

2002 ACCESSORIES & EQUIPMENT

Engine Immobilizer System - RAV4

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.

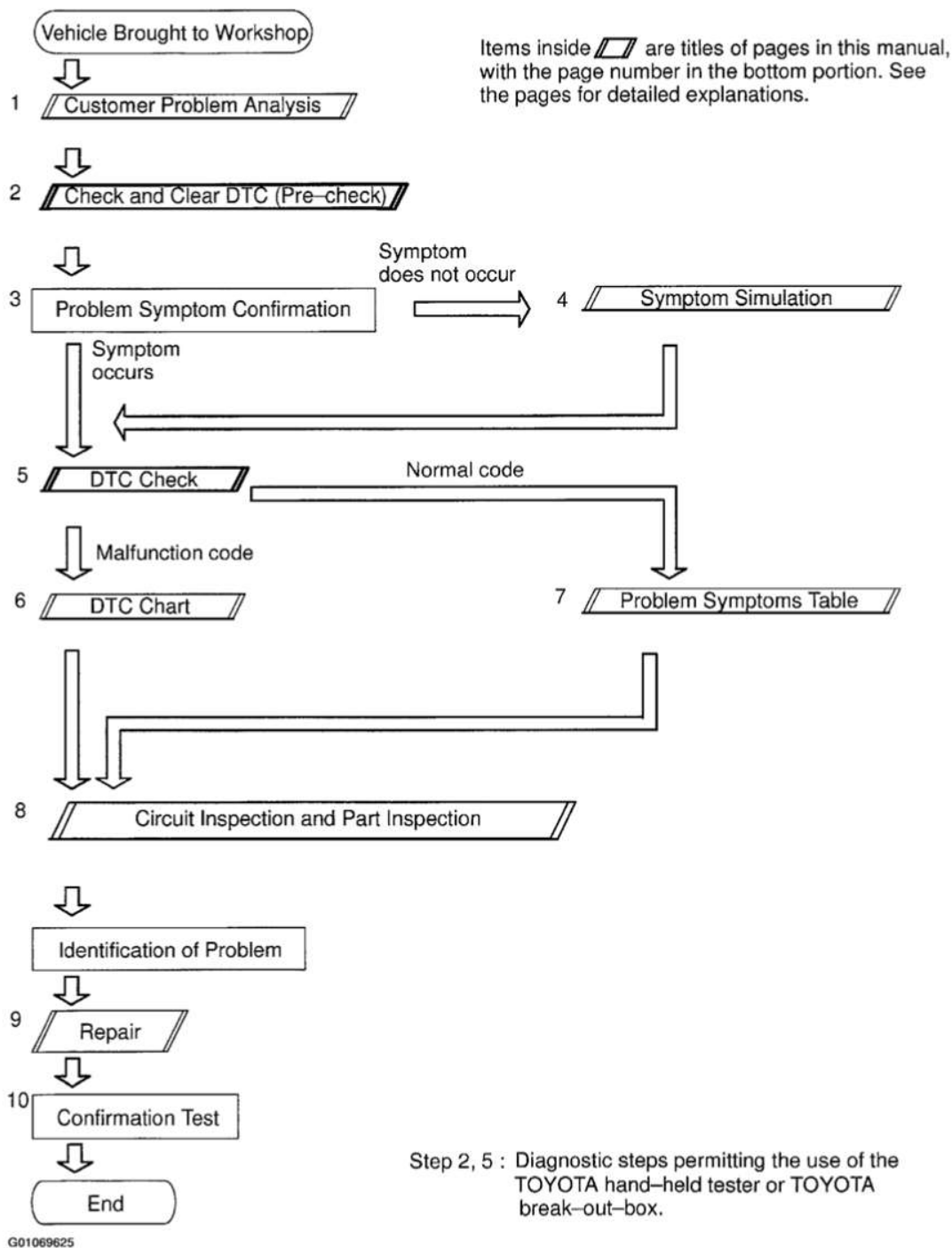


Fig. 1: Troubleshooting Flow Chart
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE IMMOBILIZER CHECK SHEET

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Immobiliser is not set. (Engine starts with key codes other than the registered key code.)
	☐ Engine does not start.

Check Item	Malfunction Indicator Light	☐ Normal ☐ Remains ON ☐ Does not Light Up
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DTC Check	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

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Fig. 2: Displaying Check Sheet

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PRE-CHECK**1. Diagnosis System****a. Description**

Engine ECU controls the function of immobilizer on this vehicle.

Data of the immobilizer or Diagnostic Trouble Code (DTC) can be read from the Data Link Connector 3 (DLC3) of the vehicle. When a trouble occurs in the immobilizer, Malfunction Indicator Lamp (MIL) does not light up but the DTC inspection is performed. Therefore when there seems to be a trouble with immobilizer, use a hand-held tester or SST (diagnosis check wire No. 2) to check and troubleshoot it.

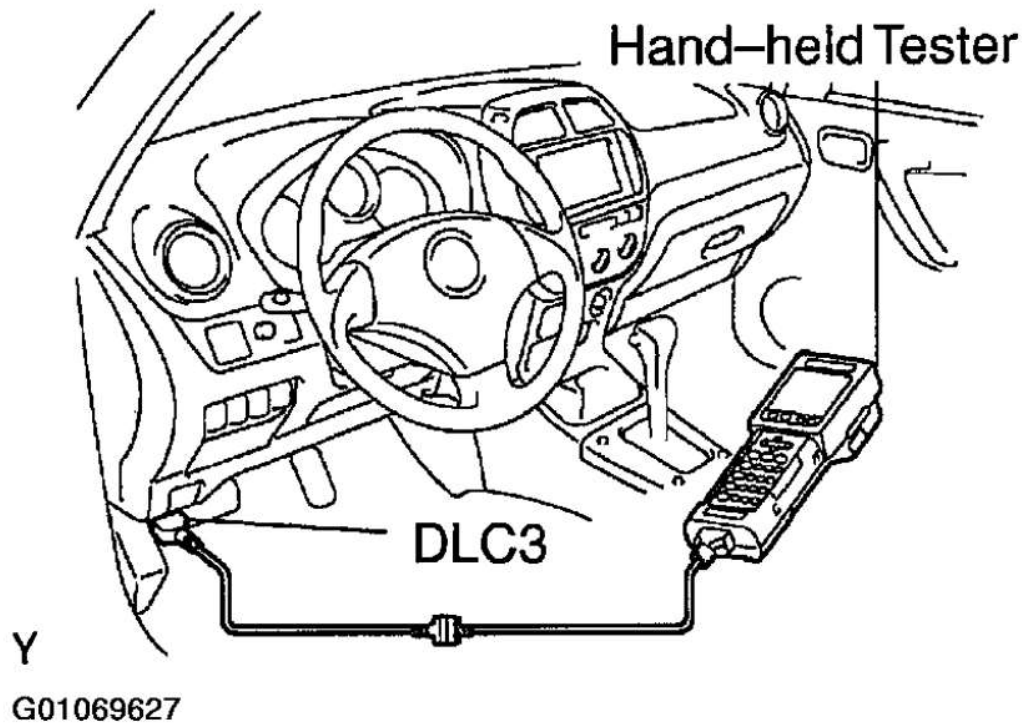
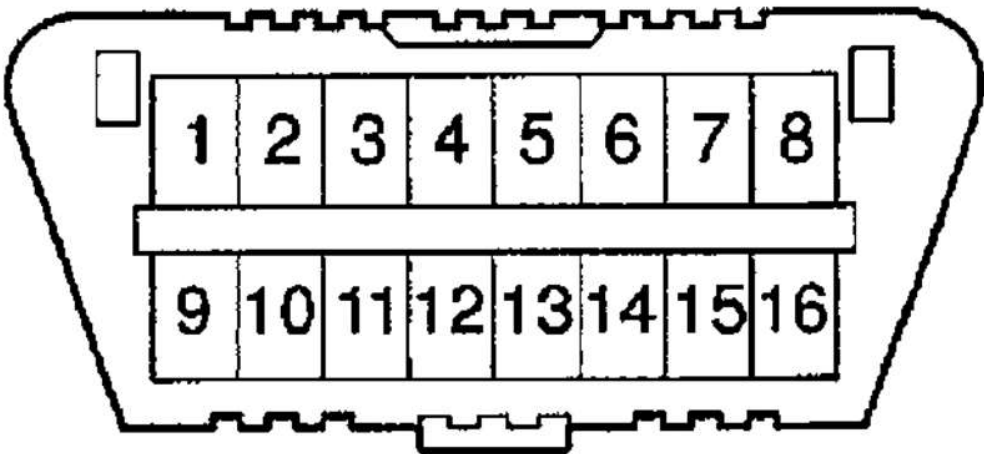


Fig. 3: Connecting Hand-Held Tester
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Inspect the DLC3.



DLC3

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Fig. 4: Displaying DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

The vehicle's engine ECU uses ISO 14230 for communication.

The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 14230 format.

Tester connection	Condition	Specified condition
7 (Bus + Line) – 5 (Signal Ground)	During communication	Pulse generation
4 (Chassis Ground) – Body Ground	Always	1 Ω or less
5 (Signal Ground) – Body Ground	Always	1 Ω or less
16 (B+) – Body Ground	Always	9 – 14 V

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Fig. 5: Displaying DLC3 Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: If your display shows **UNABLE TO CONNECT TO VEHICLE** when you have

connected the cable of the hand-held tester to the DLC3, turned the ignition switch ON and operated the hand-held tester, there is a problem on the vehicle side or tool side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

2. Inspect Diagnosis

- a. Using hand-held tester:

Check the DTC.

NOTE: **Hand-held tester only:**

Remove emph-bold wrappersWhen the diagnosis system is switched from the normal mode to the check mode, all the DTCs and freeze frame data recorded in the normal mode will be erased. So before switching the modes, always check the DTCs and freeze frame data, and note them down.

1. Prepare the hand-held tester.
2. Connect the hand-held tester to the DLC3 under the instrument panel lower pad.

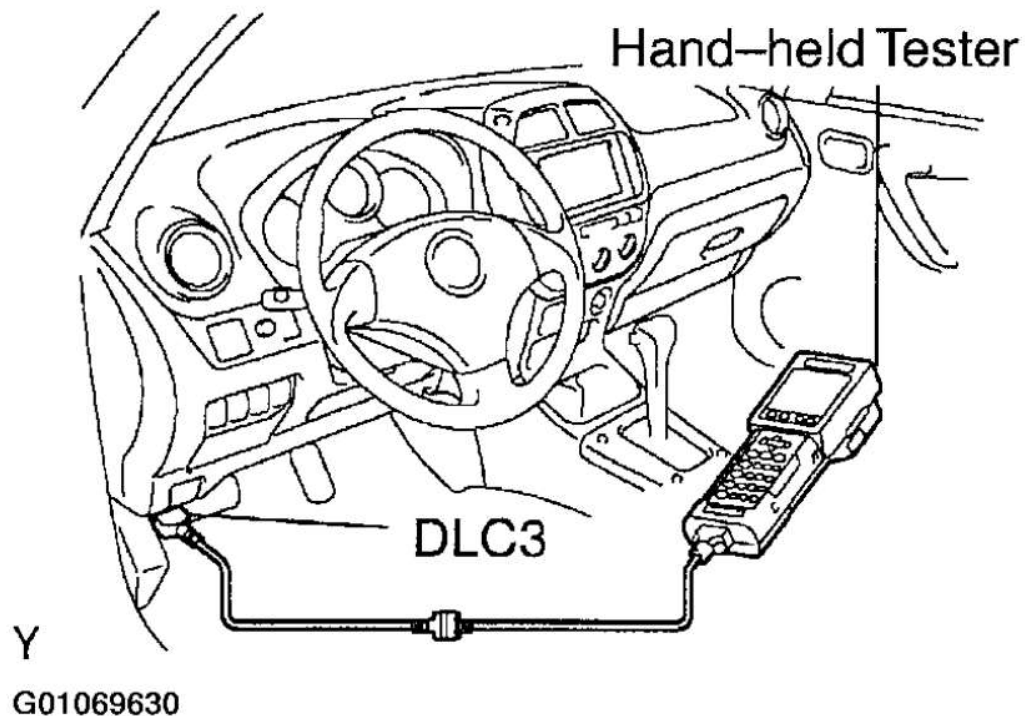


Fig. 6: Identifying Hand-Held Tester & Locating DLC3
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Turn the ignition switch ON and push the hand-held tester switch ON.
 4. Use the hand-held tester to check the DTCs and freeze frame data; note them down. (For operating instructions, see the hand-held tester instruction book.)
 5. See **DIAGNOSTIC TROUBLE CODE CHART** to confirm the details of the DTCs.
- b. Clear the DTC.

The following procedures will erase the DTCs and freeze frame data.

1. Operating the hand-held tester to erase the codes. (See the hand-held tester instruction book for operating instructions.)
2. Disconnecting the battery terminals or EFI1 fuse.

DIAGNOSTIC TROUBLE CODE CHART

DTC No.	Detection Item	Trouble Area
B2795	Unmatched Key Code	•Key •Unregistered key inserted before
B2796	No Communication in Immobiliser System	•Key •Transponder key amplifier •Wire harness •ECM
B2797	Communication Malfunction No. 1	•Wire harness •Transponder key amplifier •Unregistered key inserted before •ECM
B2798	Communication Malfunction No. 2	•Key •Transponder key amplifier •Wire harness •ECM

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Fig. 7: Identifying Immobilizer System DTC's & Troubleshooting Areas

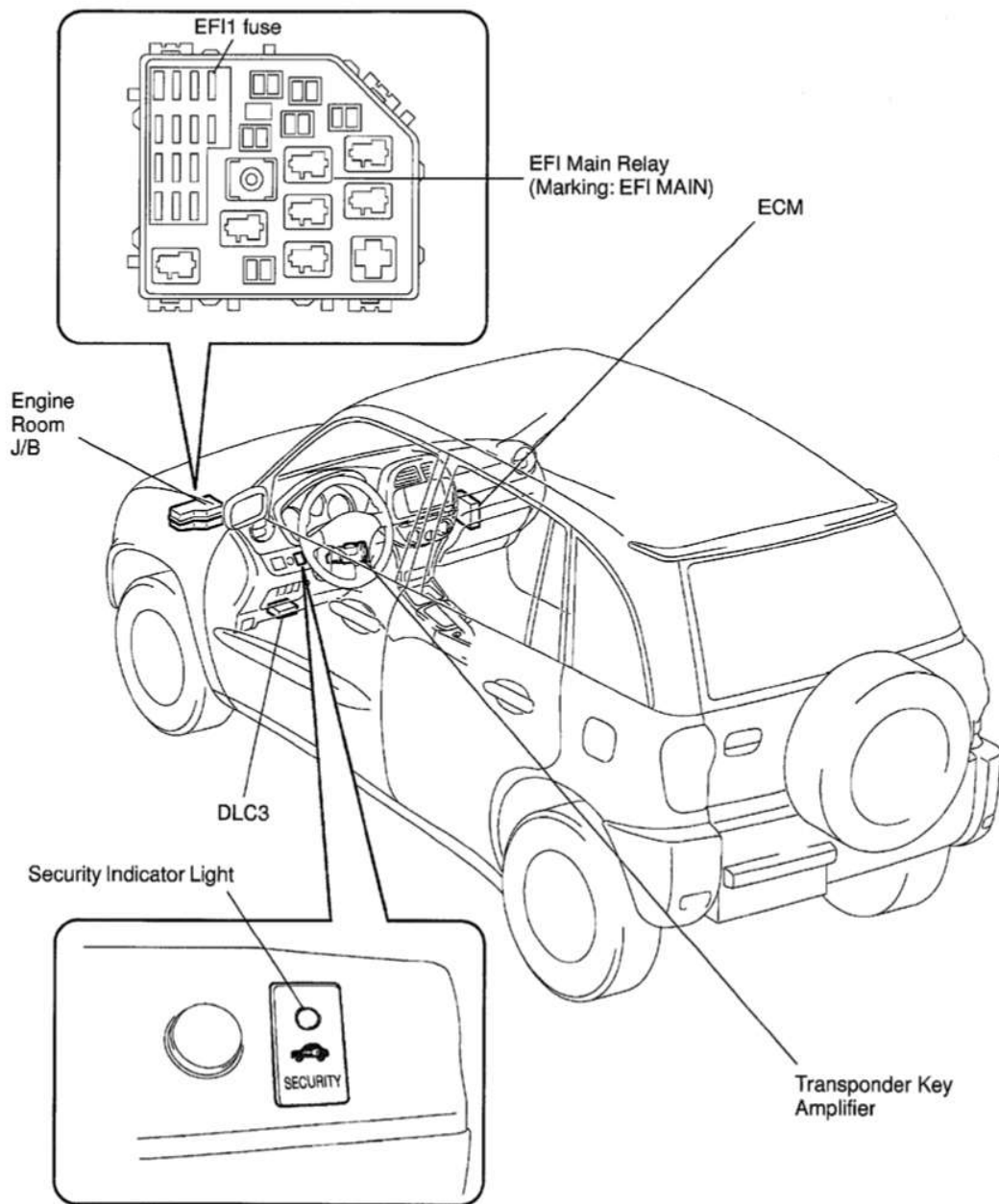
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: To reduce the unnecessary exchange of ECM, check that a trouble occurs with the original ECM at the time of exchanging ECM and the problem will be solved with a new ECM.

DIAGNOSTIC TROUBLE CODES (DTC) LIST

DTC	Description
<u>DTC B2795/99</u>	UNMATCHED KEY CODE
<u>DTC B2796</u>	NO COMMUNICATION IN IMMOBILIZER SYSTEM
<u>DTC B2797/99</u>	COMMUNICATION MALFUNCTION NO 1
<u>DTC B2798/99</u>	COMMUNICATION MALFUNCTION NO. 2

PARTS LOCATION



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Fig. 8: Locating Engine Immobilizer Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TERMINALS OF ECM

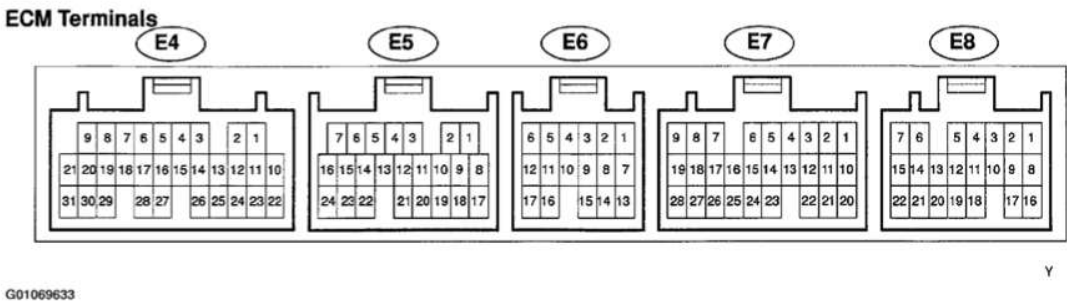


Fig. 9: Identifying ECM Connectors & Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
CODE (E7-28) - E1 (E5-17)	Y-G(W) - BR	Ignition switch ON	9 - 14
RXCK (E7-19) - E1 (E5-17)	Y(W) - BR	Ignition switch ON	9 - 14
TXCT (E7-18) - E1 (E5-17)	Y-B(W) - BR	Ignition switch ON	9 - 14
IMLD (E7-26) - E1 (E5-17)	G-R(W) - BR	Engine immobiliser system setting	9 - 14

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Fig. 10: Identifying Engine Immobilizer Terminal Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PROBLEM SYMPTOMS

PROBLEM SYMPTOM

Symptom/Suspected Area	See
Immobilizer Is Not Set (Engine Starts With Key Codes Other Than The Registered Key Code)	
ECM	HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE
Engine Does Not Start	
Key	(1)
Wire Harness	HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE
Transponder Key Amplifier	
ECM	HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE
Security Indicator Is Always ON	
Security Indicator Light	SECURITY INDICATOR LIGHT CIRCUIT & (2)
Wire Harness	HOW TO USE THE DIAGNOSTIC CHART AND

	<u>INSPECTION PROCEDURE</u>
ECM	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
Security Indicator Is Always ON (Although Code Has Been Registered In The Automatic Registration Mode, Indicator Is Not OFF)	
Wire Harness	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
Transponder Key Amplifier	
ECM	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
Security Indicator Is OFF (When DTC Of Immobilizer Is Output)	
Wire Harness	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
Transponder Key Amplifier	
ECM	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
Security Indicator Is OFF (When DTC Of Immobilizer Is Not Output)	
Wire Harness	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
ECM	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
Security Indicator Is Abnormally Blinking	
Wire Harness	<u>HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE</u>
Security Indicator Light Circuit	<u>SECURITY INDICATOR LIGHT CIRCUIT</u>
ECM	
(1) Check that the key which did not start the engine has been registered and that it is possible to start with the other already registered key codes.	
(2) Finish the automatic registration mode because the mode might still remain.	

CIRCUIT INSPECTION

DTC B2795/99: UNMATCHED KEY CODE

Circuit Description

This DTC is output when an unregistered key is inserted. When this DTC is output, delete the DTC and insert the key of the customer to check that DTC B2795 is output.

When the key outputs DTC B2795/99, register this key. When DTC B2795/99 is not output, there is a possibility that the unregistered key has been inserted before. (ECM is normal.)

Inquire of a customer about the condition of using the system to find the cause of the trouble.

(Example: Another key has been inserted, etc.)

DTC No.	DTC Detection Condition	Trouble Area
B2795/99	Unmatched key code	• Key • Unregistered key inserted before

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Fig. 11: Identifying DTC B2795/99 Trouble Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Inspection Procedure

1. Delete DTC and insert all presently available keys to check whether engine starts or not .

NOTE: When inserting the key that does not start the engine, DTC B2795/99 is stored in memory.

RESULT: See Fig. 13

OK	All keys starts engine.
NG	A specific key does not start engine.

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Fig. 12: Displaying Inspection Result
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: No problem.

NOTE: If the result is "OK", please confirm whether or not customers have ever inserted the unregistered key or the immobilizer key (with transponder chip) of other vehicle in the ignition key cylinder, and find out the cause of detecting the DTC.

NG: Register key that does not start engine.

DTC B2796: NO COMMUNICATION IN IMMOBILIZER SYSTEM

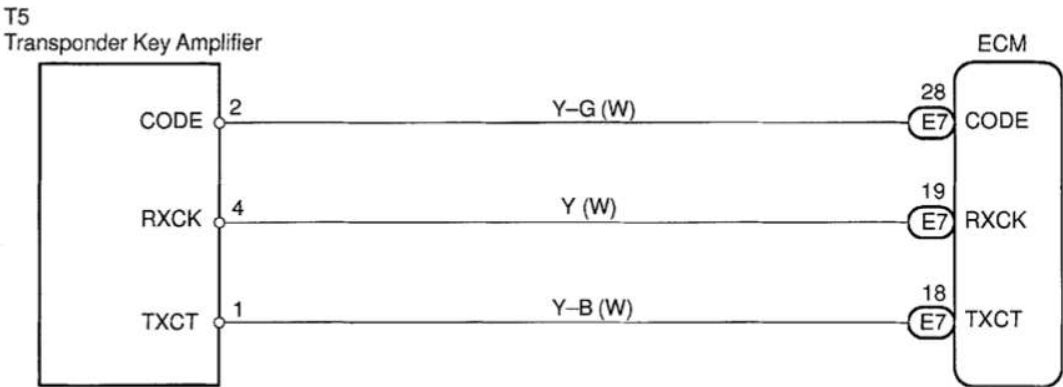
Circuit Description

DTC No.	DTC Detection Condition	Trouble Area
B2796	No communication	• Key • Transponder key amplifier • Wire harness • ECM

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Fig. 13: Identifying DTC B2796 Trouble Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Wiring Diagram



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Fig. 14: Transponder Key Amplifier Circuit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Inspection Procedure

1. Delete DTC and insert all presently available keys to check whether engine starts or not

RESULT: See Fig. 16

A	All keys start engine.
B	A specific key does not start engine. In this case, DTC B2796 is stored in memory.
C	All keys do not start engine. In this case, DTC B2796 is stored in memory.

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Fig. 15: Displaying Inspection Results
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

A: No problem at this time .

NOTE: If the result is "A", please confirm whether or not customers have

ever inserted the key (without transponder chip) of other vehicle in the ignition key cylinder, and find out the cause of detecting the DTC.

B: Transponder chip of a specific key is defective. Replace key .

C: Go to Step 2 .

2. **Check harness and connector between transponder key amplifier and ECM (See HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE) .**

NG: Repair or replace harness or connector.

OK: Go to next step.

3. **Does it operate normally after replacement of transponder key amplifier?**

YES: Replace transponder key amplifier.

NO: Check and replace ECM (See HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE).

DTC B2797/99: COMMUNICATION MALFUNCTION NO 1

Circuit Description

This code is detected when an error occurs despite of normal communication.

(Example: Some noise is included in the communication line.)

DTC No.	DTC Detection Condition	Trouble Area
B2797/99	Communication error	• Wire harness • Transponder key amplifier • Unregistered key inserted before • ECM

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Fig. 16: Identifying DTC B2797/99 Trouble Areas
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Wiring Diagram

Refer to DTC B2796/99 on **DTC B2796 NO COMMUNICATION IN IMMOBILIZER SYSTEM** .

Inspection Procedure

1. **Check noise .**

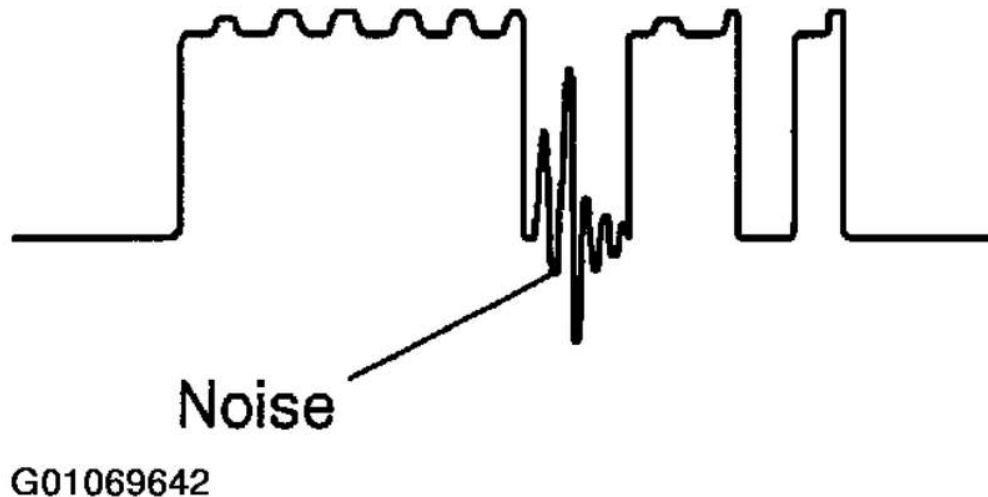


Fig. 17: Displaying Noise Graph

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Insert the already registered master key in the key cylinder.
- b. Using an oscilloscope or TOYOTA hand-held tester, check that noise is included in the CODE terminal of the ECM.

OK: No noise is detected .

OK: Go to next step.

NG: Try to find out cause of noise and remove it.

2. Does it operate normally after replacement of transponder key amplifier?

YES: Replace transponder key amplifier.

NO: Check and replace ECM (See **HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE**).

DTC B2798/99: COMMUNICATION MALFUNCTION NO. 2

Circuit Description

DTC No.	DTC Detection Condition	Trouble Area
B2798/99	Communication error	•Key •Transponder key amplifier •Wire harness •ECM

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Fig. 18: Identifying DTC B2798/99 Trouble Areas
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Wiring Diagram

Refer to DTC B2796/99 on **DTC B2796 NO COMMUNICATION IN IMMOBILIZER SYSTEM** .

Inspection Procedure

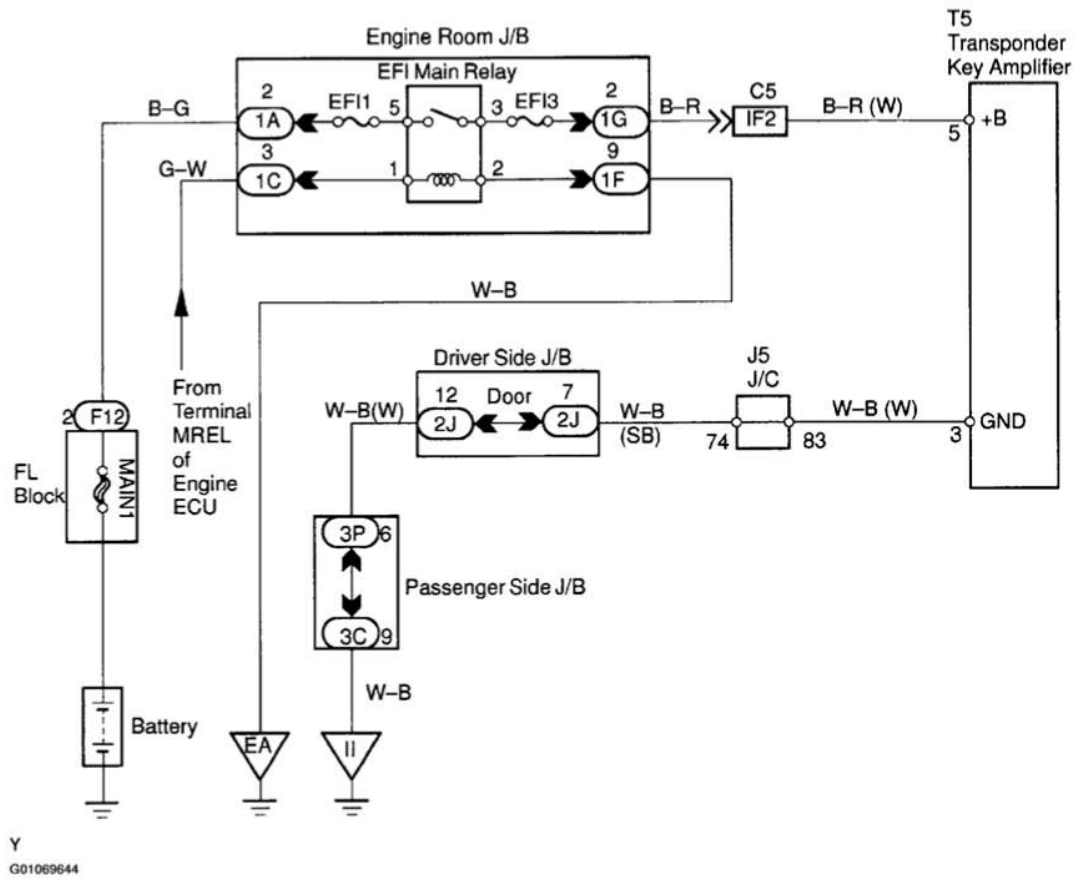
1. **Check harness and connector between transponder key amplifier and ECM .**
 OK: Go to next step.
 NG: Repair or replace harness or connector.
2. **Does it operate normally after replacement of transponder key amplifier?**
 YES: Replace transponder key amplifier.
 NO: Check and replace ECM (See **HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE**).

POWER SOURCE CIRCUIT

Circuit Description

This circuit provides power to operate the transponder key amplifier.

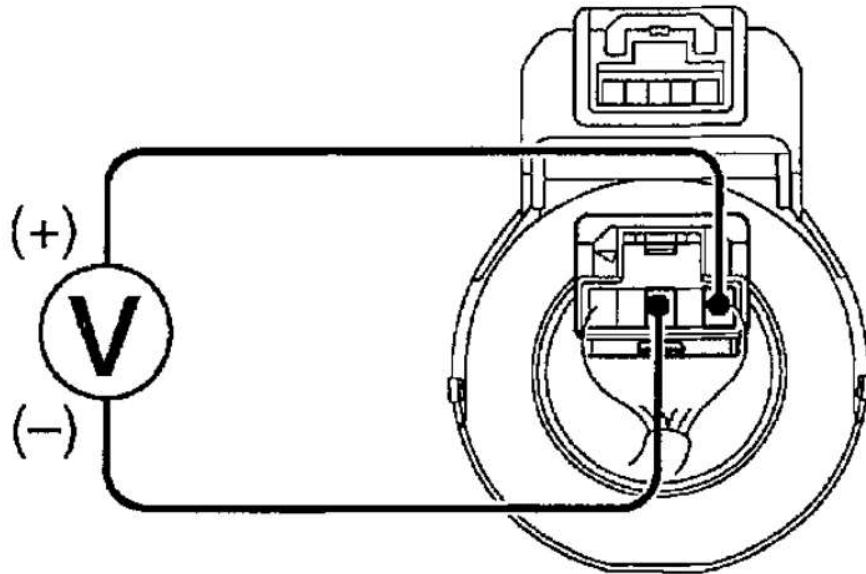
Wiring Diagram

**Fig. 19: Power Source Circuit**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Inspection Procedure

1. Check voltage between terminals +B and GND of transponder key amplifier connector .



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Fig. 20: Checking Power Source Voltage

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

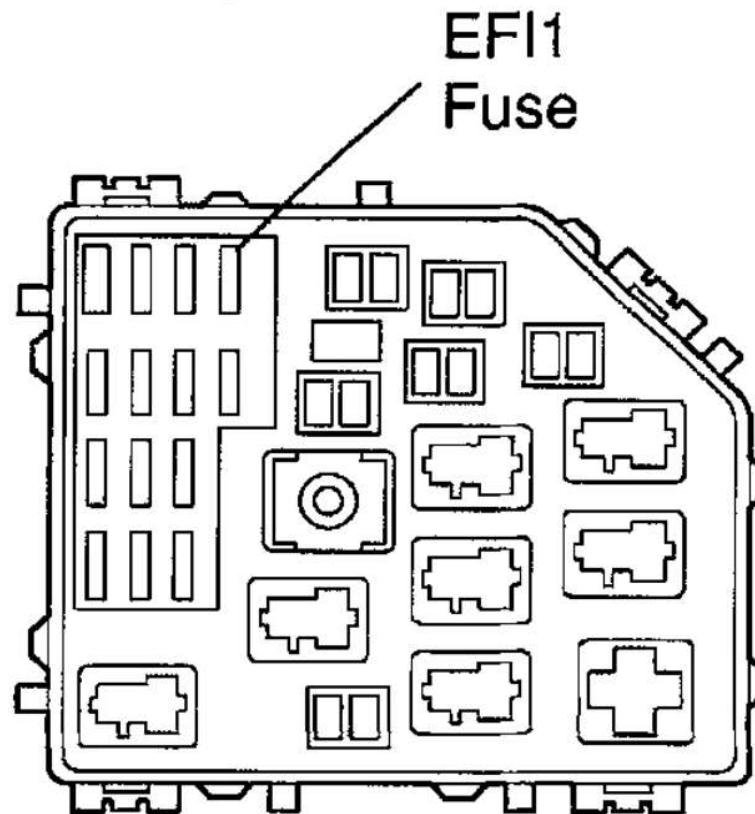
- a. Turn the ignition switch OFF.
- b. Disconnect the transponder key amplifier connector.
- c. Measure the voltage between terminals +B and GND of the transponder key amplifier connector.

OK: Voltage: 9 - 14 VOK: Proceed to next circuit inspection shown in problem symptoms table (See **PROBLEM SYMPTOMS**).

NG: Go to next step.

2. Check EFI1 fuse .

Engine Room J/B



Y

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Fig. 21: Locating EFI1 Fuse

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Remove the EFI1 fuse from the engine room J/B.
- Check the continuity of the EFI1 fuse.

OK: Continuity

OK: Go to next step.

NG: Check for short in all harness and components connected to EFI1 fuse.

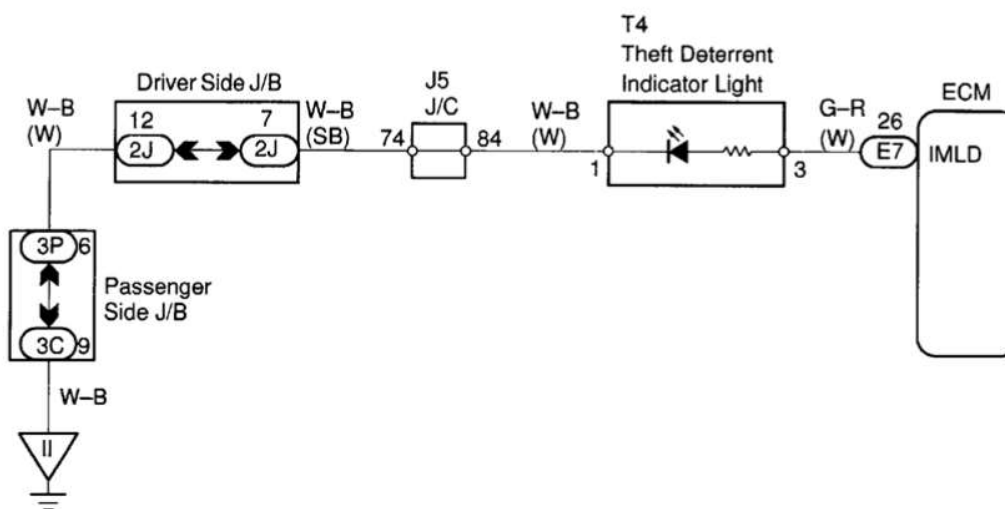
3. **Check harness and connector between transponder key amplifier and body ground (See HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE) .**

OK: Check and repair harness and connector between transponder key amplifier and battery (See HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE).

NG: Repair or replace harness or connector.

SECURITY INDICATOR LIGHT CIRCUIT**Circuit Description**

When the engine immobilizer system is preparing to set, this circuit turns the security indicator light ON. When the system has been set, it continually keeps the security indicator light ON for 0.8 seconds and turns it OFF for 1.2 seconds, thus the security indicator light blinks.

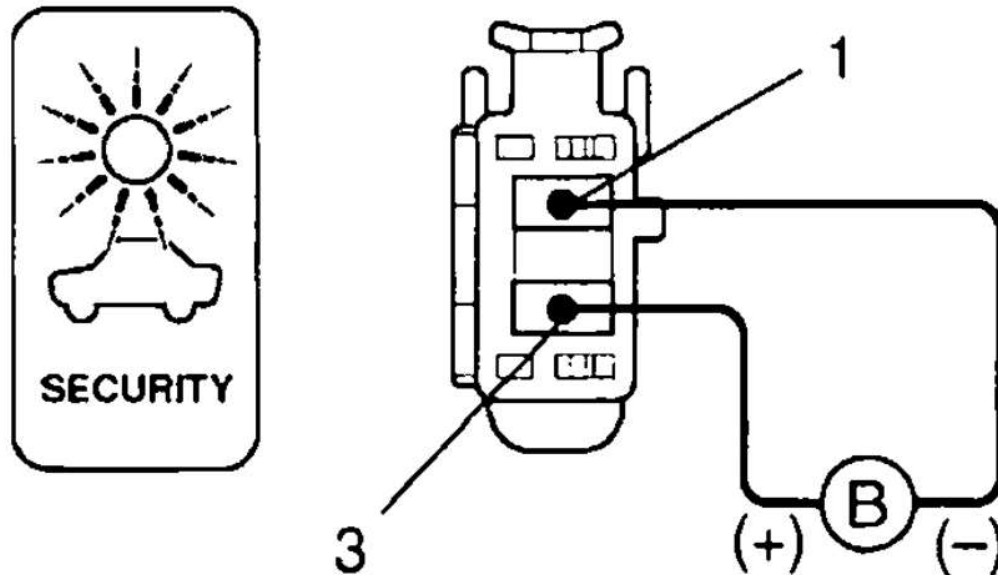
Wiring Diagram

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Fig. 22: Theft Deterrent Indicator Light Circuit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Inspection Procedure

1. Check indicator light .



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Fig. 23: Checking Indicator Light

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Disconnect the indicator connector.
- b. Connect the positive (+) lead to terminal 3 and the negative (-) lead to terminal 1 of the indicator light connector.

OK: Indicator light comes on .

OK: Go to next step.

NG: Replace indicator light.

2. **Check harness and connector between ECM and security indicator light, and security indicator light and body ground (See HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE) .**

OK: Check and replace ECM

NOTE: When there is a malfunction that the engine immobilizer system cannot be set, proceed to the next numbered circuit inspection shown in problem symptoms table (See PROBLEM SYMPTOMS).

NG: Repair or replace harness or connector.