IGNITION SWITCH: INSTALLATION (2011 RAV4)		

INSTALLATION

1. INSTALL IGNITION SWITCH ASSEMBLY



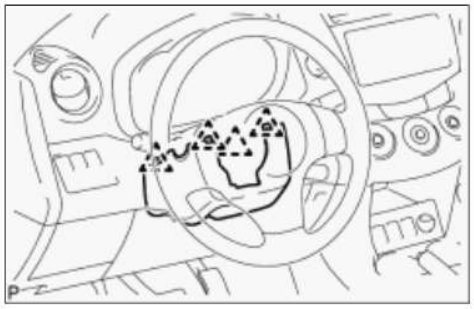
(a) Install the ignition switch with the 2 screws.



(b) Attach the claw to connect the key interlock solenoid wire harness connector to the ignition switch connector.

(c) Connect the ignition switch connector.

2. INSTALL LOWER STEERING COLUMN COVER



(a) Attach the 4 claws to install the lower steering column cover.

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

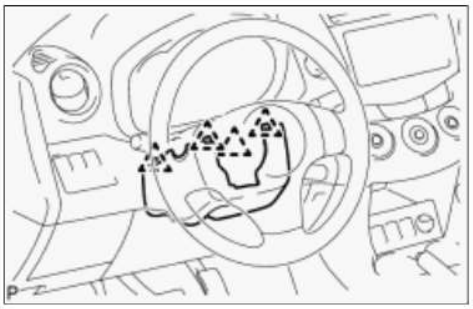
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Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YK101LX
Title: 2AR-FE STARTING: IGNITION SWITCH: REMOVAL (2011 RAV4)		

REMOVAL

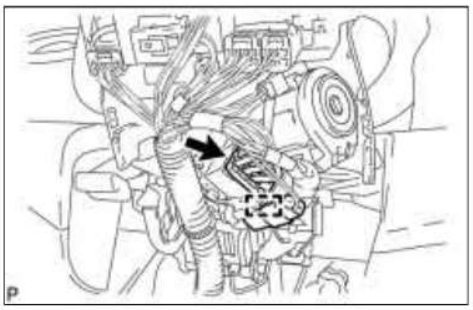
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. REMOVE LOWER STEERING COLUMN COVER



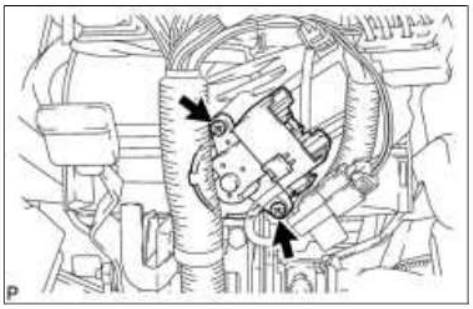
(a) Detach the 4 claws, release the tilt lever and remove the lower steering column cover.

3. REMOVE IGNITION SWITCH ASSEMBLY



(a) Disconnect the ignition switch connector.

(b) Detach the claw and disconnect the key interlock solenoid wire harness connector from the ignition switch connector.



(c) Remove the 2 screws and ignition switch.

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XEK062X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2271: Ignition Hold Monitor Malfunction (2011 RAV4)		

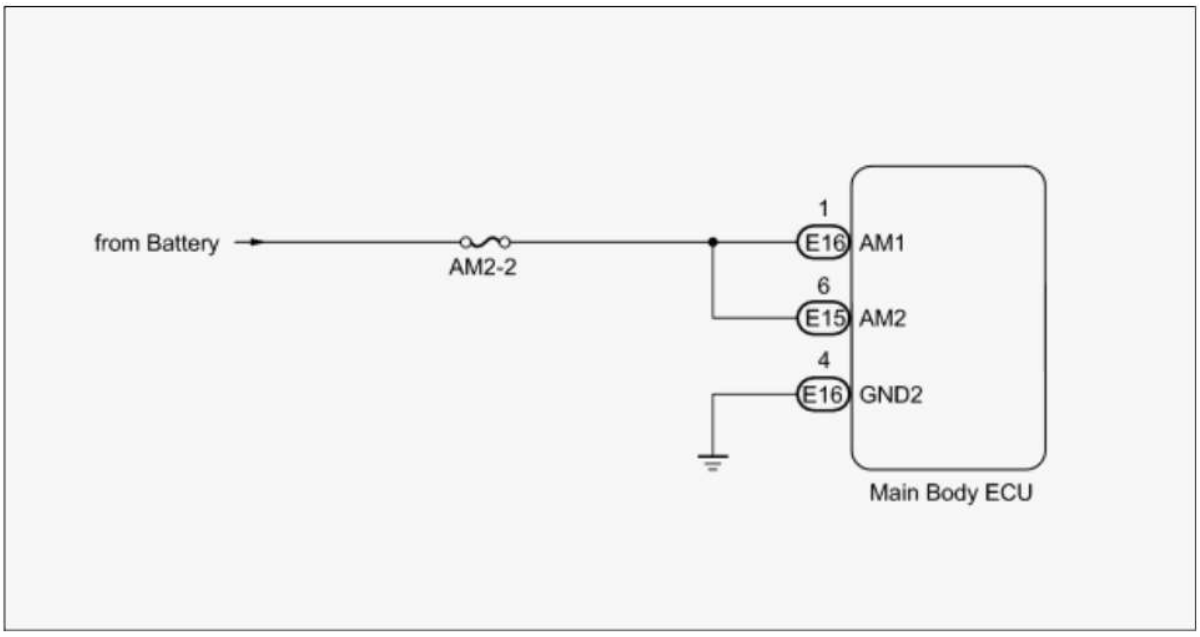
DTC	**B2271**	**Ignition Hold Monitor Malfunction**

DESCRIPTION

This DTC is stored when the IG output circuits inside the main body ECU are open or shorted.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2271	IG1 relay actuation circuit or IG2 relay actuation circuit inside the main body ECU is abnormal.	• Main body ECU • AM2-2 fuse • Harness or connector

WIRING DIAGRAM



INSPECTION PROCEDURE

PROCEDURE

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1.	CHECK WHETHER DTC OUTPUT RECURS

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Clear the DTCs.

(d) Start the engine.

(e) Allow the engine to idle for 1 minute or more.

(f) Enter the following menus: Body Electrical / Main Body / Trouble Codes.

(g) Read the DTCs.

Result:

DISPLAY (DTC OUTPUT)	PROCEED TO
B2271	A
No DTC output	B

B ▶ **USE SIMULATION METHOD TO CHECK (SYSTEM IS OK)**

A ▼

2.	INSPECT FUSE (AM2-2)

(a) Remove the AM2-2 fuse from the engine room No. 1 relay block.

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

Standard Resistance:

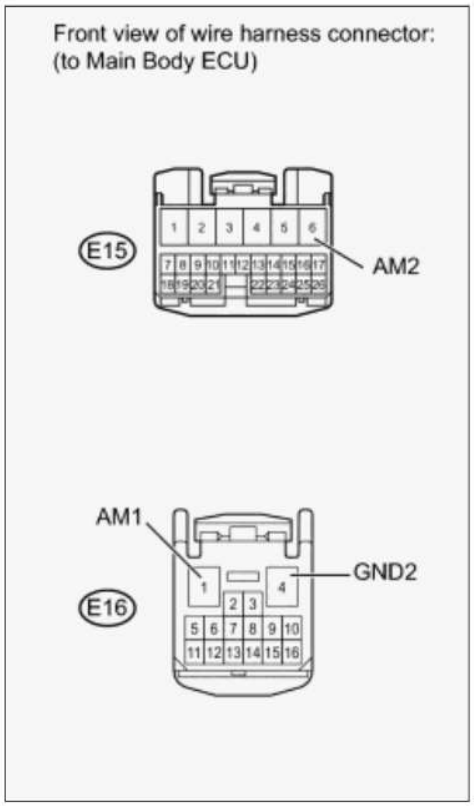
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
AM2-2 fuse	Always	Below 1 Ω

NG ▶ **REPLACE FUSE**

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OK

3.	**CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - BATTERY AND BODY GROUND)**



(a) Disconnect the E15 and E16 main body ECU connectors.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E16-1 (AM1) - Body ground	Always	11 to 14 V
E15-6 (AM2) - Body ground	Always	11 to 14 V

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E16-4 (GND2) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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OK	▶	REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XEL048X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2272: Ignition 1 Monitor Malfunction (2011 RAV4)		

DTC	**B2272**	**Ignition 1 Monitor Malfunction**

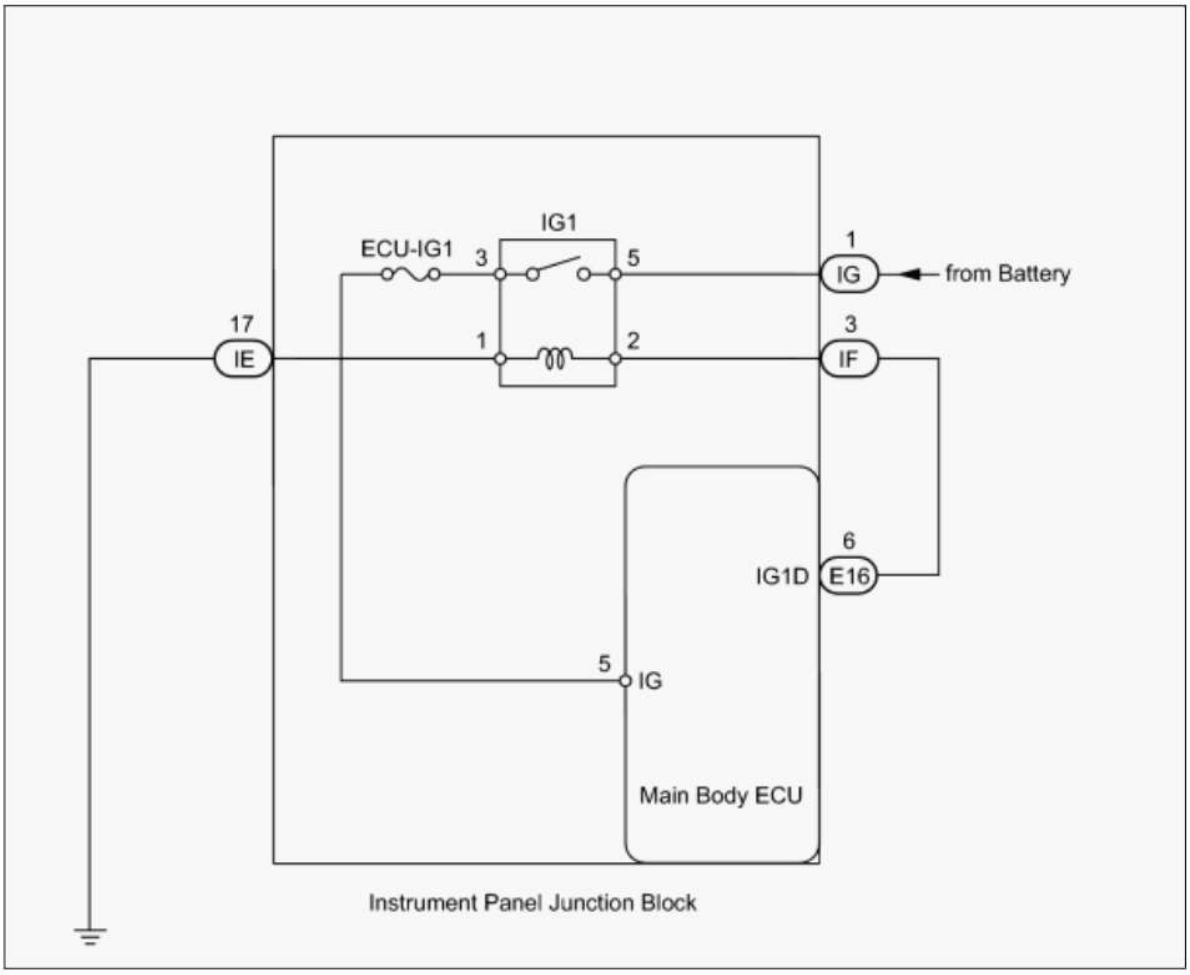
DESCRIPTION

This DTC is stored when a malfunction occurs in the IG output circuit, which is between the IG1 relay actuation circuit inside the main body ECU and the IG1 relay.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2272	IG1 relay actuation circuit inside the main body ECU or other related circuit is malfunctioning.	• Main body ECU • IG1 relay • Harness or connector

WIRING DIAGRAM

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INSPECTION PROCEDURE

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (IG1 RELAY MONITOR (INSIDE))**

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the display on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSIS NOTE
IG1 Relay Monitor(Inside)	IG1 inner relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-

OK:

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When the engine switch is turned on (IG), ON is displayed on the Techstream.

NG ▶ **INSPECT IG1 RELAY**

OK ▼

2.	CHECK SWITCH CONDITION (ENGINE SWITCH)

(a) Make sure that the electrical key is inside the cabin.

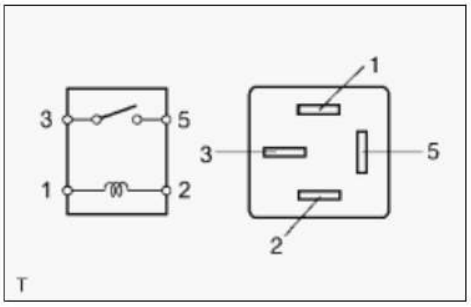
(b) With the shift lever in P, check that the power source mode changes as shown below each time the engine switch is pushed.

OK:
off → on (ACC) → on (IG) → off

NG ▶ **GO TO POWER SOURCE MODE DOES NOT CHANGE**

OK ▶ **USE SIMULATION METHOD TO CHECK**

3.	INSPECT IG1 RELAY



(a) Remove the IG1 relay from the instrument panel junction block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is applied to terminals 1 and 2	Below 1 Ω
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher

NG ▶ **REPLACE IG1 RELAY**

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OK	▶	REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XEM055X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2273: Ignition 2 Monitor Malfunction (2011 RAV4)		

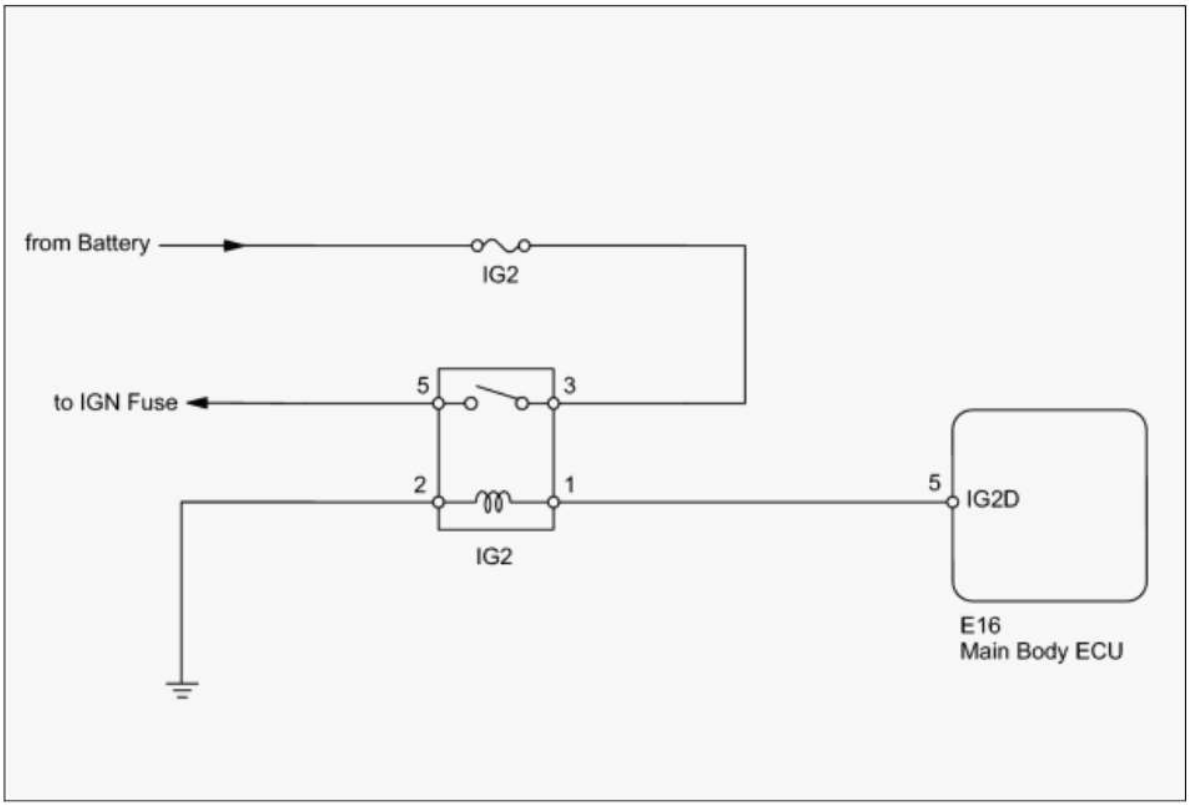
DTC	**B2273**	**Ignition 2 Monitor Malfunction**

DESCRIPTION

This DTC is stored when a malfunction occurs in the IG output circuit, which is between the IG2 relay actuation circuit inside the main body ECU and the IG2 relay.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2273	IG2 relay actuation circuit inside the main body ECU or other related circuit is malfunctioning.	• Main body ECU • IG2 relay • Harness or connector

WIRING DIAGRAM



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INSPECTION PROCEDURE

PROCEDURE

1.	READ VALUE USING TECHSTREAM (IG2 RELAY MONITOR (INSIDE))

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the display on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
IG2 Relay Monitor(Inside)	IG2 inner relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-

OK:

When the engine switch is turned on (IG), ON is displayed on the Techstream.

NG ▶ **INSPECT IG2 RELAY**

OK ▼

2.	CHECK SWITCH CONDITION (ENGINE SWITCH)

(a) Make sure that the electrical key is inside the cabin.

(b) With the shift lever in P, check that the power source mode changes as shown below each time the engine switch is pushed.

OK:

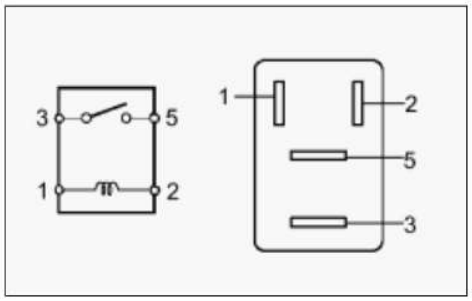
off → on (ACC) → on (IG) → off

NG ▶ **GO TO POWER SOURCE MODE DOES NOT CHANGE**

OK ▶ **USE SIMULATION METHOD TO CHECK**

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3.	**INSPECT IG2 RELAY**



(a) Remove the IG2 relay from the engine room No. 1 relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is applied to terminals 1 and 2	Below 1 Ω
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher

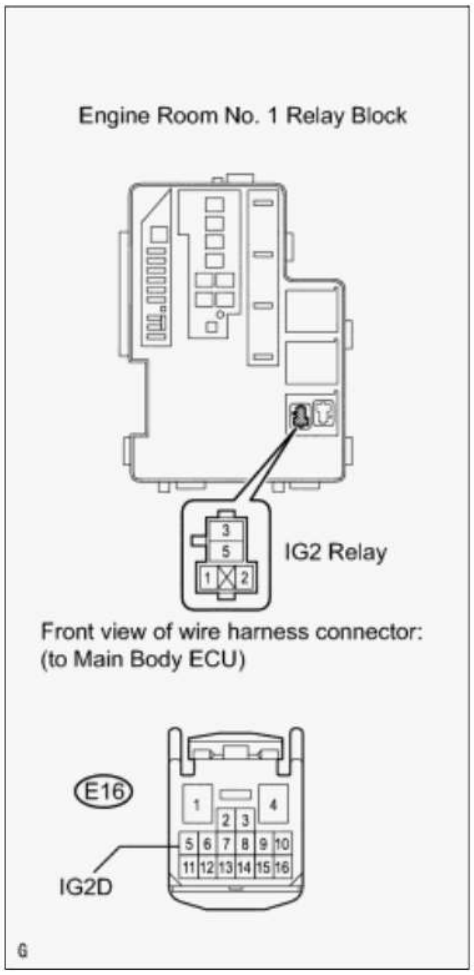
NG ▶ **REPLACE IG2 RELAY**

OK ▼

4.	**CHECK HARNESS AND CONNECTOR (IG2 RELAY - MAIN BODY ECU AND BODY GROUND)**

(a) Remove the IG2 relay from the engine room No. 1 relay block.

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(b) Disconnect the E16 main body ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Relay block IG2 relay terminal 1 - E16-5 (IG2D)	Always	Below 1 Ω
Relay block IG2 relay terminal 2 - Body ground	Always	Below 1 Ω
Relay block IG2 relay terminal 1 or E16-5 (IG2D) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XEN04JX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2274: ACC Monitor Malfunction (2011 RAV4)		

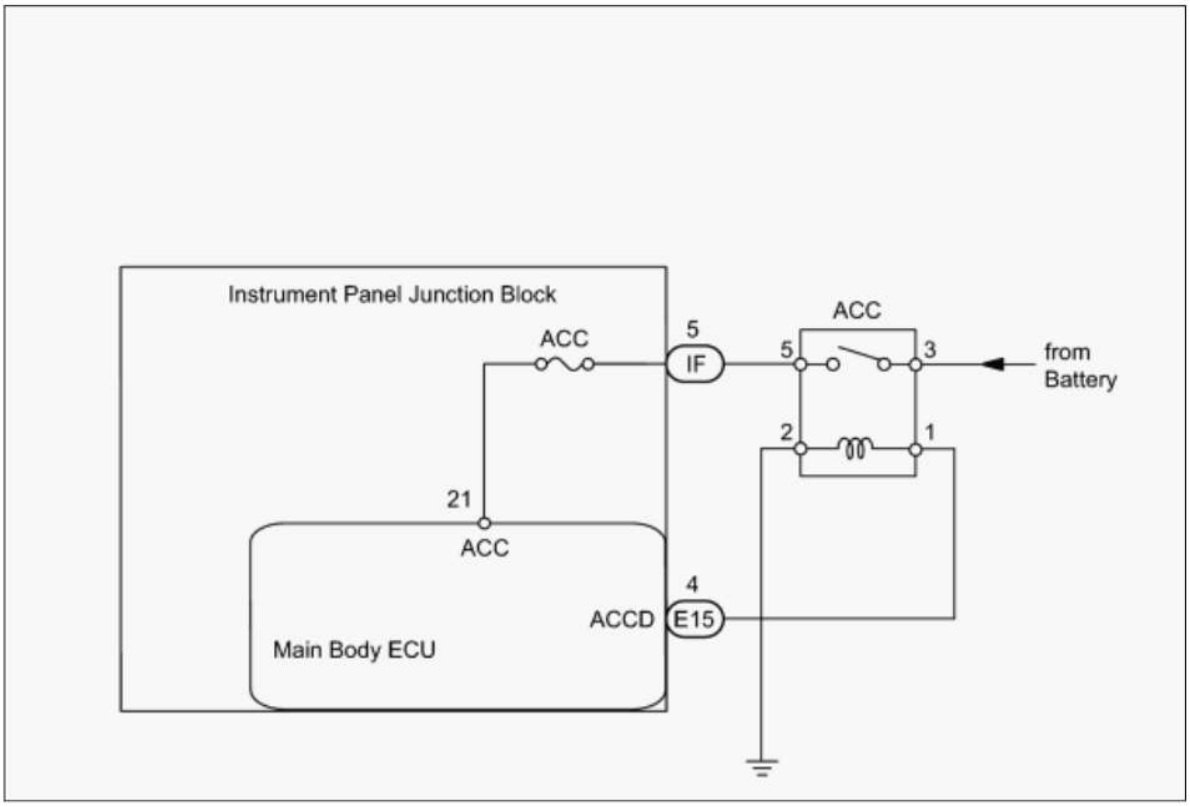
DTC	**B2274**	**ACC Monitor Malfunction**

DESCRIPTION

This DTC is stored when a malfunction occurs in the ACC output circuit, which is between the ACC relay actuation circuit inside the main body ECU and the ACC relay.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2274	ACC relay actuation circuit inside the main body ECU or other related circuit is malfunctioning.	• Main body ECU • ACC relay • Harness or connector

WIRING DIAGRAM



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INSPECTION PROCEDURE

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (ACC RELAY MONITOR)**

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the display on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
ACC Relay Monitor	ACC relay monitor/ON or OFF	ON: Engine switch on (ACC) OFF: Engine switch off	-

OK:

When the engine switch is turned on (ACC), ON is displayed on the Techstream.

NG ▶ **INSPECT ACC RELAY**

OK ▼

2.	**CHECK SWITCH CONDITION (ENGINE SWITCH)**

(a) Make sure that the electrical key is inside the cabin.

(b) With the shift lever in P, check that the power source mode changes as shown below each time the engine switch is pushed.

OK:

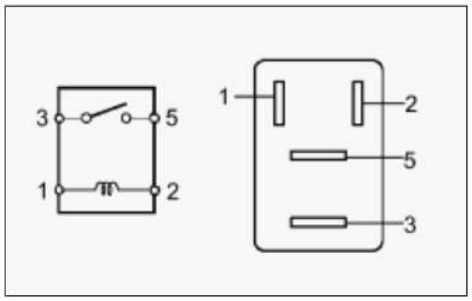
off → on (ACC) → on (IG) → off

NG ▶ **GO TO POWER SOURCE MODE DOES NOT CHANGE**

OK ▶ **USE SIMULATION METHOD TO CHECK**

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3.	**INSPECT ACC RELAY**



(a) Remove the ACC relay from the No. 5 relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is applied to terminals 1 and 2	Below 1 Ω
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher

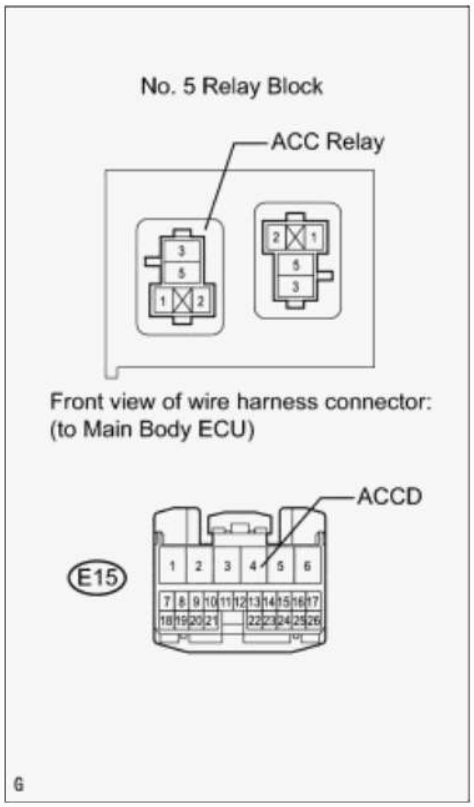
NG ▶ **REPLACE ACC RELAY**

OK ▼

4.	**CHECK HARNESS AND CONNECTOR (ACC RELAY - MAIN BODY ECU AND BODY GROUND)**

(a) Remove the ACC relay from the No. 5 relay block.

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(b) Disconnect the E15 main body ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Relay block ACC relay terminal 1 - E15-4 (ACCD)	Always	Below 1 Ω
Relay block ACC relay terminal 2 - Body ground	Always	Below 1 Ω
Relay block ACC relay terminal 1 or E15-4 (ACCD) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XES04DX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2275: STSW Monitor Malfunction (2011 RAV4)		

DTC	**B2275**	**STSW Monitor Malfunction**

DESCRIPTION

This DTC is stored when the engine start request signal circuit inside the main body ECU is open or shorted.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2275	Engine start request signal circuit inside the main body ECU or other related circuit is malfunctioning.	• Main body ECU • SFI system • Harness or connector

WIRING DIAGRAM



INSPECTION PROCEDURE

PROCEDURE

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1.	CHECK WHETHER DTC OUTPUT RECURS

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Trouble Codes.

(d) Clear the DTCs.

(e) Depress the brake pedal with the engine switch on (IG), wait at least 15 seconds, and check whether DTC B2275 recurs.

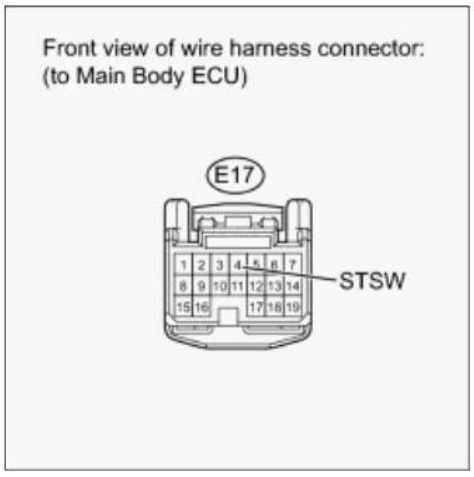
Result

DISPLAY (DTC OUTPUT)	PROCEED TO
B2275	A
No DTC output	B

B ▶ **USE SIMULATION METHOD TO CHECK**

A ▼

2.	CHECK MAIN BODY ECU (STSW VOLTAGE)



(a) Disconnect the E17 main body ECU connector.

(b) With the shift lever in P or N, depress the brake pedal fully.

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

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HINT:

The voltage is generated at terminal STSW for 0.3 seconds when the engine cranks.

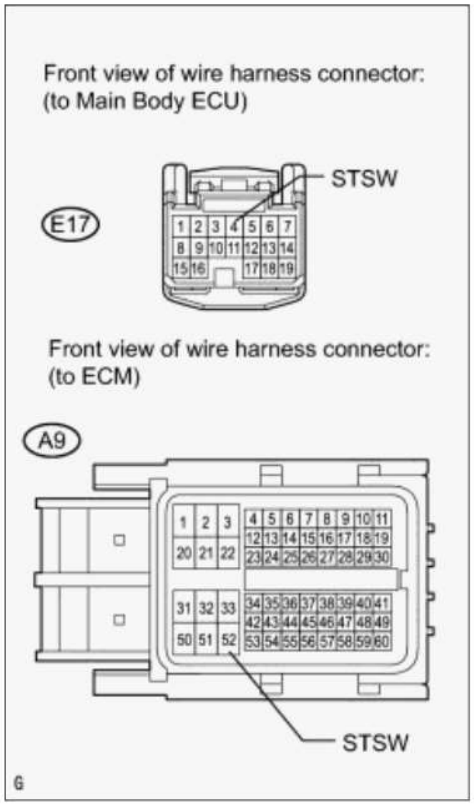
Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-4 (STSW) - Body ground	Brake pedal depressed with shift lever in P or N and engine switch pushed once	11 to 14 V

NG ▶ **CHECK WHETHER ENGINE STARTS**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - ECM)**



(a) Disconnect the E17 main body ECU connector.

(b) Disconnect the A9 ECM connector.

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

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Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-4 (STSW) - A9-52 (STSW)	Always	Below 1 Ω
E17-4 (STSW) or A9-52 (STSW) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	**CHECK WHETHER ENGINE STARTS**

(a) Temporarily replace the main body ECU (instrument panel junction block) with a new or normally functioning one.

(b) Check that the engine starts normally.

OK:
Engine starts normally.

NG ▶ **GO TO SFI SYSTEM**

OK ▶ **END (MAIN BODY ECU IS DEFECTIVE)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000Y7W040X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2276: ACCR Signal Circuit Malfunction (2011 RAV4)		

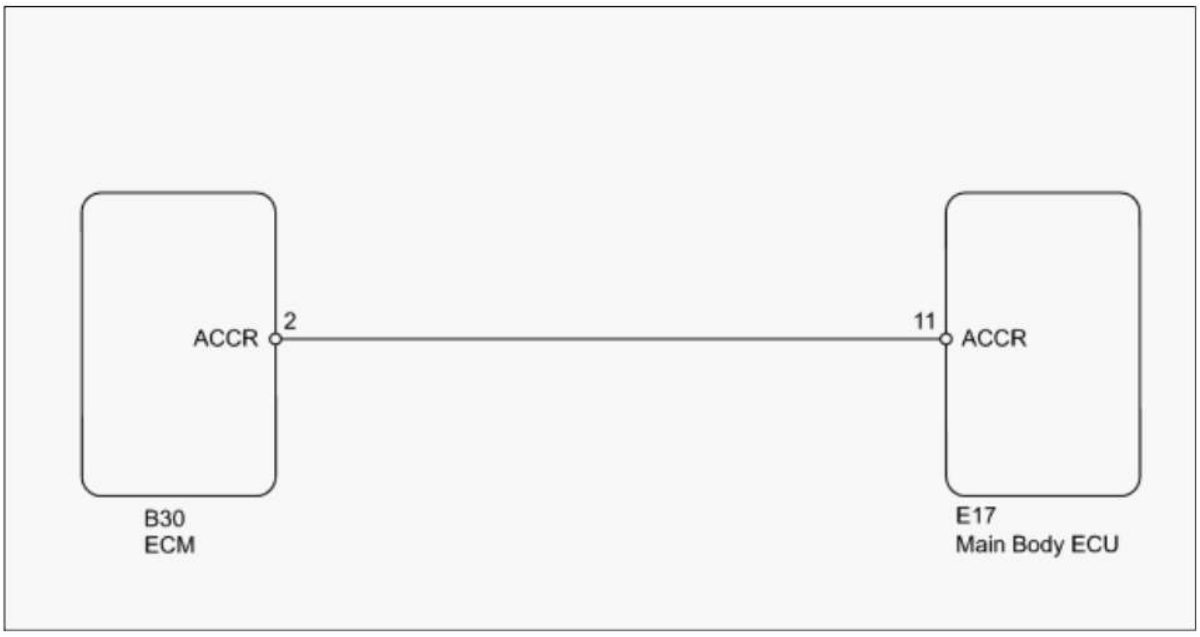
DTC	**B2276**	**ACCR Signal Circuit Malfunction**

DESCRIPTION

This DTC is stored when a malfunction is detected in the ACCR signal output by the main body ECU.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2276	ACCR output circuit inside the main body ECU or other related circuit is malfunctioning.	• Main body ECU • SFI system • Wire harness or connector

WIRING DIAGRAM



INSPECTION PROCEDURE

PROCEDURE

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1.	CHECK WHETHER DTC OUTPUT RECURS

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Trouble Codes.

(d) Clear the DTCs.

(e) Check whether DTC B2276 recurs 50 seconds or more after the engine switch is turned on (IG).

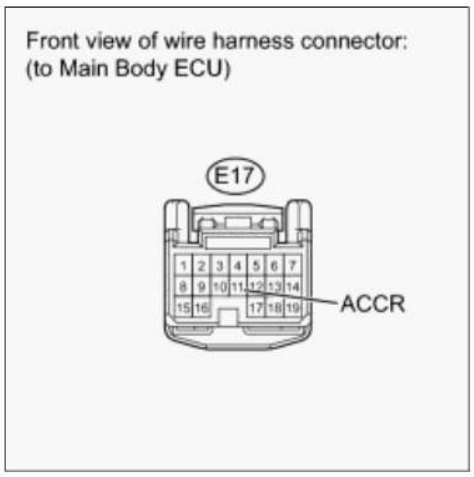
Result

DISPLAY (DTC OUTPUT)	PROCEED TO
B2276	A
No DTC output	B

B ▶ **USE SIMULATION METHOD TO CHECK**

A ▼

2.	CHECK MAIN BODY ECU (ACCR VOLTAGE)



(a) Disconnect the E17 main body ECU connector.

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

Standard Voltage:

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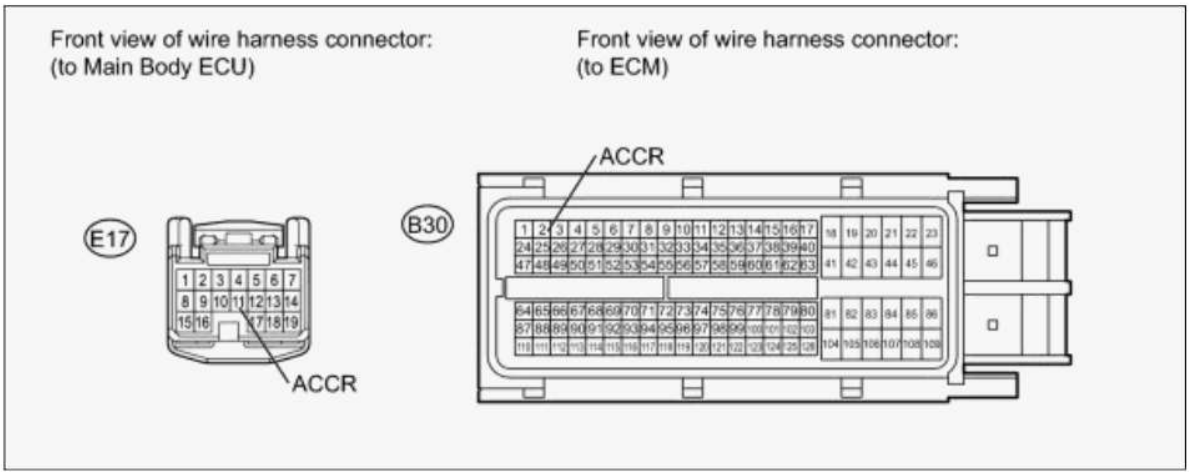
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-11 (ACCR) - Body ground	Engine switch pressed and engine cranking	11 to 14 V

NG ▶ **CHECK MAIN BODY ECU**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - ECM)**

(a) Disconnect the E17 main body ECU connector.



(b) Disconnect the B30 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-11 (ACCR) - B30-2 (ACCR)	Always	Below 1 Ω
E17-11 (ACCR) or B30-2 (ACCR) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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4.	**CHECK MAIN BODY ECU**

(a) Temporarily replace the main body ECU (instrument panel junction block) with a new or normally functioning one.

(b) Check whether DTC B2276 recurs by repeating the "CHECK WHETHER DTC OUTPUT RECURS" procedures above.

OK:

No DTC is output.

NG ▶ **GO TO SFI SYSTEM**

OK ▶ **END (MAIN BODY ECU IS DEFECTIVE)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XET04KX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2277: Detecting Vehicle Submersion (2011 RAV4)		

DTC	**B2277**	**Detecting Vehicle Submersion**

DESCRIPTION

This DTC is stored when the submersion circuit monitor inside the main body ECU detects that the vehicle has been submerged in water.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2277	Submersion circuit monitor inside the main body ECU detects that the vehicle is submerged in water.	Main body ECU

INSPECTION PROCEDURE

HINT:

Before commencing troubleshooting, check if the main body ECU is wet. If it is, replace the main body ECU.

PROCEDURE

1.	**CHECK WHETHER DTC OUTPUT RECURS**

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Trouble Codes.

(d) Clear the DTCs.

(e) Check whether DTC B2277 recurs 270 to 330 seconds or more after the engine switch is turned on (IG).

OK:
No DTC is output.

NG ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

OK ▶ **USE SIMULATION METHOD TO CHECK**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000Y7Z07AX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2278: Engine Switch Circuit Malfunction (2011 RAV4)		

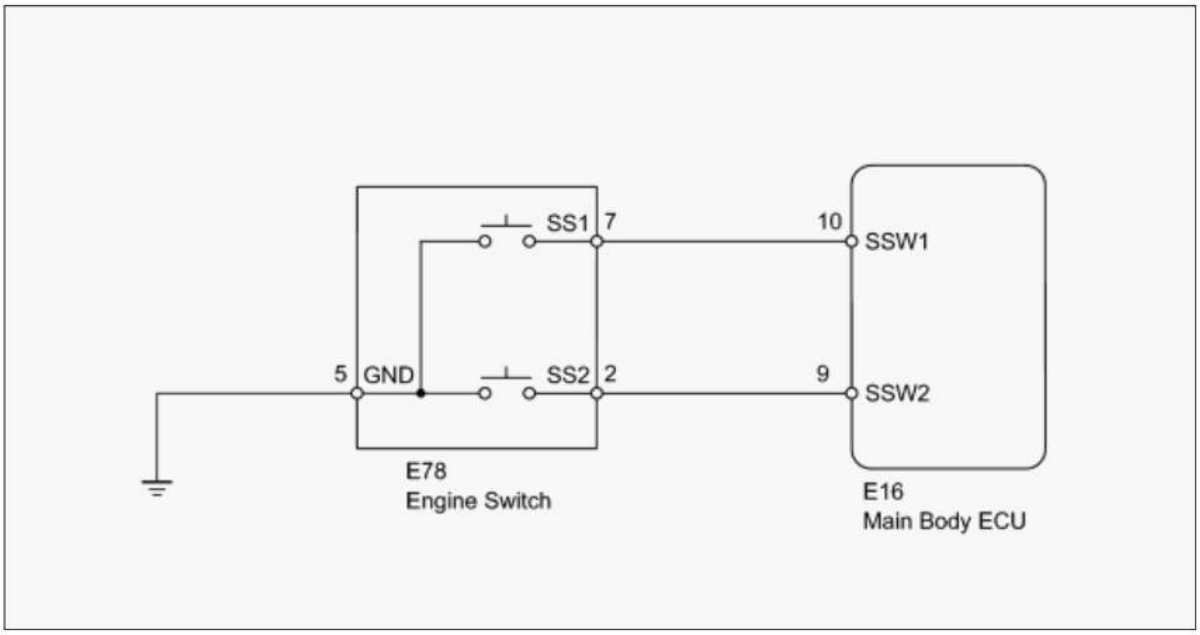
DTC	**B2278**	**Engine Switch Circuit Malfunction**

DESCRIPTION

This DTC is stored when 1) a malfunction is detected between the main body ECU and engine switch; or 2) either of the switches inside the engine switch is malfunctioning.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2278	Communication is abnormal between the main body ECU and engine switch or the engine switch is defective.	• Main body ECU • Engine switch • Harness or connector

WIRING DIAGRAM



INSPECTION PROCEDURE

PROCEDURE

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1.	READ VALUE USING TECHSTREAM (START SWITCH 1 AND 2)

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the value displayed on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Start Switch1	Start Switch 1/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
Start Switch2	Start Switch 2/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-

OK:
When the engine switch is turned on (IG), ON appears on the Techstream screen.

NG ▶ **INSPECT ENGINE SWITCH**

OK ▼

2.	CHECK SWITCH CONDITION (ENGINE SWITCH)

(a) Make sure that the electrical key is inside the cabin.

(b) With the shift lever in P, check that the power source mode changes as shown below each time the engine switch is pushed.

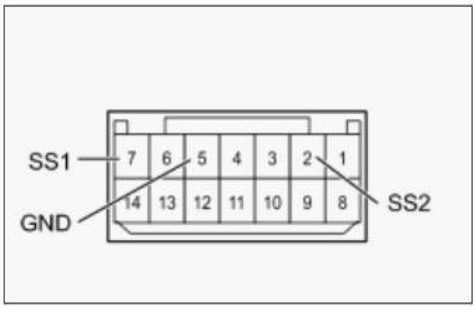
OK:
off → on (ACC) → on (IG) → off

NG ▶ **GO TO POWER SOURCE MODE DOES NOT CHANGE**

OK ▶ **USE SIMULATION METHOD TO CHECK**

3.	INSPECT ENGINE SWITCH

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(a) Remove the engine switch INFO .

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

Standard Resistance:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
7 (SS1) - 5 (GND)	Pushed	Below 1 Ω
2 (SS2) - 5 (GND)	Pushed	Below 1 Ω
7 (SS1) - 5 (GND)	Not pushed	10 kΩ or higher
2 (SS2) - 5 (GND)	Not pushed	10 kΩ or higher

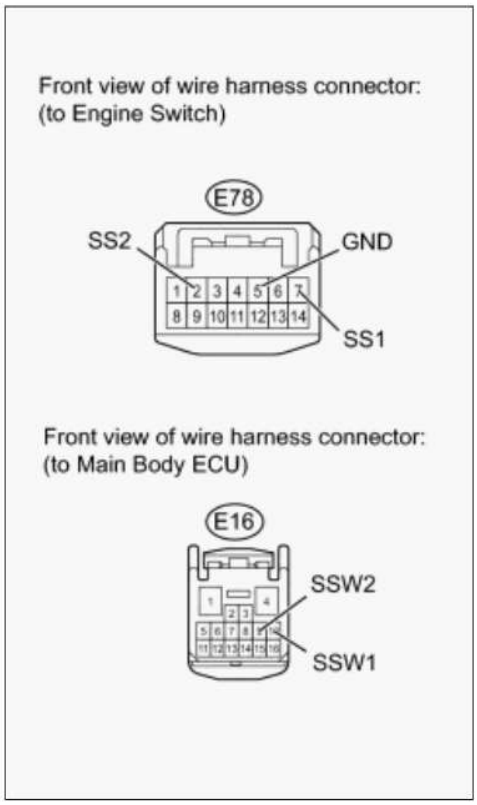
NG ▶ **REPLACE ENGINE SWITCH**

OK ▼

4.	**CHECK HARNESS AND CONNECTOR (ENGINE SWITCH - MAIN BODY ECU AND BODY GROUND)**

(a) Disconnect the E78 engine switch connector.

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(b) Disconnect the E16 main body ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E78-7 (SS1) - E16-10 (SSW1)	Always	Below 1 Ω
E78-2 (SS2) - E16-9 (SSW2)	Always	Below 1 Ω
E78-5 (GND) - Body ground	Always	Below 1 Ω
E78-7 (SS1) or E16-10 (SSW1) - Body ground	Always	10 kΩ or higher
E78-2 (SS2) or E16-9 (SSW2) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM0000026HJ012X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2281: "P" Signal Malfunction (2011 RAV4)		

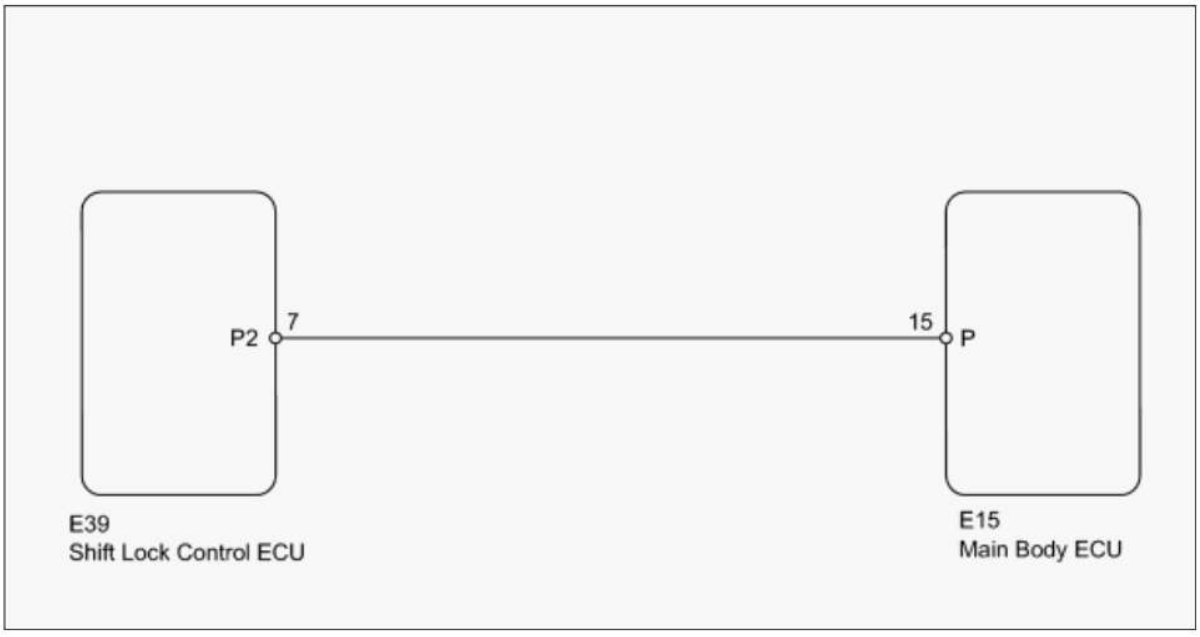
DTC	**B2281**	**"P" Signal Malfunction**

DESCRIPTION

DTC B2281 is stored when the circuit between the main body ECU and shift lock control ECU is abnormal.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2281	Communication or the communication line between the main body ECU and shift lock control ECU is abnormal.	• Main body ECU • Shift lock control ECU • Harness or connector

WIRING DIAGRAM

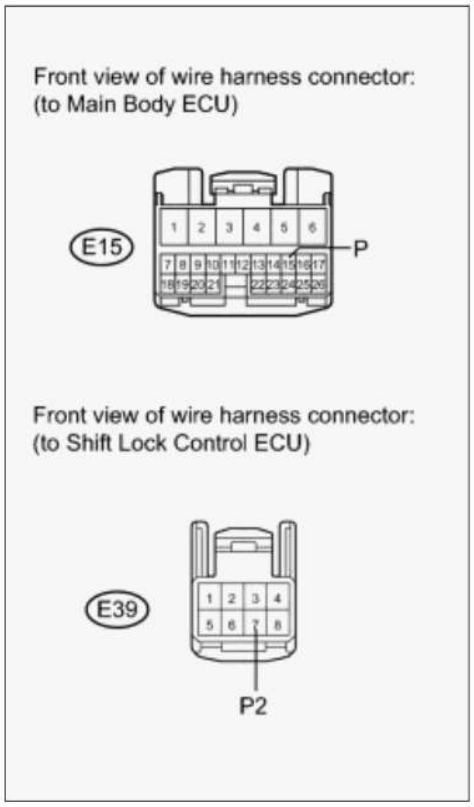


INSPECTION PROCEDURE

PROCEDURE

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1.	**CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - SHIFT LOCK CONTROL ECU)**



(a) Disconnect the E15 main body ECU connector.

(b) Disconnect the E39 ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E15-15 (P) - E39-7 (P2)	Always	Below 1 Ω
E15-15 (P) or E39-7 (P2) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

2.	**CHECK SHIFT LOCK CONTROL ECU**

(a) Temporarily replace the shift lock control ECU with a new or normally functioning one.

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(b) Check that the engine starts normally.

OK:
Engine starts normally.

NG ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

OK ▶ **END (SHIFT LOCK CONTROL ECU IS DEFECTIVE)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XEV08JX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2282,B2283: Vehicle Speed Signal Malfunction (2011 RAV4)		

DTC	**B2282**	**Vehicle Speed Signal Malfunction**

DTC	**B2283**	**Vehicle Speed Sensor Malfunction**

DESCRIPTION

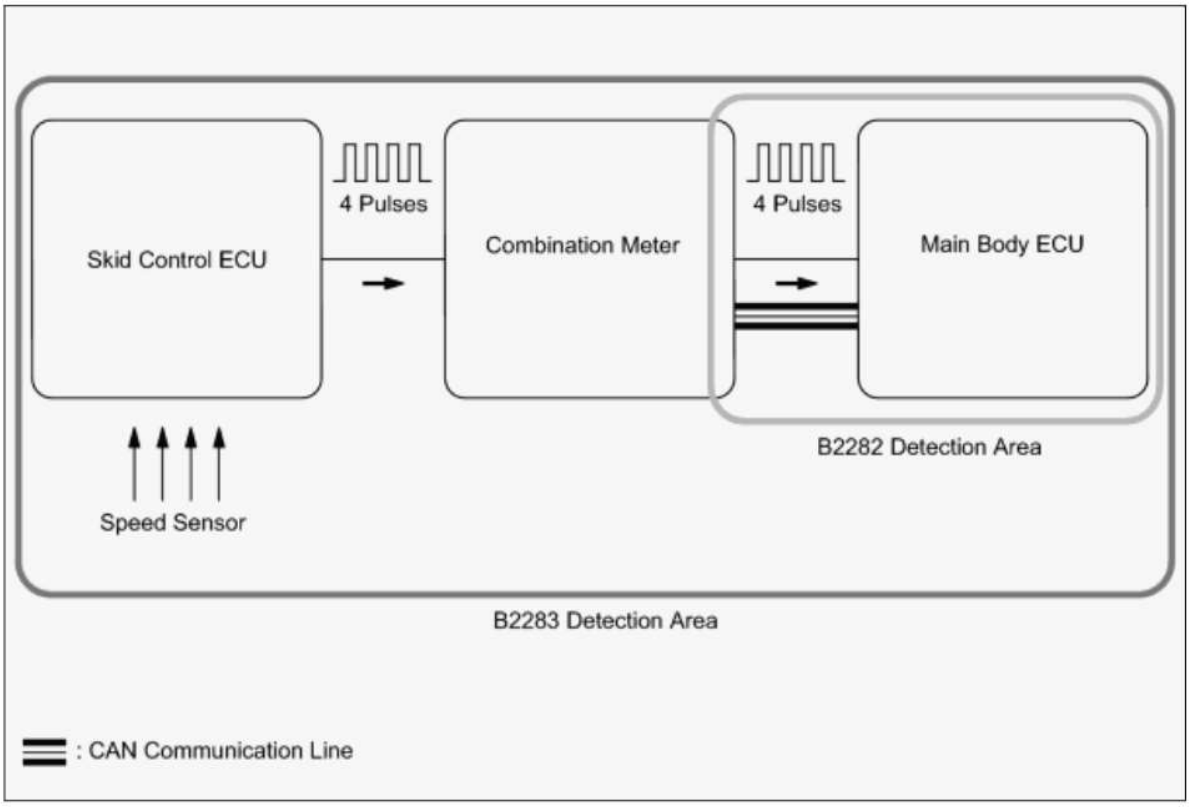
The main body ECU and combination meter are connected with a cable and a CAN communication line. DTC B2282 is stored when signals, transmitted through the cable and the communication line, do not match.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2282	Both conditions are met: • Signals between the main body ECU and combination meter are inconsistent. • Malfunction is detected in the circuit between the vehicle speed sensor and combination meter.	• Main body ECU • Combination meter • Wire harness or connector

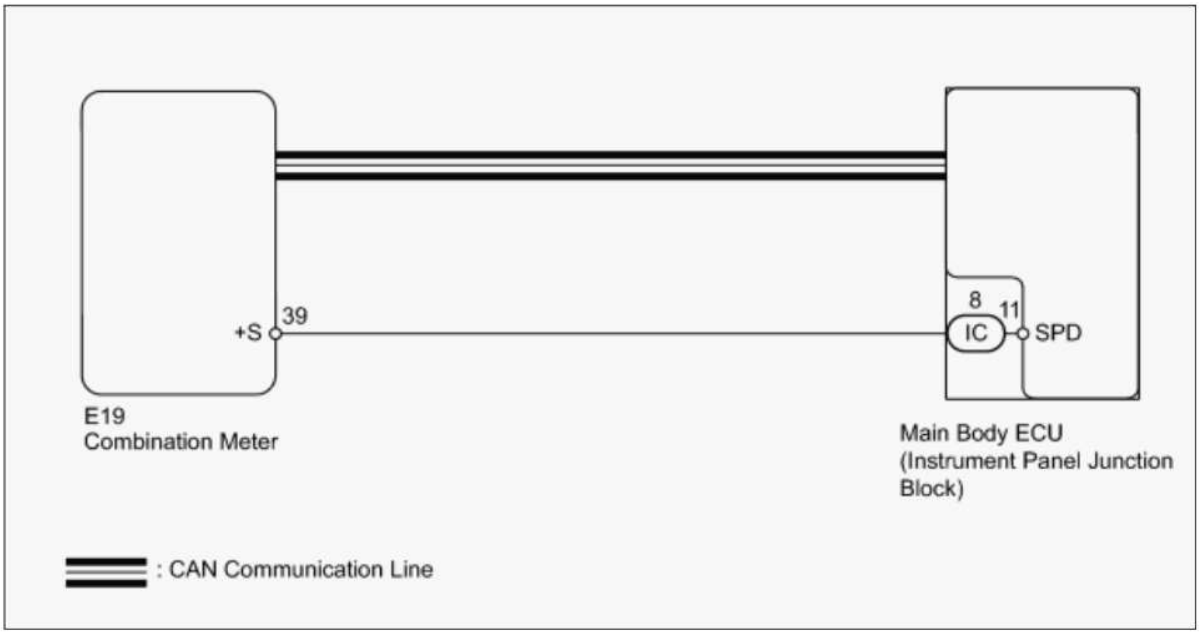
The skid control ECU converts these signals into 4-pulse signals and sends them to the combination meter. After these signals are converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, they are then transmitted to the main body ECU. The main body ECU determines the vehicle speed based on the frequencies of these pulse signals.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2283	Both conditions are met: • Vehicle speed decreases significantly. • Vehicle speed does not correspond with engine speed.	• Main body ECU • Combination meter • Speed sensor • Skid control ECU • Wire harness or connector

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WIRING DIAGRAM



INSPECTION PROCEDURE

PROCEDURE

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1.	**READ VALUE USING TECHSTREAM (VEHICLE SPEED SIGNAL)**

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the display on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Vehicle Speed Signal	Vehicle speed signal/Stop or Run	Stop: Vehicle stopped Run: Vehicle being driven	-

OK:
When the vehicle is stopped, Stop appears on the Techstream screen.

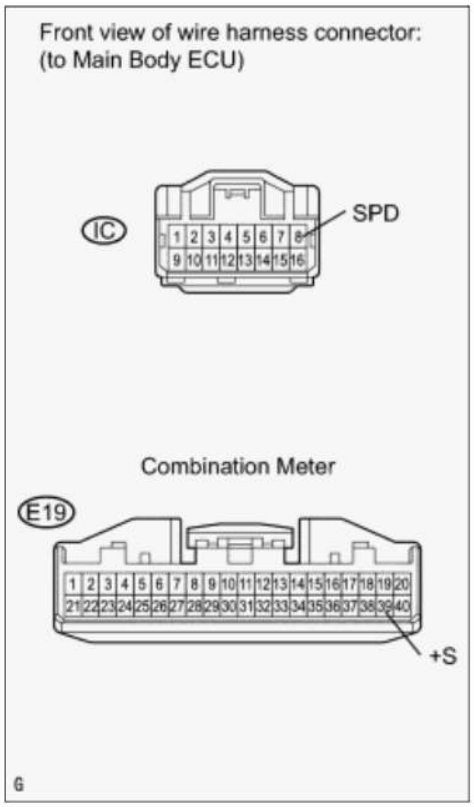
NG ▶ **CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - COMBINATION METER)**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

2.	**CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - COMBINATION METER)**

(a) Disconnect the IC instrument panel junction block connector.

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(b) Disconnect the E19 combination meter connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
IC-8 (SPD) - E19-39 (+S)	Always	Below 1 Ω
IC-8 (SPD) or E19-39 (+S) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**CHECK WHETHER ENGINE STARTS**

(a) Temporarily replace the main body ECU (instrument panel junction block) with a new or normally functioning one.

(b) Check that the engine starts normally.

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OK:
Engine starts normally.

NG ▶ **GO TO METER / GAUGE SYSTEM**

OK ▶ **END (MAIN BODY ECU IS DEFECTIVE)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YD307RX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2285,B2288: Steering Lock Position Signal Circuit Malfunction (2011 RAV4)		

DTC	**B2285**	**Steering Lock Position Signal Circuit Malfunction**

DTC	**B2288**	**Steering Lock Signal Circuit Malfunction**

DESCRIPTION

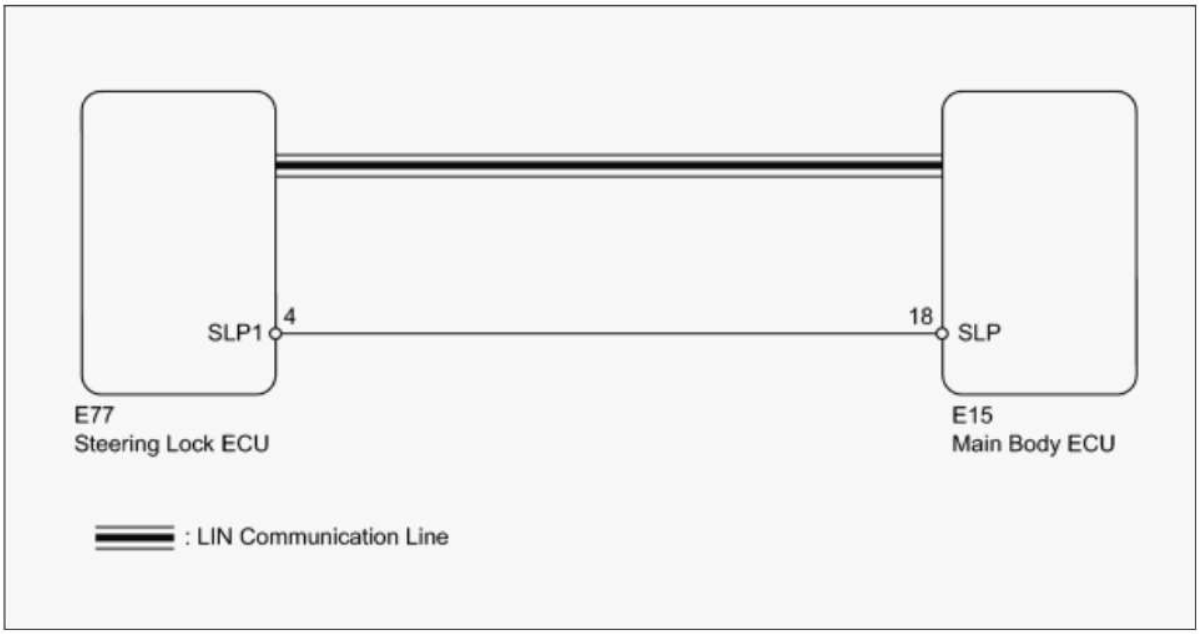
The main body ECU and steering lock ECU are connected by a cable and a LIN communication line. These DTCs are stored when: 1) signals, transmitted through the cable and the communication line, do not match; or 2) a malfunction is detected in the circuit between the main body ECU and steering lock ECU.

The steering lock ECU unlocks the steering wheel only when it receives an unlock signal from LIN communication and the cable.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2285	Cable and LIN signals between the main body ECU and steering lock ECU are inconsistent.	• Main body ECU • Steering lock system • Harness or connector
B2288	After turning the engine switch from off to on (IG), the steering wheel does not unlock for a certain period of time.	• Main body ECU • Steering lock system • Harness or connector

WIRING DIAGRAM

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INSPECTION PROCEDURE

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (STEERING LOCK CONDITION)**

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the display on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Steering Unlock Switch	Steering lock condition/ON or OFF	ON: Steering unlocked OFF: Steering locked	-

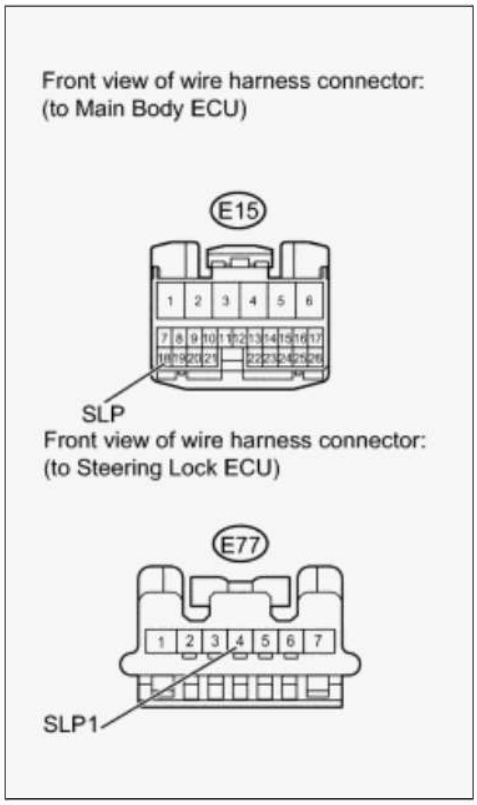
OK:
When the steering wheel is unlocked, ON appears on the Techstream screen.

NG ▶ **CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - STEERING LOCK ECU)**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

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2.	CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - STEERING LOCK ECU)



(a) Disconnect the E15 main body ECU connector.

(b) Disconnect the E77 steering lock ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E15-18 (SLP) - E77-4 (SLP1)	Always	Below 1 Ω
E15-18 (SLP) or E77-4 (SLP1) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	CHECK WHETHER ENGINE STARTS

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(a) Temporarily replace the main body ECU (instrument panel junction block) with a new or normally functioning one.

(b) Check that the engine starts normally.

OK:

Engine starts normally.

NG ▶ **GO TO STEERING LOCK SYSTEM**

OK ▶ **END (MAIN BODY ECU IS DEFECTIVE)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YD408KX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2286: Runnable Signal Malfunction (2011 RAV4)		

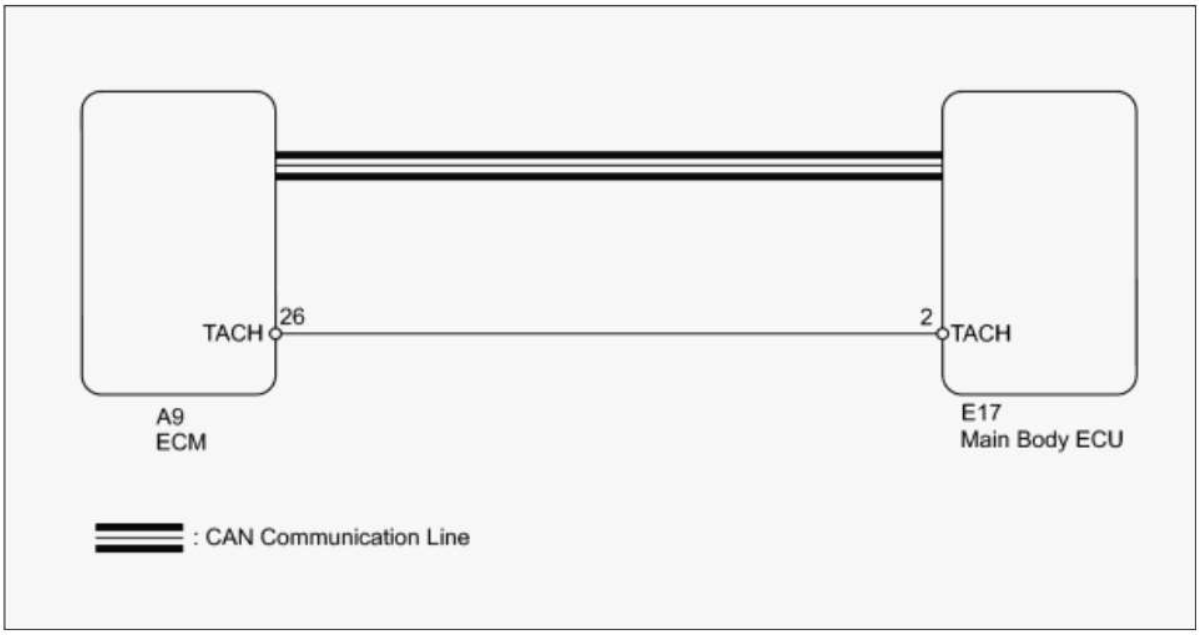
DTC	**B2286**	**Runnable Signal Malfunction**

DESCRIPTION

The main body ECU and ECM are connected by a cable and the CAN communication line. If the cable information and CAN information are inconsistent, this DTC is stored.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2286	Cable information and CAN information between the main body ECU and ECM are inconsistent.	• Main body ECU • SFI system • Harness or connector

WIRING DIAGRAM



INSPECTION PROCEDURE

PROCEDURE

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1.	READ VALUE USING TECHSTREAM (ENGINE CONDITION)

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the display on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Engine Condition	Engine condition/Stop or Run	Stop: Engine stopped Run: Engine running	-

OK:
When the engine is running, Run is displayed on the Techstream.

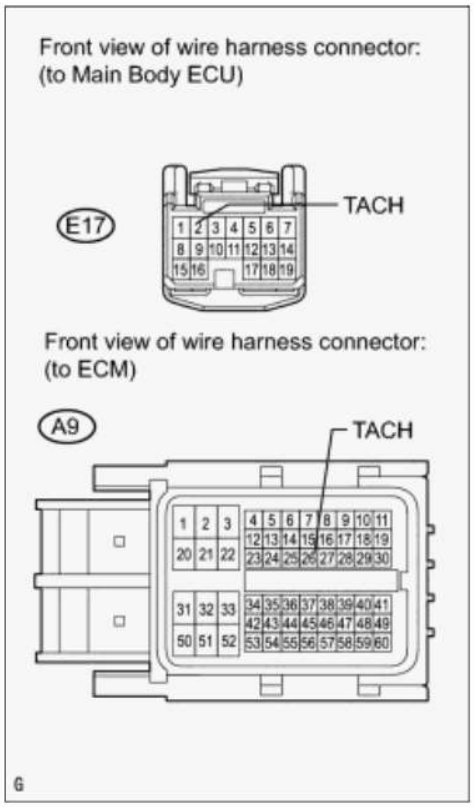
NG ▶ **CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - ECM)**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

2.	CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - ECM)

(a) Disconnect the E17 main body ECU connector.

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(b) Disconnect the A9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-2 (TACH) - A9-26 (TACH)	Always	Below 1 Ω
E17-2 (TACH) or A9-26 (TACH) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**CHECK WHETHER ENGINE STARTS**

(a) Temporarily replace the main body ECU (instrument panel junction block) with a new or normally functioning one.

(b) Check that the engine starts normally.

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OK:
Engine starts normally.

NG ▶ **GO TO SFI SYSTEM**

OK ▶ **END (MAIN BODY ECU IS DEFECTIVE)**

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Last Modified: 9-7-2011	6.4 C	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XEY05KX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: B2287,B2289: LIN Communication Master Malfunction (2011 RAV4)		

DTC	**B2287**	**LIN Communication Master Malfunction**

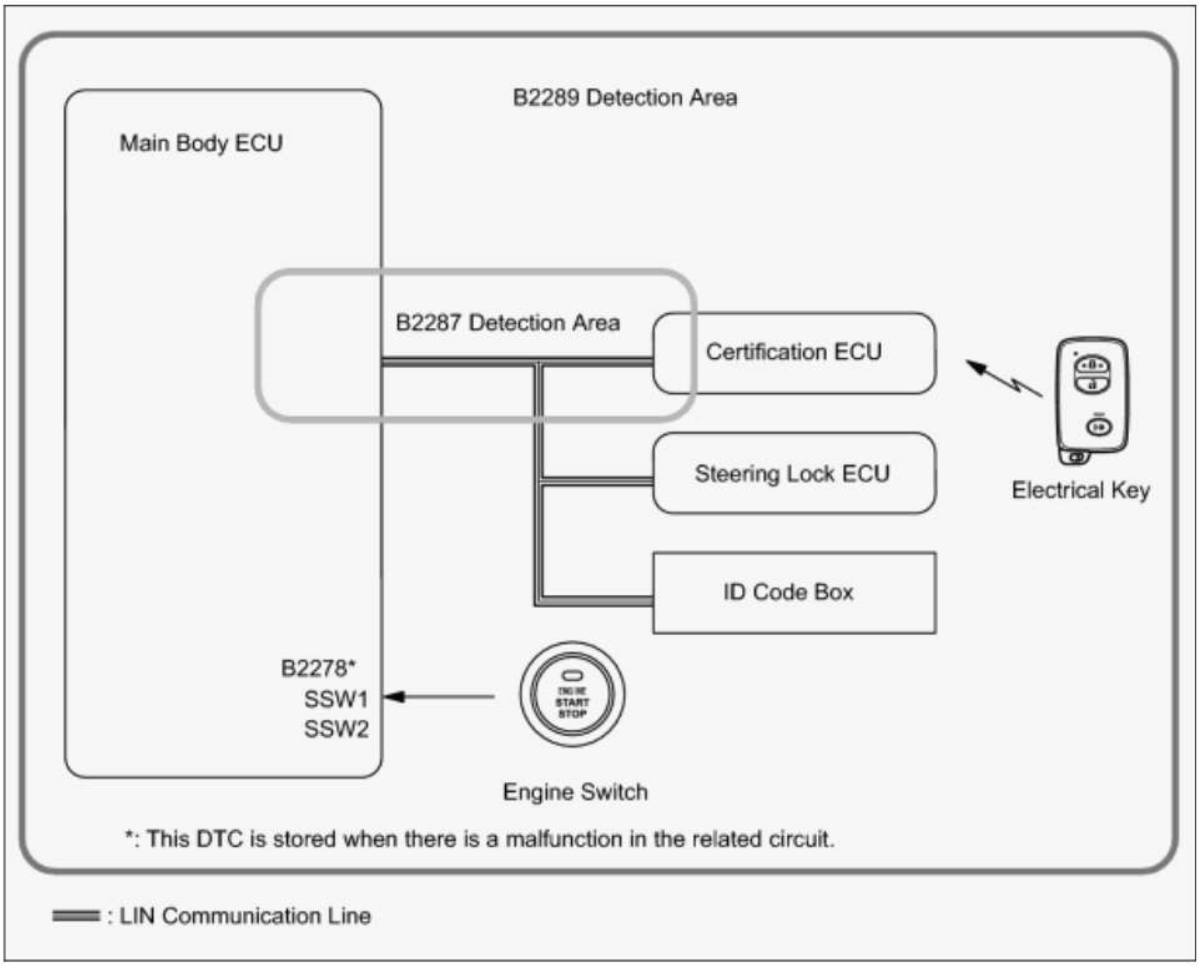
DTC	**B2289**	**Key Collation Waiting Time Over**

DESCRIPTION

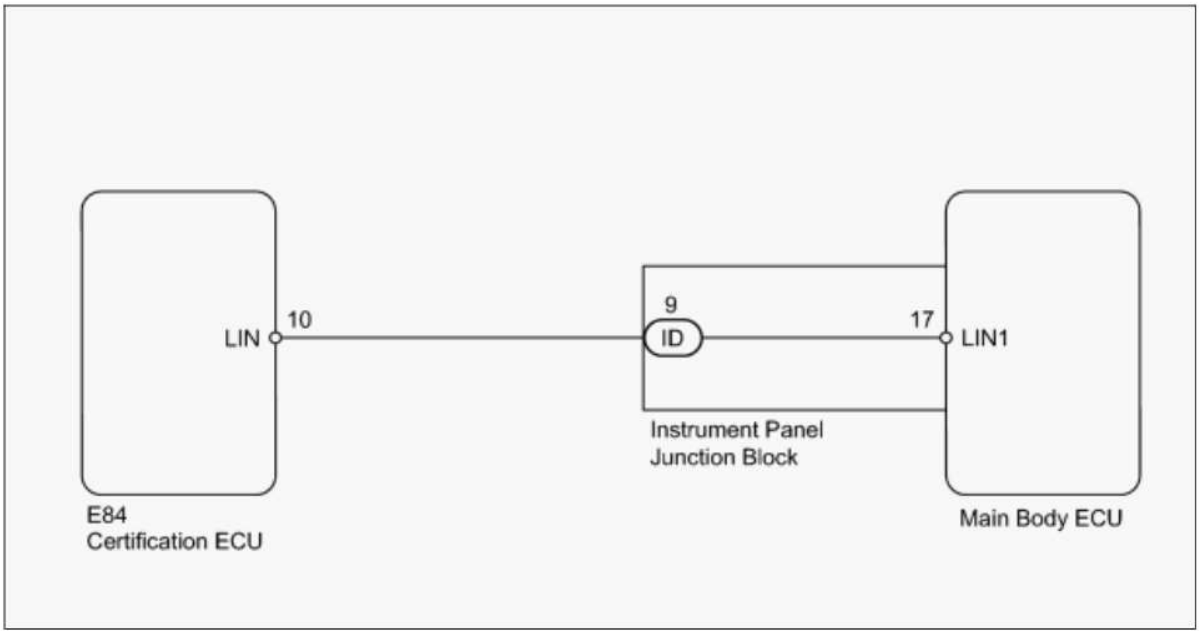
DTC B2287 is stored when the LIN communication circuit between the main body ECU and certification ECU is abnormal. DTC B2289 is stored when there is a malfunction in the immobiliser system.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
B2287	Communication or the communication line between the main body ECU and certification ECU is abnormal.	• Main body ECU • ECU aggregation box (Certification ECU) • Harness or connector
B2289	Either condition is met: • Communication or the communication line among the main body ECU, certification ECU, steering lock ECU and ID code box is abnormal. • Immobiliser system malfunctions.	• Main body ECU • Engine immobiliser system (w/ Smart Key System) • Harness or connector • Engine switch • Entry function • Electrical key

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WIRING DIAGRAM

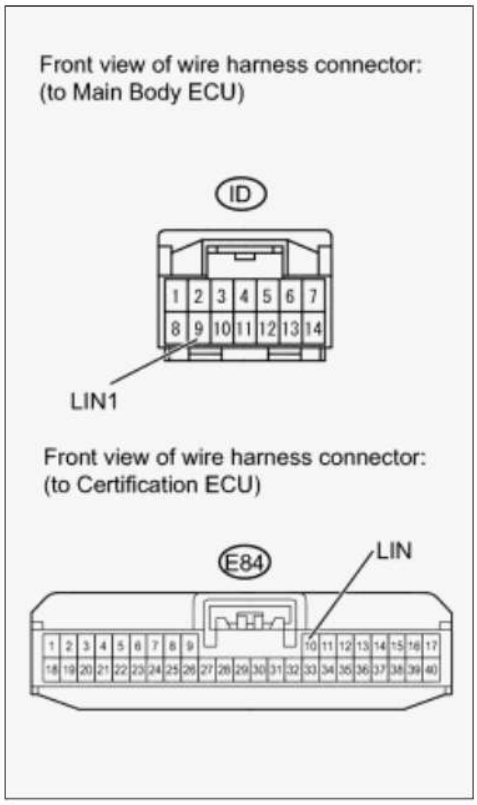


INSPECTION PROCEDURE

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PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - CERTIFICATION ECU)**



(a) Disconnect the ID instrument panel junction block connector.

(b) Disconnect the E84 certification ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
ID-9 (LIN1) - E84-10 (LIN)	Always	Below 1 Ω
ID-9 (LIN1) or E84-10 (LIN) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

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2.	**CHECK CERTIFICATION ECU**

(a) Temporarily replace the ECU aggregation box (certification ECU) with a new one INFO .

NOTICE:

When replacing the certification ECU, registration procedures must be performed according to the "Registration" section INFO .

(b) Check for DTCs again.

OK:

No DTC is output.

NG ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

OK ▶ **END (CERTIFICATION ECU IS DEFECTIVE)**

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Last Modified: 9-7-2011	6.4 U	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XI507JX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: DATA LIST / ACTIVE TEST (2011 RAV4)		

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the Techstream to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / (desired system) / Data List.

(e) According to the display on the Techstream, read the Data List.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
ACC SW	Engine switch on (ACC)/ON or OFF	ON: Engine switch on (ACC) OFF: Engine switch off	-
IG SW	Engine switch on (IG)/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
Stop Light SW	Stop light switch/ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	-
Start Switch1	Start switch 1/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
Start Switch2	Start switch 2/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
Steering Unlock Switch	Steering lock condition/ON or OFF	ON: Steering unlocked OFF: Steering locked	-

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Neutral SW/ Clutch SW	Park/neutral position switch/ON or OFF	ON: Shift lever in P or N OFF: Shift lever not in P or N	-
Shift P Signal	Shift lever P position signal/ON or OFF	ON: Shift lever in P OFF: Shift lever not in P	-
Vehicle Speed Signal	Vehicle speed signal/Stop or Run	Stop: Vehicle stopped Run: Vehicle being driven	-
Engine Condition	Engine condition/Stop or Run	Stop: Engine stopped Run: Engine running	-
IG1 Relay Monitor(Outside)	IG1 relay outer relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
IG2 Relay Monitor(Outside)	IG2 relay outer relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
IG1 Relay Monitor(Inside)	IG1 relay inner relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
IG2 Relay Monitor(Inside)	IG2 relay inner relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
ACC Relay Monitor	ACC relay monitor/ON or OFF	ON: Engine switch on (ACC) OFF: Engine switch off	-
Latch Circuit	Latch circuit/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off or on (ACC)	-
Starter Request Signal	Starter request signal/ON or OFF	ON: ST relay on OFF: ST relay off	-
Power Supply Condition	Power supply condition/ALL OFF, ACC ON, IG1 ON, IG2 ON or ST ON	ALL OFF: All relays off ACC ON: ACC relay on IG1 ON: IG1 relay on IG2 ON: IG2 relay on ST ON: STSW signal on	-
ACC Relay Cut Signal	ACC relay cut signal/ON or OFF	ON: Engine cranking OFF: Engine not cranking	-
Starter Relay Monitor	ST relay monitor/ON or OFF	ON: Engine cranking OFF: Engine not cranking	-

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Communication Smart/Wireless	Communication to certification ECU/OK or STOP	OK: Communication STOP: No communication	-
The Number of DTC	Number of diagnostic trouble codes/Min: 0, Max: 255	-	-

Smart Key

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Ignition Switch	Engine switch/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
Unmatched Vehicle-ID	Key ID/Yes or No	Yes: Key ID matches No: Key ID differs	-
No Response	Response/Yes or No	Yes: Response No: No response	-
Unmatch Code or Form	Code format/Yes or No	Yes: Code format matches No: Code format differs	-
Key Low Battery	Key battery conditions/Yes or No	Yes: Battery depleted No: Battery not depleted	-
#Codes	Number of diagnostic trouble codes/Min: 0, Max: 255	-	-
ID Code Difference(Resp)	ID code/Yes or No	Yes: ID code matches No: ID code differs	-
C Code Difference	Challenge code/Yes or No	Yes: Challenge code matches No: Challenge code differs	-
Engine Start Condition	Engine start permission determined by certification ECU/OK or NG	OK: Engine start permitted NG: Engine start prohibited	-
S Code Check	S code certification result/NG or OK	OK: S code certification result normal NG: S code certification result abnormal	-
L Code Check	L code certification result/NG or OK	OK: L code certification result normal NG: L code certification result abnormal	-
Ignition Available Area	Key area where engine start is possible/All or Front	All: All areas Front: Front only	-

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2. PERFORM ACTIVE TEST

HINT:

Using the Techstream to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / (desired system) / Active Test.

(e) According to the display on the Techstream, perform the Active Test.

Main Body

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Indicator for Lighting	Indicator illumination	ON/OFF	-
Indicator Condition	Indicator light illumination pattern	Green/Red/No Sig	-
P Supply for Steering Lock	Steering lock ECU power supply	ON/OFF	-

Smart Key

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Fr-Seat Inside Transmitter	Indoor key oscillator (for front floor)	ON/OFF	-

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Last Modified: 9-7-2011	6.4 D	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YEG07AX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: DIAGNOSIS SYSTEM (2011 RAV4)		

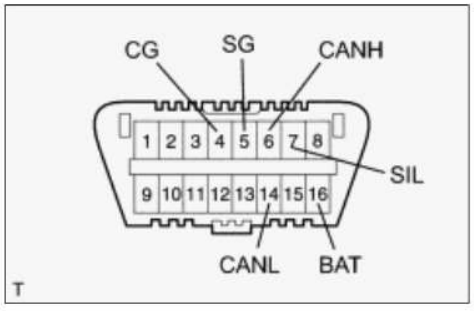
DIAGNOSIS SYSTEM

1. DESCRIPTION

(a) The push-button start function data and the Diagnostic Trouble Codes (DTCs) can be read through the Data Link Connector 3 (DLC3) of the vehicle. When the function seems to be malfunctioning, use the Techstream to check for malfunctions and perform repairs.

2. CHECK DLC3

(a) This vehicle uses the ISO 15765-4 communication protocol. The terminal arrangement of the DLC3 complies with ISO 15031-03 and matches the ISO 15765-4 format.



TERMINAL NO. (SYMBOL)	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
7 (SIL) - 5 (SG)	Bus "+" line	During transmission	Pulse generation
4 (CG) - Body ground	Chassis ground	Always	Below 1 Ω
5 (SG) - Body ground	Signal ground	Always	Below 1 Ω
16 (BAT) - Body ground	Battery positive	Always	11 to 14 V
6 (CANH) - 14 (CANL)	CAN bus line	Engine switch off*	54 to 69 Ω
6 (CANH) - 16 (BAT)	HIGH-level CAN bus line	Engine switch off*	6 kΩ or higher
6 (CANH) - 4 (CG)	HIGH-level CAN bus line	Engine switch off*	200 Ω or higher
14 (CANL) - 16 (BAT)	LOW-level CAN bus line	Engine switch off*	6 kΩ or higher
14 (CANL) - 4 (CG)	LOW-level CAN bus line	Engine switch off*	200 Ω or higher

NOTICE:

***: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the engine switch, other switches or doors.**

If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

HINT:

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Connect the cable of the Techstream to the DLC3, turn the engine switch on (IG) and attempt to use the Techstream. If the display indicates that a communication error has occurred, there is a problem either with the vehicle or with the Techstream.

- If communication is normal when the Techstream is connected to another vehicle, inspect the DLC3 of the original vehicle.
- If communication is still not possible when the Techstream is connected to another vehicle, the problem may be in the Techstream itself. Consult the service department listed in the Techstream's instruction manual.

3. INSPECT BATTERY VOLTAGE

Standard voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.





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Last Modified: 9-7-2011	6.4 S	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XIZ08EX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: DIAGNOSTIC TROUBLE CODE CHART (2011 RAV4)		

DIAGNOSTIC TROUBLE CODE CHART

Smart Key System

DTC CODE	DETECTION ITEM	TROUBLE AREA	SEE PAGE
B2271	Ignition Hold Monitor Malfunction	- Main body ECU - AM2-2 fuse - Harness or connector	INFO
B2272	Ignition 1 Monitor Malfunction	- Main body ECU - IG1 relay - Harness or connector	INFO
B2273	Ignition 2 Monitor Malfunction	- Main body ECU - IG2 relay - Harness or connector	INFO
B2274	ACC Monitor Malfunction	- Main body ECU - ACC relay - Harness or connector	INFO
B2275	STSW Monitor Malfunction	- Main body ECU - SFI system - Harness or connector	INFO
B2276	ACCR Signal Circuit Malfunction	- Main body ECU - SFI system - Harness or connector	INFO
B2277	Detecting Vehicle Submersion	Main body ECU	INFO
B2278	Engine Switch Circuit Malfunction	- Main body ECU - Engine switch - Harness or connector	INFO
B2281	"P" Signal Malfunction	- Main body ECU - Shift lock ECU - Harness or connector	INFO
B2282	Vehicle Speed Signal Malfunction	- Main body ECU - Combination meter - Harness or connector	INFO
B2283	Vehicle Speed Sensor Malfunction	- Main body ECU - Combination meter - Speed sensor - Skid control ECU - Harness or connector	INFO

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DTC CODE	DETECTION ITEM	TROUBLE AREA	SEE PAGE
B2285	Steering Lock Position Signal Circuit Malfunction	- Main body ECU - Steering lock system - Harness or connector	INFO
B2286	Runnable Signal Malfunction	- Main body ECU - SFI system - Harness or connector	INFO
B2287	LIN Communication Master Malfunction	- Main body ECU - Certification ECU - Harness or connector	INFO
B2288	Steering Lock Signal Circuit Malfunction	- Main body ECU - Steering lock system - Harness or connector	INFO
B2289	Key Collation Waiting Time Over	- Main body ECU - Entry function - Engine immobiliser system (w/Smart Key System) - Engine switch - Electrical key - Harness or connector	INFO

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Last Modified: 9-7-2011	6.4 D	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YEH07SX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: DTC CHECK / CLEAR (2011 RAV4)		

DTC CHECK / CLEAR

1. CHECK DTC

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Trouble codes.

(d) Check the DTCs and write them down.

HINT:

For further information about using the Techstream, refer to the instruction manual.

(e) Confirm the details of the DTCs.

2. CLEAR DTC

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) (do not start the engine) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Trouble codes.

HINT:

Refer to the instruction manual for further details.

(d) Clear the DTCs.

HINT:

For further information about using the Techstream, refer to the instruction manual.





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Last Modified: 9-7-2011	6.4 J	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** X39400000IL029J
Title: 2AR-FE STARTING: SMART KEY SYSTEM: Engine does not Start (2011 RAV4)		

Engine does not Start

DESCRIPTION

1. ENGINE START SYSTEM OPERATION

(a) When the engine switch is pressed with the brake pedal depressed and the shift lever in P or N, the main body ECU determines that it is an engine start request.

(b) The certification ECU and other ECUs perform key verification via the LIN communication line.

(c) The main body ECU activates the ACC relay.

(d) The main body ECU activates the IG1 and IG2 relays. The engine switch indicator light illuminates in green.

(e) The certification ECU outputs a steering unlock signal. The signal is sent to the steering lock ECU via the main body ECU.

(f) The main body ECU sends an engine start request signal to the ECM.

(g) The ECM sends an ACC cut request signal to the main body ECU.

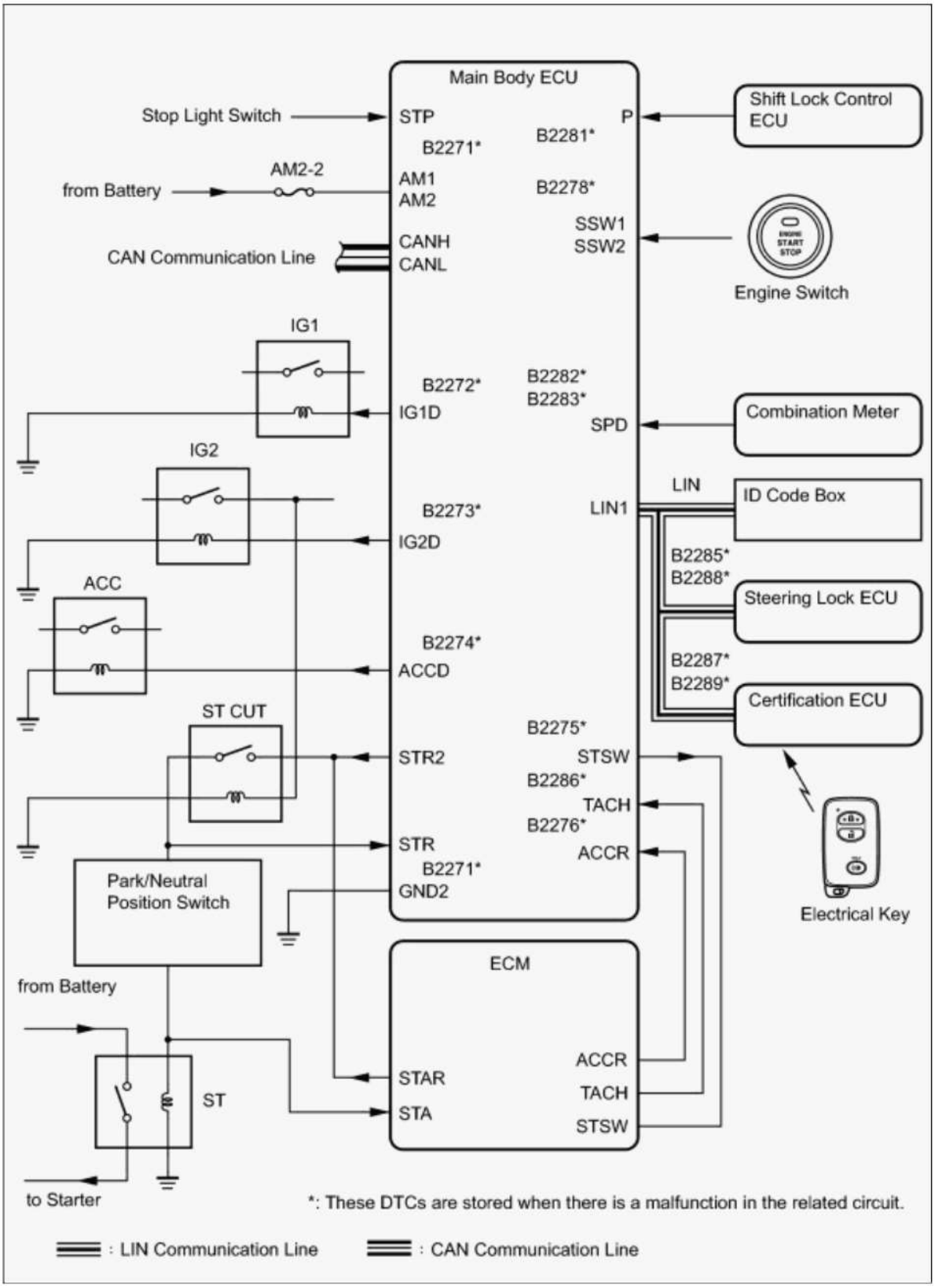
(h) The ECM and main body ECU activate the ST cut relay.

(i) The main body ECU deactivates the ACC relay until the ECU detects an engine start.

(j) The ECU reactivates the ACC relay and turns off the engine switch indicator light.

SYMBOL OF MAIN BODY ECU	SIGNAL
SSW1/SSW2	Engine switch on (ACC) and on (IG) signals
ACCD	ACC relay operation signal
IG2D	IG2 relay operation signal
STR2	ST cut relay operation signal
STR	Park/neutral position switch signal
STP	Stop light switch signal
TACH	Engine start detection signal
STSW	Starter activation request signal
ACCR	ACC cut request signal

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WIRING DIAGRAM

See Cranking Holding Function Circuit INFO .

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INSPECTION PROCEDURE

PROCEDURE

1.	CHECK ENGINE SWITCH (SWITCH CONDITION)

(a) Check the power source mode change.

(1) When the key is inside the vehicle and the shift lever is in P, check that pressing the engine switch causes the power source mode to change as follows:

OK:
off → on (ACC) → on (IG) → off

NG ▶ **GO TO SMART KEY SYSTEM (POWER SOURCE MODE DOES NOT CHANGE)**

OK ▼

2.	CHECK WHETHER DTC OUTPUT OCCURS

(a) Clear the DTCs INFO .

(b) Check whether the trouble recurs 5 seconds after the engine switch is turned on (IG).

(c) Check whether DTCs for the main body ECU or certification ECU are output.

Result

DTC OUTPUT SYSTEM NAME	PROCEED TO
No DTC output	A
DTC for main body ECU output Smart key system	B
DTC for certification ECU output Steering lock system	C
DTC for certification ECU output Engine immobiliser system	D

B ▶ **GO TO SMART KEY SYSTEM (DIAGNOSTIC TROUBLE CODE CHART)**

C ▶ **GO TO ENGINE IMMOBILISER SYSTEM (DIAGNOSTIC TROUBLE CODE CHART)**

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A

3.	**CHECK CRANKING FUNCTION**

(a) Check the engine cranking function.

(1) When there is fuel in the fuel tank, the key is inside the vehicle and the shift lever is in P, check that depressing the brake pedal and pressing the engine switch causes the engine to crank.

OK:

Engine cranks.

NG ▶ **READ VALUE USING TECHSTREAM (SHIFT LOCK CONTROL ECU)**

OK

4.	**READ VALUE USING TECHSTREAM (L CODE)**

(a) Use the Data List to check if L code certification is functioning properly.

Smart Key

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
L Code Check	L code certification result/NG or OK	OK: L code certification result normal NG: L code certification result abnormal	-

OK:

OK is displayed on the Techstream.

NG ▶ **REPLACE STEERING LOCK ECU (STEERING LOCK ACTUATOR ASSEMBLY)**

OK

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5.	**READ VALUE USING TECHSTREAM (ENGINE START CONDITION)**

(a) Use the Data List to check if the engine start is functioning properly.

Smart Key

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Engine Start Condition	Engine start permission determined by certification ECU/OK or NG	OK: Engine start permitted NG: Engine start prohibited	-

OK:
When the brake pedal is depressed with the key inside the vehicle, OK is displayed on the Techstream.

NG ▶ **REPLACE ECU AGGREGATION BOX ASSEMBLY (CERTIFICATION ECU)**

OK

6.	**READ VALUE USING TECHSTREAM (S CODE)**

(a) Use the Data List to check if S code certification is functioning properly.

Smart Key

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
S Code Check	S code certification result/NG or OK	OK: S code certification result normal NG: S code certification result abnormal	-

OK:
OK is displayed on the Techstream.

NG ▶ **REPLACE ECU AGGREGATION BOX ASSEMBLY (CERTIFICATION ECU)**

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OK

7.	**REPLACE ID CODE BOX**

(a) Replace the ID code box INFO .

(b) Register the recognition code (ECU code) INFO .

(c) Check that the engine starts.

OK:
Engine starts.

NG ▶ **REPLACE ECM**

OK ▶ **END**

8.	**READ VALUE USING TECHSTREAM (SHIFT LOCK CONTROL ECU)**

(a) Use the Data List to check if the shift position signal is functioning properly.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Shift P Signal	Shift lever P position signal/ON or OFF	ON: Shift lever in P OFF: Shift lever not in P	-

OK:
ON (shift lever in P) and OFF (shift lever not in P) are displayed on the Techstream.

NG ▶ **CHECK SHIFT LOCK CONTROL ECU**

OK

9.	**READ VALUE USING TECHSTREAM (PARK/NEUTRAL POSITION SWITCH)**

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(a) Use the Data List to check if the park/neutral position switch is functioning properly.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Neutral SW/ Clutch SW	Park/neutral position switch/ON or OFF	ON: Shift lever in P or N OFF: Shift lever not in P or N	-

OK:
ON (shift lever in P or N) and OFF (shift lever not in P or N) are displayed on the Techstream.

NG ▶ **INSPECT STARTER RELAY (ST)**

OK ▼

10.	**READ VALUE USING TECHSTREAM (STOP LIGHT SWITCH)**

(a) Use the Data List to check if the stop light switch is functioning properly.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Stop Light SW	Stop light switch/ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	-

OK:
ON (brake pedal is depressed) and OFF (brake pedal is released) are displayed on the Techstream.

NG ▶ **GO TO LIGHTING SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)**

OK ▼

11.	**CHECK STEERING LOCK**

(a) Check if the steering lock is released when turning the engine switch on (ACC).

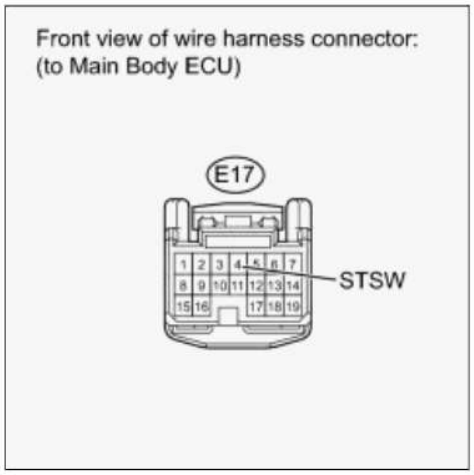
OK:
The steering lock is released.

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NG ▶ **GO TO STEERING LOCK SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)**

OK ▼

12.	**CHECK MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**



(a) Disconnect the E17 main body ECU connector.

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

HINT:

The voltage is generated at terminal STSW for 0.3 seconds when the engine cranks.

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-4 (STSW) - Body ground	Brake pedal depressed with shift lever in P or N and engine switch pushed once	11 to 14 V

NG ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

OK ▶ **REPLACE ECM**

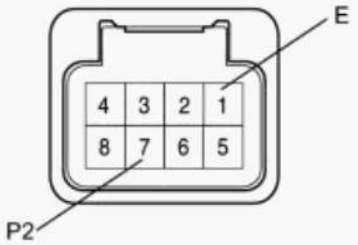
13.	**CHECK SHIFT LOCK CONTROL ECU**

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(a) Disconnect the E39 shift lock control ECU connector.

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

Component without harness connected:
(Shift Lock Control ECU)



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
7 (P2) - 1 (E)	Shift lever not in P	Below 1 Ω
7 (P2) - 1 (E)	Shift lever in P	10 kΩ or higher

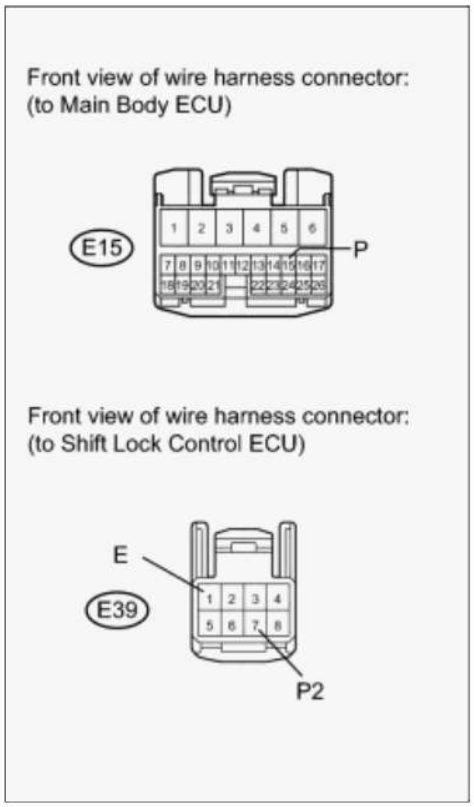
NG ▶ **REPLACE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY**

OK ▼

14.	**CHECK HARNESS AND CONNECTOR (SHIFT LOCK CONTROL ECU - MAIN BODY ECU AND BODY GROUND)**

(a) Disconnect the E15 main body ECU connector.

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(b) Disconnect the E39 shift lock control ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E15-15 (P) - E39-7 (P2)	Always	Below 1 Ω
E39-1 (E) - Body ground	Always	Below 1 Ω
E15-15 (P) or E39-7 (P2) - Body ground	Always	10 kΩ or higher

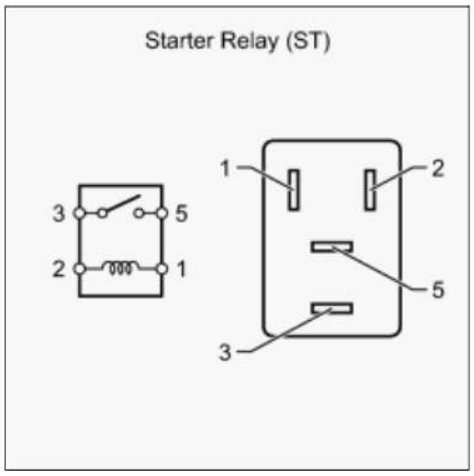
NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

15.	**INSPECT STARTER RELAY (ST)**

(a) Remove the starter relay from the engine room relay block.

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

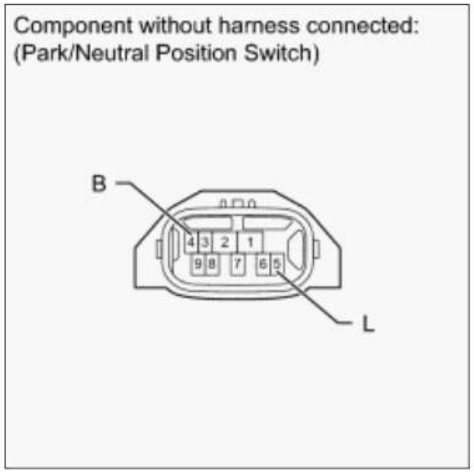
Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage applied to terminals 1 and 2	Below 1 Ω
3 - 5	Battery voltage not applied to terminals 1 and 2	10 kΩ or higher

NG ▶ **REPLACE STARTER RELAY**

OK ▼

16.	**INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**



(a) Disconnect the park/neutral position switch connector.

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

Standard Resistance:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
4 (B) - 5 (L)	P	Below 1 Ω
4 (B) - 5 (L)	N	Below 1 Ω
4 (B) - 5 (L)	Not in P or N	10 kΩ or higher

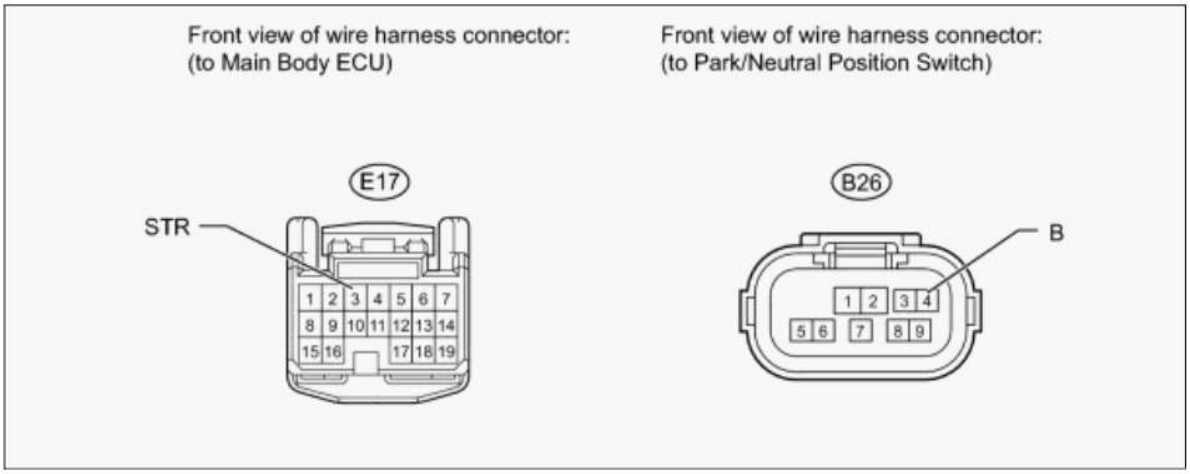
NG ▶ **REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

OK ▼

17.	**CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - PARK/NEUTRAL POSITION SWITCH)**

(a) Disconnect the E17 ECU connector.

(b) Disconnect the B26 switch connector.



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-3 (STR) - B26-4 (B)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E17-3 (STR) or B26-4 (B) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

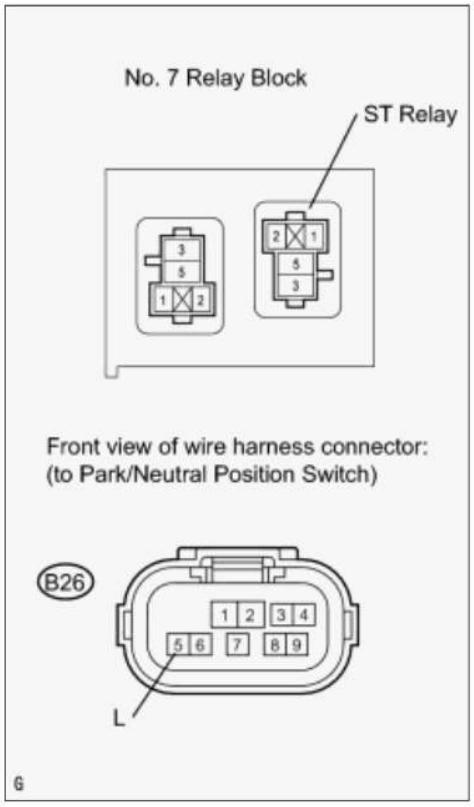
OK ▼

18.	**CHECK HARNESS AND CONNECTOR (STARTER RELAY - PARK/NEUTRAL POSITION SWITCH AND BODY GROUND)**

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
B26-5 (L) - Relay block ST relay terminal 1	Always	Below 1 Ω
B26-5 (L) or Relay block ST relay terminal 1 - Body ground	Always	10 kΩ or higher
Relay block ST relay terminal 2 - Body ground	Always	Below 1 Ω



NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

19.	**REPLACE STEERING LOCK ECU (STEERING LOCK ACTUATOR ASSEMBLY)**

(a) Replace the steering lock actuator assembly (steering lock ECU) INFO .

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(b) Register the recognition code (ECU code) INFO .

(c) Check that the engine starts.

OK:
Engine starts.

NG ▶ **REPLACE ID CODE BOX**

OK ▶ **END**

20.	REPLACE ECU AGGREGATION BOX ASSEMBLY (CERTIFICATION ECU)

(a) Replace the certification ECU INFO .

(b) Register the recognition code (ECU code) INFO .

(c) Check that the engine starts.

OK:
Engine starts.

NG ▶ **REPLACE ID CODE BOX**

OK ▶ **END**

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Last Modified: 9-7-2011	6.4 J	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YA206PX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: Engine Switch Indicator Circuit (2011 RAV4)		

Engine Switch Indicator Circuit

DESCRIPTION

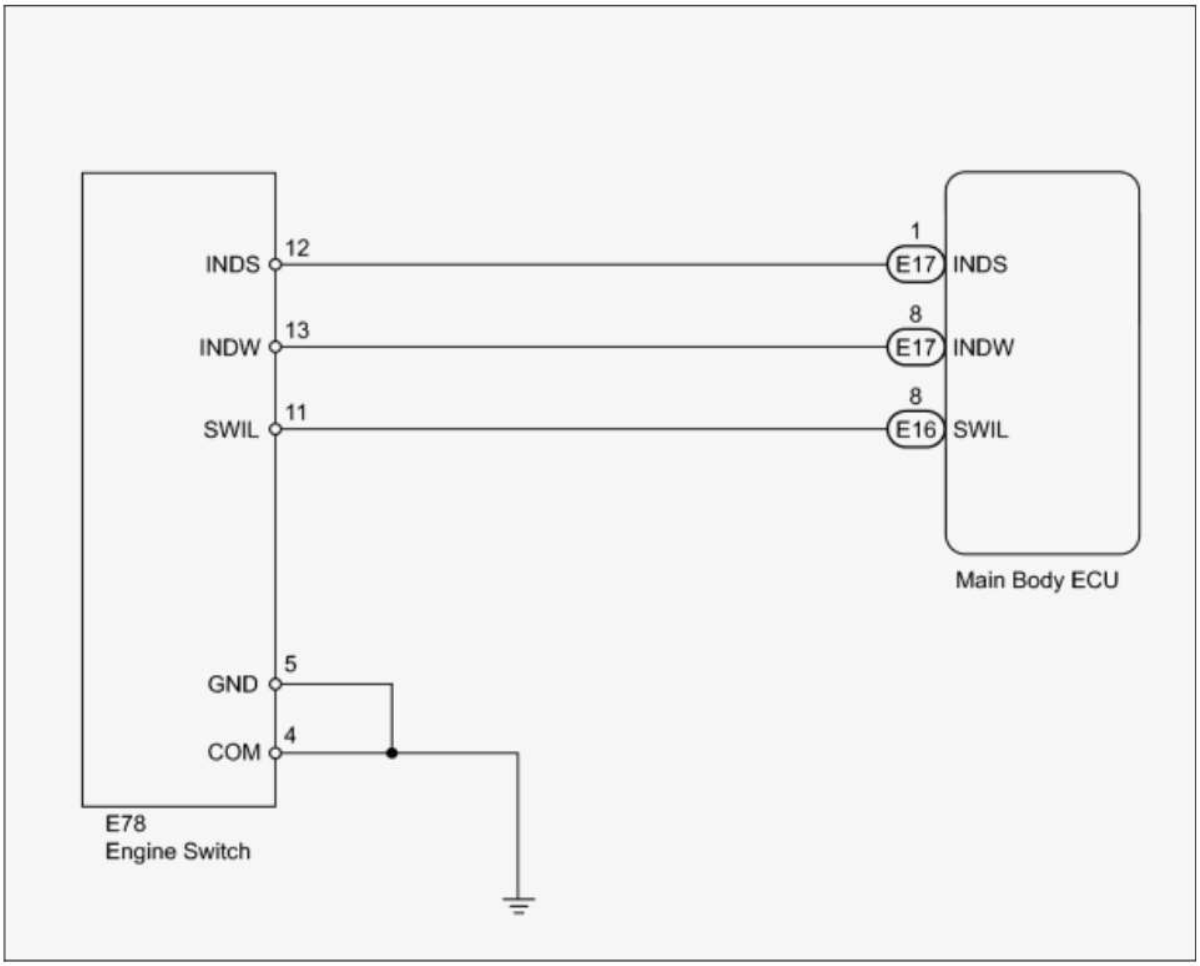
Engine start conditions or system malfunctions can be checked by observing the status of the engine switch indicator light.

Engine Switch Indicator Light Condition

POWER SOURCE MODE/CONDITION	INDICATOR LIGHT CONDITION	
	BRAKE PEDAL RELEASED	BRAKE PEDAL DEPRESSED AND SHIFT LEVER IN P OR N
Off	Off	Illuminates (green)
On (ACC) or on (IG)	Illuminates (amber)	Illuminates (green)
Engine running	Off	Off
Steering lock not unlocked	Flashes (green) for 15 seconds	Flashes (green) for 15 seconds
System malfunction	Flashes (amber) for 15 seconds	Flashes (amber) for 15 seconds
Stop light switch malfunction with shift lever in P or N	Flashes (green) for 15 seconds	Flashes (green) for 15 seconds

WIRING DIAGRAM

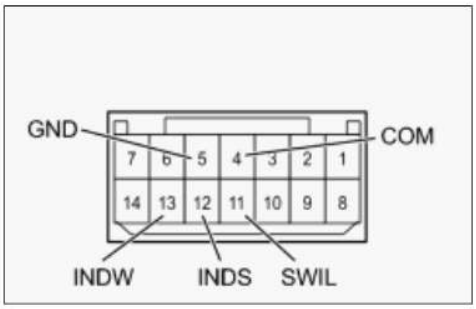
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INSPECTION PROCEDURE

PROCEDURE

1.	**INSPECT ENGINE SWITCH**



(a) Remove the engine switch INFO .

(b) Apply battery voltage to the switch and check the illumination condition of the engine switch indicator light.

NOTICE:

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- If the positive (+) lead and the negative (-) lead are incorrectly connected, the engine switch indicator light does not illuminate.
- If the voltage is too low, the indicator light does not illuminate.

OK:

MEASUREMENT CONDITION	CONDITION	SPECIFIED CONDITION
Battery terminal (+) → Terminal 11 (SWIL) Battery terminal (-) → Terminal 4 (COM) or 5 (GND)	Battery voltage is applied to the terminals	Illuminates
Battery terminal (+) → Terminal 12 (INDS) Battery terminal (-) → Terminal 4 (COM) or 5 (GND)	Battery voltage is applied to the terminals	Illuminates (green)
Battery terminal (+) → Terminal 13 (INDW) Battery terminal (-) → Terminal 4 (COM) or 5 (GND)	Battery voltage is applied to the terminals	Illuminates (amber)

NG ▶ **REPLACE ENGINE SWITCH**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (ENGINE SWITCH - MAIN BODY ECU AND BODY GROUND)**

(a) Disconnect the E78 engine switch connector.

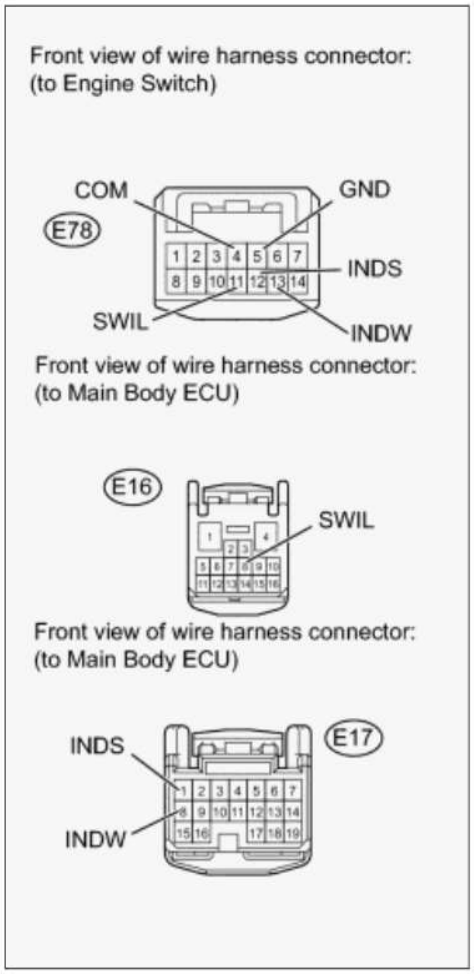
(b) Disconnect the E16 and E17 main body ECU connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E78-11 (SWIL) - E16-8 (SWIL)	Always	Below 1 Ω
E78-12 (INDS) - E17-1 (INDS)	Always	Below 1 Ω
E78-13 (INDW) - E17-8 (INDW)	Always	Below 1 Ω
E78-5 (GND) - Body ground	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E78-4 (COM) - Body ground	Always	Below 1 Ω
E78-11 (SWIL) or E16-8 (SWIL) - Body ground	Always	10 kΩ or higher
E78-12 (INDS) or E17-1 (INDS) - Body ground	Always	10 kΩ or higher
E78-13 (INDW) or E17-8 (INDW) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

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Last Modified: 9-7-2011	6.4 D	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YEF08UX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: HOW TO PROCEED WITH TROUBLESHOOTING (2011 RAV4)		

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use these procedures to troubleshoot the push-button start function.
- *: Use the Techstream.

1.	**VEHICLE BROUGHT TO WORKSHOP**

NEXT

2.	**INSPECT BATTERY VOLTAGE**

Standard voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

3.	**INSPECT COMMUNICATION FUNCTION OF CAN COMMUNICATION SYSTEM***

(a) Using the Techstream, check if the CAN communication system is functioning normally INFO .

Result

RESULT	PROCEED TO
CAN DTC is not output	A
CAN DTC is output	B

B INFO **GO TO DIAGNOSTIC TROUBLE CODE CHART**

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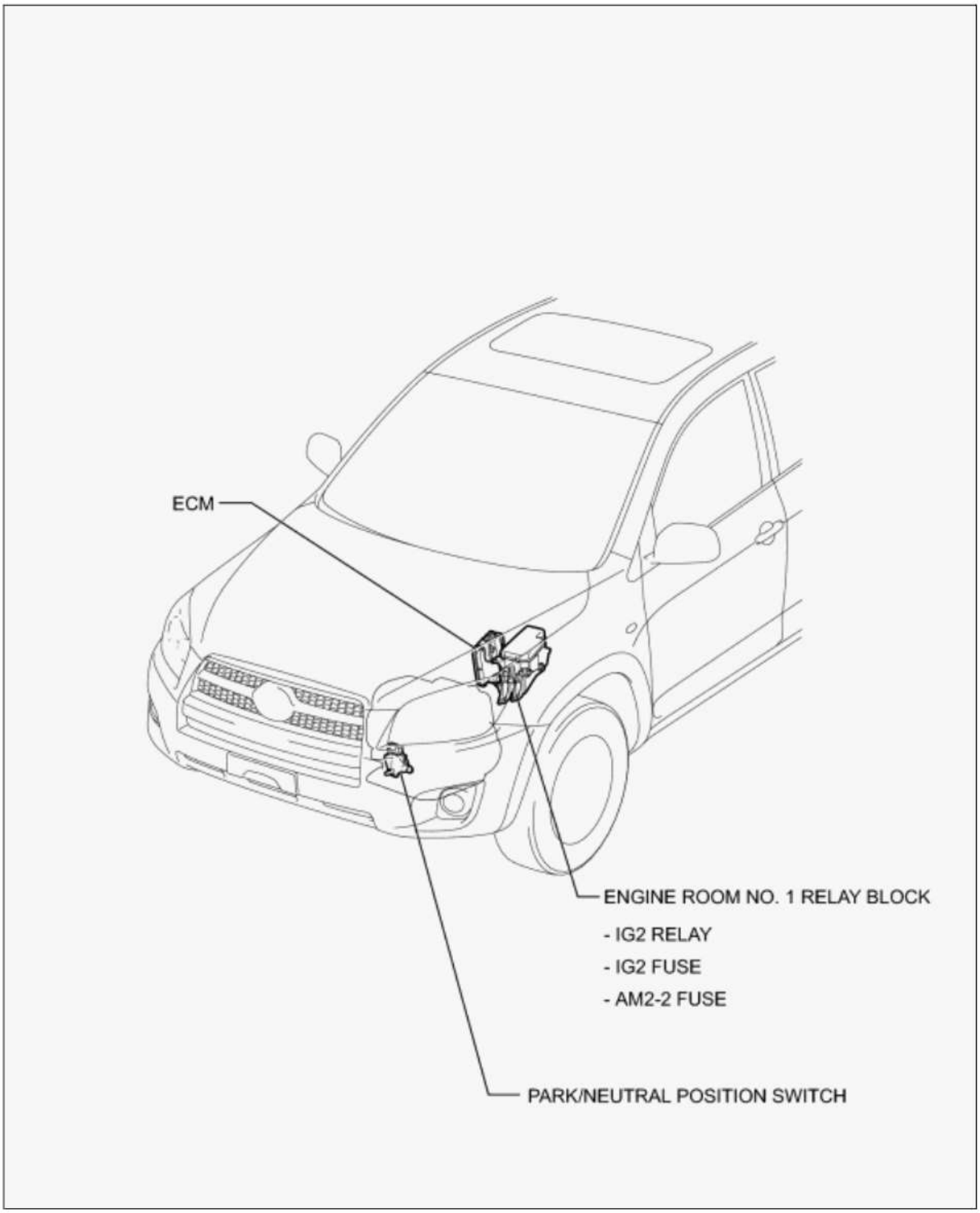
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Last Modified: 9-7-2011	6.4 R	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YEE05QX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: PARTS LOCATION (2011 RAV4)		

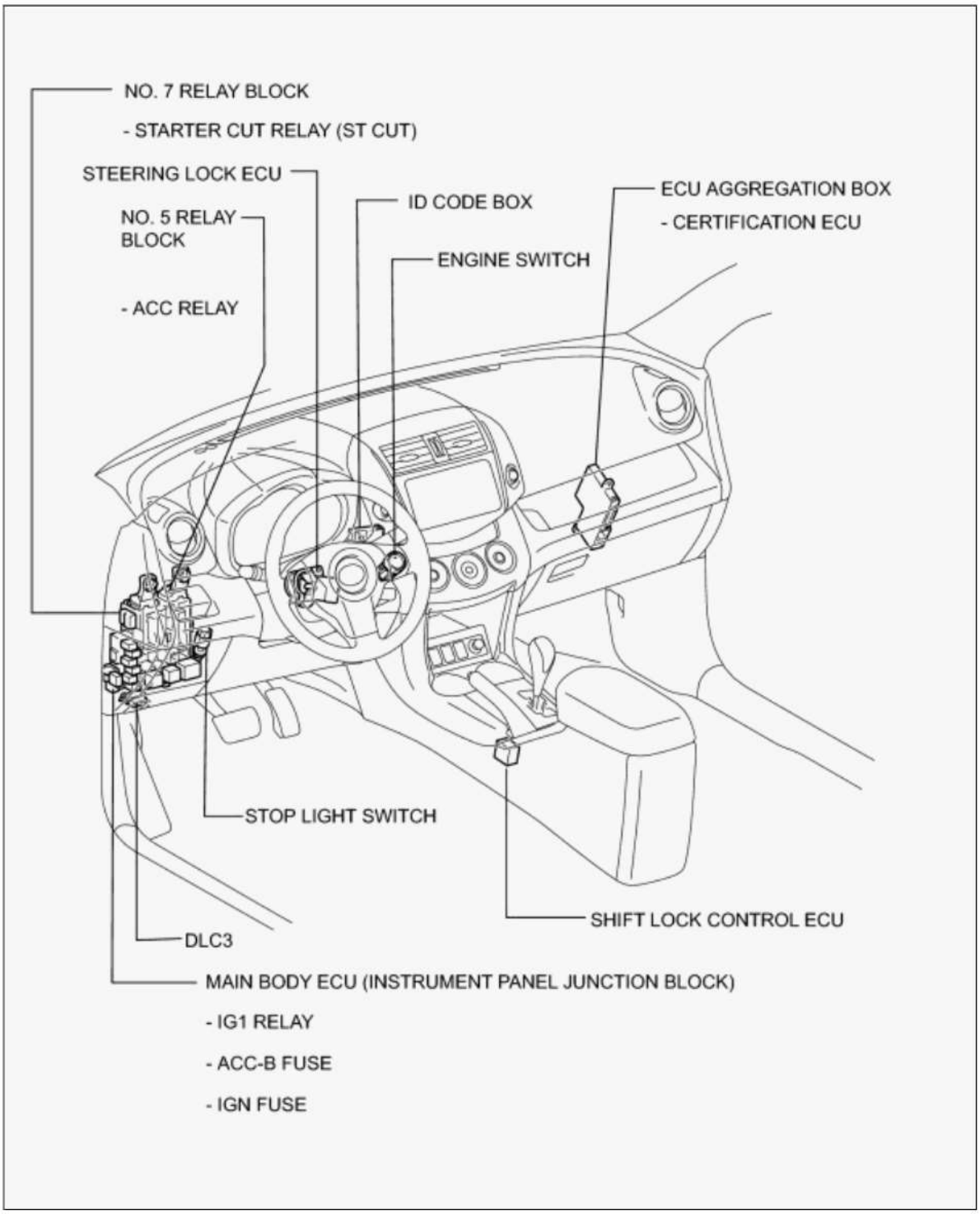
PARTS LOCATION

ILLUSTRATION



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ILLUSTRATION



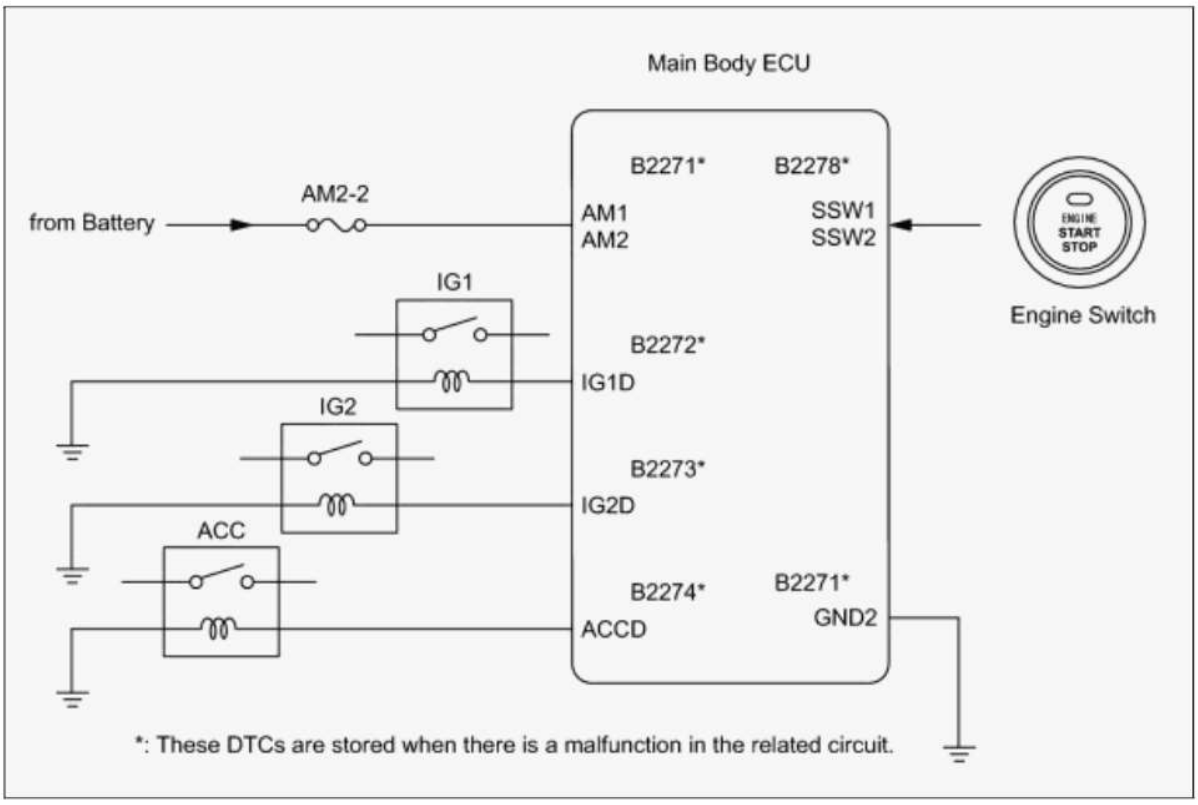
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Last Modified: 9-7-2011	6.4 J	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000Y7X021X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: Power Source Mode does not Change (2011 RAV4)		

Power Source Mode does not Change

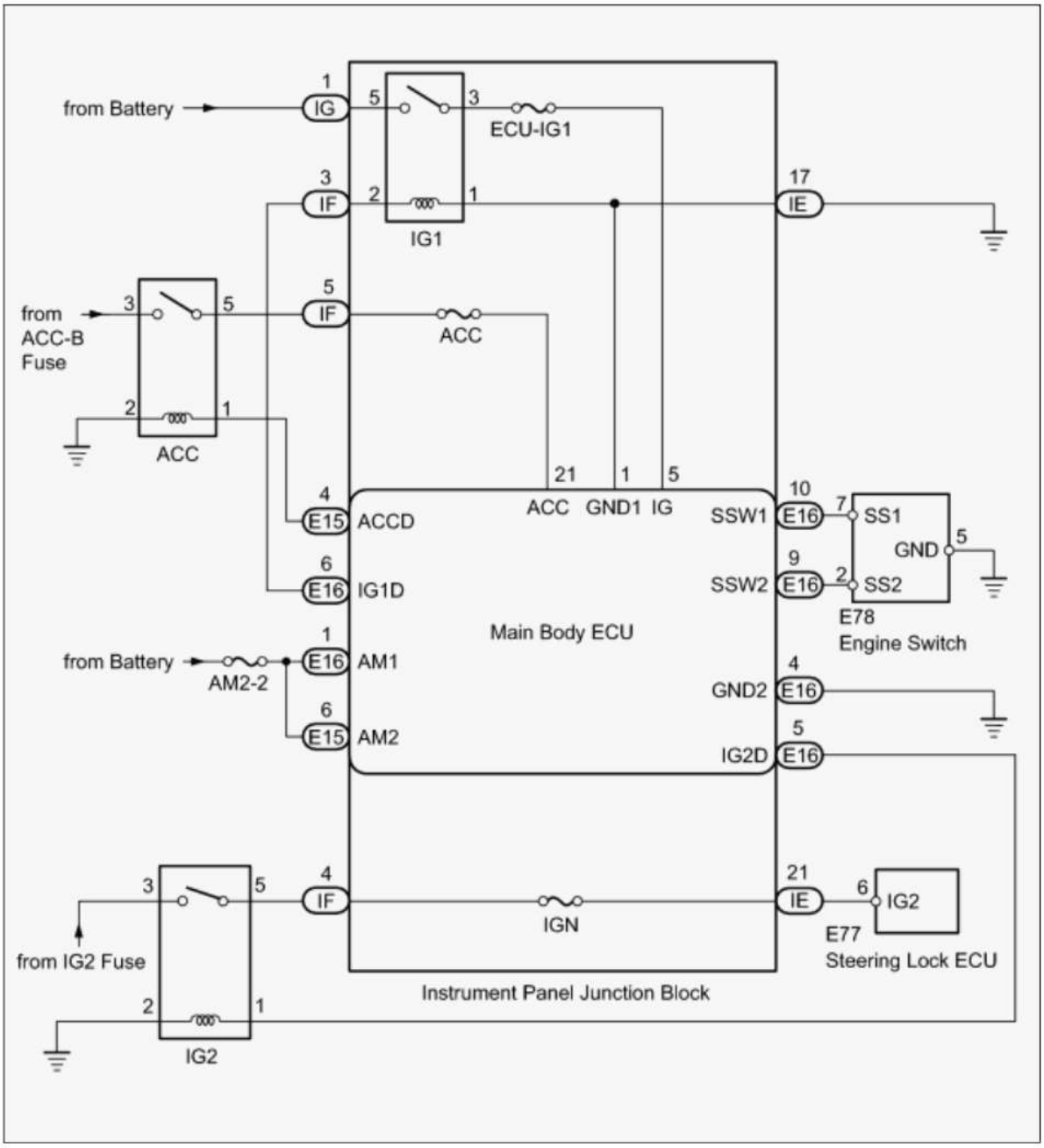
DESCRIPTION

When the certification ECU has detected the electrical key inside the cabin before the brake pedal is depressed, the power source mode can be changed in the following order sequentially by pressing the engine switch: off → on (ACC) → on (IG) → off.



WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

When one of the DTCs shown in the illustration above is detected, troubleshoot the DTC(s) by following the troubleshooting procedure relevant to the DTC(s). If the power source mode still cannot be changed normally, despite troubleshooting, one of the following may have occurred:

- The LIN communication line is malfunctioning.
- The certification ECU has determined that no key is inside the cabin.
- The engine switch is malfunctioning.
- The main body ECU is malfunctioning.

HINT:

If the vehicle is in key cancel mode, change to normal mode INFO .

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PROCEDURE

1.	**CHECK WHETHER DTC OUTPUT OCCURS**

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

HINT:

When it is impossible to turn the engine switch on (IG), connect the Techstream to the vehicle, and turn a courtesy light switch on and off at 1.5 second intervals until communication between the tester and vehicle begins.

(c) Enter the following menus: Body Electrical / Main Body / Trouble Codes.

(d) Clear the DTCs.

HINT:

After all DTCs are cleared, check if the trouble occurs again 5 seconds after the engine switch is turned on (IG).

(e) Check for DTCs again.

OK:
No DTC is output.

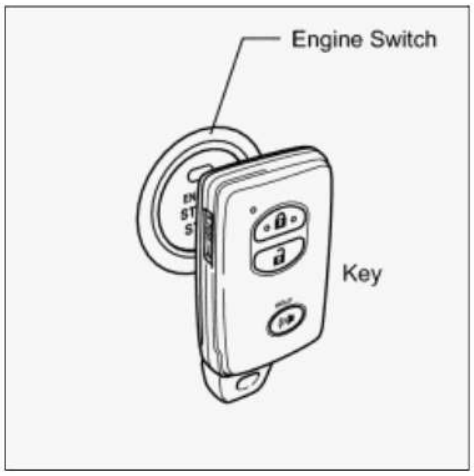
NG ▶ **GO TO DIAGNOSTIC TROUBLE CODE CHART**

OK ▼

2.	**CHECK SMART KEY SYSTEM**

(a) Remove the battery of the electrical key transmitter INFO .

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(b) With the brake pedal depressed, touch the TOYOTA mark of the key to the engine switch.

(c) When operating the engine switch, check whether the engine switch changes to on (ACC) or on (IG).

HINT:

- When the electrical key transmitter cannot be verified even when it is in the operational area, the engine start check can be performed by removing the transmitter battery from the electrical key transmitter and holding the transmitter against the engine switch.
- When performing the check, if the engine switch turns on (ACC) or on (IG), there is a problem with key certification inside the cabin.

Result

RESULT	PROCEED TO
Does not change to on (ACC) or on (IG)	A
Changes to on (ACC) and on (IG)	B

B ▶ **GO TO SMART KEY SYSTEM (FOR ENTRY FUNCTION) (ROOM OSCILLATOR DOES NOT RECOGNIZE KEY)**

A ▼

3.	**INSPECT FUSE (AM2-2)**

(a) Remove the AM2-2 fuse from the engine room No. 1 relay block.

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

Standard Resistance:

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
AM2-2 fuse	Always	Below 1 Ω

NG ▶ **REPLACE FUSE**

OK ▼

4.	READ VALUE USING TECHSTREAM (RELAY MONITOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the engine switch on (IG) and turn the Techstream on.

(c) Enter the following menus: Body Electrical / Main Body / Data List.

(d) Read the display on the Techstream.

Main Body

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
IG1 Relay Monitor(Inside)	IG1 relay inner relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
IG2 Relay Monitor(Inside)	IG2 relay inner relay monitor/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	-
ACC Relay Monitor	ACC relay monitor/ON or OFF	ON: Engine switch on (ACC) OFF: Engine switch off	-

OK:
When the engine switch is turned on (IG), IG1 Relay Monitor(Inside) is ON and IG2 Relay Monitor(Inside) is ON.
When the engine switch is turned on (ACC), ACC Relay Monitor is ON.

NG ▶ **INSPECT IG1 RELAY**

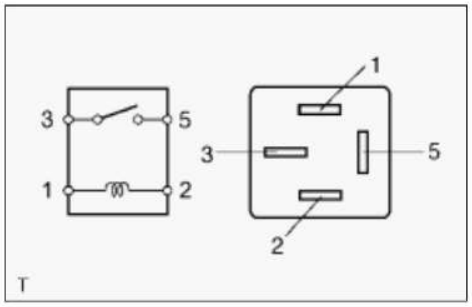
OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

5.	INSPECT IG1 RELAY

(a) Inspect the IG1 relay.

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(1) Remove the IG1 relay from the instrument panel junction block.



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is applied to terminals 1 and 2	Below 1 Ω
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher

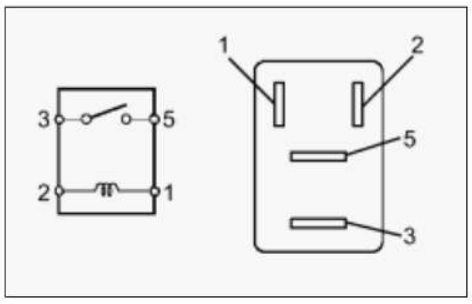
NG ▶ **REPLACE RELAY**

OK ▼

6.	**INSPECT IG2 RELAY**

(a) Inspect the IG2 relay.

(1) Remove the IG2 relay from the engine room No. 1 relay block.



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is applied to terminals 1 and 2	Below 1 Ω
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher

NG ▶ **REPLACE RELAY**

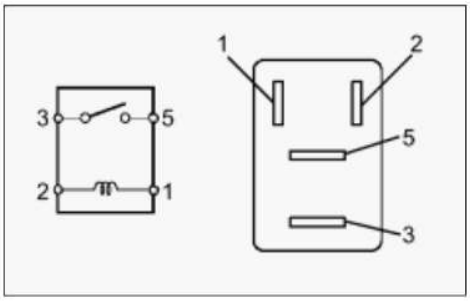
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OK

7.	**INSPECT ACC RELAY**

(a) Inspect the ACC relay.

(1) Remove the ACC relay from the engine room No. 5 relay block.



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is applied to terminals 1 and 2	Below 1 Ω
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher

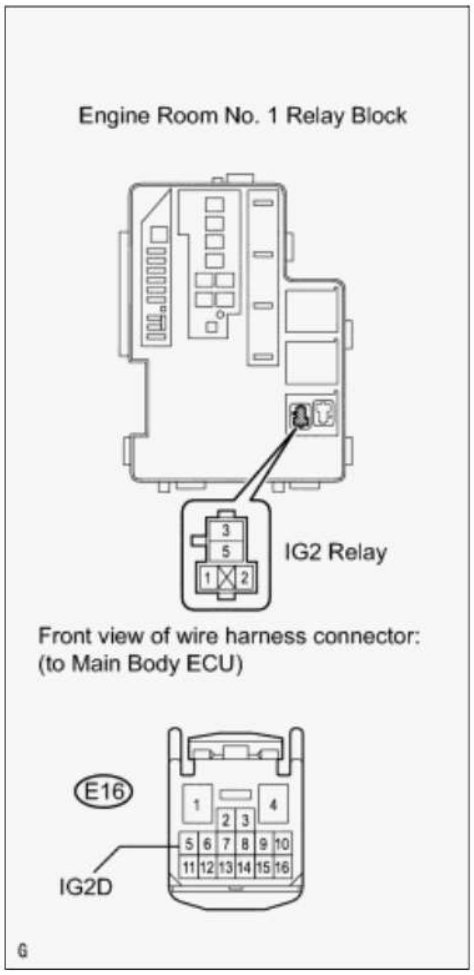
NG ▶ **REPLACE RELAY**

OK

8.	**CHECK HARNESS AND CONNECTOR (IG2 RELAY - MAIN BODY ECU)**

(a) Remove the IG2 relay from the engine room No. 1 relay block.

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(b) Disconnect the E16 main body ECU connector.

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

Standard Resistance:

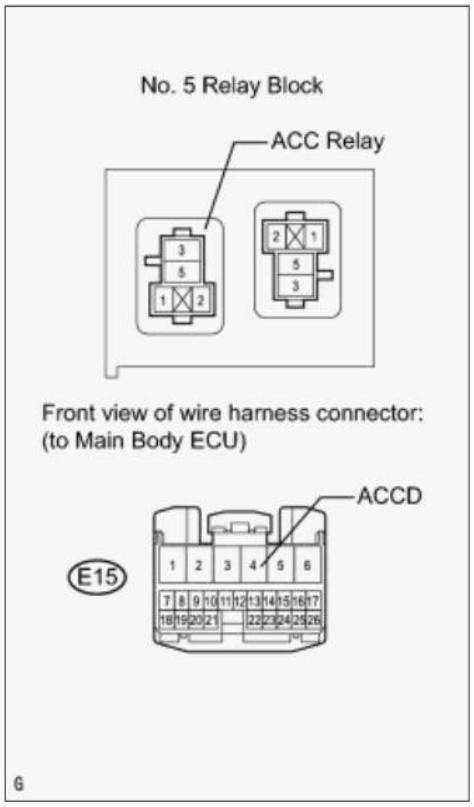
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Relay block IG2 relay terminal 1 - E16-5 (IG2D)	Always	Below 1 Ω
Relay block IG2 relay terminal 2 - Body ground	Always	Below 1 Ω
Relay block IG2 relay terminal 1 or E16-5 (IG2D) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

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9.	CHECK HARNESS AND CONNECTOR (ACC RELAY - MAIN BODY ECU)



(a) Remove the ACC relay from the No. 5 relay block.

(b) Disconnect the E15 main body ECU connector.

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

Standard Resistance:

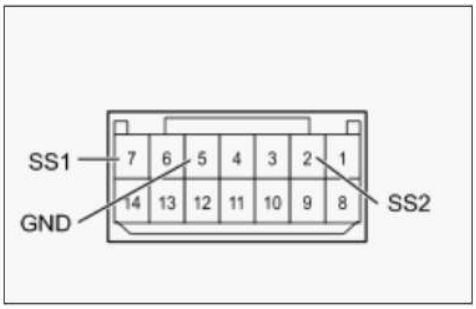
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Relay block ACC relay terminal 1 - E15-4 (ACCD)	Always	Below 1 Ω
Relay block ACC relay terminal 2 - Body ground	Always	Below 1 Ω
Relay block ACC relay terminal 1 or E15-4 (ACCD) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

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10.	INSPECT ENGINE SWITCH



(a) Remove the engine switch INFO .

(b) Measure the resistance of the switch.

Standard Resistance:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
7 (SS1) - 5 (GND)	Pushed	Below 1 Ω
2 (SS2) - 5 (GND)	Pushed	Below 1 Ω
7 (SS1) - 5 (GND)	Not pushed	10 kΩ or higher
2 (SS2) - 5 (GND)	Not pushed	10 kΩ or higher

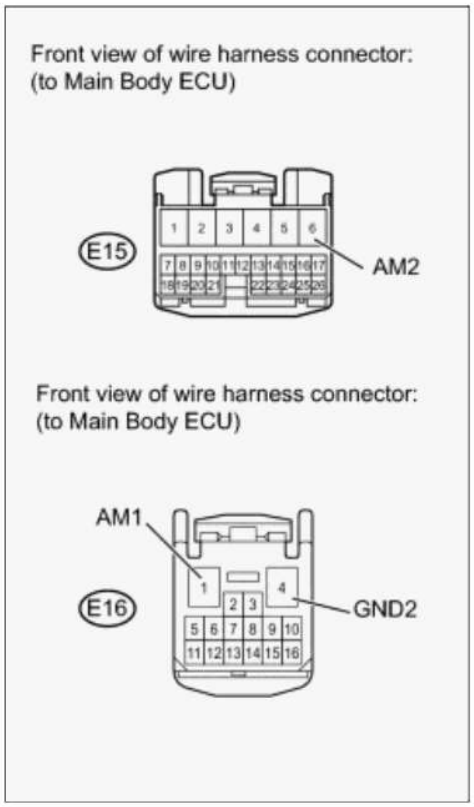
NG ▶ **REPLACE ENGINE SWITCH**

OK ▼

11.	CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - BATTERY AND BODY GROUND)

(a) Disconnect the E15 and E16 main body ECU connectors.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E16-1 (AM1) - Body ground	Always	11 to 14 V
E15-6 (AM2) - Body ground	Always	11 to 14 V

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E16-4 (GND2) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)**

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Last Modified: 9-7-2011	6.4 L	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YED087X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: PRECAUTION (2011 RAV4)		

PRECAUTION

1. PRECAUTIONS WHEN USING THE TECHSTREAM

(a) When using the Techstream to troubleshoot the LIN communication line: Connect the Techstream to the vehicle, and turn a courtesy light switch on and off at 1.5 second intervals until communication between the tester and vehicle begins.

(b) After all DTCs are cleared, check if the trouble occurs again 6 seconds after the engine switch is turned on (IG).

2. PRECAUTIONS FOR PUSH-BUTTON START FUNCTION

(a) Before starting the engine, firmly depress the brake pedal until the indicator of the engine switch lights up in green.

(b) The power source mode (off, on (ACC), on (IG)) is always stored in the vehicle. After the battery is disconnected and reconnected, the power source condition before battery disconnection will be restored. Be sure to turn the engine switch off before disconnecting the cable from the battery terminal. Be careful if the power source condition before the battery became depleted is not known.

(c) After the battery is disconnected and reconnected, be sure to wait 10 seconds or more before starting the engine. The engine may not start immediately after the battery is reconnected.

(d) When the key battery is depleted and the key is held close to the engine switch to start the engine, several warnings may sound. However, the warnings most likely sound because the vehicle cannot determine if the key is in the vehicle or not, and not because there is an actual malfunction. The following warnings may sound:

- Driver side door open → closed:

  - Warning to inform that the shift lever is in a position other than P, and the power source mode is not off.
  - Warning to inform that the shift lever is in P but the power source mode is not off.

- Door other than the driver side door open → closed:

  - Warning to inform that a passenger is carrying the key out of the vehicle.

3. PRECAUTION FOR CERTIFICATION ECU

NOTICE:

If the certification ECU and/or steering lock actuator assembly (steering lock ECU) is replaced, open and close the driver side door to record the current steering lock position in the certification ECU. If this is not performed, the engine may not start.

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Last Modified: 9-7-2011	6.4 T	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XI609PX
Title: 2AR-FE STARTING: SMART KEY SYSTEM: PROBLEM SYMPTOMS TABLE (2011 RAV4)		

PROBLEM SYMPTOMS TABLE

HINT:

Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.

Smart Key System

SYMPTOM	SUSPECTED AREA	SEE PAGE
Power Source Mode does not Change	Engine Switch Indicator Circuit	INFO
	Room Oscillator does not Recognize Key	INFO
	Engine switch	INFO
	ID code box	INFO
	Main body ECU	INFO
	Harness or connector	INFO
Engine does not Start	Push-button start function DTCs	INFO
	Power Source Mode does not Change	INFO
	Engine immobiliser system	INFO
	Steering lock system	INFO
	SFI system	INFO
	Engine switch	INFO
	Park/neutral position switch	INFO
	Stop light switch	INFO
	Main body ECU	INFO
	Harness or connector	INFO

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Last Modified: 9-7-2011	6.4 D	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XI3073X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: SYSTEM DESCRIPTION (2011 RAV4)		

SYSTEM DESCRIPTION

1. PUSH-BUTTON START DESCRIPTION

(a) The push-button start uses a push-type engine switch, which the driver can operate by merely carrying the key. This system consists primarily of the main body ECU, engine switch, ID code box, steering lock ECU, key, ACC relay, IG1 relay, IG2 relay and certification ECU. The main body ECU controls the system. This function operates in cooperation with the smart key system. The table below shows the transition of the engine switch state, which depends on whether the brake pedal is depressed or released.

(b) This system has different power source mode patterns depending on the brake pedal condition.

BRAKE PEDAL	POWER SOURCE MODE PATTERN
Not depressed, shift lever in P	Each time engine switch is pushed • off → on (ACC) → on (IG) → off
Not depressed	When engine switch is pushed in engine started condition • Engine started → off
Depressed, shift lever in P or N	When engine switch is pushed once • off → engine start
Depressed, shift lever in P or N	When engine switch is pushed in on (ACC) condition • on (ACC) → engine start
Depressed, shift lever in P or N	When engine switch is pushed in on (IG) condition • on (IG) → engine start
Depressed	When engine switch is pushed in engine started condition • Engine started → off

When the battery of the key is low, the push-button start function can be operated by holding the key against the engine switch.

2. FUNCTION OF COMPONENT

COMPONENT	FUNCTION
Engine Switch (Transponder Key Amplifier)	• Transmits the engine switch signal to the main body ECU. • Informs the driver of the power source mode or a system abnormality with the indicator light illumination. • Receives the ID code and transmits it to the certification ECU when the battery of the key is low.

3. SYSTEM FUNCTION

The electric controls of the push-button start function are described below:

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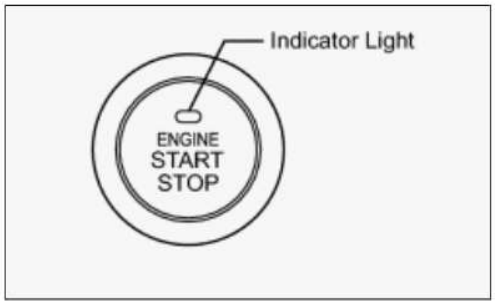
CONTROL	OUTLINE
Engine Switch Control	• When the driver operates the engine switch while in possession of the key, the certification ECU starts the indoor electrical key oscillator, which transmits a request signal to the key. Upon receiving this signal, the key transmits the ID code signal to the main body ECU. • The ID code box verifies the check results received from the certification ECU via the LIN line and sends them to the main body ECU. Based on these results, the main body ECU authorizes operation of the engine switch.
Diagnosis	• When the main body ECU detects a malfunction, the main body ECU diagnoses and memorizes the failed section.

4. CONSTRUCTION AND OPERATION

(a) Engine switch:

The engine switch consists of a momentary type switch, color (amber, green) LEDs and the transponder key amplifier.

- The amber LED is for illumination.
- The amber and green LEDs are for the indicator light. The driver can check the present power source mode and whether the engine can start or not by checking the illumination state of the indicator light.
- When the main body ECU detects an abnormality in the smart key system, it makes the amber indicator light flash. If the engine stops in this state, it might not be possible to restart it.



(b) Indicator light condition:

Engine Switch Indicator Light Condition

POWER SOURCE MODE/CONDITION	INDICATOR LIGHT CONDITION	
	BRAKE PEDAL RELEASED	BRAKE PEDAL DEPRESSED AND SHIFT LEVER IN P OR N
Off	Off	Illuminates (green)
On (ACC) or on (IG)	Illuminates (amber)	Illuminates (green)
Engine running	Off	Off
Steering lock locked	Flashes (green) for 30 seconds	Flashes (green) for 30 seconds

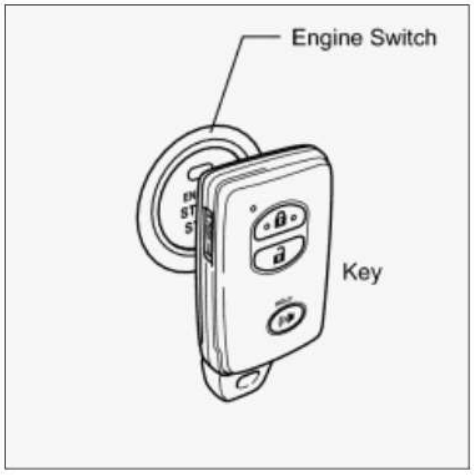
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System malfunction	Flashes (amber) for 15 seconds	Flashes (amber) for 15 seconds
Stop light switch malfunction with shift lever in P or N	Flashes (green) for 15 seconds	Flashes (green) for 15 seconds

(c) Main body ECU:

The main body ECU consists of the IG1 and IG2 relay actuation circuits and CPU.

5. WHEN KEY BATTERY IS LOW



(a) To operate the push-button start function when the key battery is low, touch the TOYOTA mark of the key to the engine switch while depressing the brake pedal with the shift lever in P or N.

(b) The main body ECU transmits a key verification request signal from the stop light switch to the certification ECU.

(c) The certification ECU does not receive an ID code response from the door control receiver, so it actuates the transponder key amplifier built into the engine switch.

(d) The transponder key amplifier outputs an engine immobiliser radio wave to the key.

(e) The key receives the radio wave, and returns a radio wave response to the transponder key amplifier.

(f) The transponder key amplifier combines the key ID codes with the radio wave response and transmits it to the certification ECU.

(g) The certification ECU judges and verifies the ID code, and transmits a key verification OK signal to the main body ECU. The buzzer in the combination meter sounds at the same time.

(h) After the buzzer sounds, with the shift lever in P or N, if the engine switch is pressed within 5 seconds with the brake pedal not depressed and the shift lever in P or N, the power source mode changes to on (ACC) or on (IG), which is the same as under normal operation.

6. DIAGNOSIS

The main body ECU can detect malfunctions in the push-button start function when the power source mode is on (IG).

When the ECU detects a malfunction, the amber indicator light of the engine switch flashes to warn the driver. At the same time, the ECU stores the 5-digit DTC (Diagnostic Trouble Code) in memory.

- The indicator light warning continues for 15 seconds even after the power source mode is changed to off.

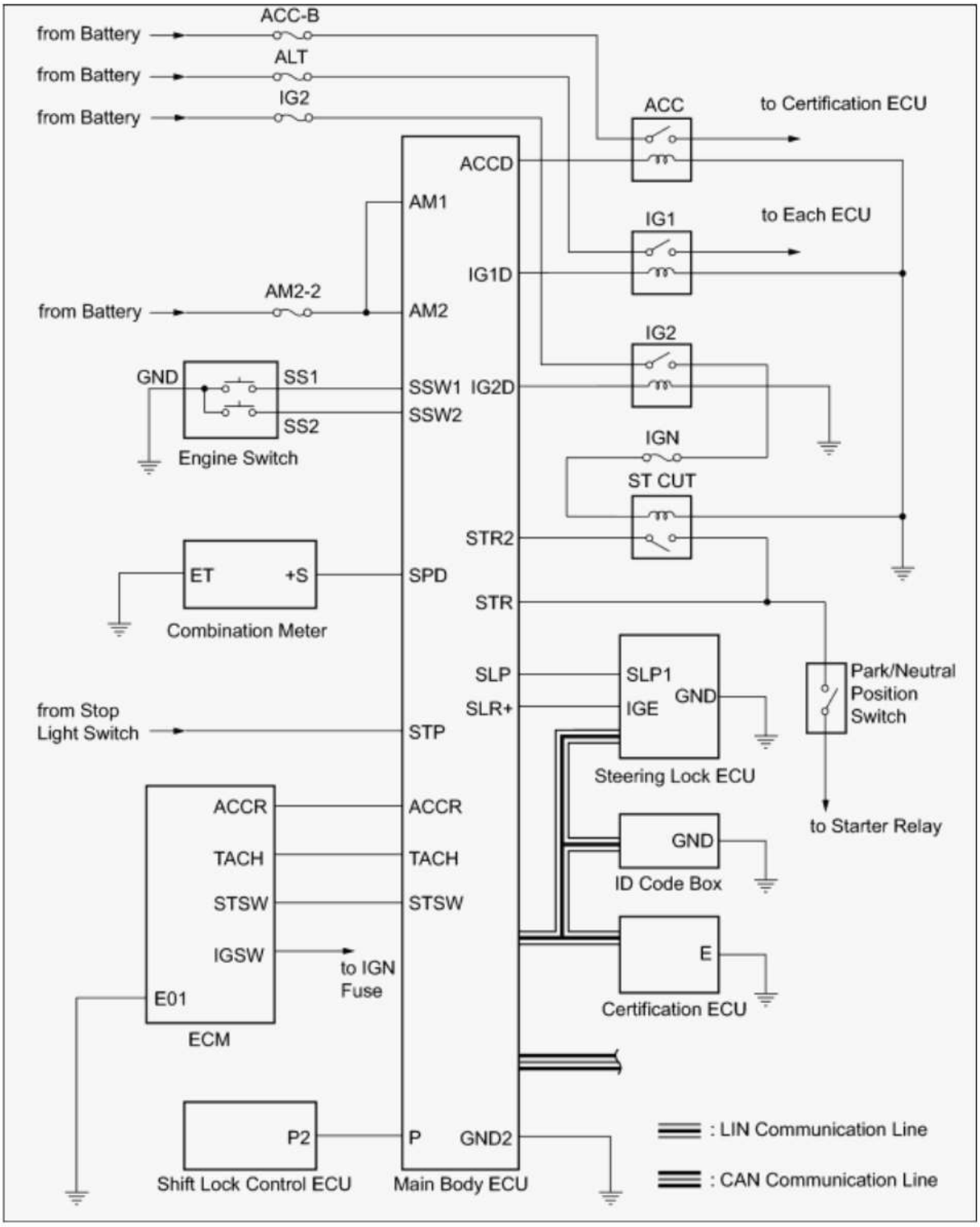
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- The DTCs can be checked by connecting the intelligent tester to the DLC3.
- The push-button start function cannot be operated if a malfunction occurs.

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Last Modified: 9-7-2011	6.4 U	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XI4067X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: SYSTEM DIAGRAM (2011 RAV4)		

SYSTEM DIAGRAM



Communication Table

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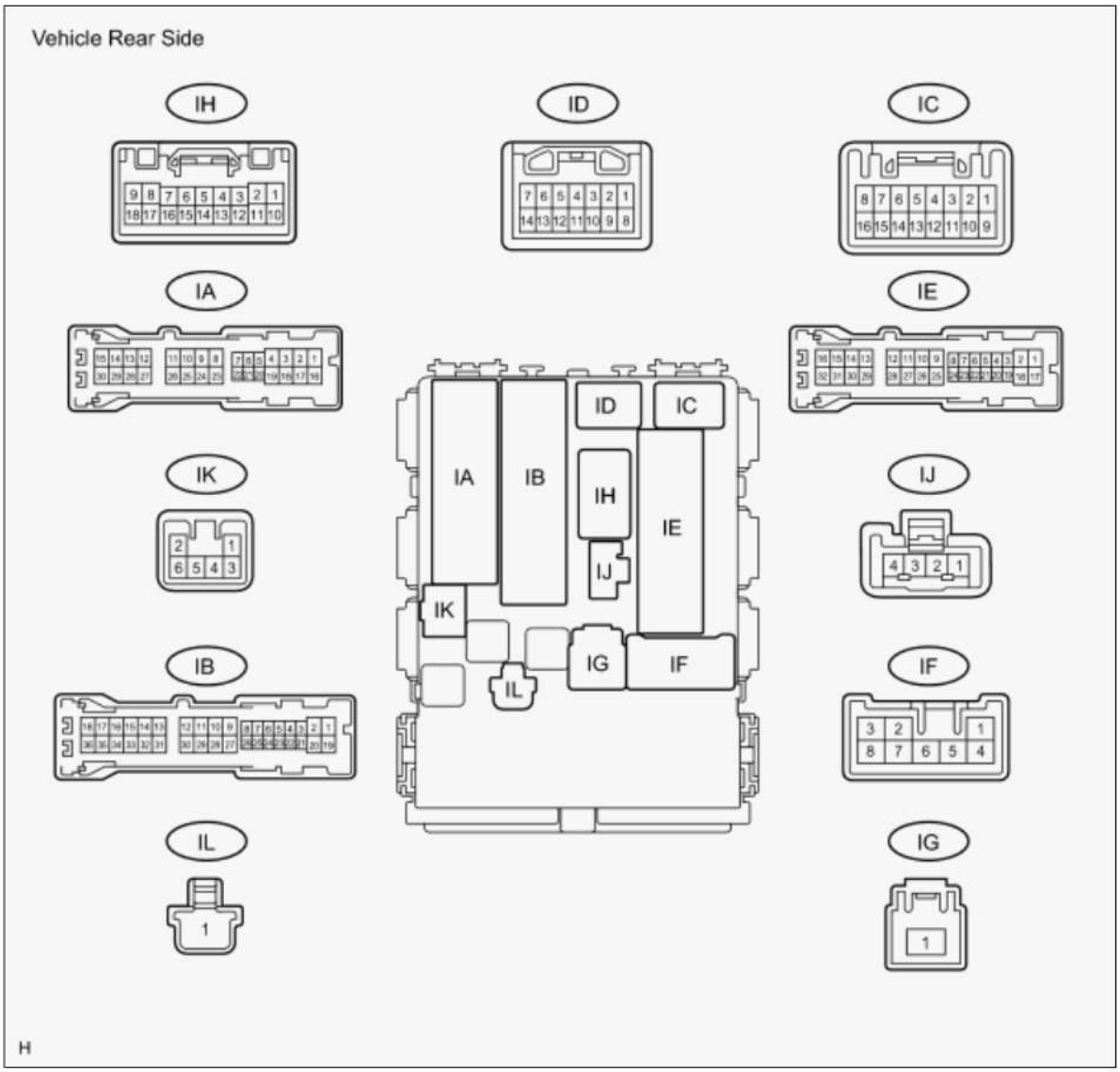
SENDER	RECEIVER	SIGNAL	LINE
ECM	Main body ECU	Engine speed signal	CAN
Combination meter	Main body ECU	Vehicle speed signal	CAN
Steering lock ECU	Main body ECU	Steering lock/unlock signal	LIN
Certification ECU	Main body ECU	LIN master signal	LIN
Main body ECU	ID code box	ID required signal	LIN
Main body ECU	Certification ECU	Key existence condition signal	LIN

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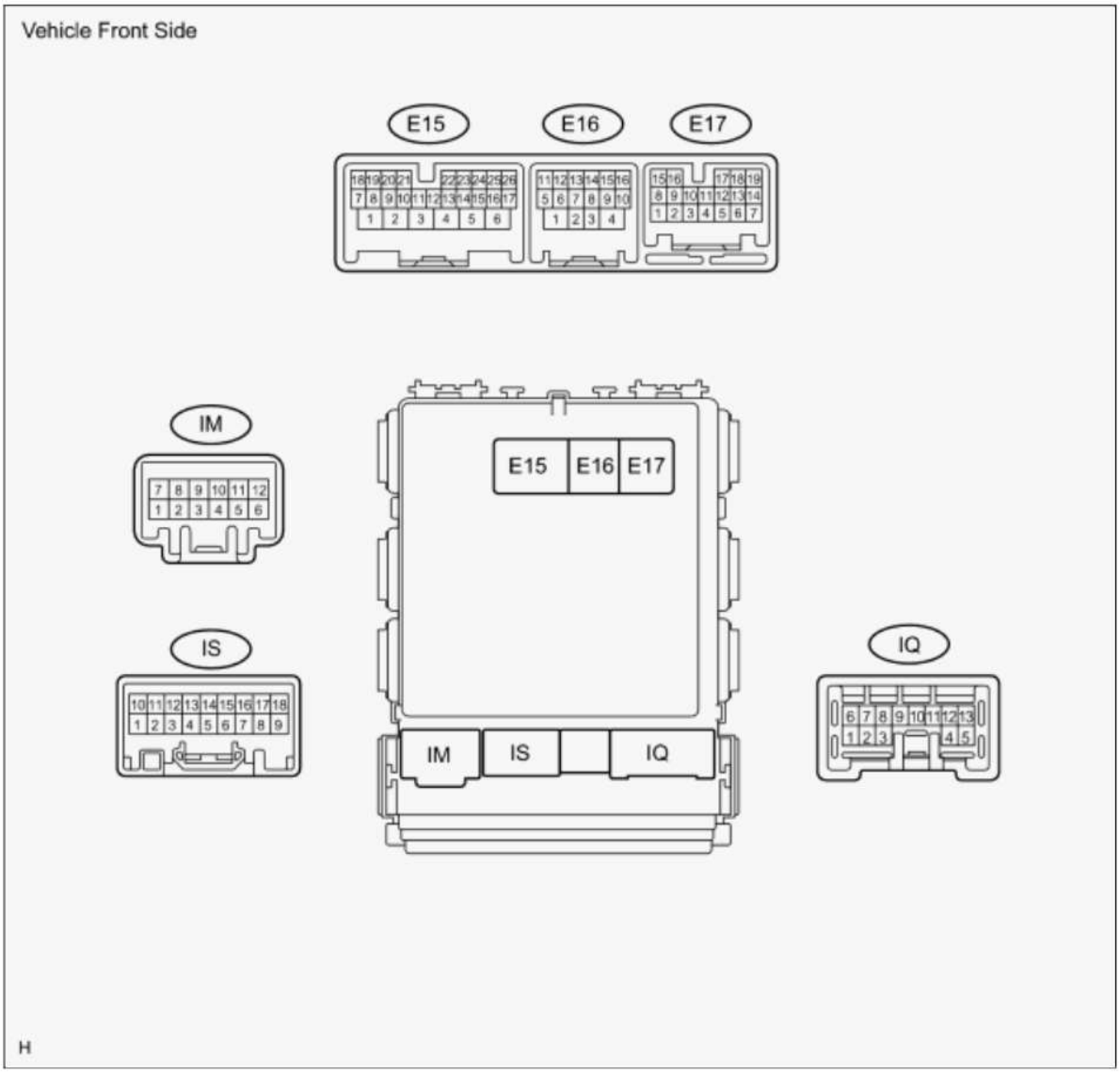
Last Modified: 9-7-2011	6.4 U	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000XI2075X
Title: 2AR-FE STARTING: SMART KEY SYSTEM: TERMINALS OF ECU (2011 RAV4)		

TERMINALS OF ECU

1. CHECK MAIN BODY ECU (INSTRUMENT PANEL JUNCTION BLOCK)



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(a) Disconnect the ID, IE, E15 and E16 junction block connectors.

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

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E16-1 (AM1) - Body ground	W - Body ground	+B power supply	Always	11 to 14 V
E15-6 (AM2) - Body ground	W - Body ground	+B power supply	Always	11 to 14 V
E16-10 (SSW1) - Body ground	W - Body ground	Engine switch signal	Engine switch pushed	Below 1 Ω
E16-10 (SSW1) - Body ground	W - Body ground	Engine switch signal	Engine switch not pushed	10 kΩ or higher
E16-9 (SSW2) - Body ground	B - Body ground	Engine switch signal	Engine switch pushed	Below 1 Ω

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E16-9 (SSW2) - Body ground	B - Body ground	Engine switch signal	Engine switch not pushed	10 kΩ or higher
IE-17 (GND1) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
E16-4 (GND2) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
ID-9 (LIN1) - Body ground	V - Body ground	LIN line	Always	10 kΩ or higher

If the result is not as specified, there may be a malfunction on the wire harness side.

(c) Reconnect the ID, IE, E15 and E16 junction block connectors.

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

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E15-4 (ACCD) - E16-4 (GND2)	R - W-B	ACC signal	Engine switch on (ACC)	11 to 14 V
E15-4 (ACCD) - E16-4 (GND2)	R - W-B	ACC signal	Engine switch off	Below 1 V
E16-5 (IG2D) - E16-4 (GND2)	W - W-B	IG2 signal	Engine switch on (IG)	11 to 14 V
E16-5 (IG2D) - E16-4 (GND2)	W - W-B	IG2 signal	Engine switch on (ACC)	Below 1 V
E15-7 (SLR+) - E16-4 (GND2)	Y - W-B	Steering lock motor signal	Steering lock motor operating	Below 1 V
E15-7 (SLR+) - E16-4 (GND2)	Y - W-B	Steering lock motor signal	Steering lock motor not operating	11 to 14 V
E15-18 (SLP) - E16-4 (GND2)	G - W-B	Steering lock actuator position signal	Steering lock locked	11 to 14 V
E15-18 (SLP) - E16-4 (GND2)	G - W-B	Steering lock actuator position signal	Steering lock released	Below 1 V
IC-8 (SPD) - E16-4 (GND2)	V - W-B	Speed signal from combination meter	Engine switch on (IG), Drive wheel rotating slowly	Pulse generation (see waveform 1)
E17-2 (TACH) - E16-4 (GND2)	GR - W-B	Tachometer signal	Engine running	Pulse generation (see waveform 2)

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E17-4 (STSW) - E16-4 (GND2)	R - W-B	Starter activation request signal	Brake pedal depressed with shift lever in P or N, engine switch pushed once	11 to 14 V*
E17-3 (STR) - E16-4 (GND2)	W - W-B	Park/neutral position switch	Shift lever in P or N	Below 1 V
E17-14 (STR2) - E16-4 (GND2)	W - W-B	Starter signal	Brake pedal depressed with shift lever in P or N, engine switch pushed once	11 to 14 V*
E17-1 (INDS) - E16-4 (GND2)	R - W-B	Vehicle condition signal	Brake pedal depressed with shift lever in P or N, engine switch off, on (ACC) or on (IG)	11 to 14 V
E17-8 (INDW) - E16-4 (GND2)	Y - W-B	Vehicle condition signal	Brake pedal released with shift lever in P or N, engine switch off, on (ACC) or on (IG)	11 to 14 V
E16-8 (SWIL) - E16-4 (GND2)	G - W-B	Illumination signal	Light control switch TAIL or HEAD	11 to 14 V
E15-14 (STP) - E16-4 (GND2)	L - W-B	Stop light switch signal	Brake pedal depressed	11 to 14 V

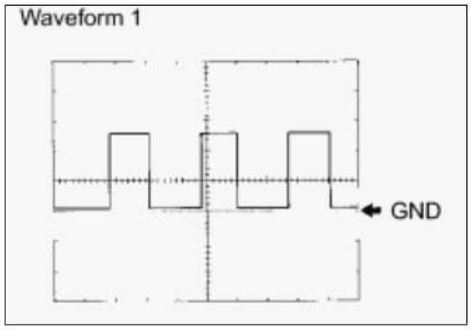
HINT:

***: Voltage is output for 0.3 seconds before the engine is started.**

If the result is not as specified, the ECU may have a malfunction.

(e) Using an oscilloscope, check waveform 1.

Waveform 1 (Reference)



ITEM	CONTENT
Terminal No. (Symbol)	IC-8 (SPD) - E16-4 (GND2)
Tool Setting	5 V/DIV., 10 msec./DIV.
Condition	Driving at approx. 20 km/h (12 mph)

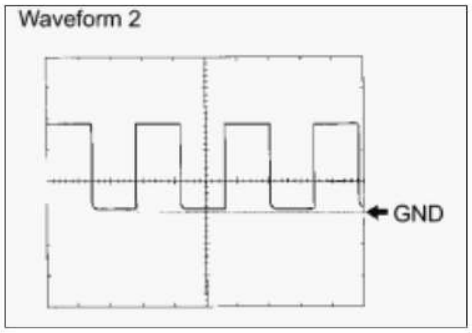
HINT:

As the vehicle speed increases, the wavelength shortens.

(f) Using an oscilloscope, check waveform 2.

Waveform 2 (Reference)

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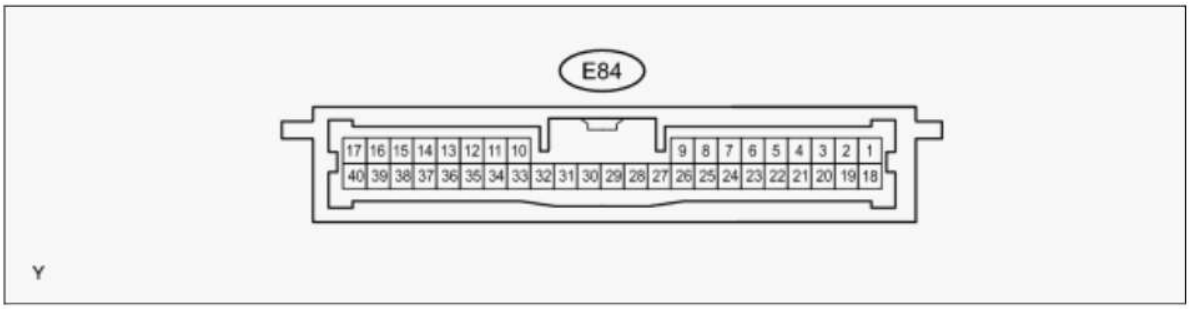


ITEM	CONTENT
Terminal No. (Symbol)	E17-2 (TACH) - E16-4 (GND2)
Tool Setting	5 V/DIV., 10 msec./DIV.
Condition	Engine idling

HINT:

As the engine speed increases, the wavelength shortens.

2. CHECK CERTIFICATION ECU



(a) Disconnect the E84 ECU connector.

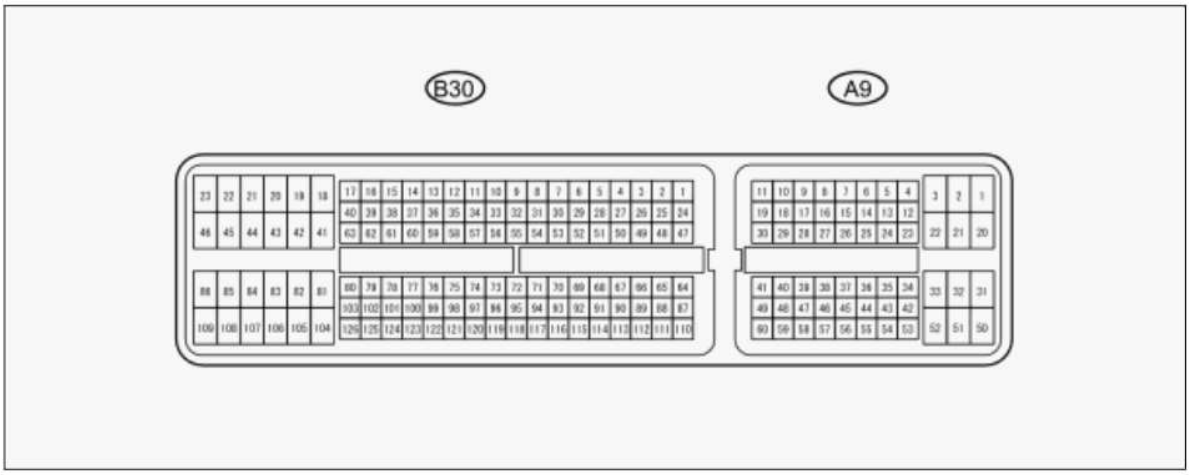
(b) Measure the voltage and resistance according to the value(s) in the table below.

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E84-1 (+B1) - Body ground	R - Body ground	+B power supply	Always	11 to 14 V
E84-18 (IG) - Body ground	B - Body ground	Ignition power supply	Engine switch on (IG)	11 to 14 V
E84-18 (IG) - Body ground	B - Body ground	Ignition power supply	Engine switch off	Below 1 V
E84-10 (LIN) - Body ground	V - Body ground	LIN line	Always	10 kΩ or higher
E84-17 (E) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω

If the result is not as specified, there may be a malfunction on the wire harness side.

3. CHECK ECM

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(a) Disconnect the A9 and B30 ECM connectors.

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

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
A9-20 (BATT) - B30-104 (E1)	W - BR	Battery (for measuring battery voltage and for ECM memory)	Always	11 to 14 V
A9-2 (+B) - B30-104 (E1)	B - BR	Power source of ECM	Engine switch on (IG)	11 to 14 V
A9-1 (+B2) - B30-104 (E1)	B - BR	Power source of ECM	Engine switch on (IG)	11 to 14 V
A9-28 (IGSW) - B30-104 (E1)	B - BR	Engine switch signal	Engine switch on (IG)	11 to 14 V
B30-104 (E1) - Body ground	BR - Body ground	Ground	Always	Below 1 Ω
B30-81 (E02) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
B30-46 (E04) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
B30-109 (E01) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω

If the result is not as specified, there may be a malfunction on the wire harness side.

(c) Reconnect the A9 and B30 ECM connectors.

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

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
A9-48 (STA) - B30-104 (E1)	LG - BR	Starter relay operation signal	Cranking	5.5 V or more

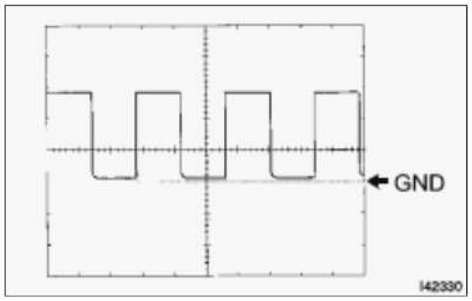
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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
B30-2 (ACCR) - B30-104 (E1)	LG - BR	ACC relay cut signal (output)	Engine switch on (IG) → Cranking	11 to 14 V → Below 1 V
A9-26 (TACH) - B30-104 (E1)	GR - BR	Engine speed signal (output)	Idling	Pulse generation (see waveform 1)
B30-17 (STAR) - B30-104 (E1)	W - BR	Starter relay drive signal	Cranking	11 to 14 V

If the result is not as specified, the ECM may have a malfunction.

(e) Using an oscilloscope, check waveform 1.

(1) Waveform 1 (Reference)

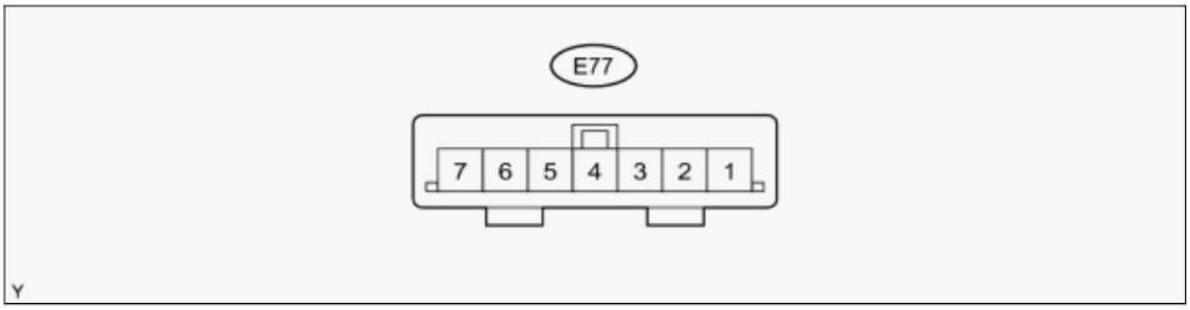


ITEM	CONTENT
Terminal No. (Symbol)	A9-26 (TACH) - B30-104 (E1)
Tool Setting	5 V/DIV., 10 msec./DIV.
Condition	Engine idling

HINT:

As the engine speed increases, the wavelength shortens.

4. CHECK STEERING LOCK ECU



(a) Disconnect the E77 ECU connector.

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

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E77-7 (B) - Body ground	L - Body ground	+B power supply	Always	11 to 14 V
E77-6 (IG2) - Body ground	B - Body ground	Ignition power supply	Engine switch on (IG)	11 to 14 V

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E77-6 (IG2) - Body ground	B - Body ground	Ignition power supply	Engine switch off	Below 1 V
E77-1 (GND) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
E77-2 (SGND) - Body ground	BR - Body ground	Ground	Always	Below 1 Ω

- If the result is not as specified, there may be a malfunction on the wire harness side.

(c) Reconnect the E77 ECU connector.

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

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E77-4 (SLP1) - E77-1 (GND)	G - W-B	Steering lock actuator position signal	Steering lock locked	11 to 14 V
E77-4 (SLP1) - E77-1 (GND)	G - W-B	Steering lock actuator position signal	Steering lock released	Below 1 V

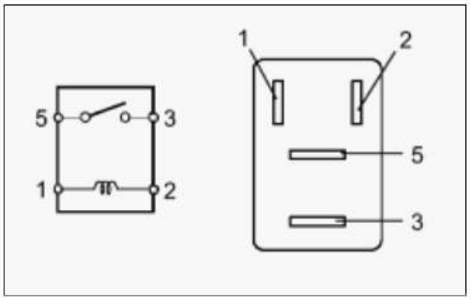
- If the result is not as specified, the ECU may have a malfunction.

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Last Modified: 9-7-2011	6.4 G	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000003QAH004X
Title: 2AR-FE STARTING: STARTER CUT RELAY: ON-VEHICLE INSPECTION (2011 RAV4)		

ON-VEHICLE INSPECTION

1. INSPECT STARTER CUT RELAY (ST CUT)



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage not applied to terminals 1 and 2	10 kΩ or higher
	Battery voltage applied to terminals 1 and 2	Below 1 Ω

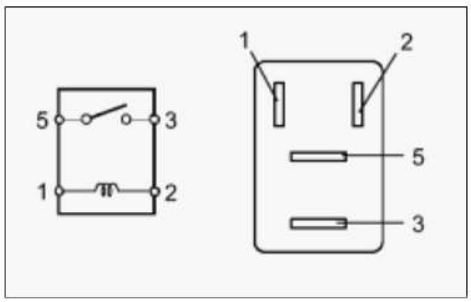
If the result is not as specified, replace the relay.

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Last Modified: 9-7-2011	6.4 G	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000001FFP024X
Title: 2AR-FE STARTING: STARTER RELAY: ON-VEHICLE INSPECTION (2011 RAV4)		

ON-VEHICLE INSPECTION

1. INSPECT STARTER RELAY (ST)



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage not applied to terminals 1 and 2	10 kΩ or higher
	Battery voltage applied to terminals 1 and 2	Below 1 Ω

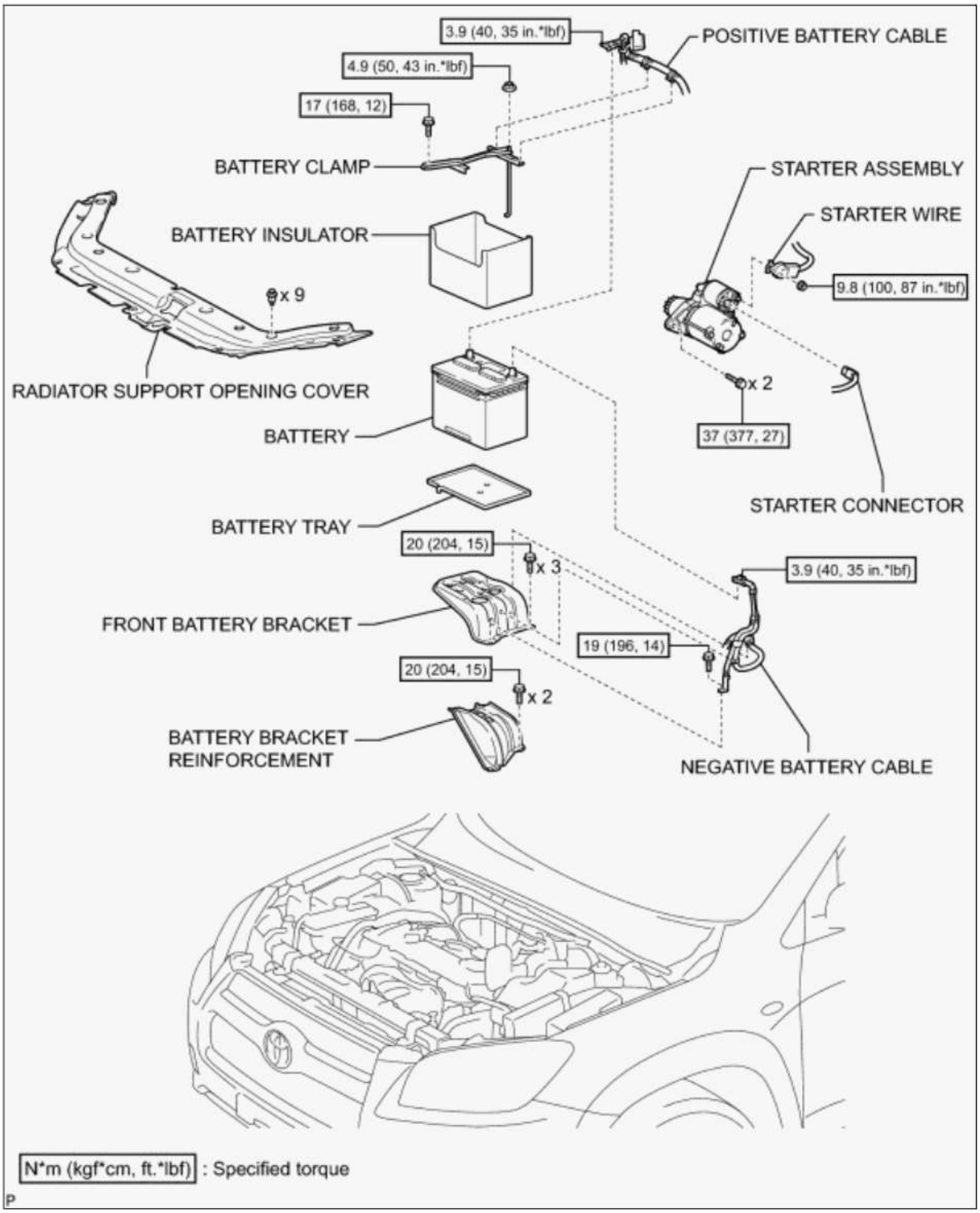
If the result is not as specified, replace the relay.

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Last Modified: 9-7-2011	6.4 K	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YQ301FX
Title: 2AR-FE STARTING: STARTER: COMPONENTS (2011 RAV4)		

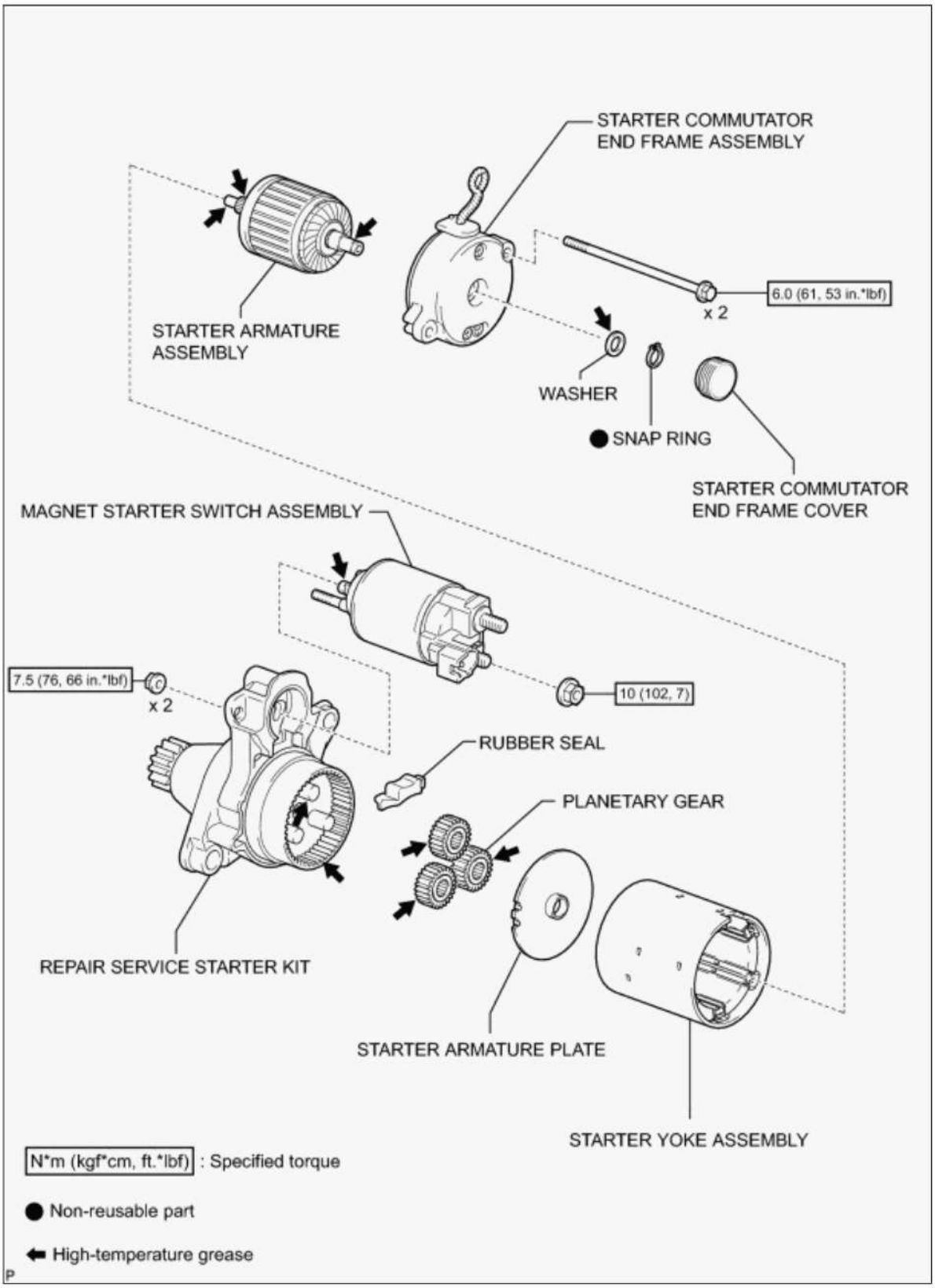
COMPONENTS

ILLUSTRATION



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ILLUSTRATION

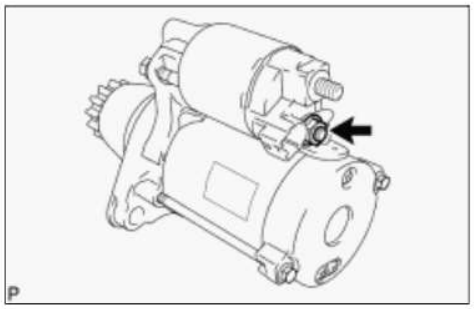


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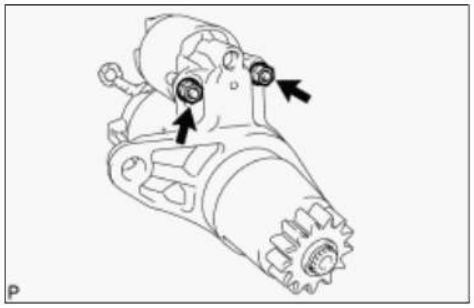
Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YQ5028X
Title: 2AR-FE STARTING: STARTER: DISASSEMBLY (2011 RAV4)		

DISASSEMBLY

1. REMOVE MAGNET STARTER SWITCH ASSEMBLY



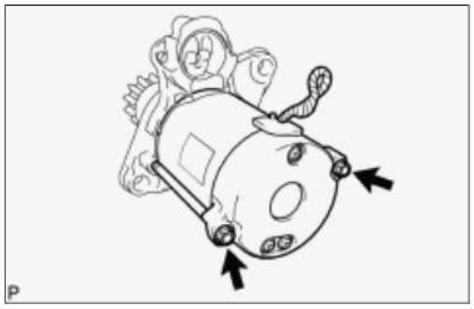
(a) Remove the nut and disconnect the lead wire from the magnet starter switch.



(b) Remove the 2 nuts holding the magnet starter switch to the repair service starter kit.

(c) Remove the magnet starter switch.

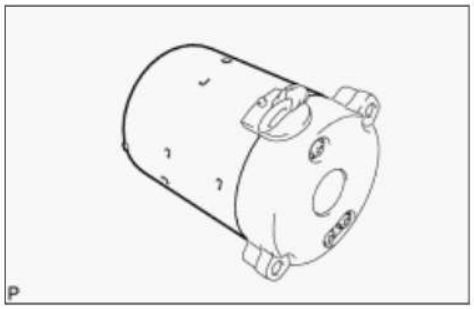
2. REMOVE STARTER YOKE ASSEMBLY



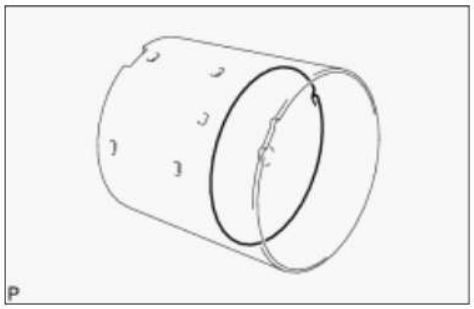
(a) Remove the 2 through-bolts, and pull out the starter yoke together with the starter commutator end frame.

(b) Remove the starter yoke from the starter commutator end frame.

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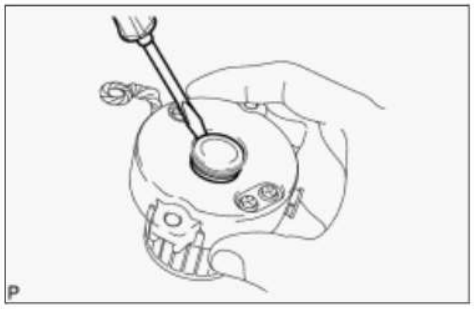


3. REMOVE STARTER ARMATURE PLATE



(a) Remove the starter armature plate from the starter yoke.

4. REMOVE STARTER COMMUTATOR END FRAME COVER

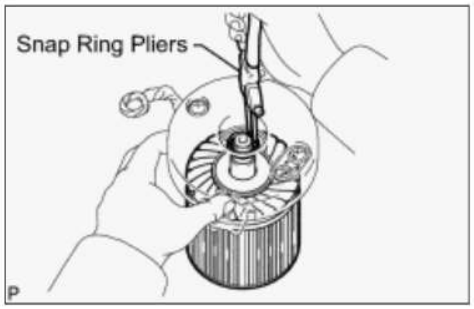


(a) Using a screwdriver, pry out the starter commutator end frame cover to remove it.

5. REMOVE STARTER ARMATURE ASSEMBLY

(a) Using snap ring pliers, remove the snap ring and washer.

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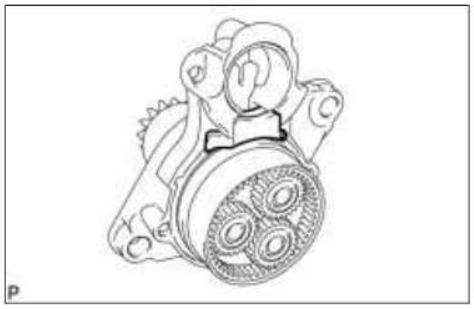


(b) Remove the starter armature from the starter commutator end frame.

NOTICE:

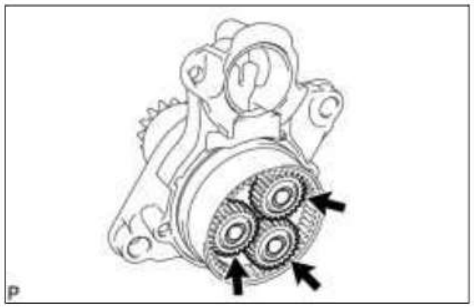
Do not drop the starter armature.

6. REMOVE RUBBER SEAL



(a) Remove the rubber seal from the repair service starter kit.

7. REMOVE PLANETARY GEAR



(a) Remove the 3 planetary gears from the repair service starter kit.

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Last Modified: 9-7-2011	6.4 G	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YQ2025X
Title: 2AR-FE STARTING: STARTER: INSPECTION (2011 RAV4)		

INSPECTION

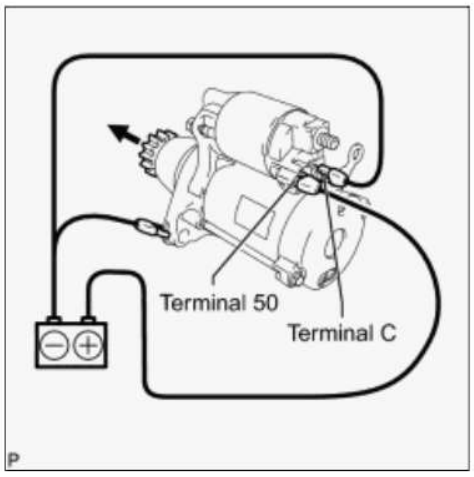
1. INSPECT STARTER ASSEMBLY

NOTICE:

These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

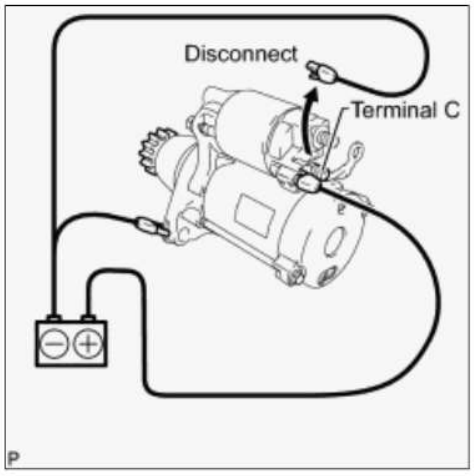
(a) Perform the pull-in test.

(1) Disconnect the lead wire from terminal C.



(2) Connect the battery to the magnet starter switch as shown in the illustration. Check that the clutch pinion gear extends.

If the clutch pinion gear does not move, replace the magnet starter switch assembly.



(b) Perform the holding test.

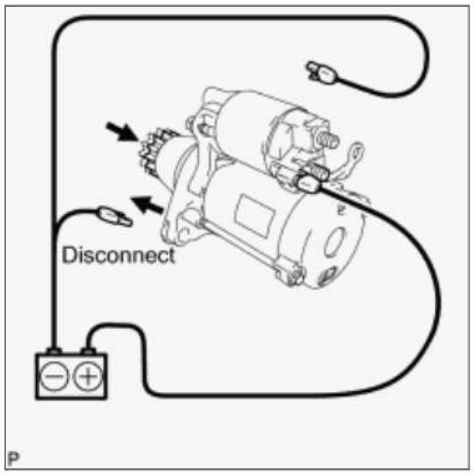
(1) Maintain the battery connections of the pull-in test above, but disconnect the negative (-) lead from terminal C. Check that the pinion gear remains extended.

If the clutch pinion gear returns inward, replace the magnet starter switch assembly.

(c) Check the clutch pinion gear return.

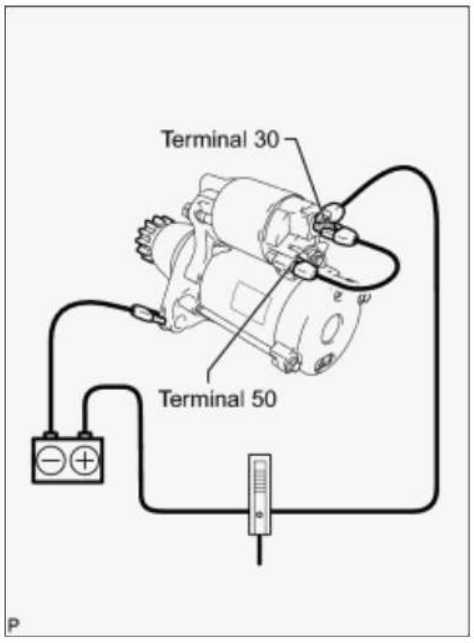
(1) Disconnect the negative (-) lead from the starter body.

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Check that the clutch pinion gear returns.

If the clutch pinion gear does not return, replace the magnet starter switch assembly.



(d) Perform the no-load performance test.

(1) Connect the lead wire to terminal C with the nut. Make sure that the lead is not grounded.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

(2) Clamp the starter in a vise.

(3) Connect the battery and an ammeter to the starter as shown in the illustration.

(4) Check that the starter rotates smoothly and steadily while the pinion gear is moving out. Then measure the current.

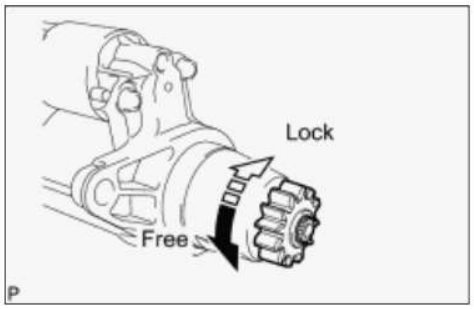
Standard current:

90 A or less at 11.5 V

If the result is not as specified, replace the starter assembly.

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2. INSPECT STARTER CLUTCH

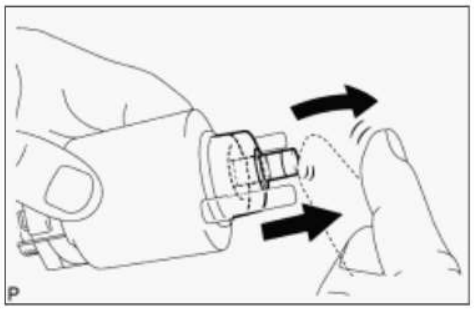


(a) Check the starter clutch.

(1) Rotate the clutch pinion gear counterclockwise and check that it turns freely. Try to rotate the clutch pinion gear clockwise and check that it locks.

If necessary, replace the starter repair service starter kit.

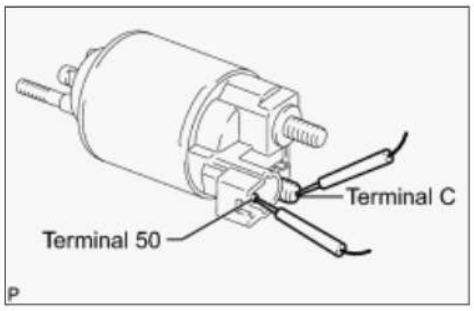
3. INSPECT MAGNET STARER SWITCH ASSEMBLY



(a) Inspect the plunger.

(1) Push in the plunger and check that it returns quickly to its original position.

If necessary, replace the magnet starter switch assembly.



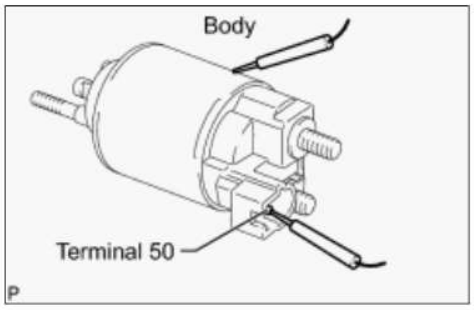
(b) Inspect the pull-in coil.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Terminal 50 - Terminal C	Always	Below 1 Ω

If the result is not as specified, replace the magnet starter switch assembly.



(c) Inspect the holding coil.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Terminal 50 - Switch body	Always	Below 2 Ω

If the result is not as specified, replace the magnet starter switch assembly.

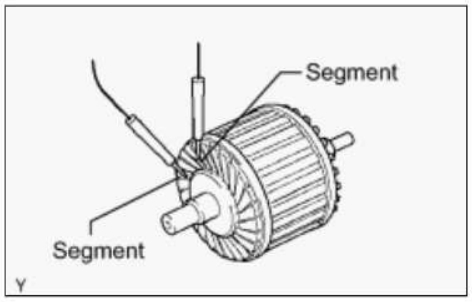
4. INSPECT STARTER ARMATURE ASSEMBLY

(a) Inspect the commutator for an open circuit.

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

Standard Resistance:

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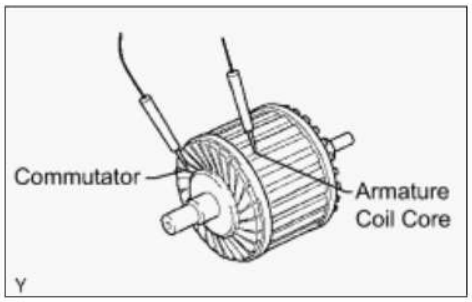
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Segment - Segment	Always	Below 1 Ω

If the result is not as specified, replace the starter armature assembly.

(b) Inspect the commutator for a short circuit.

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

Standard Resistance:

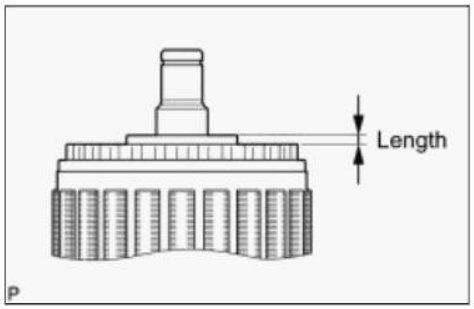


TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Commutator - Armature coil core	Always	10 kΩ or higher

If the result is not as specified, replace the starter armature assembly.

(c) Check the surface of the commutator for dirt and burns.

If the surface is dirty or burnt, correct it with sandpaper (No. 400) or a lathe.



(d) Using a vernier caliper, measure the commutator length.

Standard length:

3.1 to 3.8 mm (0.122 to 0.150 in.)

If the length is more than the maximum, replace the starter armature assembly.

5. INSPECT STARTER COMMUTATOR END FRAME ASSEMBLY

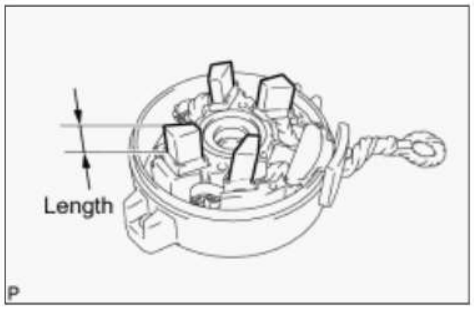
(a) Using a vernier caliper, measure the brush length.

Standard length:

4.0 to 9.0 mm (0.158 to 0.359 in.)

If the length is less than the minimum, replace the starter commutator end frame assembly.

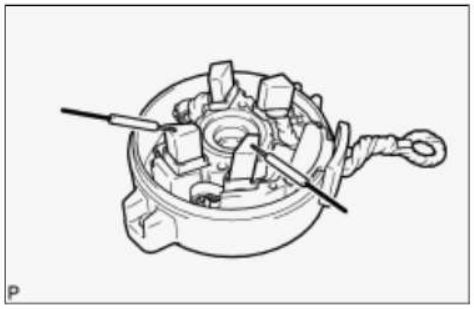
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(b) Inspect the insulation.

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

Standard Resistance:



TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Positive (+) brush - Negative (-) brush	Always	10 kΩ or higher

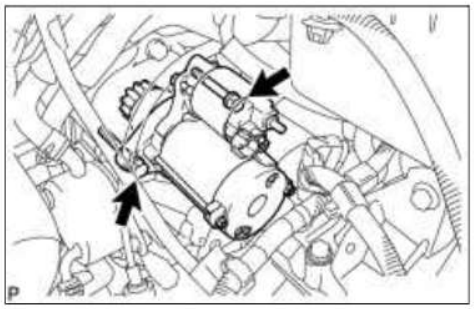
If the result is not as specified, repair or replace the starter commutator end frame assembly.

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Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YQ101RX
Title: 2AR-FE STARTING: STARTER: INSTALLATION (2011 RAV4)		

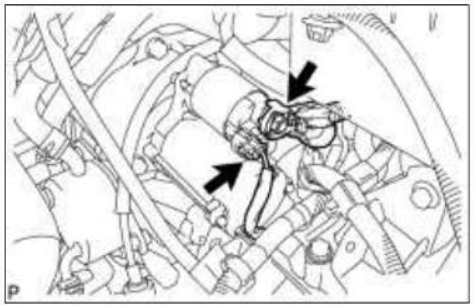
INSTALLATION

1. INSTALL STARTER ASSEMBLY



(a) Install the starter with the 2 bolts.

Torque: 37 N·m (377 kgf·cm, 27ft·lbf)

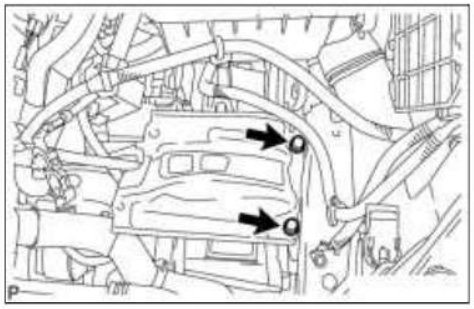


(b) Connect the starter connector.

(c) Install the terminal nut and cover the nut with the cap.

Torque: 9.8 N·m (100 kgf·cm, 87in·lbf)

2. INSTALL BATTERY BRACKET REINFORCEMENT

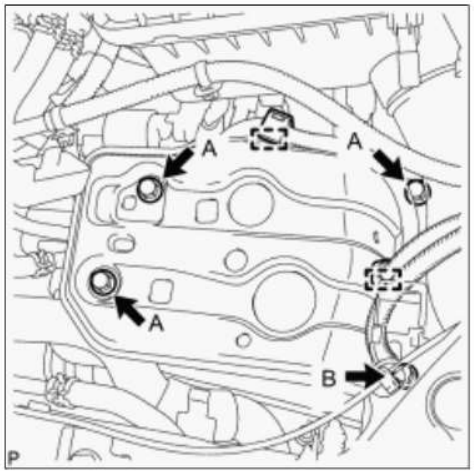


(a) Install the battery bracket reinforcement with the 2 bolts.

Torque: 20 N·m (204 kgf·cm, 15ft·lbf)

3. INSTALL FRONT BATTERY BRACKET

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(a) Install the front battery bracket with the 4 bolts.

for bolt (A) - Torque: 20 N·m (204 kgf·cm, 15ft·lbf)
for bolt (B) - Torque: 19 N·m (196 kgf·cm, 14ft·lbf)

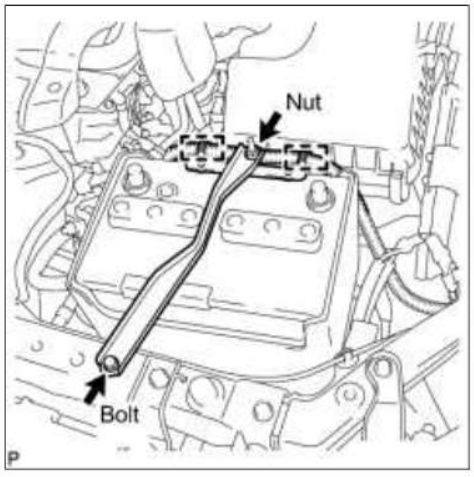
(b) Attach the 2 wire harness clamps.

4. INSTALL BATTERY TRAY

5. INSTALL BATTERY

6. INSTALL BATTERY INSULATOR

7. INSTALL BATTERY CLAMP



(a) Attach the hook of the battery clamp to the front battery bracket.

(b) Partially tighten the nut and temporarily install the bolt.

(c) Adjust the battery clamp position.

(d) Tighten the nut and bolt.

for bolt - Torque: 17 N·m (168 kgf·cm, 12ft·lbf)
for nut - Torque: 4.9 N·m (50 kgf·cm, 43in·lbf)

(e) Attach the 2 wire harness clamps.

8. INSTALL RADIATOR SUPPORT OPENING COVER INFO

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9. CONNECT CABLE TO POSITIVE BATTERY TERMINAL

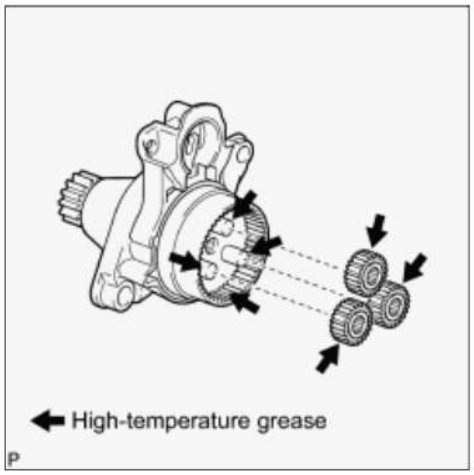
10. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

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Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YQ6027X
Title: 2AR-FE STARTING: STARTER: REASSEMBLY (2011 RAV4)		

REASSEMBLY

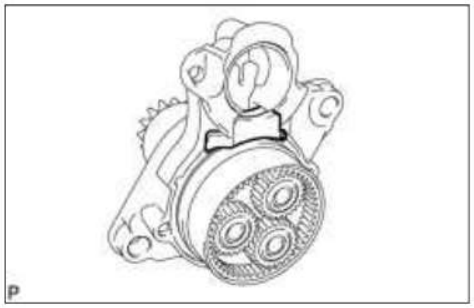
1. INSTALL PLANETARY GEAR



(a) Apply high-temperature grease to the planetary gears and pin parts of the planetary shaft.

(b) Install the 3 planetary gears.

2. INSTALL RUBBER SEAL

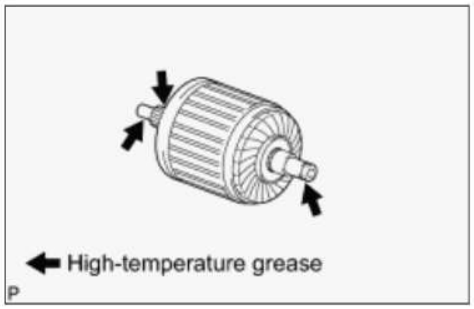


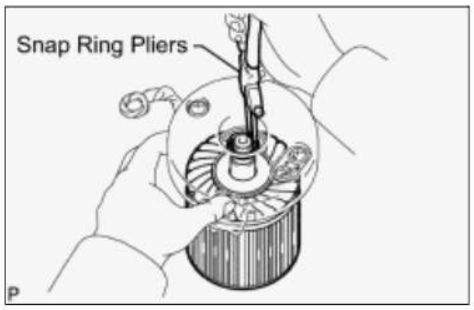
(a) Install the rubber seal to the repair service starter kit.

3. INSTALL STARTER ARMATURE ASSEMBLY

(a) Apply high-temperature grease to the washer and the armature shaft.

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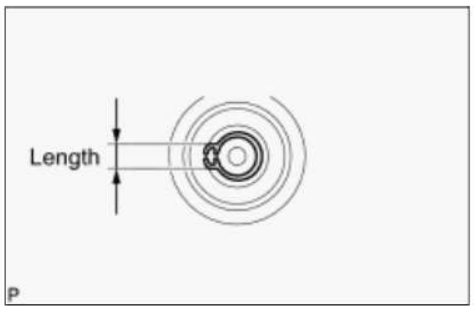
(b) Install the starter armature to the starter commutator end frame.

(c) Install the washer.

(d) Using snap ring pliers, securely install a new snap ring to the armature shaft groove.

NOTICE:

Be sure to install the snap ring, properly because it easily expands.



(e) Using a vernier caliper, measure the length of the snap ring.

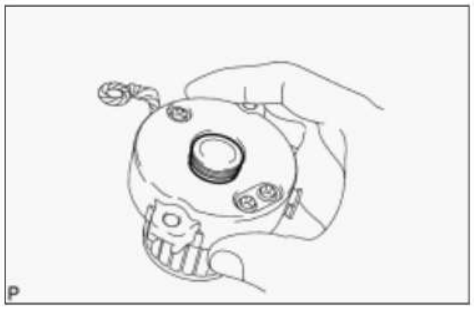
Maximum length:
5.0 mm (0.197 in.)

If the length is more than the maximum, replace the snap ring with a new one.

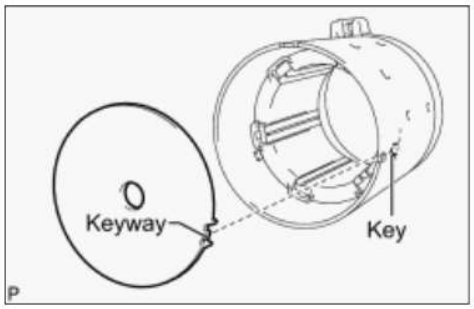
4. INSTALL STARTER COMMUTATOR END FRAME COVER

(a) Install the starter commutator end frame cover to the starter commutator end frame.

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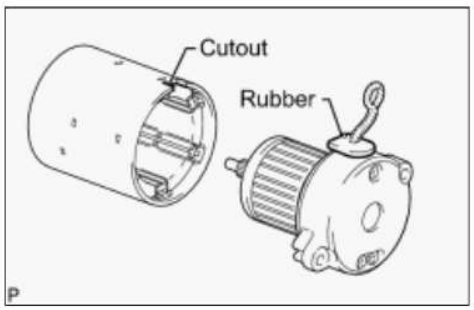
5. INSTALL STARTER ARMATURE PLATE



(a) Insert the armature plate into the starter yoke.

(b) Align the keyway of the starter armature plate with the key inside the starter yoke, and install the starter armature plate.

6. INSTALL STARTER COMMUTATOR END FRAME ASSEMBLY



(a) Align the rubber of the end frame with the cutout of the starter yoke.

(b) Install the starter commutator end frame to the starter yoke.

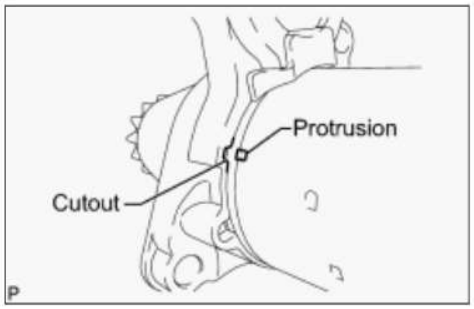
NOTICE:

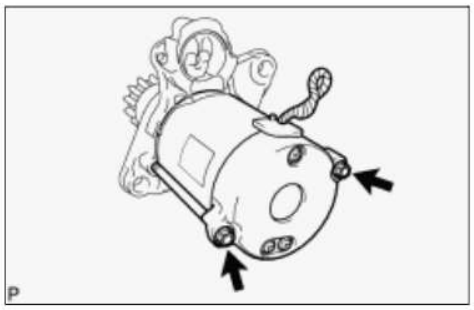
The magnet of the starter yoke may attract the starter armature when the starter commutator end frame is installed, causing the magnet to break.

7. INSTALL STARTER YOKE ASSEMBLY

(a) Align the protrusion of the starter yoke with the cutout of the repair service starter kit.

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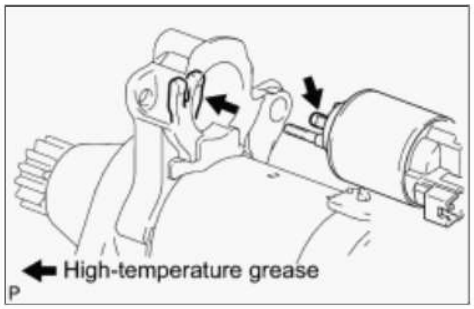


(b) Install the starter yoke with the 2 through-bolts.

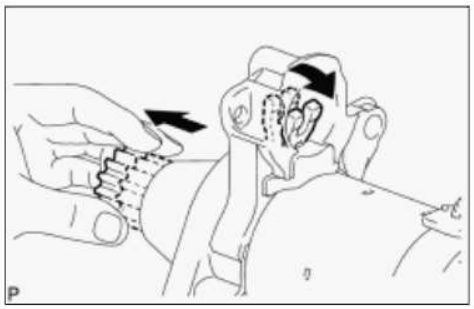
Torque: 6.0 N·m (61 kgf·cm, 53in·lbf)

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8. INSTALL MAGNET STARTER SWITCH ASSEMBLY

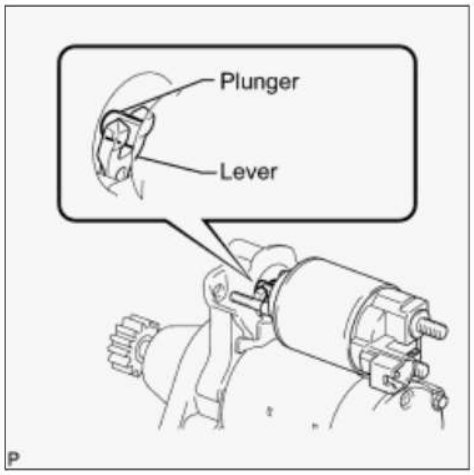


(a) Apply high-temperature grease to the plunger and the lever.

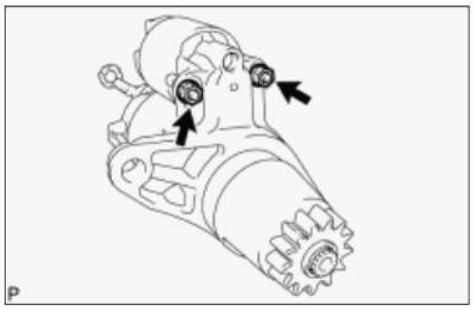


(b) Pull the pinion gear and push down the lever.

(c) Temporarily install the magnet starter switch by hooking the

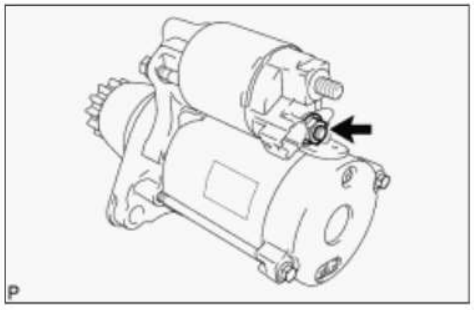


plunger into the upper side of the pinion drive lever.



(d) Install the magnet starter switch with the 2 nuts.

Torque: 7.5 N·m (76 kgf·cm, 66in·lbf)



(e) Connect the lead wire to the magnet starter switch with the nut.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

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Last Modified: 9-7-2011	6.4 A	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YQ401NX
Title: 2AR-FE STARTING: STARTER: REMOVAL (2011 RAV4)		

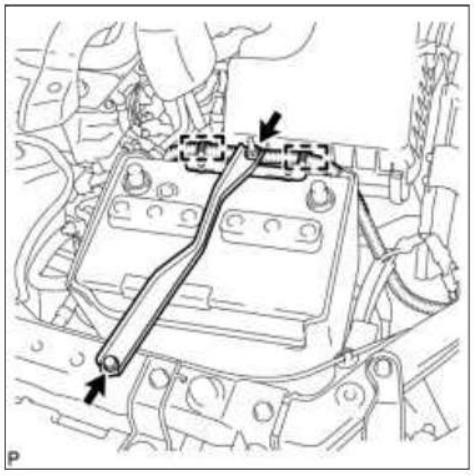
REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. DISCONNECT CABLE FROM POSITIVE BATTERY TERMINAL

3. REMOVE RADIATOR SUPPORT OPENING COVER INFO

4. REMOVE BATTERY CLAMP



(a) Remove the bolt and loosen the nut.

(b) Detach the 2 wire harness clamps.

(c) Detach the hook of the battery clamp from the front battery bracket, and then remove the battery clamp.

5. REMOVE BATTERY INSULATOR

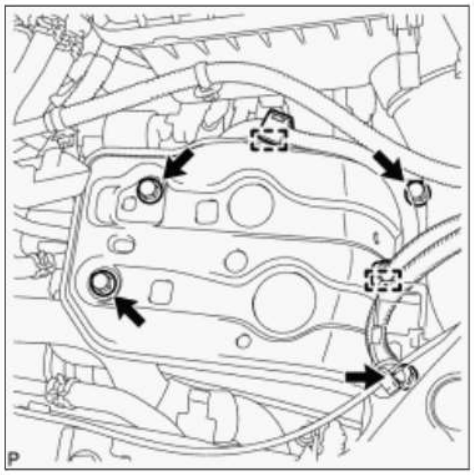
6. REMOVE BATTERY

7. REMOVE BATTERY TRAY

8. REMOVE FRONT BATTERY BRACKET

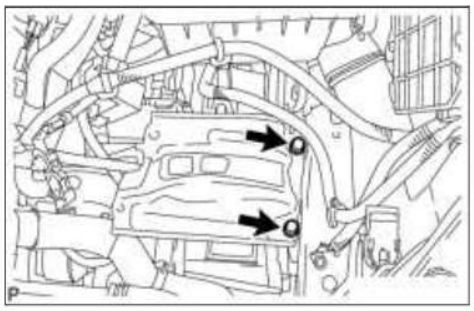
(a) Detach the 2 wire harness clamps.

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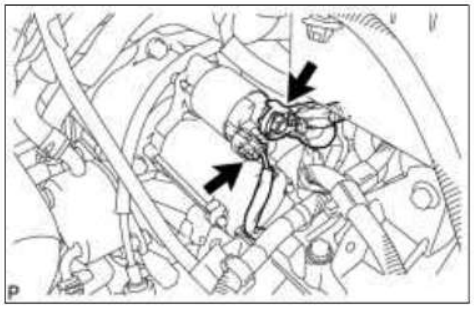
(b) Remove the 4 bolts and front battery bracket.

9. REMOVE BATTERY BRACKET REINFORCEMENT



(a) Remove the 2 bolts and battery bracket reinforcement.

10. REMOVE STARTER ASSEMBLY

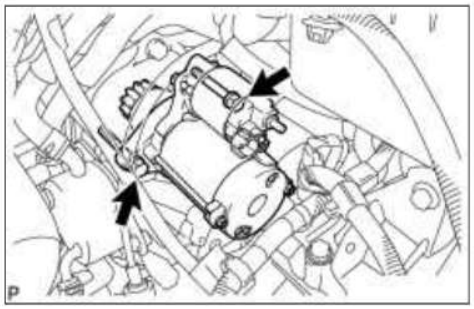


(a) Disconnect the starter connector.

(b) Open the terminal cap, remove the nut and disconnect the starter wire.

(c) Remove the 2 bolts and starter.

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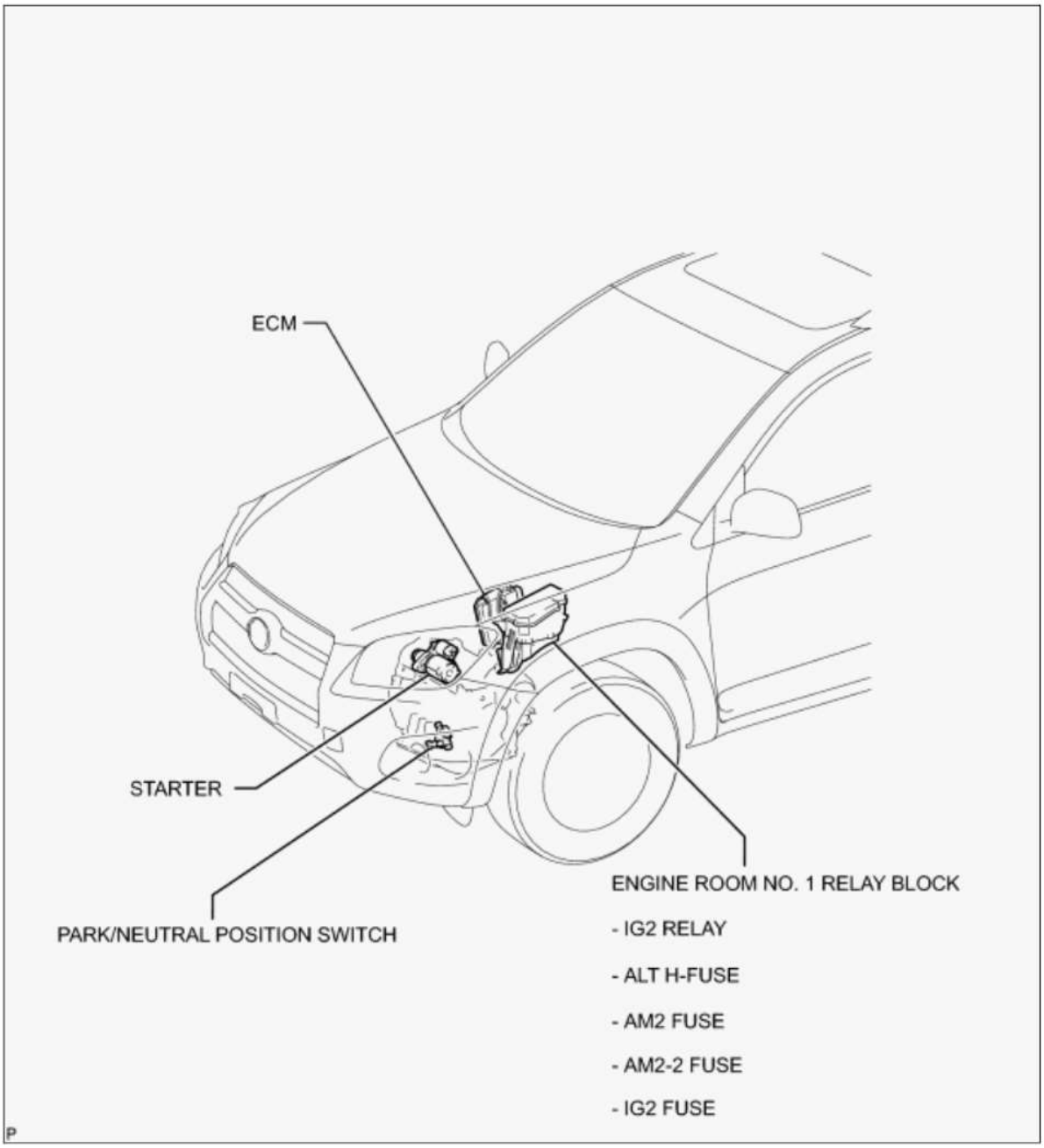


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Last Modified: 9-7-2011	6.4 R	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM0000020R600JX
Title: 2AR-FE STARTING: STARTING SYSTEM: PARTS LOCATION (2011 RAV4)		

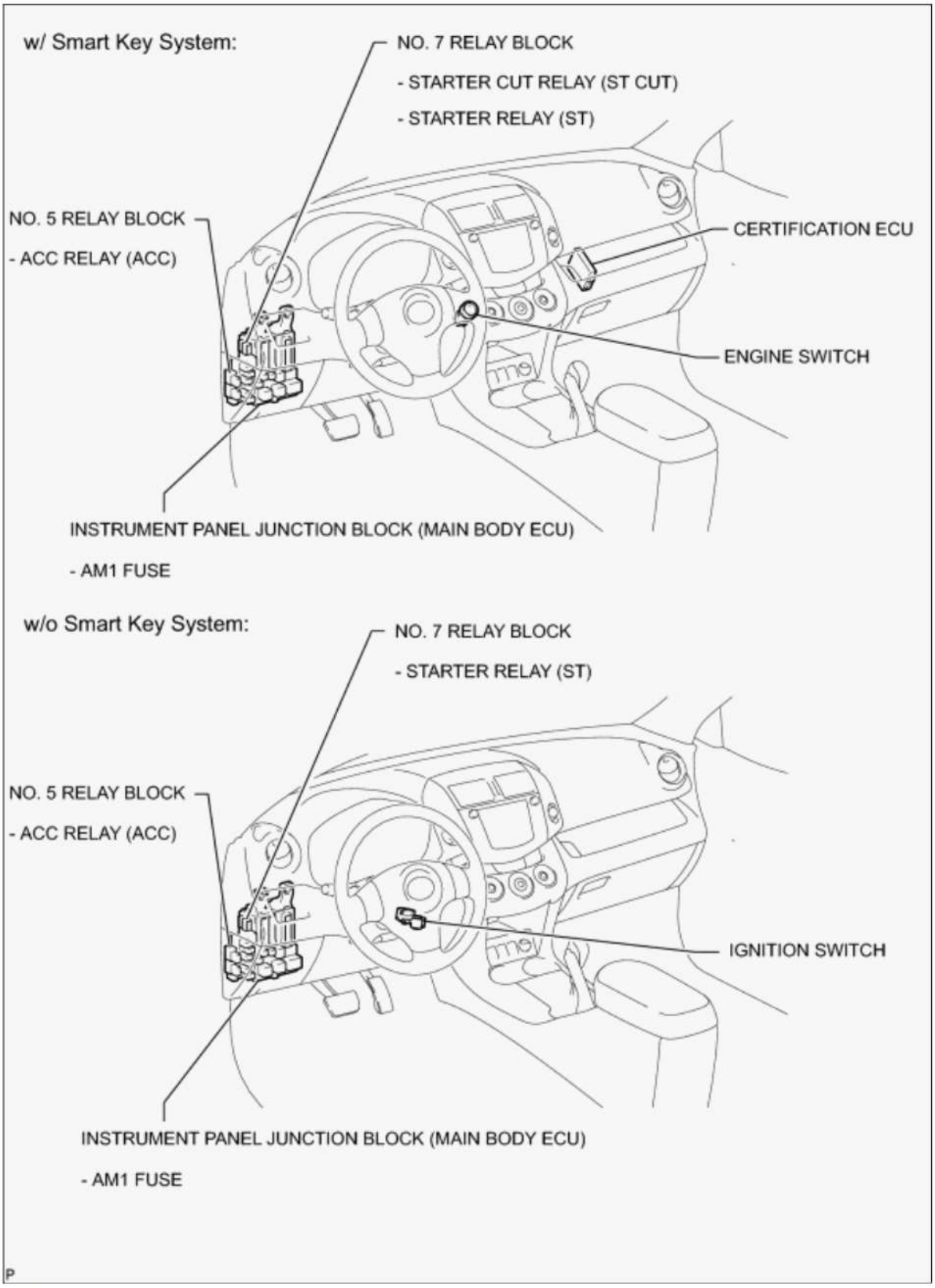
PARTS LOCATION

ILLUSTRATION



ILLUSTRATION

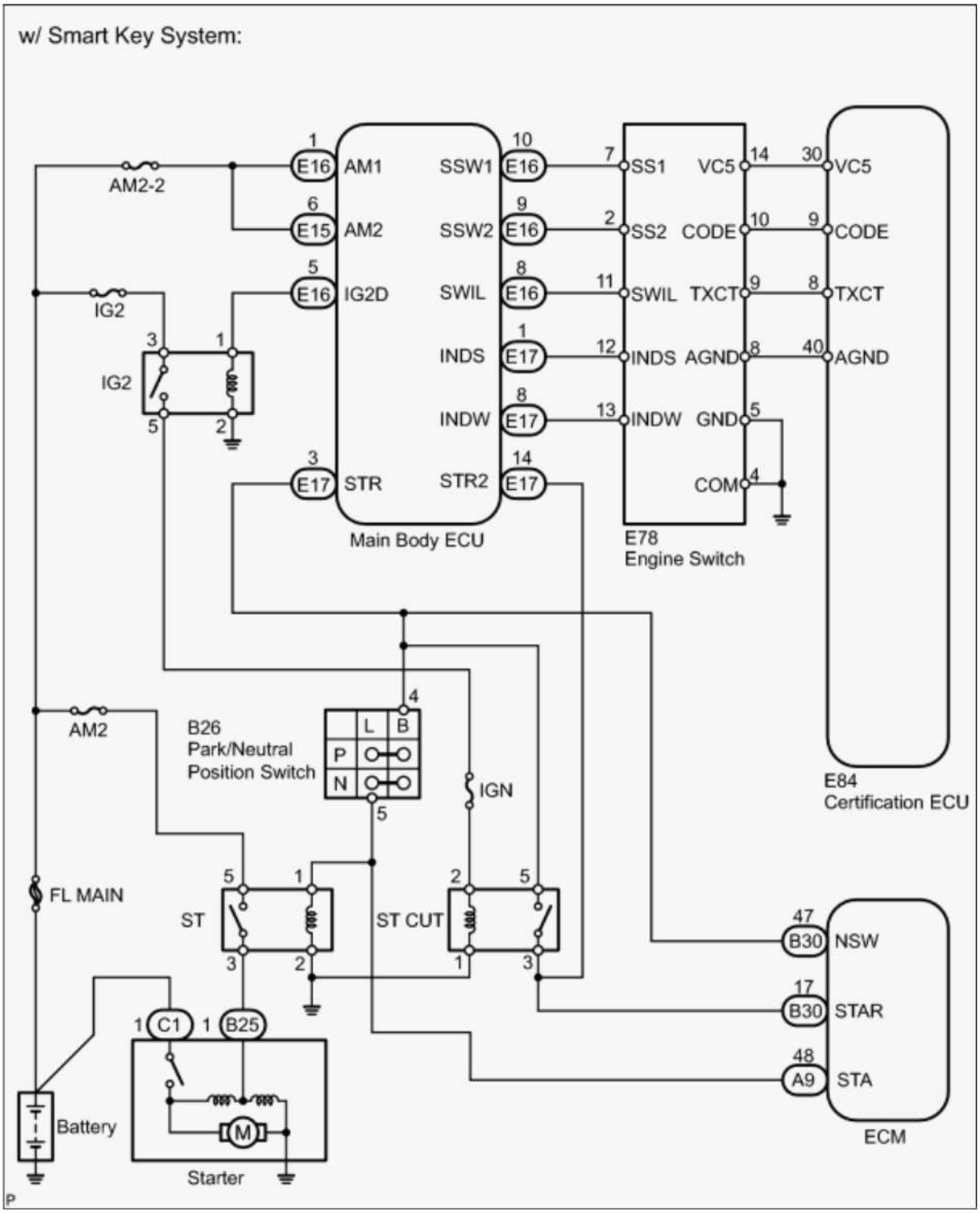
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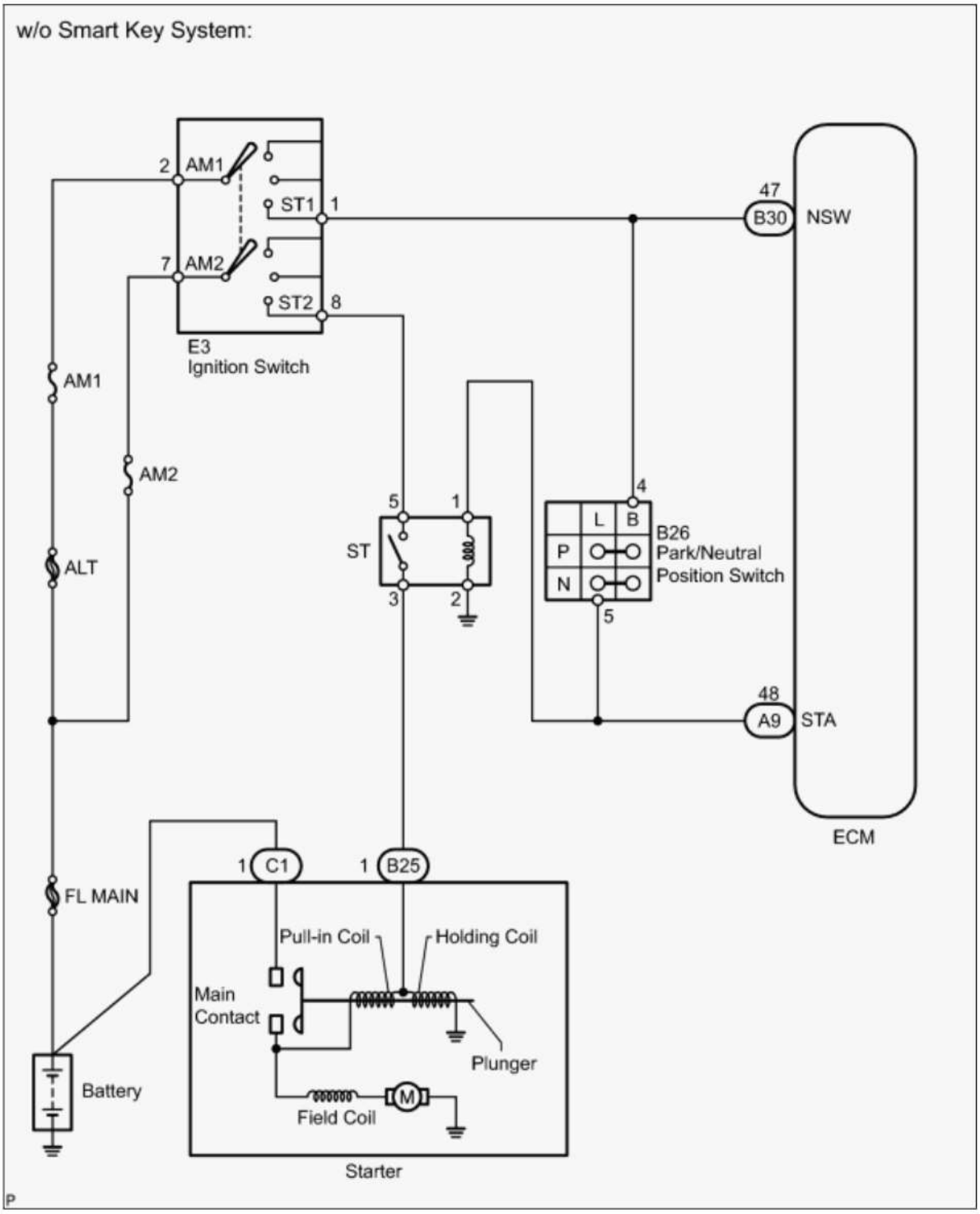
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Last Modified: 9-7-2011	6.4 U	**From:** 201008
Model Year: 2011	**Model:** RAV4	**Doc ID:** RM000000YKA016X
Title: 2AR-FE STARTING: STARTING SYSTEM: SYSTEM DIAGRAM (2011 RAV4)		

SYSTEM DIAGRAM



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