

ENGINE IMMOBILISER SYSTEM (w/ Smart Key System)

PRECAUTION

NOTICE:

For initialization:

When disconnecting the cable from the negative (-) battery terminal, initialize the following system after the cable is reconnected.

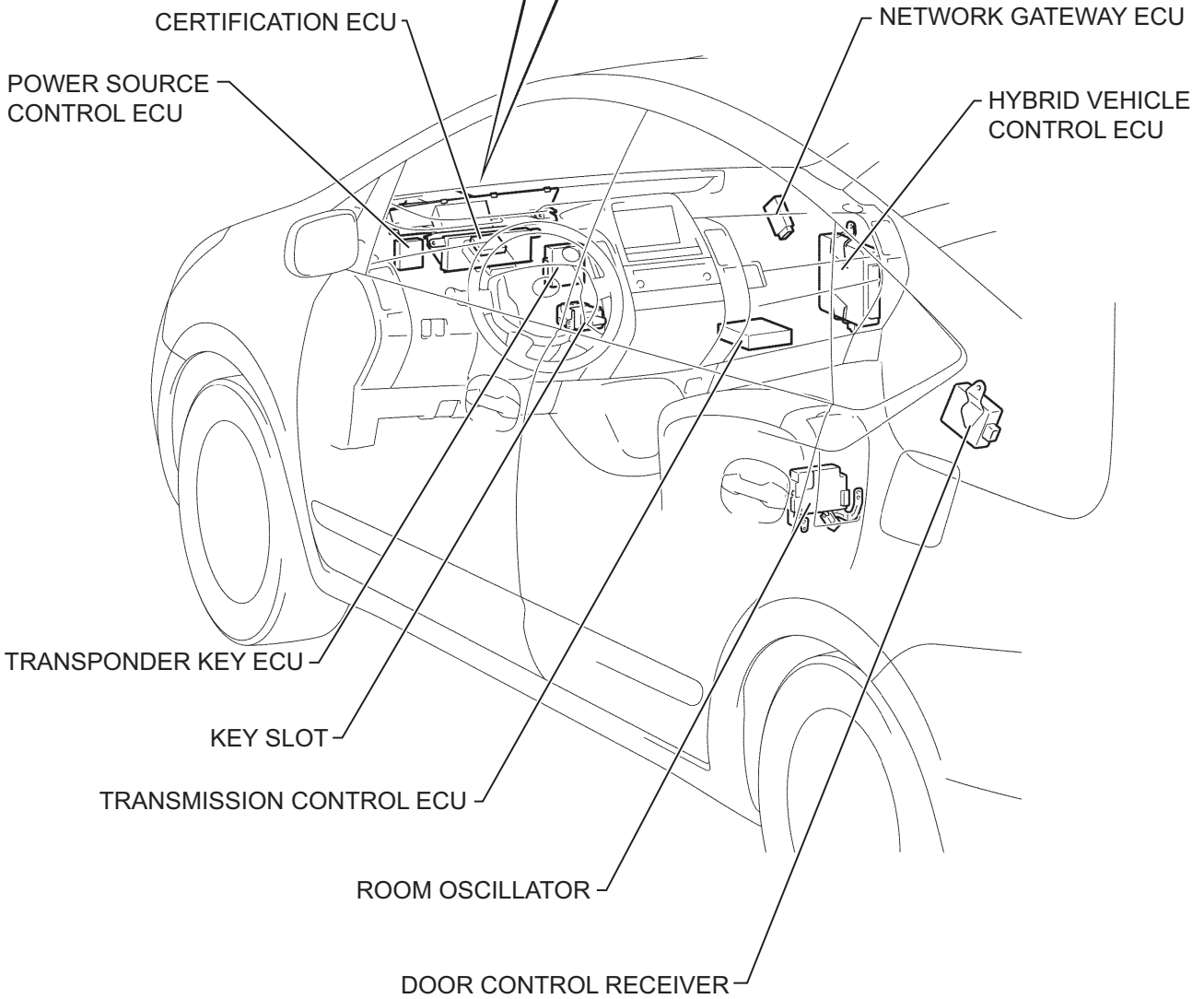
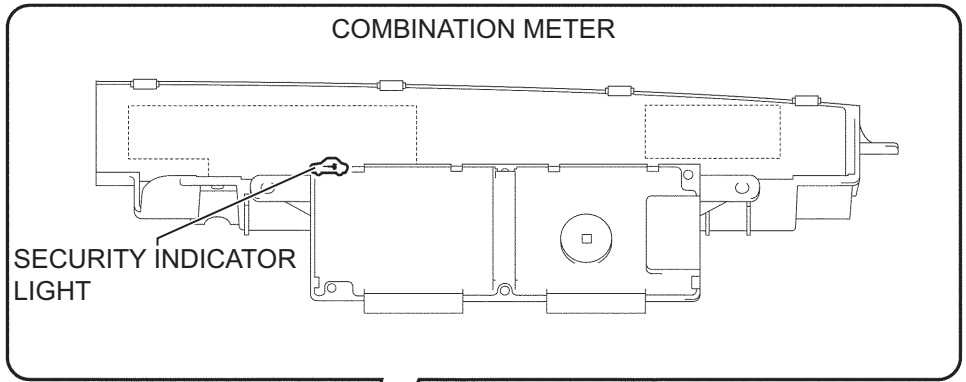
System Name	See procedure
Power Window Control System	IN-32

EI

For hybrid system activation:

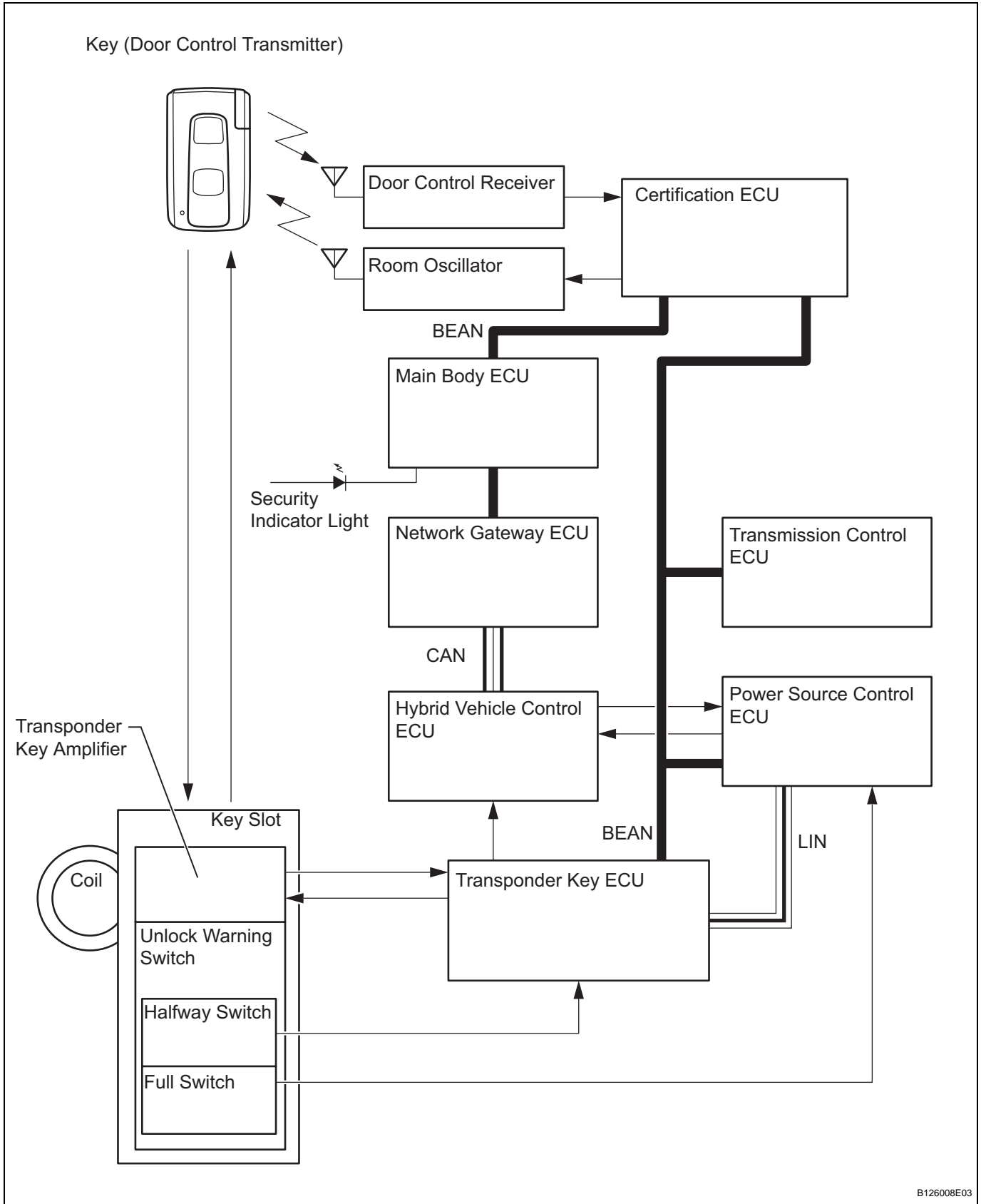
- When the warning light is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first try. If so, press the power switch again.
- If the power switch is ON (IG), the battery is disconnected, and the key is not in the key slot or not within the key detection area during reconnection, DTC B2799 (see page [EI-25](#)) may be output.

PARTS LOCATION



EI

SYSTEM DIAGRAM



EI

SYSTEM DESCRIPTION

1. ENGINE IMMOBILISER SYSTEM DESCRIPTION

- (a) The immobiliser system is a theft deterrent system that determines whether or not to disable starting of the hybrid control system depending on a comparison of the key's ID code and the vehicle's pre-registered code.

The immobiliser system compares the vehicle transponder key ECU's pre-registered ID code with the key-embedded transponder chip's ID code. If the ID codes do not match, the immobiliser system activates and the hybrid control system cannot be started. The transponder key ECU manages communication with the hybrid vehicle control ECU and power source control ECU. When the ID codes of the transponder chip and transponder key ECU match, the transponder key ECU authorizes the starting of the hybrid control system.

2. FUNCTION OF MAIN COMPONENTS

Components	Outline
Transponder key coil/amplifier	Receives key ID code, amplifies ID code and outputs it to transponder key ECU. Key ID code is received when key is inserted into key slot.
Halfway switch (inside key slot)	Detects if key is/is not inserted into key slot and outputs results to transponder key ECU
Full switch (inside key slot)	Detects if key is/is not inserted into key slot and outputs results to power source control ECU
Room oscillator	Transmits key detection signals within detection area in vehicle interior upon receiving transmission request signal from certification ECU. Entry key ECU request signal is activated when key is brought into vehicle interior and, without inserting key into key slot, power switch is pushed.
Door control receiver	Transmits ID code to certification ECU. Key ID code is received when key is brought into vehicle interior and, without inserting key into key slot, power switch is pushed
Security indicator light	Illuminates or starts flashing. Illumination is controlled by body ECU

3. SYSTEM FUNCTION

- (a) Starting hybrid control system with key inserted into the key slot:

When the transponder key ECU detects that the halfway switch is ON, the ECU provides current to the transponder key coil and produces a faint electric wave. A transponder chip in the key receives the faint electric wave. Upon receiving the faint electric wave, the transponder chip outputs a key ID code signal. The transponder key coil receives this signal, the transponder key amplifier amplifies it, and then the signal is transmitted to the transponder key ECU. The transponder key ECU matches the key's ID code with the vehicle's ID code, which was previously registered in the ECU. If the ID codes match, the transponder key ECU turns off the security indicator. Then when the power switch is pushed, the code match results are sent through the transponder key ECU to the power

source control ECU, which authorizes the transition of the power switch's power modes. The ACC, IG1 and IG2 relays are turned ON, supplying power to the power switch ON (ACC) and ON (IG) power modes. Also, the power source control ECU changes the power switch's indicator to amber, informing the driver that the power mode is set to ON (IG). Then, the power source control ECU sends a system start signal to the hybrid vehicle control ECU. The hybrid vehicle control ECU confirms that the key ID code has been verified. If the ID code has been verified, the hybrid vehicle control ECU bypasses the immobiliser system and starts the hybrid control system.

- (b) Starting hybrid control system without inserting the key into key slot:

If a user operates the power switch while the key is in the user's possession, the certification ECU outputs a request signal to the room oscillator. The room oscillator emits signals in order to form a key detection area in the vehicle interior. The key then sends its ID code signal to the certification ECU via the door control receiver. The certification ECU matches the key's ID code with the vehicle's ID code, which was previously registered in the transponder key ECU. If the ID codes match, the transponder key ECU turns off the security indicator. Then when the power switch is pushed, the code match results are sent through the transponder key ECU to the power source control ECU, which authorizes the transition of the power switch's power modes. The ACC, IG1 and IG2 relays are turned ON, supplying power to the power switch ON (ACC) and ON (IG) power modes. Also, the power source control ECU changes the power switch's indicator to amber, informing the driver that the power mode is set to ON (IG). Then, the power source control ECU sends a system start signal to the hybrid vehicle control ECU. The hybrid vehicle control ECU confirms that the key ID code has been verified. If the ID code has been verified, the hybrid vehicle control ECU bypasses the immobiliser system and starts the hybrid control system.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use these procedures to troubleshoot the engine immobiliser system.
- *: Use the intelligent tester.

1 VEHICLE BROUGHT TO WORKSHOP

EI 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 START HYBRID CONTROL SYSTEM

Result

Result	Proceed to
Power switch cannot be turned ON (ACC) or when hybrid control system can be started	A
Power switch can be turned ON (ACC) and hybrid control system cannot be started	B

B

Go to HYBRID CONTROL SYSTEM

A

4 CHECK FOR DTC*

- Check for DTCs and note any codes that are output (see page [EI-24](#)).
- Delete the DTC.
- Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.

Result:

Result	Proceed to
DTC reoccurs	A
DTC does not reoccur	B

B

Go to step 7

A

5 PROBLEM SYMPTOMS TABLE**Result:**

Result	Proceed to
Fault is not listed in problem symptoms table	A
Fault is listed in problem symptoms table	B

B**Go to step 7****A****6** OVERALL ANALYSIS AND TROUBLESHOOTING*

- (a) DATA LIST/ACTIVE TEST (see page [EI-24](#))
- (b) Terminals of ECU (see page [EI-18](#))

NEXT**7** ADJUST, REPAIR OR REPLACE**NEXT****8** CONFIRMATION TEST**NEXT****END****EI**

REGISTRATION

1. DESCRIPTION OF CODE REGISTRATION

HINT:

- The key code (immobiliser code) is needed when the transponder key ECU, hybrid vehicle control ECU, certification ECU or key is replaced with a new one.
- The key has 3 codes: the key code, the entry code and the wireless code. All of these code types need to be registered when the key is replaced with new one. Refer to the following key code registration procedures and the entry and wireless code registration procedures (see page [DL-142](#)).

2. PART REPLACEMENT AND KEY REGISTRATION PROCEDURES

- (a) The following table shows ECU replacement and key registration procedures in case the malfunctioning ECU has been determined after troubleshooting the engine immobiliser system.

HINT:

- The following procedures indicated in the table below require the use of the intelligent tester:
 - New key code registration
 - Additional key code registration
 - Key code erasure
 - ECU code registration
- If all of the registered keys are not available, replacement of the transponder key ECU is also required.

Part to be replaced	Procedure	Refer to
Transponder key ECU	1. Replace transponder key ECU	-
	2. Reregister all keys	"KEY REGISTRATION IN AUTOMATIC REGISTRATION (NEW REGISTRATION)"
	3. Using SST (09843-018040), connect terminals TC and CG of DLC3	"ECU CODE REGISTRATION (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)"
	4. Turn power switch ON (IG) and leave it as is for 30 minutes	
	5. Register ECU communication ID to be used between certification ECU and transponder key ECU	"ECU CODE REGISTRATION (TRANSPONDER KEY ECU - CERTIFICATION ECU)"
Certification ECU	1. Replace certification ECU	-
	2. Register ECU communication ID to be used between certification ECU and transponder key ECU	"ECU CODE REGISTRATION (TRANSPONDER KEY ECU - CERTIFICATION ECU)"
Hybrid vehicle control ECU	1. Replace ECM	Refer to replacement (see page ES-469)
	2. Using SST (09843-018040), connect terminals TC and CG of DLC3	"ECU CODE REREGISTRATION (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)"
	3. Turn power switch ON (IG) and leave it as is for 30 minutes	
Key	1. Using remaining key, erase key code of lost key	"ERASURE OF KEY CODE"
	2. Register additional keys as necessary	"REGISTRATION OF ADDITIONAL KEY (ADDITIONAL REGISTRATION)"

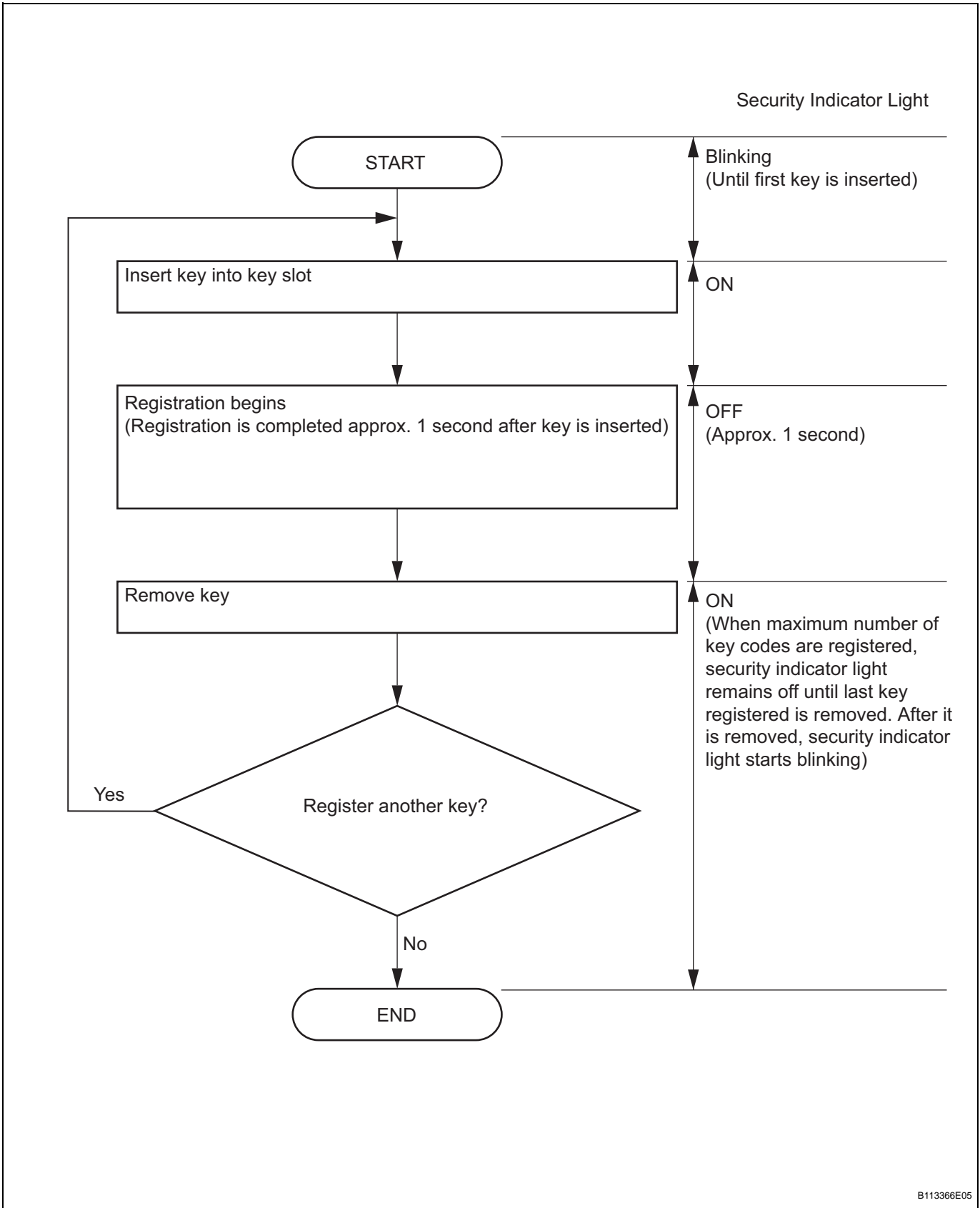
3. KEY REGISTRATION IN AUTOMATIC REGISTRATION (NEW REGISTRATION)

- (a) When a key is inserted into the key slot, the key code (immobiliser code) registration is automatic. In this mode, a maximum of 2 key codes can be registered.

HINT:

- When a new transponder key ECU is installed, key codes (immobiliser codes) must be registered in the transponder key ECU.
- New transponder key ECU are automatically set to automatic key code registration mode.

EI



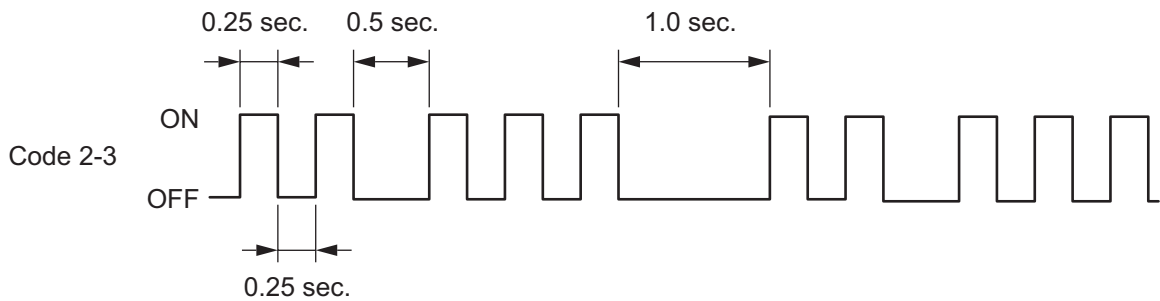
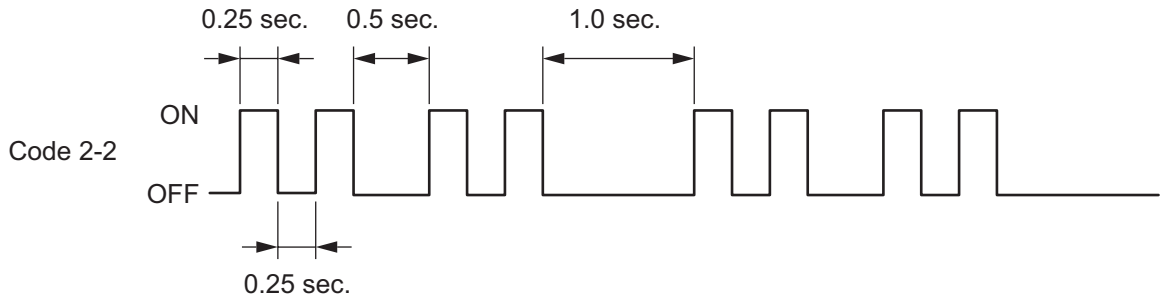
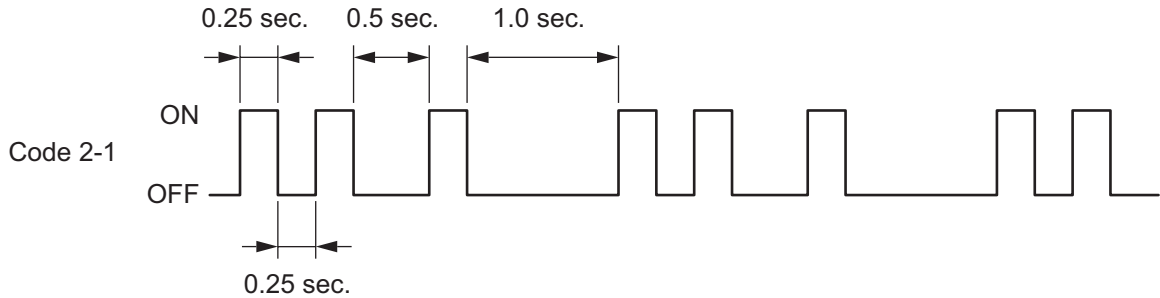
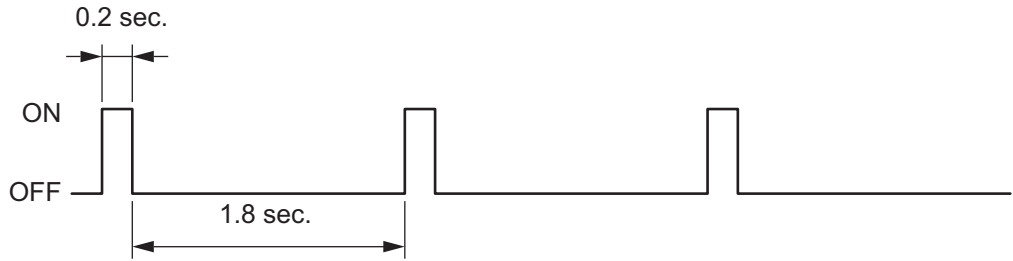
(b) End automatic key code registration mode. Automatic key code registration mode can be forced to end when at least 1 key code (immobiliser code) for the key has been registered.

- (1) Turn the power switch from ON (IG) and OFF 5 times within 10 seconds using the already registered key.

HINT:

- When no key is inserted into the key slot in automatic key code registration mode, the security indicator light remains on.
- When the immobiliser system is operating normally and the key is pulled out, the security indicator light blinks continuously.
- If the key code registration has failed in automatic key code registration mode, code 2-1 will be output from the security indicator light. Trying to reregister an already registered key will cause code 2-2 to be output when the key is inserted. If the number of registered key codes exceeds the limit, code 2-3 will be output from the security indicator light. The output details are shown below.

Normal
(Immobiliser system
is operating normally)



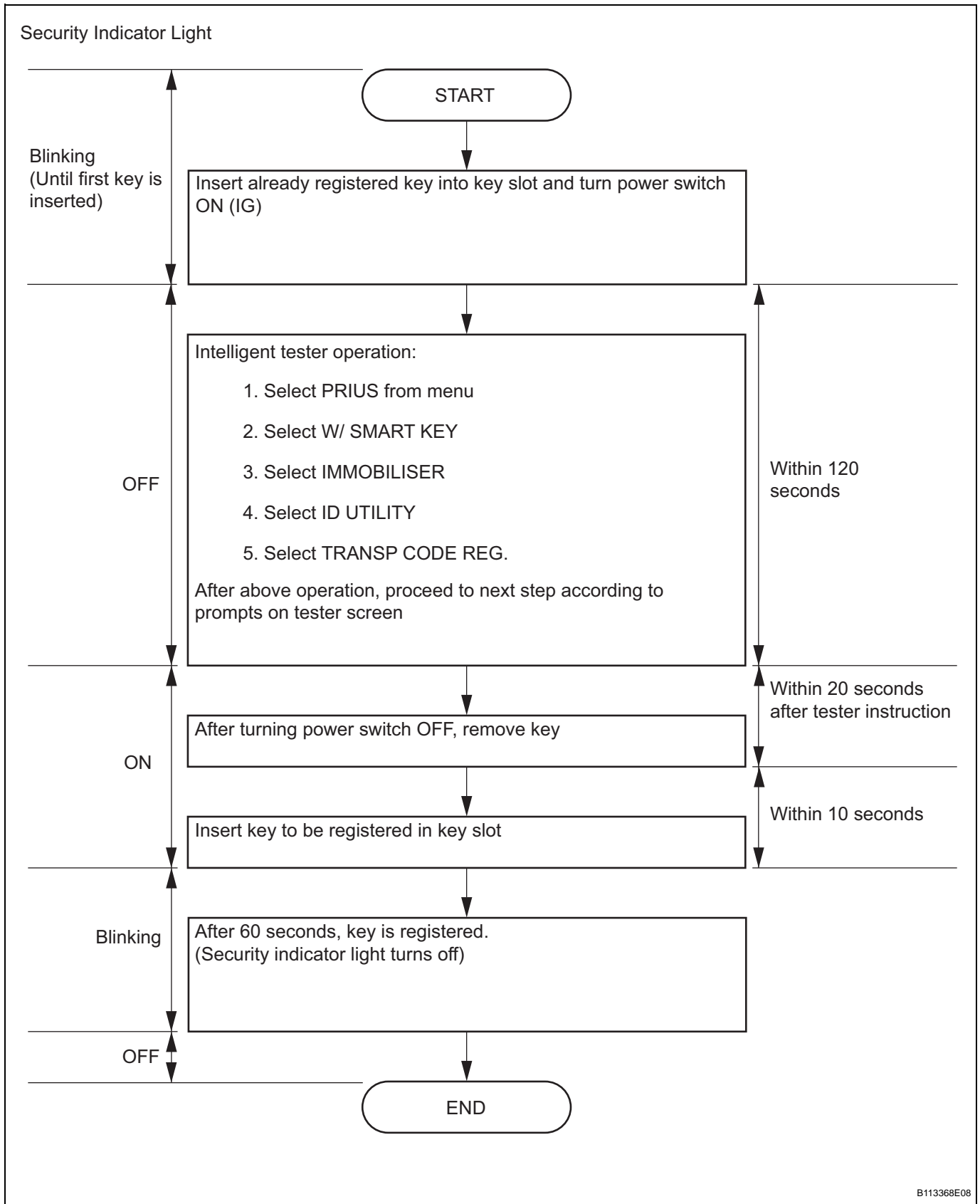
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4. REGISTRATION OF ADDITIONAL KEY (ADDITIONAL REGISTRATION)

(a) Register an additional key using the intelligent tester.

HINT:

- A maximum of 5 key codes can be registered.
- Registration mode will be ended if each step is not completed within the specified time.

**HINT:**

- A brief outline of procedures for key code registration is shown above. For more detailed information, refer to the intelligent tester screen's instructions.

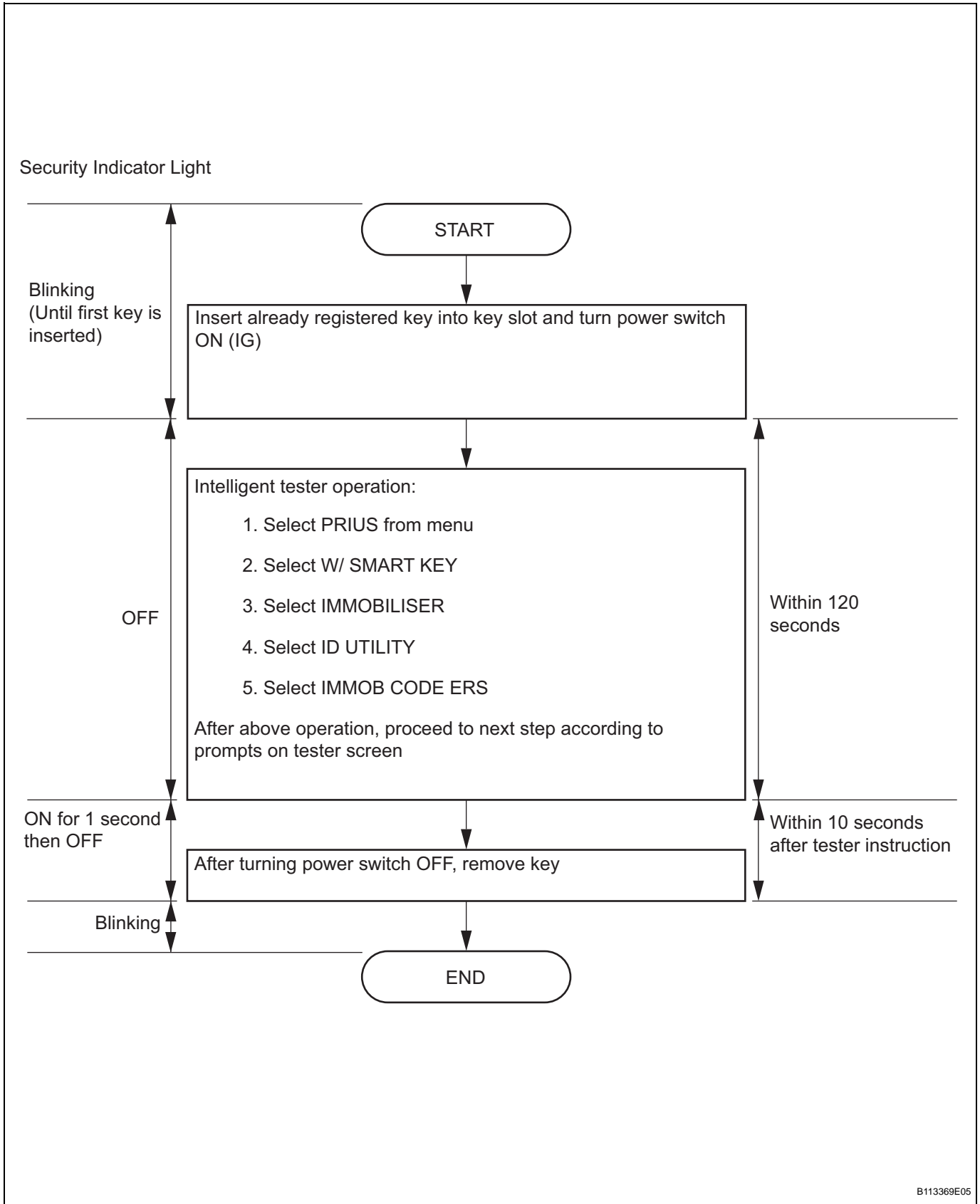
- When the immobiliser system is operating normally and key is pulled out, the security indicator light blinks continuously.
- If the key code registration has failed in automatic key code registration mode, code 2-1 will be output from the security indicator light. Trying to reregister an already registered key will cause code 2-2 to be output when the key is inserted. If the number of registered key codes exceeds the limit, code 2-3 will be output from the security indicator light. The output details are shown in the "KEY REGISTRATION IN AUTOMATIC REGISTRATION (NEW REGISTRATION)" procedures.

5. ERASURE OF KEY CODE

- (a) Erase the key codes using the intelligent tester.

HINT:

- All key codes are erased except for the key that is used to erase the key codes. In order to use a key whose code has been erased, a new key code must be registered.
- Registration will be canceled if each step is not completed within the specified time.



HINT:

- A brief outline of procedures for the key code erasure is shown above. For more detailed information, refer to the intelligent tester screen's instructions.

- When the immobiliser system is operating normally and key is pulled out, the security indicator light blinks continuously.

6. ECU COMMUNICATION ID REGISTRATION (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)

NOTICE:

- If the transponder key ECU and/or hybrid vehicle control ECU has been replaced, register the ECU communication ID to both ECUs in order to match their IDs.
 - The hybrid control system cannot be started unless the ECU communication ID matches.
 - When the transponder key ECU has been replaced, do not turn the power switch from ON to OFF 20 times or more consecutively. The ECU communication ID must be registered before such an occurrence or the transponder key ECU will need to be replaced. If the transponder key ECU is unable to recognize the hybrid vehicle control ECU, the hybrid control system will be unable to be started. If the transponder key ECU cannot recognize the hybrid vehicle control ECU, the transponder key ECU must be replaced again with a new one.
 - After the registration, pressing the power switch may not start the system on the first try. If so, press the power switch again.
 - After the hybrid control system is started, erase DTC B2799 (code for hybrid vehicle control ECU's immobiliser communication error) using either of the following:
 - Using the intelligent tester (see page EI-24).
 - Disconnect the battery for 30 seconds.
- (a) Register the ECU communication ID.
- (b) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040

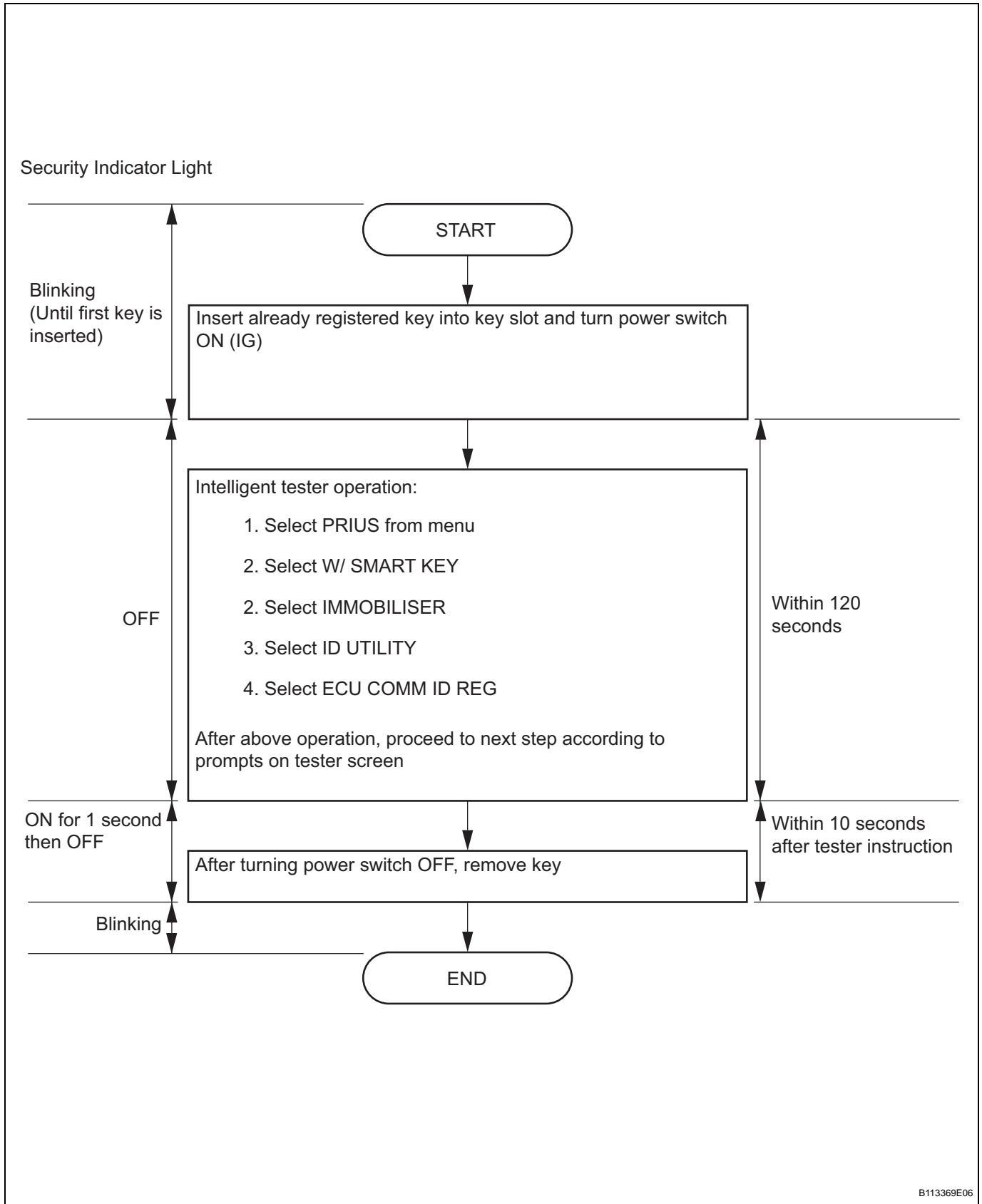


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- (c) Turn the power switch ON (IG) (do not start the hybrid control system) and leave it as is for 30 minutes.
- (d) Turn the power switch OFF and disconnect terminals TC and CG.

(e) Check that the hybrid control system starts.

**7. ECU COMMUNICATION ID REGISTRATION
(TRANSPONDER KEY ECU - CERTIFICATION ECU)**



HINT:

- A brief outline of procedures for key code registration is shown above. For more detailed information, refer to the intelligent tester screen's instructions.
- When the engine immobiliser system is operating normally and the key is pulled out, the security indicator light blinks continuously.

**8. ECU COMMUNICATION ID REREGISTRATION
(TRANSPONDER KEY ECU - HYBRID VEHICLE
CONTROL ECU)****NOTICE:**

- **The ECU communication ID should be registered when the hybrid vehicle control ECU is replaced in order to match the ECU communication ID (transponder key ECU - hybrid vehicle control ECU).**
 - **The hybrid control system cannot be started unless the ECU communication ID (transponder key ECU - hybrid vehicle control ECU) matches.**
- (a) Insert the already registered key in the key slot and turn the power switch ON (READY) with the brake pedal depressed.
 - (b) Check that the hybrid control system stays on for more than 3 seconds.

PROBLEM SYMPTOMS TABLE

HINT:

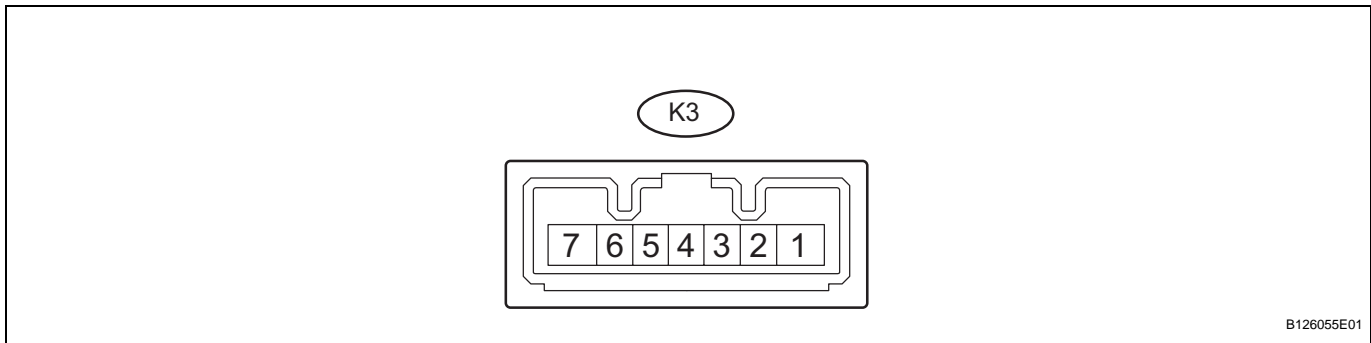
- Use the table below to help determine the cause of the problem symptom. The potential causes of the symptoms are listed in order of probability in the "Suspected area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- Inspect the fuses and relays related to this system before inspecting the suspected areas below.

Engine immobiliser system

Symptom	Suspected area	See page
Hybrid control system does not start	1. Power source circuit	EI-47
	2. Hybrid control system	HV-21

TERMINALS OF ECU

1. CHECK KEY SLOT



- (a) Disconnect the K3 key slot connector.
- (b) Measure the resistance of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (K3-7) - Body ground	P - Body ground	Ground	Always	Below 1 Ω

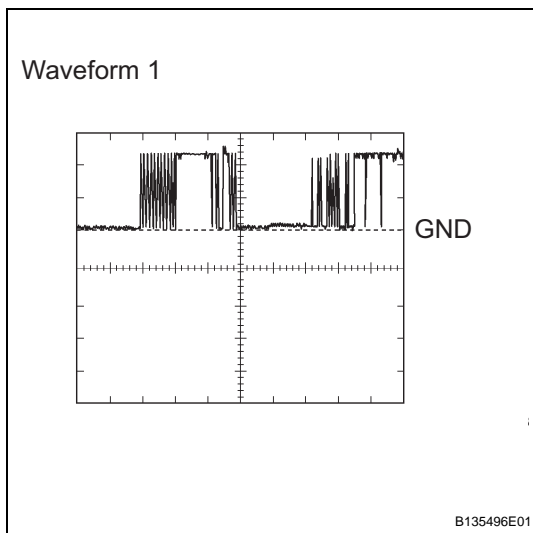
If the result is not as specified, there may be a malfunction on the wire harness side.

- (c) Reconnect the K3 key slot connector.
- (d) Measure the resistance and voltage of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (K3-7) - Body ground	P - Body ground	Ground	Always	Below 1 Ω
VC5 (K3-1) - GND (K3-7)	Y - P	Power source	No key in key slot	Below 1 V
			Key inserted	4.6 to 5.4 V
CODE (K3-4) - GND (K3-7)	L - P	Demodulated signal of key code data	No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 1)
TXCT (K3-5) - GND (K3-7)	LG - P	Key code output signal	No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 2)

If the result is not as specified, the key slot (amplifier) may have a malfunction.

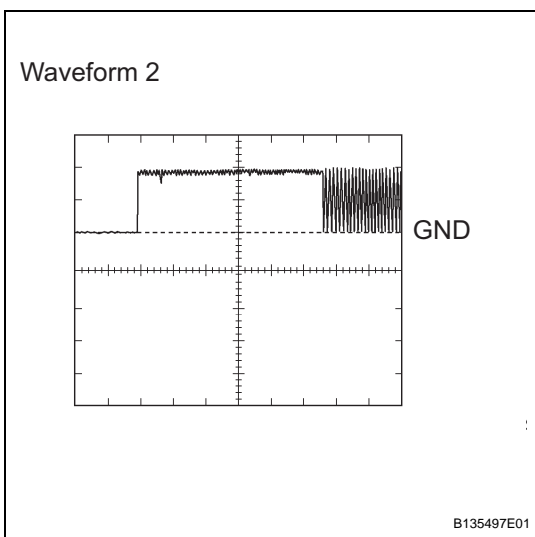
- (e) Using an oscilloscope, check the waveform 1.
- Waveform 1 (Reference):**



Item	Content
Symbols (Terminal No.)	CODE (K3-4) - GND (K3-7)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted

(f) Using an oscilloscope, check the waveform 2.

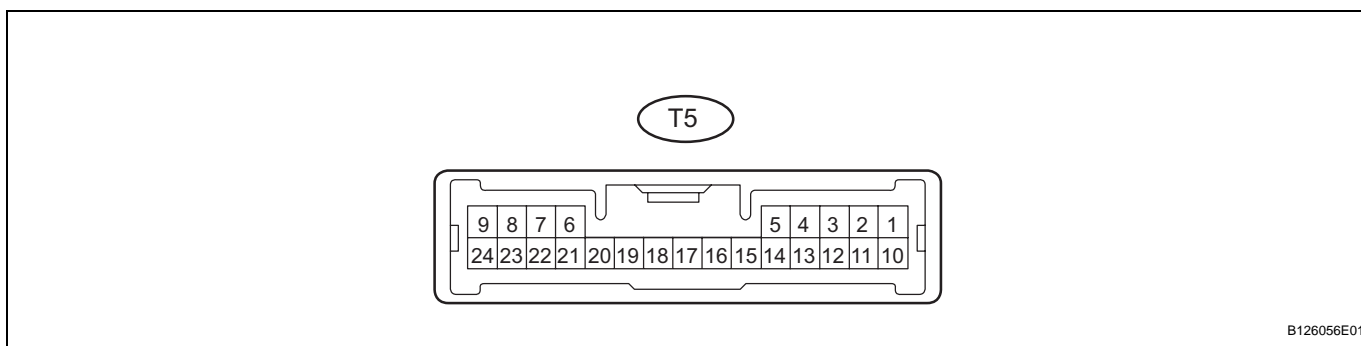
Waveform 2 (Reference):



Item	Content
Symbols (Terminal No.)	TXCT (K3-5) - GND (K3-7)
Tool Setting	2 V/DIV., 10 msec./DIV.
Condition	Key inserted

2. CHECK TRANSPONDER KEY ECU

EI



- (a) Disconnect the T5 ECU connector.
- (b) Measure the resistance and voltage of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (T5-22) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
AGND (T5-7) - GND (T5-22)	P - W-B	Ground	Always	Below 1 Ω
CPUB (T5-3) - GND (T5-22)	L - W-B	+B (CPUB) power supply	Always	10 to 14 V
IG (T5-4) - GND (T5-22)	O - W-B	Ignition power supply	Power switch OFF	Blow 1 V
			Power switch ON (IG)	10 to 14 V
CUWS (T5-5) - GND (T5-22)	B - W-B	Halfway switch signal	No key in key slot	Below 1 Ω
			Key inserted	10 kΩ or higher

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

- (c) Reconnect the T5 ECU connector.
- (d) Measure the voltage of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
CUWS (T5-5) - GND (T5-22)	B - W-B	Halfway switch signal	No key in key slot	10 to 14 V
			Key inserted	Below 1 V
VC5 (T5-20) - GND (T5-22)	Y - W-B	Key slot power source	No key in key slot	Below 1 V
			Key inserted	4.6 to 5.4 V

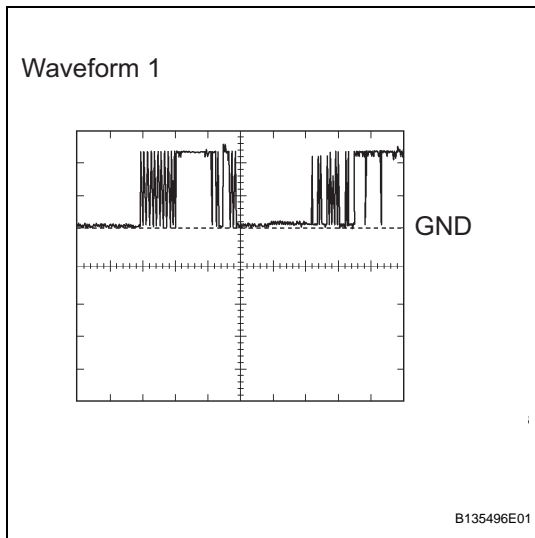
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
CODE (T5-21) - GND (T5-22)	L - W-B	Transponder key amplifier communication signal	No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 1)
TXCT (T5-6) - GND (T5-22)	LG - P	Hybrid vehicle control ECU output signal	No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 2)
HEV0 (T5-19) - GND (T5-22)	W - W-B	Hybrid vehicle control ECU output signal	Power switch OFF	Below 1 V
			Power switch ON (IG)	Pulse generation (see waveform 3)
HEV1 (T5-18) - GND (T5-22)	R - W-B	Hybrid vehicle control ECU input signal	Always	Pulse generation (see waveform 4)

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

- (e) Using an oscilloscope, check the waveform 1.

Waveform 1 (Reference):

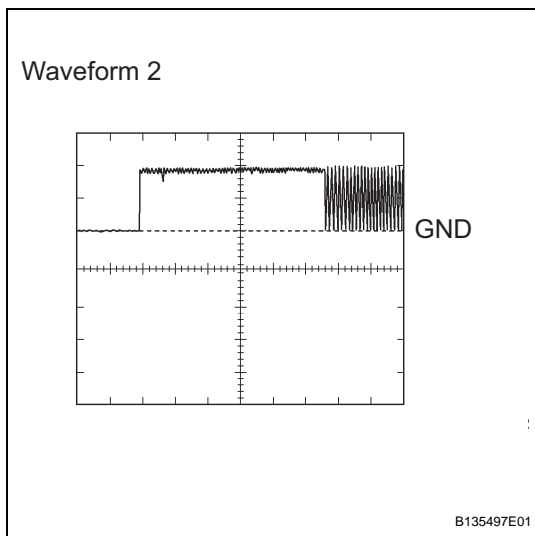
Item	Content
Symbols (Terminal No.)	CODE (T5-21) - GND (T5-22)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted



- (f) Using an oscilloscope, check the waveform 2.

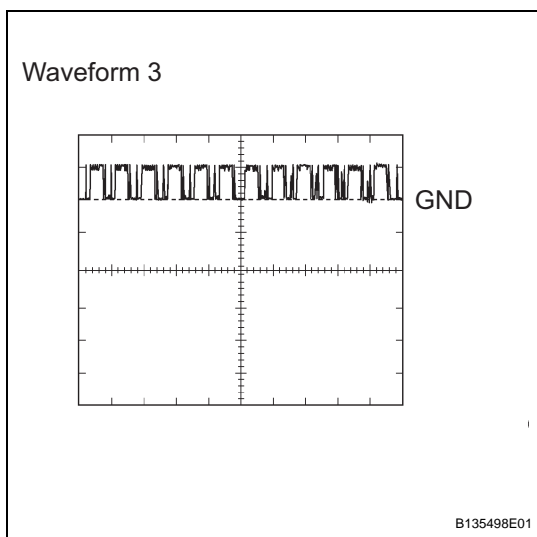
Waveform 2 (Reference):

Item	Content
Symbols (Terminal No.)	TXCT (T5-6) - GND (T5-22)
Tool Setting	2 V/DIV., 10 msec./DIV.
Condition	Key inserted



(g) Using an oscilloscope, check the waveform 3.

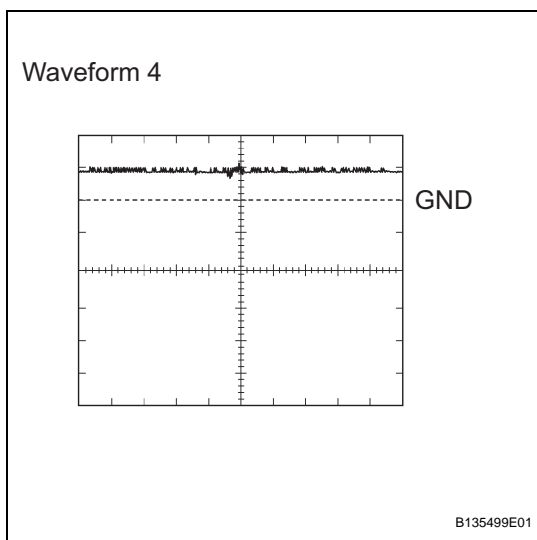
Waveform 3 (Reference):



Item	Content
Symbols (Terminal No.)	HEV0 (T5-19) - GND (T5-22)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Power switch ON (IG)

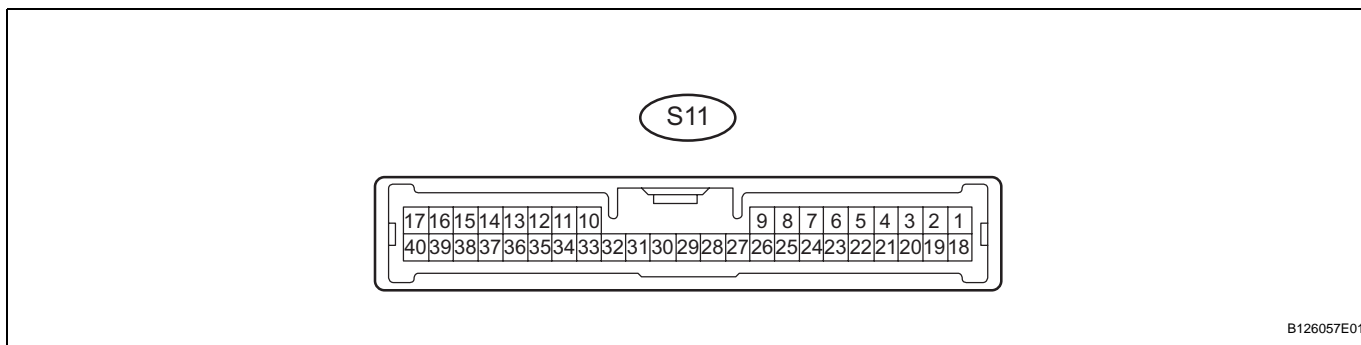
(h) Using an oscilloscope, check the waveform 4.

Waveform 4 (Reference):



Item	Content
Symbols (Terminal No.)	HEV1 (T5-18) - GND (T5-22)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Always

3. CHECK CERTIFICATION ECU

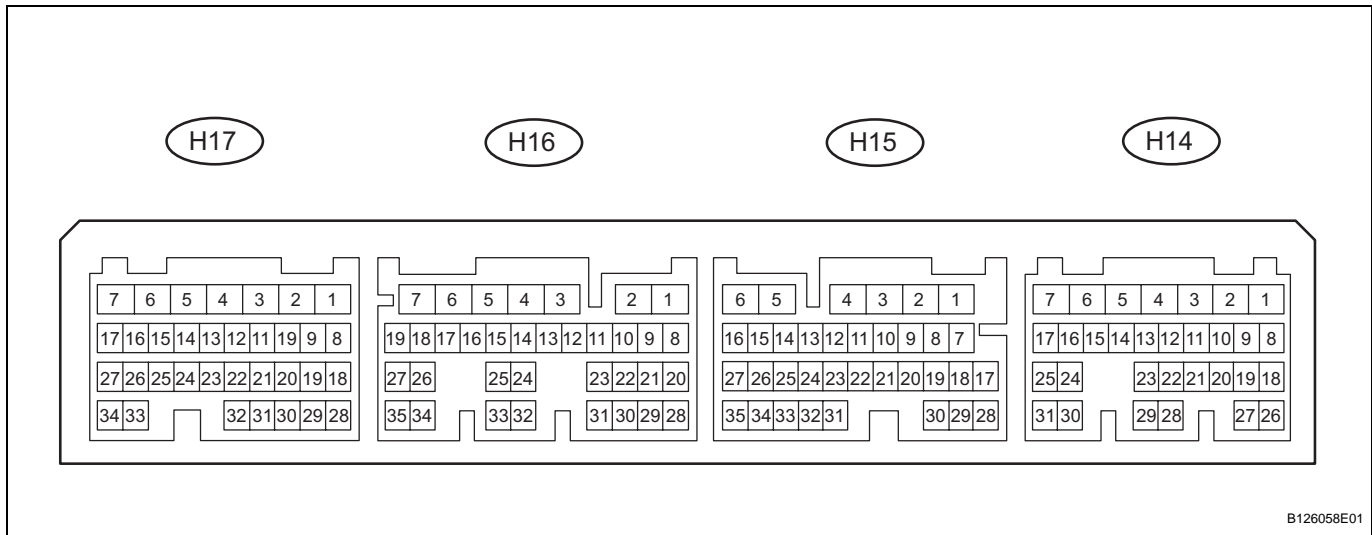


- (a) Disconnect the S11 ECU connector.
- (b) Measure the resistance and voltage of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
E (S11-17) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
+B1 (S11-1) - E (S11-17)	R - W-B	Battery power supply	Always	10 to 14 V
KSW (S11-4) - E (S11-17)	Y - W-B	Halfway switch signal	No key in key slot	10 kΩ or higher
			Key inserted	Below 1 Ω
IG (S11-18) - E (S11-17)	B - W-B	Ignition switch supply	Power switch OFF	Below 1 V
			Power switch ON (IG)	10 to 14 V

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

4. CHECK HYBRID VEHICLE CONTROL ECU



(a) Measure the resistance and voltage of the connectors.

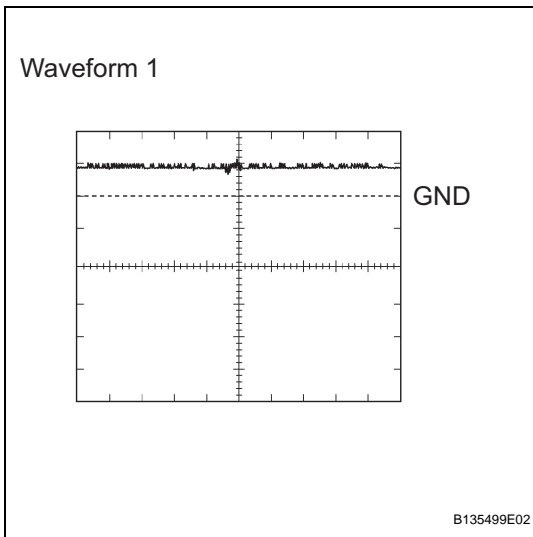
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND1 (H14-1) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
GND 2 (H14-4) - Body ground				
ST2 (H14-5) - GND1 (H14-1)	Y - W-B	Ignition ready control signal input	Hybrid control system stopped and power switch ON (READY)	10 to 14 V
IGSW (H14-7) - GND1 (H14-1)	O - W-B	Ignition start control signal input	Hybrid control system stopped and power switch ON (IG)	
BATT (H15-6) - GND1 (H14-1)	Y - W-B	Battery	Always	
+B1 (H16-7) - GND1 (H14-1)	L - W-B	Ignition power supply	Power switch ON (IG)	
+B2 (H16-6) - GND1 (H14-1)				
IMI (H14-18) - GND2 (H14-4)	W - W-B	Transponder key ECU input signal	Always	Pulse generation (see waveform 1)
IMO (H14-26) - GND2 (H14-4)	R - W-B	Transponder key ECU output signal	Power switch OFF	Below 1 V
			Power switch ON (IG)	Pulse generation (see waveform 2)

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

(b) Using an oscilloscope, check the waveform 1.

Waveform 1 (Reference):

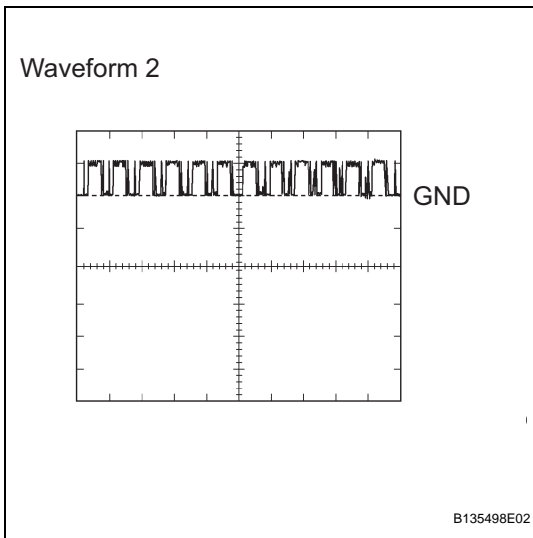
Item	Content
Symbols (Terminal No.)	IMI (H14-18) - GND2 (H14-4)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Always



(c) Using an oscilloscope, check the waveform 2.

Waveform 2 (Reference):

Item	Content
Symbols (Terminal No.)	IMO (H14-26) - GND2 (H14-4)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Power switch ON (IG)



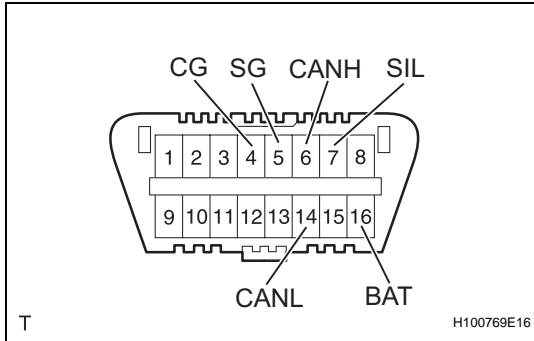
DIAGNOSIS SYSTEM

1. DESCRIPTION

- (a) The hybrid vehicle control ECU controls vehicle's immobiliser system function. Immobiliser system data and the Diagnostic Trouble Codes (DTCs) can be read through the vehicle's Data Link Connector 3 (DLC3). In some cases, a malfunction may be occurring in the immobiliser system even though the security indicator light is off. When the system seems to be malfunctioning, use the intelligent tester to check for malfunctions and perform repairs.

2. CHECK DLC3

- (a) The vehicle uses the ISO 15765-4 communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.



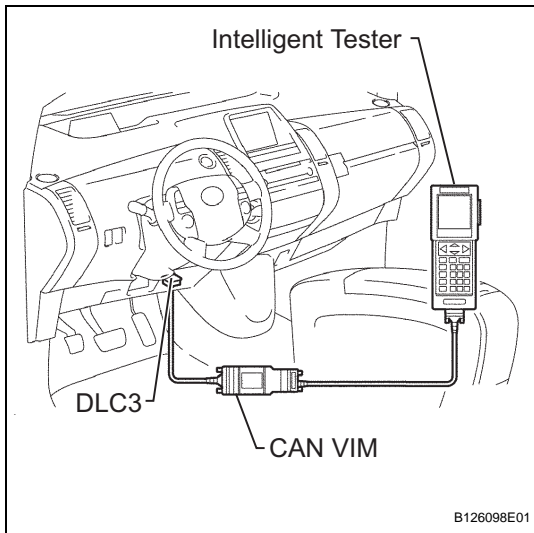
Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground		
BAT (16) - Body ground	Battery positive		
CANH (6) - CANL (14)	HIGH-level CAN bus line	Power switch OFF	54 to 69 Ω
CANH (6) - Battery positive			1 k Ω or higher
CANH (6) - CG (4)			1 k Ω or higher
CANL (14) - Battery positive	1 M Ω or higher		
CANL (14) - CG (4)	LOW-level CAN bus line		1 M Ω or higher

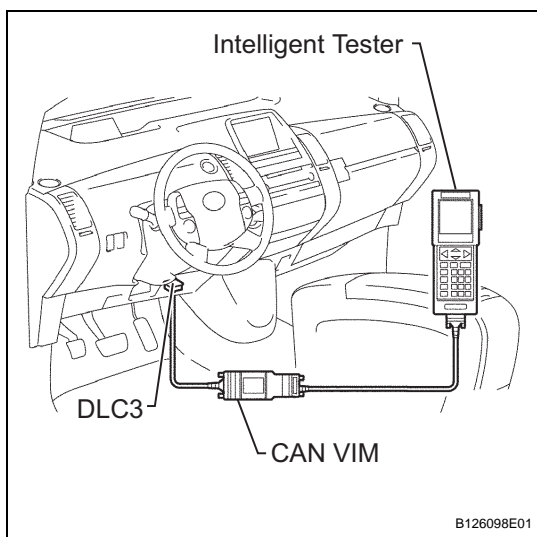
If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

HINT:

Connect the cable of the intelligent tester (with CAN VIM) to the DLC3, turn the power switch ON (IG) and attempt to use the tester. If the screen displays the message UNABLE TO CONNECT TO VEHICLE, there is a problem either with the vehicle or with the tester.

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





DTC CHECK / CLEAR

1. CHECK DTC

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Read the DTCs by following the directions on the tester's screen.

2. CLEAR DTC

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Erase the DTCs by following the directions on the tester's screen.

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Read the DATA LIST by following the directions on the tester screen.

Transponder key ECU:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal / ON or OFF	ON: Key is in key slot OFF: No key is in key slot	-
SHIFT POS	Shift position P signal / ON or OFF	ON: Shift position is P OFF: Shift position is not P	-
+B	Battery voltage / NORMAL or BREAK	NORMAL: Battery supply is normal BREAK: Battery supply is malfunctioning	-
ANTENNA COIL	Transponder key coil condition / NORMAL or FAIL	NORMAL: Transponder key coil is normal FAIL: Transponder key coil is malfunctioning	-
IMMOBILISER	Immobiliser system status / SET or UNSET	SET: Without key UNSET: Power switch ON (IG)	-
CHECK (SECURITY)	Verification with entry key ECU / NORMAL or ABNORMAL	NORMAL: Verified with entry key ECU ABNORMAL: Not verified with entry key ECU	-
REMIT (START)	Hybrid control system starting control / OK or NG	OK: Hybrid control system starting is permitted NG: Hybrid control system is not permitted	-
G-CODE SUPPORT	G-code support / SUPPORT or NOT SUP	SUPPORT: G-code is supported NOT SUP: G-code is not supported	-
MASTER KEY	Key code signal / NOMATCH or MATCH	MATCH: Key code is send NOMATCH: Unmatched key code is sent	-
REGIST MAS CODE	Number of registered key / min.: 0; max.: 5	Number of registered key	-

2. PERFORM ACTIVE TEST

HINT:

Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time. The DATA LIST can be displayed during the ACTIVE TEST.

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).

- (c) Perform the ACTIVE TEST by following the directions on the tester's screen.

Transponder key ECU:

Item	Test Details	Diagnostic Note
NOT P-POS WARN	Shift p-pos warning is ON / OFF	-
METER CHIME	Meter chime is ON / OFF	-
METER BUZ	Meter buzzer is ON / OFF	-
SECURITY INDC	Turn security indicator light ON / OFF	-

DIAGNOSTIC TROUBLE CODE CHART

1. TRANSPONDER KEY ECU DTC CHART

Transponder key ECU:

DTC No.	Detection Item	Trouble Area	See page
B2775	Interior Verification Abnormal (To Theft Deterrent ECU)	- Transponder key ECU - Certification ECU - Smart key system	EI-27
B2784	Antenna Coil Open / Short	- Wire harness - Key slot - Transponder key ECU	EI-30
B2785	Communication Malfunction between ECUs Connected by LIN	- Wire harness - Transponder key ECU - Power source control ECU	EI-33
B2793	Transponder Chip Malfunction	Key (door control transmitter)	EI-35
B2794	Unmatched Encryption Code	Key (door control transmitter)	EI-36
B2795	Unmatched Key Code	Key (door control transmitter)	EI-37
B2796	No Communication in Immobiliser System	- Key (door control transmitter) - Key slot - Wire harness	EI-38
B2797	Communication Malfunction No. 1	- Key (door control transmitter) - Wire harness - Key slot	EI-41
B2798	Communication Malfunction No. 2	- Key (door control transmitter)	EI-38

2. HYBRID VEHICLE CONTROL ECU DTC CHART

Hybrid vehicle control ECU

DTC No.	Detection Item	Trouble Area	See page
B2799-539	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-44
B2799-540	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-44
B2799-541	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-44
B2799-542	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-44
B2799-543	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-44
B2799-544	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-44

DTC	B2775	Interior Verification Abnormal (To Theft Deterrent ECU)
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DESCRIPTION

This DTC is output when: 1) there is no response from the certification ECU, 2) the ECU communication ID was unable to be registered properly, 3) a communication error occurs between the transponder key ECU and certification ECU.

DTC No.	DTC Detection Condition	Trouble Area
B2775	When any of following conditions are met: <ul style="list-style-type: none"> • There is no response from certification ECU • ECU communication ID is unable to be registered properly • Communication error occurs between transponder key ECU and certification ECU 	<ul style="list-style-type: none"> • Transponder key ECU • Certification ECU • Smart key system (for door lock)

INSPECTION PROCEDURE

1	CHECK FOR DTC
----------	----------------------

- (a) Delete the DTC (see page [EI-24](#)).
- (b) Check for DTCs when turning the power switch ON (IG) without inserting the key into the key slot.

Result:

Result	Proceed to
DTC reoccurs	A
DTC does not reoccur	B

B	NORMAL
----------	---------------



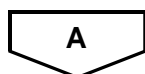
2	CHECK CERTIFICATION ECU (VERIFICATION)
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- (a) Check that the smart indicator on the meter is ON.

Result:

Result	Proceed to
Smart indicator is ON	A
Smart indicator is OFF	B

B	GO TO SMART KEY SYSTEM (for Door lock)
----------	---



3	CHECK TRANSPONDER KEY ECU
----------	----------------------------------

- (a) Insert the key into the key slot.
- (b) Check that the power switch can be turned ON (IG).

OK:

Power switch can be turned ON (IG).

OK

Go to step 5

NG

4

CHECK FOR DTC (IMMOBILISER SYSTEM DTC)

- (a) Check for DTCs and note any codes that are output (see page EI-24).
- (b) Delete the DTC.
- (c) Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.

Result:

Result	Proceed to
DTC does not reoccur	A
DTC reoccurs	B

NG

GO TO DTC CHART

OK

5

REREGISTER ECU COMMUNICATION ID CODE

- (a) Reregister the ECU communication ID code with a transponder key ECU and certification ECU (see page EI-7).
- (b) Check that the power switch can be turned ON (IG) even if the key is not inserted into the key slot.

OK:

Power switch can be turned ON (IG) without key in key slot

OK

NORMAL

NG

6

CHECK TRANSPONDER KEY ECU (OPERATION)

- (a) Temporarily replace the transponder key ECU with a new or normally functioning one.
- (b) Check that the power switch can be turned ON (ACC or IG) and the hybrid control system can be started.

Result:

Result	Proceed to
Power switch can be turned ON (ACC and IG) and hybrid control system can be started with/without inserting key into key slot	A
Power switch cannot be turned ON (ACC and IG) and hybrid control system cannot be started without inserting key into key slot	B
Power switch cannot be turned (ACC and IG) and hybrid control system cannot be started with inserting key into key slot	C

B

REPLACE CERTIFICATION ECU

C

GO TO SMART KEY SYSTEM

A

END (TRANSPONDER KEY ECU IS DEFECTIVE)

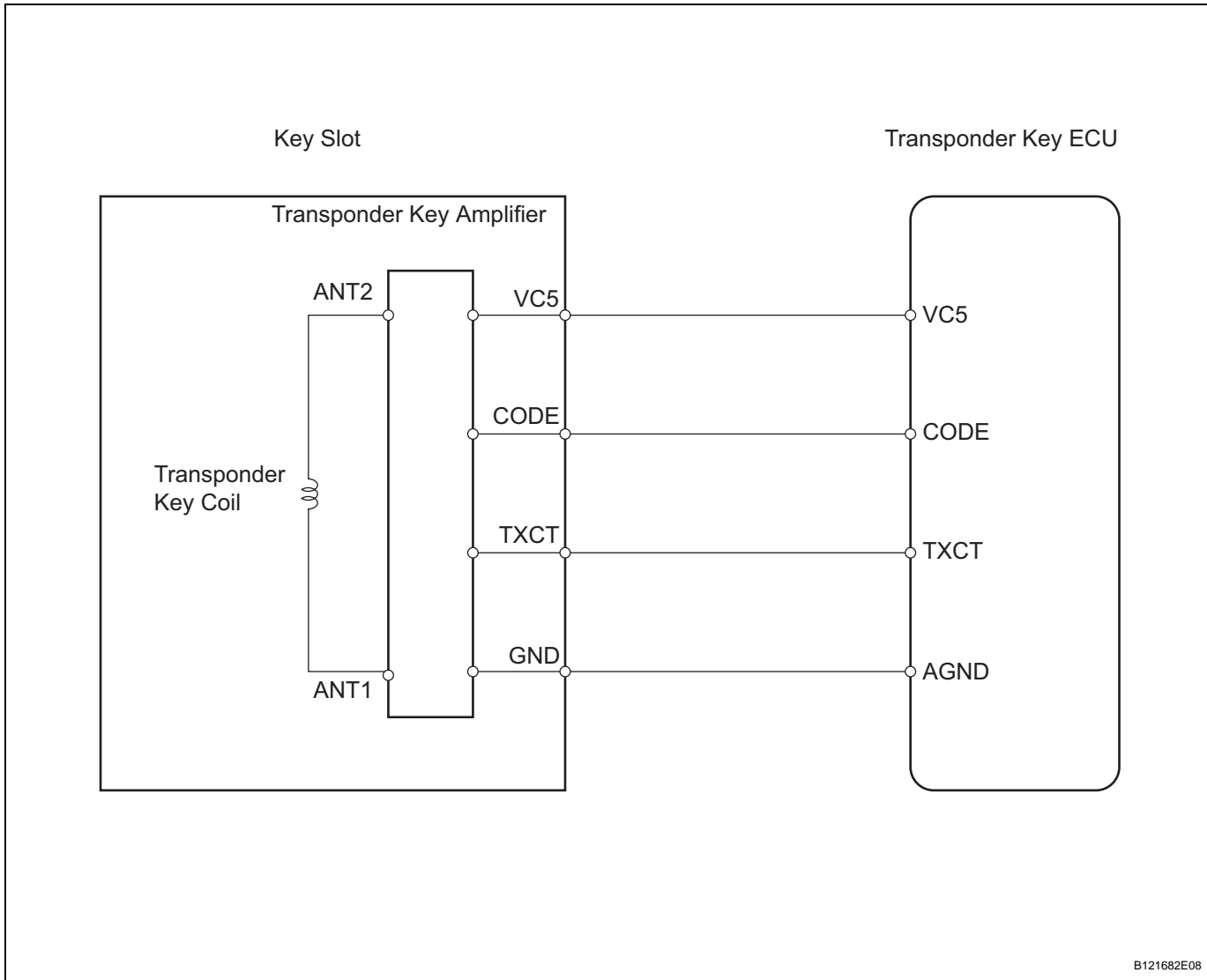
DTC	B2784	Antenna Coil Open / Short
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DESCRIPTION

This DTC is detected when a transponder key coil (antenna coil) is open/shorted.

DTC No.	DTC Detection Condition	Trouble Area
B2784	Antenna coil is open/shorted	<ul style="list-style-type: none"> Wire harness Key slot Transponder key ECU

E WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE OF INTELLIGENT TESTER (TRANSPONDER KEY COIL)

- (a) Check the DATA LIST for proper functioning of the transponder key coil.

Transponder key ECU:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
ANTENNA COIL	Transponder key coil condition / NORMAL or FAIL	NORMAL: Transponder key coil is normal FAIL: Transponder key coil is malfunctioning	-

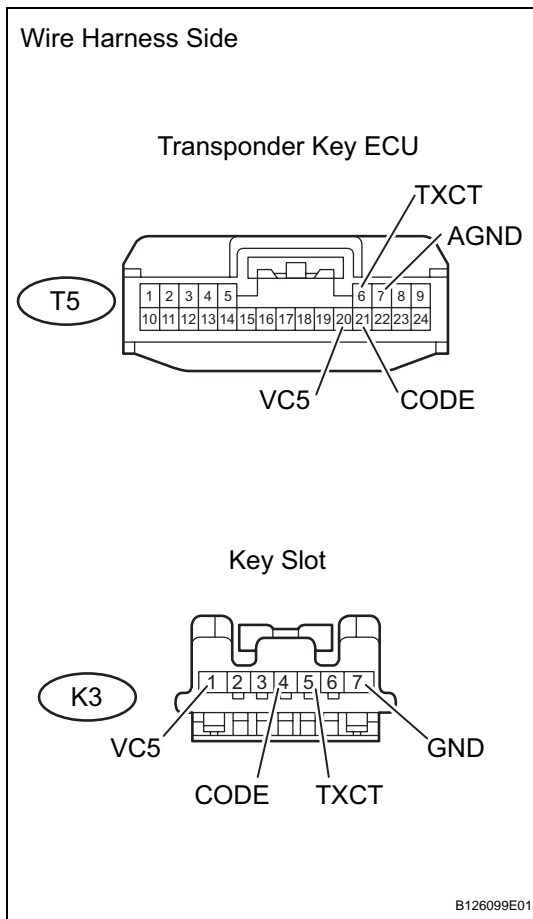
OK:

NORMAL (transponder key coil is normal) appears on screen.

OK

REPLACE TRANSPONDER KEY ECU

NG

2 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - KEY SLOT)

- (a) Disconnect the T5 ECU connector.
 (b) Disconnect the K3 key slot connector.
 (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-20 (VC5) - K3-1 (VC5)	Below 1 Ω
T5-21 (CODE) - K3-4 (CODE)	
T5-6 (TXCT) - K3-5 (TXCT)	
T5-7 (AGND) - K3-7 (GND)	10 k Ω or higher
T5-20 (VC5) or K3-1 (VC5) - Body ground	
T5-21 (CODE) or K3-4 (CODE) - Body ground	
T5-6 (TXCT) or K3-5 (TXCT) - Body ground	
T5-7 (AGND) or K3-7 (GND) - Body ground	

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

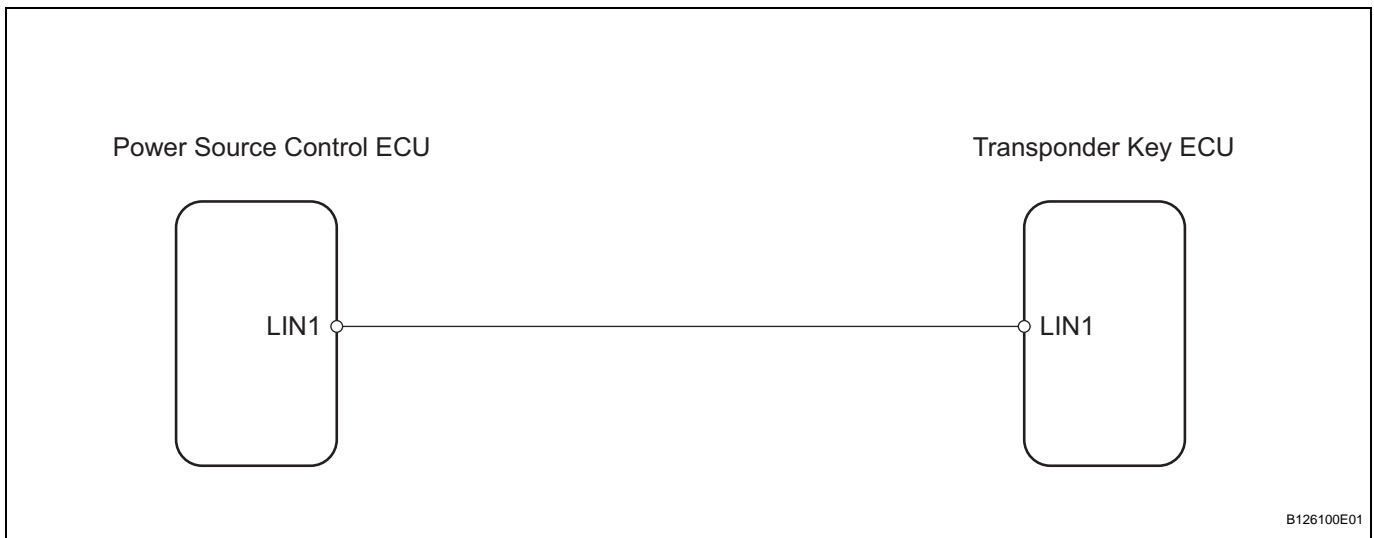
REPLACE KEY SLOT

DTC	B2785	Communication Malfunction between ECUs Connected by LIN
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DESCRIPTION

This DTC is output if communication between the transponder key ECU and power source control ECU is not possible.

DTC No.	DTC Detection Condition	Trouble Area
B2785	Communication between transponder key ECU and power source control ECU is not possible	<ul style="list-style-type: none"> • Wire harness • Power source control ECU • Transponder key ECU

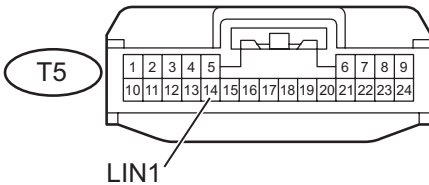
WIRING DIAGRAM

INSPECTION PROCEDURE

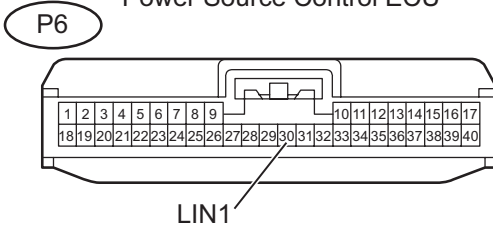
1 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - POWER SOURCE CONTROL ECU)

Wire Harness Side

Transponder Key ECU



Power Source Control ECU



B126101E01

- (a) Reconnect the T5 and P6 ECU connectors.
 (b) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-14 (LIN1) - P6-30 (LIN1)	Below 1 Ω
T5-14 (LIN1) or P6-30 (LIN1) - Body ground	10 k Ω or higher

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****2 CHECK TRANSPONDER KEY ECU (OPERATION)**

- (a) Temporarily replace the transponder key ECU with a new or normally functioning one.
 (b) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned ON (ACC and IG) and hybrid control system can be started.

NG**REPLACE POWER SOURCE CONTROL ECU****OK****END (TRANSPONDER KEY ECU IS DEFECTIVE)**

DTC**B2793****Transponder Chip Malfunction****DESCRIPTION**

This DTC is output when: 1) during key code registration, a key malfunction occurs; or 2) the key code was unable to be registered properly. Follow the inspection procedure below.

DTC No.	DTC Detection Condition	Trouble Area
B2793	Transponder chip malfunction	Key (door control transmitter)

INSPECTION PROCEDURE**1****REREGISTER KEY**

- (a) Delete the DTC (see page [EI-24](#)).
- (b) Reregister the key (which caused this DTC to be output) with the transponder key ECU (see page [EI-7](#)).
- (c) Insert the same key into the key slot.
- (d) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned (ACC and IG) and hybrid control system can be started.

NG**REPLACE KEY****OK****END****EI**

DTC**B2794****Unmatched Encryption Code****DESCRIPTION**

This DTC is output when a key with an incomplete key code is inserted into the key slot.

DTC No.	DTC Detection Condition	Trouble Area
B2794	Key with incomplete key code is inserted	Key (door control transmitter)

INSPECTION PROCEDURE**EI****1****REREGISTER KEY**

- (a) Delete the DTC (see page [EI-24](#)).
- (b) Reregister the key (which caused this DTC to be output) with the transponder key ECU (see page [EI-7](#)).
- (c) Insert the same key into the key slot.
- (d) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned (ACC and IC) and hybrid control system can be started.

NG**REPLACE KEY****OK****END**

DTC**B2795****Unmatched Key Code****DESCRIPTION**

This DTC is output when a key with a key code that has not been registered in the ECU is inserted into the key slot.

DTC No.	DTC Detection Condition	Trouble Area
B2795	Key with unregistered code is inserted	Key (door control transmitter)

INSPECTION PROCEDURE**1****REREGISTER KEY**

- (a) Delete the DTC (see page [EI-24](#)).
- (b) Reregister the key (which caused this DTC to be output) with the transponder key ECU (see page [EI-7](#)).
- (c) Insert the same key into the key slot.
- (d) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned (ACC and IC) and hybrid control system can be started.

NG**REPLACE KEY****OK****END****EI**

DTC	B2796	No Communication in Immobiliser System
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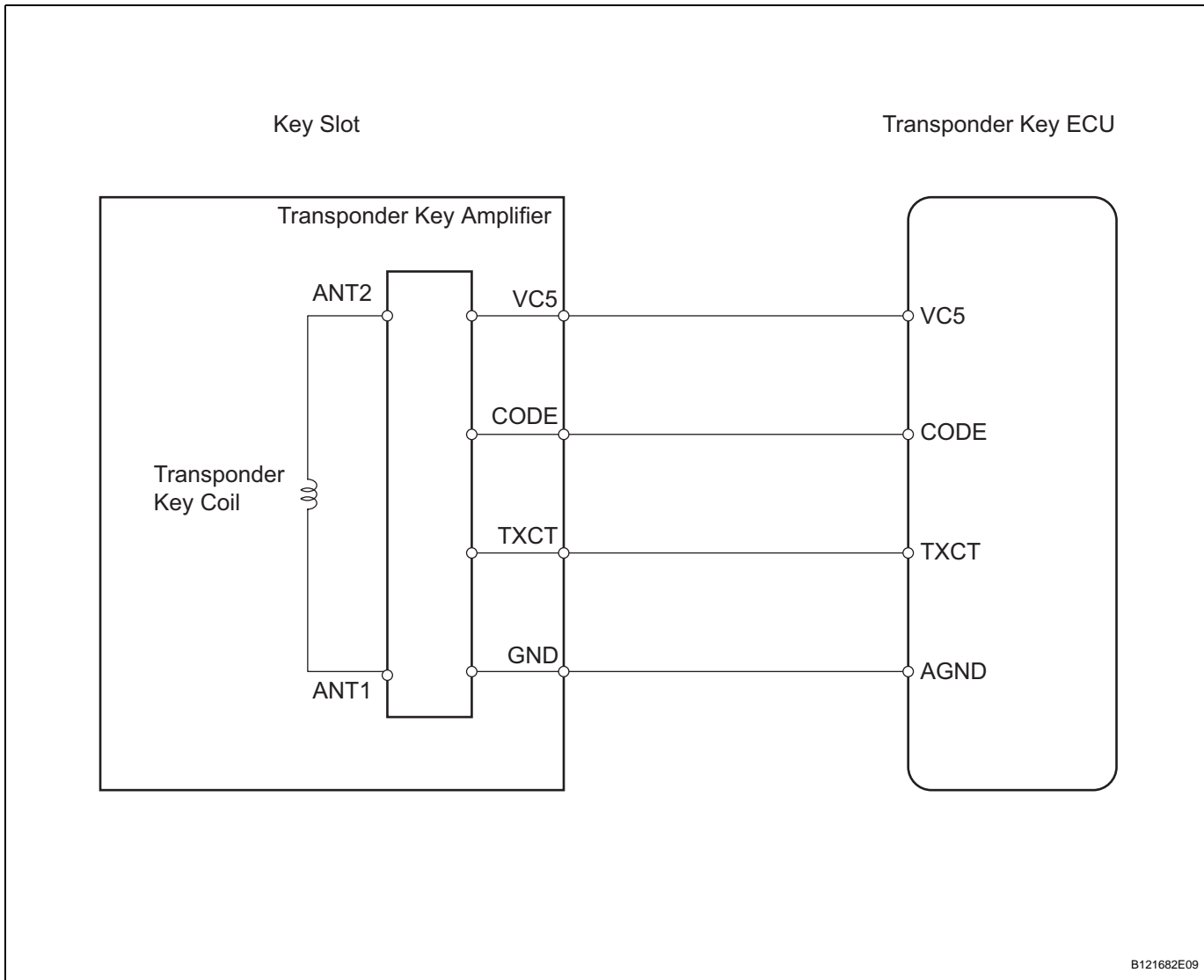
DTC	B2798	Communication Malfunction No. 2
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DESCRIPTION

When a key is inserted into the key slot but no communication occurs between the key and transponder key ECU, DTC B2796 is output. When a key is inserted into the key slot but a communication error occurs between the key and transponder key ECU, DTC B2798 is output.

DTC No.	DTC Detection Condition	Trouble Area
B2796	No communication	<ul style="list-style-type: none"> • Key (door control transmitter) • Wire harness • Key slot • Transponder key ECU
B2798	Communication error	Key (door control transmitter)

WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE OF INTELLIGENT TESTER (ENGINE IMMOBILISER SYSTEM)

- (a) Check the DATA LIST for proper functioning of the engine immobiliser system.

Transponder key ECU:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
IMMOBILISER	Engine immobiliser system status / SET or UNSET	SET: No key is in key slot UNSET: Power switch ON (IG)	-

OK:

"UNSET" (power switch ON (IG)) appears on screen.

OK

REPLACE TRANSPONDER KEY ECU

NG

2 CHECK DOOR CONTROL TRANSMITTER (OPERATION)

- (a) Temporarily replace the door control transmitter with a new or normally functioning one.
(b) Check that change the power switch can be turned ON (IG).

OK:

Power switch can be turned ON (ACC and IG) and hybrid control system can be started.

OK

END (DOOR CONTROL TRANSMITTER IS DEFECTIVE)

NG

3 READ VALUE OF INTELLIGENT TESTER (TRANSPONDER KEY COIL)

- (a) Check the DATA LIST for proper functioning of the transponder key coil.

Transponder key ECU:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
ANTENNA COIL	Transponder key coil condition / NORMAL or FAIL	NORMAL: Transponder key coil is normal FAIL: Transponder key coil is malfunctioning	-

OK:

"NORMAL" (transponder key coil is normal) is appears on screen.

NG

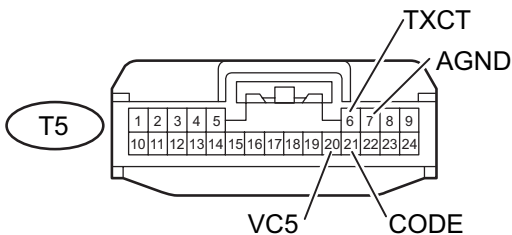
REPLACE KEY SLOT

OK

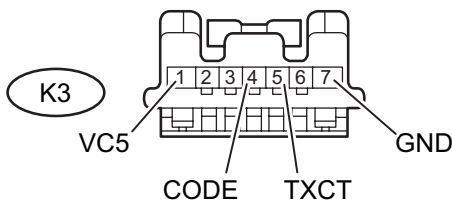
4 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - KEY SLOT)

Wire Harness Side

Transponder Key ECU



Key Slot



B126099E01

- Disconnect the T5 ECU connector.
- Disconnect the K3 key slot connector.
- Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-20 (VC5) - K3-1 (VC5)	Below 1 Ω
T5-21 (CODE) - K3-4 (CODE)	
T5-6 (TXCT) - K3-5 (TXCT)	
T5-7 (AGND) - K3-7 (GND)	
T5-20 (VC5) or K3-1 (VC5) - Body ground	10 k Ω or higher
T5-21 (CODE) or K3-4 (CODE) - Body ground	
T5-6 (TXCT) or K3-5 (TXCT) - Body ground	
T5-7 (AGND) or K3-7 (GND) - Body ground	

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****5 CHECK KEY SLOT (OPERATION)**

- Temporarily replace the key slot with a new or normally functioning one.
- Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned ON (ACC and IG) and hybrid control system can be started.

NG**REPLACE TRANSPONDER KEY ECU****OK****END (KEY SLOT IS DEFECTIVE)**

DTC**B2797****Communication Malfunction No. 1****DESCRIPTION**

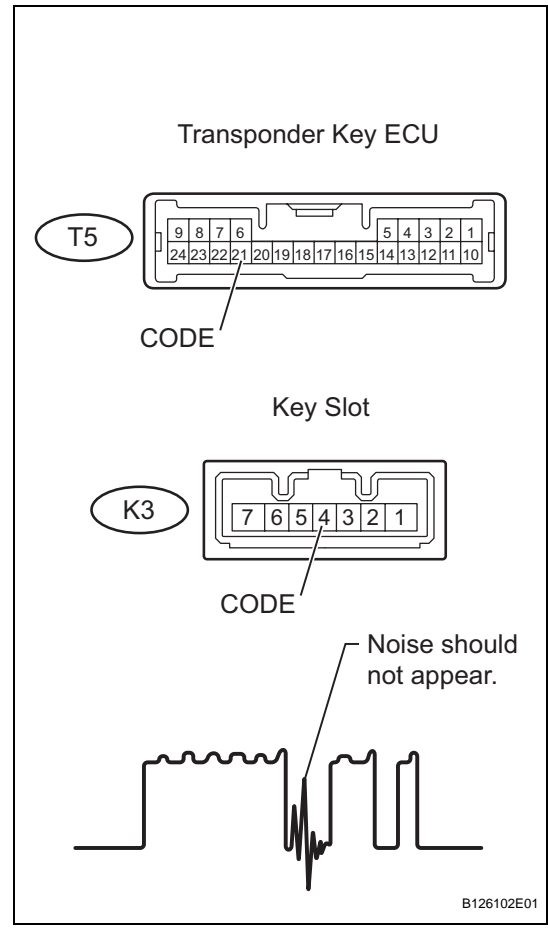
This DTC is output when a communication error occurs between the key slot and transponder key ECU. A possible reason for the communication error is that noise is occurring on the communication line. Following the inspection procedure below.

DTC No.	DTC Detection Condition	Trouble Area
B2797	Key has noise occurring on communication line	<ul style="list-style-type: none"> • Key (door control transmitter) • Wire harness • Key slot • Transponder key ECU

WIRING DIAGRAM

INSPECTION PROCEDURE

1 CHECK TRANSPONDER KEY ECU



(a) Using an oscilloscope or the intelligent tester, check for noise in the waveform between the terminals of the K3 key slot connector and T5 ECU connector.

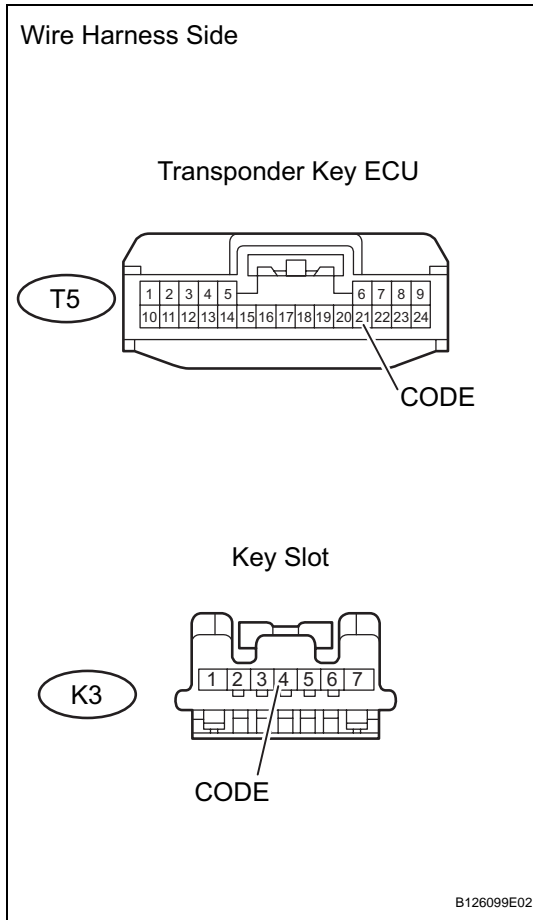
OK:
No noise is present (see illustration).

Tester Connection	Tool Setting	Condition	Specified Condition
T21-15 (CODE) - T20-4 (CODE)	5 V/DIV., 20 msec./DIV.	Key inserted	No noise is present

NG **FIND CAUSE OF NOISE AND REMOVE IT**

OK

EI

2 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - KEY SLOT)

- Disconnect the T5 ECU connector.
- Disconnect the K3 key slot connector.
- Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T21-5 (CODE) - K3-4 (CODE)	Below 1 Ω

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****3 CHECK KEY SLOT (OPERATION)**

- Temporarily replace the key slot with a new or normally functioning one.
- Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned ON (ACC and IG) and hybrid control system can be turned.

NG**REPLACE TRANSPONDER KEY ECU****OK****END (KEY SLOT IS DEFECTIVE)**

DTC	B2799-539	Engine Immobiliser System Malfunction
DTC	B2799-540	Engine Immobiliser System Malfunction
DTC	B2799-541	Engine Immobiliser System Malfunction
DTC	B2799-542	Engine Immobiliser System Malfunction
DTC	B2799-543	Engine Immobiliser System Malfunction
DTC	B2799-544	Engine Immobiliser System Malfunction

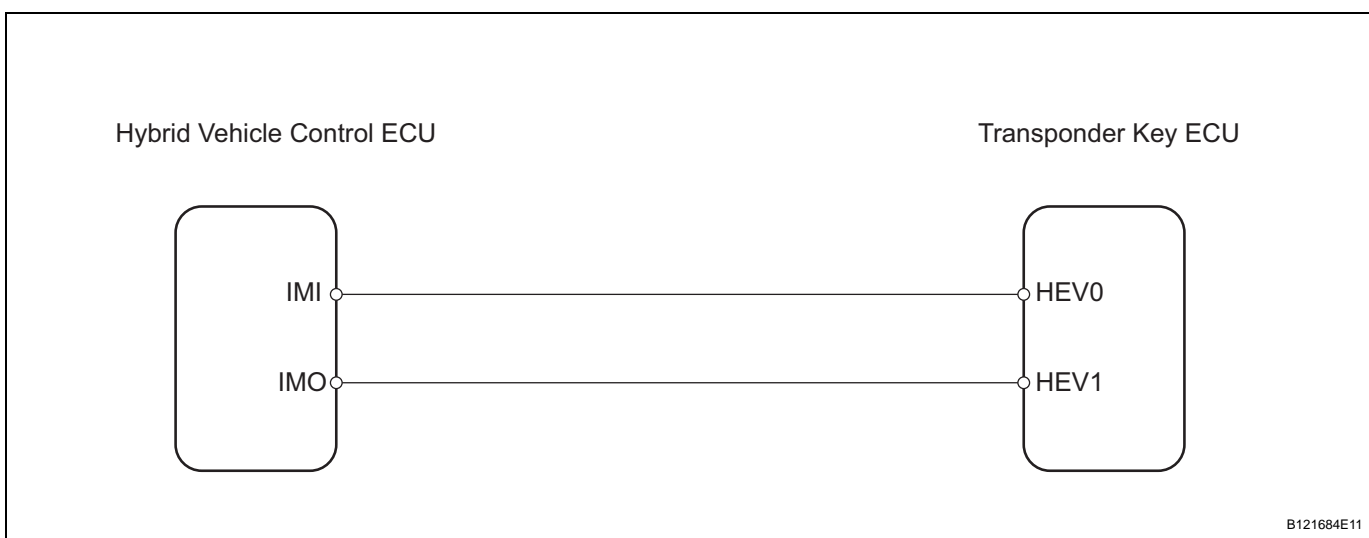
DESCRIPTION

These DTCs are detected when: 1) the wire harness between the transponder key ECU and hybrid vehicle control ECU is open or shorted, 2) the ECU communication IDs of the hybrid vehicle control ECU and transponder key ECU are different, 3) the start ON (READY) signal is delayed, or 4) the key codes are unmatched.

Before troubleshooting for these DTCs, make sure no transponder key ECU DTCs are present. If present, troubleshoot the transponder key ECU DTCs or hybrid vehicle control ECU DTCs first.

DTC No.	DTC Detection Condition	Trouble Area
B2799-539 B2799-540 B2799-541 B2799-542 B2799-543 B2799-544	When any of the following conditions are met: <ul style="list-style-type: none"> Wire harness between transponder key ECU and hybrid vehicle control ECU is open or short ECU communication IDs of hybrid vehicle control ECU and transponder key ECU are different ON (READY) signal is delayed more than 10 seconds from when power switch is turned to ON (READY) Key codes are unmatched 	<ul style="list-style-type: none"> Wire harness Transponder key ECU Hybrid vehicle control ECU

WIRING DIAGRAM



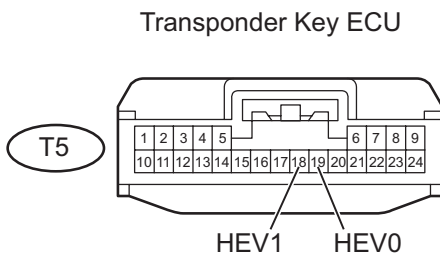
INSPECTION PROCEDURE

1 CHECK FOR DTC

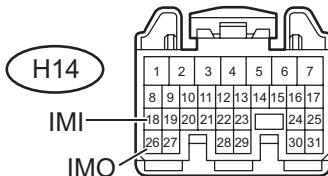
- Delete the DTC (see page EI-24).
- Check that no DTC is output.

OK:**DTC is not output.****OK****END****NG****EI****2 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)**

Wire Harness Side



Hybrid Vehicle Control ECU



B126103E01

- Disconnect the T5 and H14 ECU connectors.
- Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-19 (HEV0) - H14-18 (IMI)	Below 1 Ω
T5-18 (HEV1) - H14-26 (IMO)	
T5-19 (HEV0) or H14-18 (IMI) - Body ground	10 k Ω or higher
T5-18 (HEV1) or H14-26 (IMO) - Body ground	

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****3 CHECK TRANSPONDER KEY ECU (OPERATION)**

- Temporarily replace the transponder key ECU with a new or normally functioning one.
- Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned ON (ACC and IG) and hybrid control system can be started.

NG

REPLACE HYBRID VEHICLE CONTROL ECU

OK

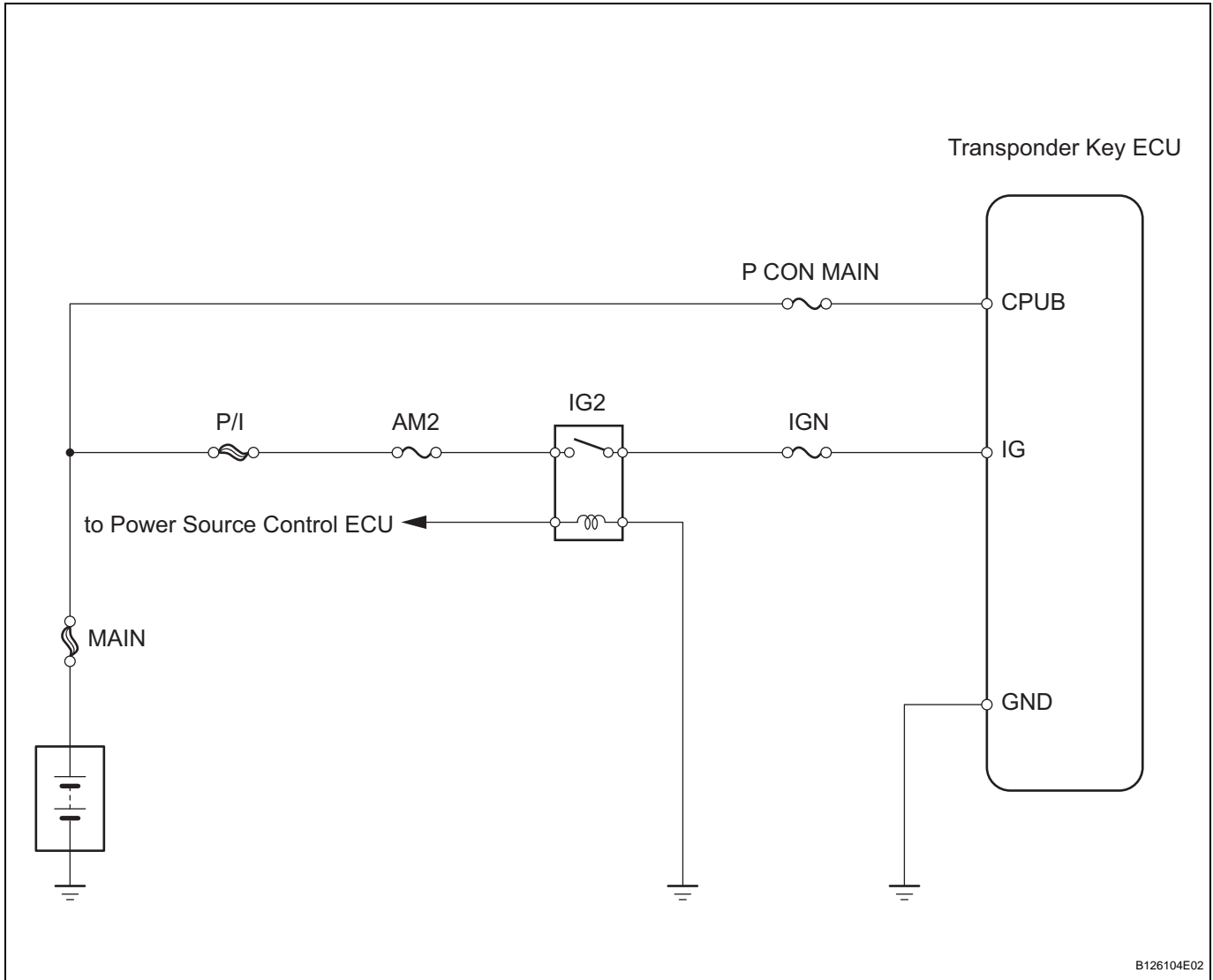
END (TRANSPONDER KEY ECU IS DEFECTIVE)

Power Source Circuit

DESCRIPTION

This circuit provides power to operate the transponder key ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK POWER SWITCH (OPERATION)

(a) Check that the power switch can be turned.

HINT:

- Without depressing the brake pedal, push the power switch repeatedly. Power switch should change as following: OFF → ON (ACC) → ON (IG) → OFF.

- With depressing the brake pedal, push the power switch repeatedly. Power switch should change as following: OFF → ON (ACC) → ON (IG) → ON (READY) → OFF.

NG → **GO TO SMART KEY SYSTEM (for Starting)**

OK

2 INSPECT FUSE (IGN, P CON MAIN, AM2)

EI

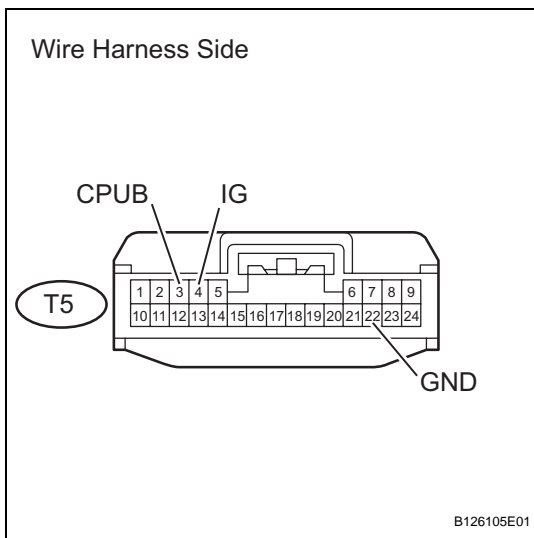
- Remove the IGN fuse from the instrument panel junction block.
- Remove the P CON MAIN and AM2 fuses from the engine room junction block.
- Measure the resistance of the fuses.

Standard resistance:
Below 1 Ω

NG → **REPLACE FUSE**

OK

3 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - BATTERY AND BODY GROUND)



- Disconnect the T5 ECU connector.
- Measure the resistance and voltage of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
T5-22 (GND) - Body ground	Below 1 Ω

Standard voltage

Tester Connection	Condition	Specified Condition
T5-4 (IG) - Body ground	Power switch ON (IG)	10 to 14 V
	Power switch OFF	Below 1 V
T5-3 (CPUB) - Body ground	Always	10 to 14 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

ENGINE IMMOBILISER SYSTEM (w/o Smart Key System)

PRECAUTION

NOTICE:

For initialization:

When disconnecting the cable from the negative (-) battery terminal, initialize the following system after the cable is reconnected.

System Name	See procedure
Power Window Control System	IN-32

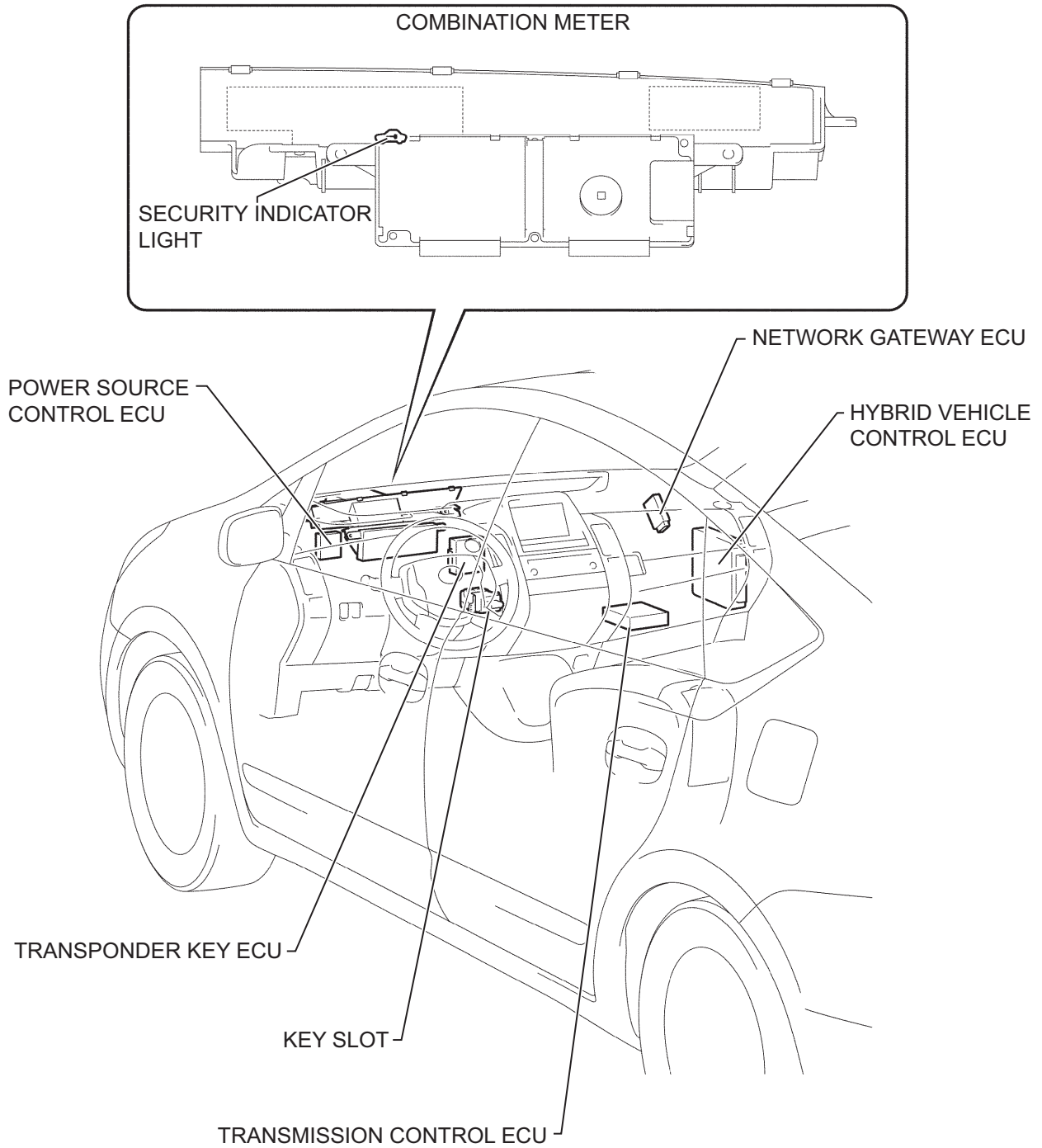
EI

For hybrid system activation:

- When the warning light is illuminated or the battery has been disconnected and reconnected, pressing the power switch may not start the system on the first try. If so, press the power switch again.
- If the power switch is ON (IG), the battery is disconnected, and the key is not in the key slot or not within the key detection area during reconnection, DTC B2799 (see page [EI-70](#)) may be output.

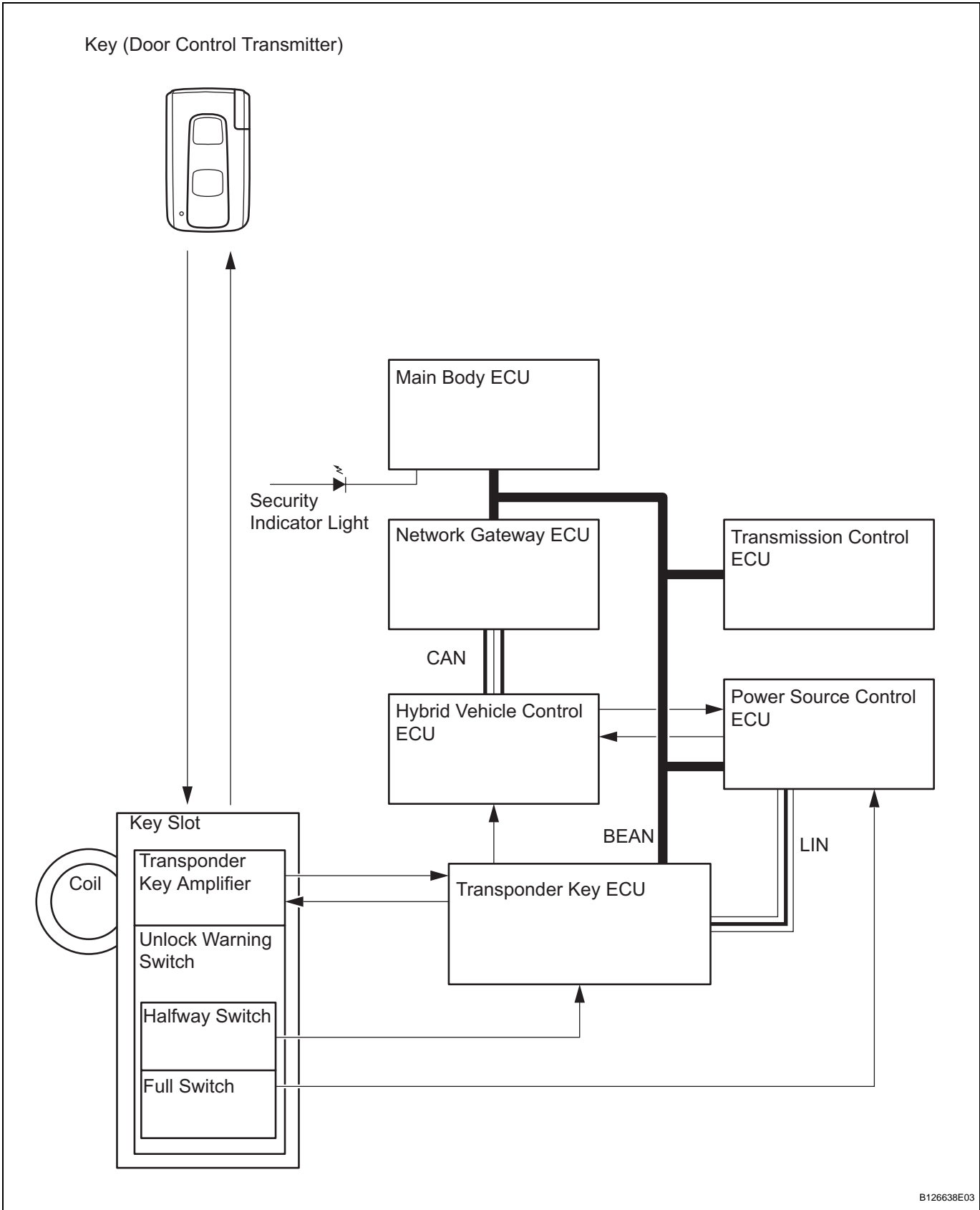
PARTS LOCATION

EI



SYSTEM DIAGRAM

EI



SYSTEM DESCRIPTION

1. ENGINE IMMOBILISER SYSTEM DESCRIPTION

- (a) The immobiliser system is a theft deterrent system that determines whether or not to disable starting of the hybrid control system depending on a comparison of the key's ID code and the vehicle's pre-registered code.

The immobiliser system compares the vehicle transponder key ECU's pre-registered ID code with the key-embedded transponder chip's ID code. If the ID codes do not match, the immobiliser system activates and the hybrid control system cannot be started. The transponder key ECU manages communication with the hybrid vehicle control ECU and power source control ECU. When the ID codes of the transponder chip and transponder key ECU match, the transponder key ECU authorizes the starting of the hybrid control system.

2. FUNCTION OF MAIN COMPONENTS

Components	Outline
Transponder key coil/amplifier	Receives key ID code, amplifies ID code and outputs it to transponder key ECU. Key ID code is received when key is inserted into key slot.
Halfway switch (inside key slot)	Detects if key is/is not inserted into key slot and outputs results to transponder key ECU
Full switch (inside key slot)	Detects if key is/is not inserted into key slot and outputs results to power source control ECU
Security indicator light	Illuminates or starts flashing. Illumination is controlled by body ECU

3. SYSTEM FUNCTION

- (a) When the transponder key ECU detects that the halfway switch is ON, the ECU provides current to the transponder key coil and produces a faint electric wave. A transponder chip in the key receives the faint electric wave. Upon receiving the faint electric wave, the transponder chip outputs a key ID code signal. The transponder key coil receives this signal, the transponder key amplifier amplifies it, and then the signal is transmitted to the transponder key ECU. The transponder key ECU matches the key's ID code with the vehicle's ID code, which was previously registered in the ECU. If the ID codes match, the transponder key ECU turns off the security indicator. Then when the power switch is pushed, the code match results are sent through the transponder key ECU to the power source control ECU, which authorizes the transition of the power switch's power modes. The ACC, IG1 and IG2 relays are turned ON, supplying power to the power switch ON (ACC) and ON (IG) power

modes. Also, the power source control ECU changes the power switch's indicator to amber, informing the driver that the power mode is set to ON (IG). Then, the power source control ECU sends a system start signal to the hybrid vehicle control ECU. The hybrid vehicle control ECU confirms that the key ID code has been verified. If the ID code has been verified, the hybrid vehicle control ECU bypasses the immobiliser system and starts the hybrid control system.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use these procedures to troubleshoot the engine immobiliser system.
- *: Use the intelligent tester.

1 VEHICLE BROUGHT TO WORKSHOP

EI 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 START HYBRID CONTROL SYSTEM

Result:

Result	Proceed to
Power switch cannot be turned ON (ACC) or when hybrid control system can be started	A
Power switch can be turned ON (ACC) and hybrid control system cannot be started	B

B

Go to HYBRID CONTROL SYSTEM

A

4 CHECK FOR DTC*

- Check for DTCs and note any codes that are output (see page [EI-69](#)).
- Delete the DTC.
- Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.

Result:

Result	Proceed to
DTC reoccurs	A
DTC does not reoccur	B

B

Go to step 7

A

5 PROBLEM SYMPTOMS TABLE**Result:**

Result	Proceed to
Fault is not listed in problem symptoms table	A
Fault is listed in problem symptoms table	B

B**Go to step 7****A****6** OVERALL ANALYSIS AND TROUBLESHOOTING*

- (a) DATA LIST/ACTIVE TEST (see page [EI-69](#))
- (b) Terminals of ECU (see page [EI-63](#))

NEXT**7** ADJUST, REPAIR OR REPLACE**NEXT****8** CONFIRMATION TEST**NEXT****END****EI**

REGISTRATION

1. DESCRIPTION OF CODE REGISTRATION

HINT:

- The key code (immobiliser code) is needed when the transponder key ECU, hybrid vehicle control ECU or key is replaced with a new one.
- The key has 2 codes: the key code and the wireless code. Both of these code types need to be registered when the key is replaced with a new one. Refer to the following key code registration procedures and the entry and wireless code registration procedures (see page [DL-95](#)).

2. PART REPLACEMENT AND KEY REGISTRATION PROCEDURES

- (a) The following table shows ECU replacement and key registration procedures in case the malfunctioning ECU has been determined after troubleshooting the engine immobiliser system.

HINT:

- The following procedures indicated in the table below require the use of the intelligent tester:
 - New key code registration
 - Additional key code registration
 - Key code erasure
 - ECU code registration
- If all of the registered keys are not available, replacement of the transponder key ECU is also required.

Part to be replaced	Procedure	Refer to
Transponder key ECU	1. Replace transponder key ECU	-
	2. Reregister all keys	"KEY REGISTRATION IN AUTOMATIC REGISTRATION (NEW REGISTRATION)"
	3. Using SST (09843-018040), connect terminals TC and CG of DLC3	"ECU CODE REGISTRATION (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)"
	4. Turn power switch ON (IG) and leave it as is for 30 minutes	
Hybrid vehicle control ECU	1. Replace ECM	Refer to replacement (see page ES-469)
	2. Using SST (09843-018040), connect terminals TC and CG of DLC3	"ECU CODE REREGISTRATION (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)"
	3. Turn power switch ON (IG) and leave it as is for 30 minutes	
Key	1. Using remaining key, erase key code of lost key	"ERASURE OF KEY CODE"
	2. Register additional keys as necessary	"REGISTRATION OF ADDITIONAL KEY (ADDITIONAL REGISTRATION)"

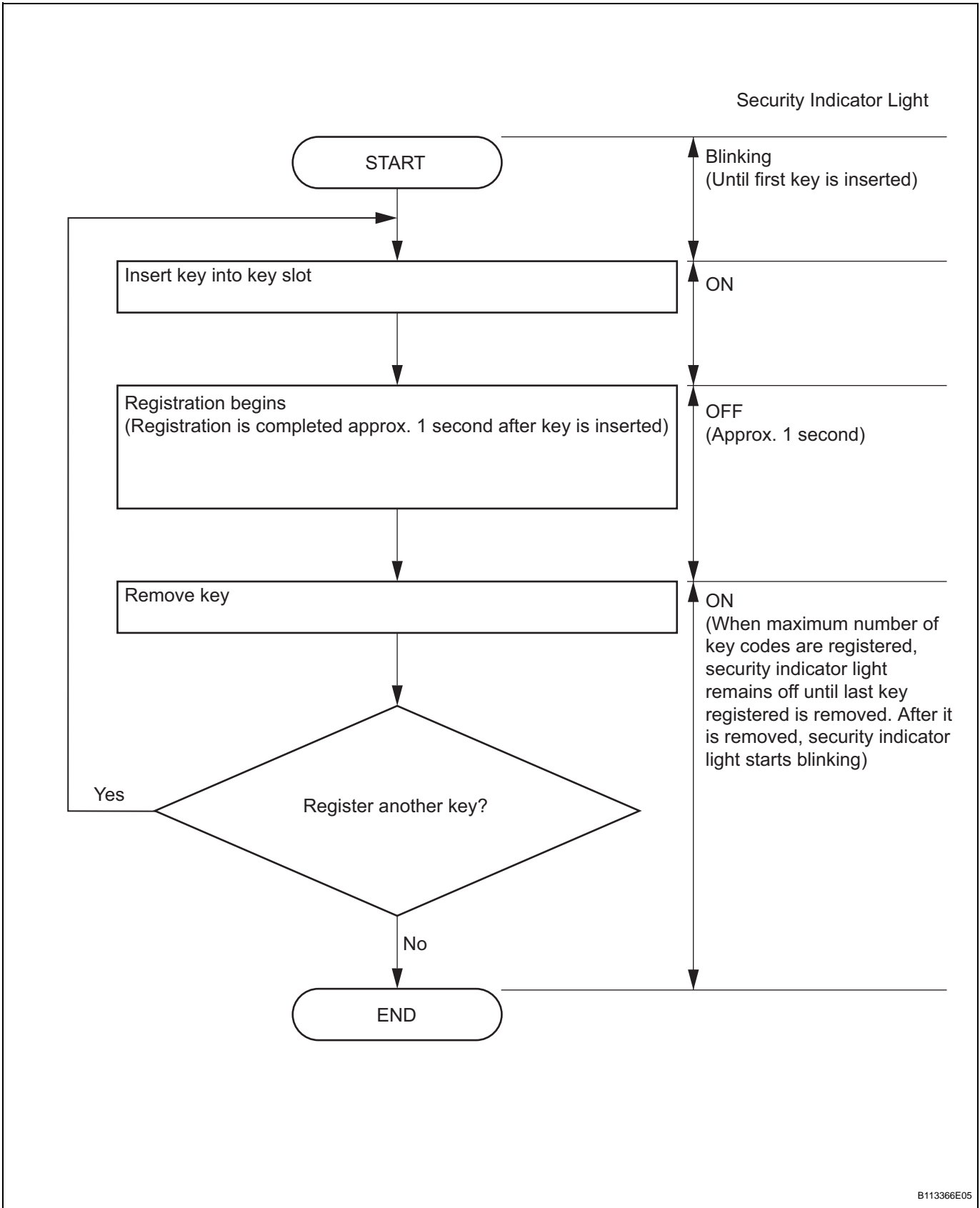
3. KEY REGISTRATION IN AUTOMATIC REGISTRATION (NEW REGISTRATION)

- (a) When a key is inserted into the key slot, the key code (immobiliser code) registration is automatic. In this mode, a maximum of 2 key codes can be registered.

HINT:

- When a new transponder key ECU is installed, key codes (immobiliser codes) must be registered in the transponder key ECU.
- New transponder key ECU are automatically set to automatic key code registration mode.

EI



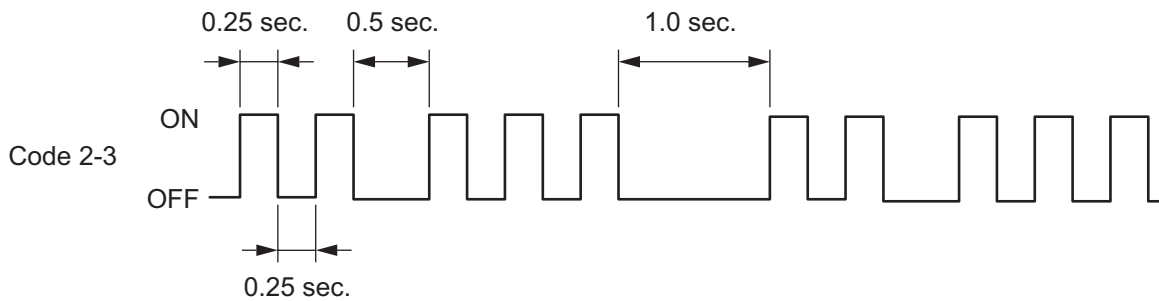
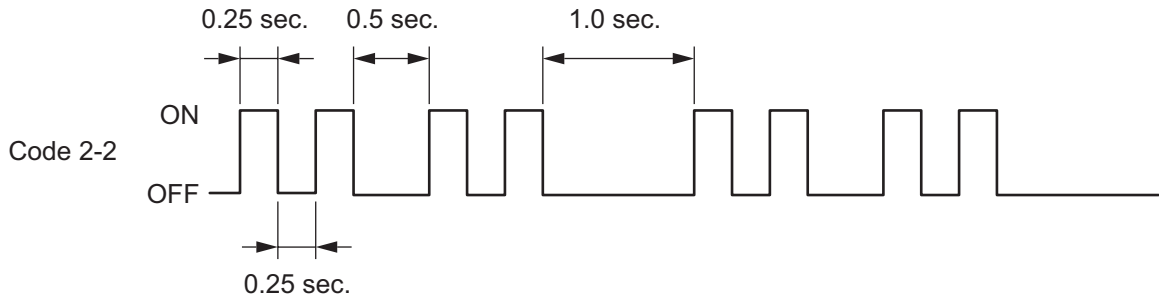
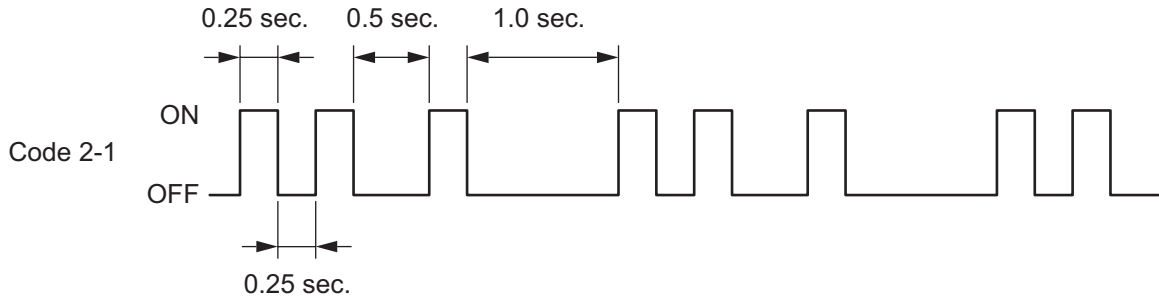
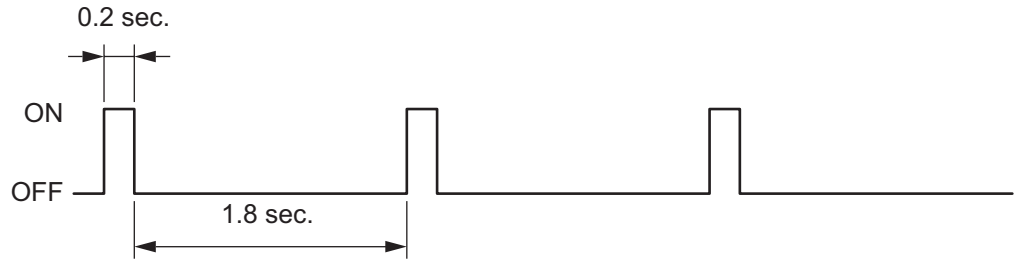
(b) End automatic key code registration mode. Automatic key code registration mode can be forced to end when at least 1 key code (immobiliser code) for the key has been registered.

- (1) Turn the power switch from ON (IG) and OFF 5 times within 10 seconds using the already registered key.

HINT:

- When no key is inserted into the key slot in automatic key code registration mode, the security indicator light remains on.
- When the immobiliser system is operating normally and the key is pulled out, the security indicator light blinks continuously.
- If the key code registration has failed in automatic key code registration mode, code 2-1 will be output from the security indicator light. Trying to reregister an already registered key will cause code 2-2 to be output when the key is inserted. If the number of registered key codes exceeds the limit, code 2-3 will be output from the security indicator light. The output details are shown below.

Normal
(Immobiliser system
is operating normally)



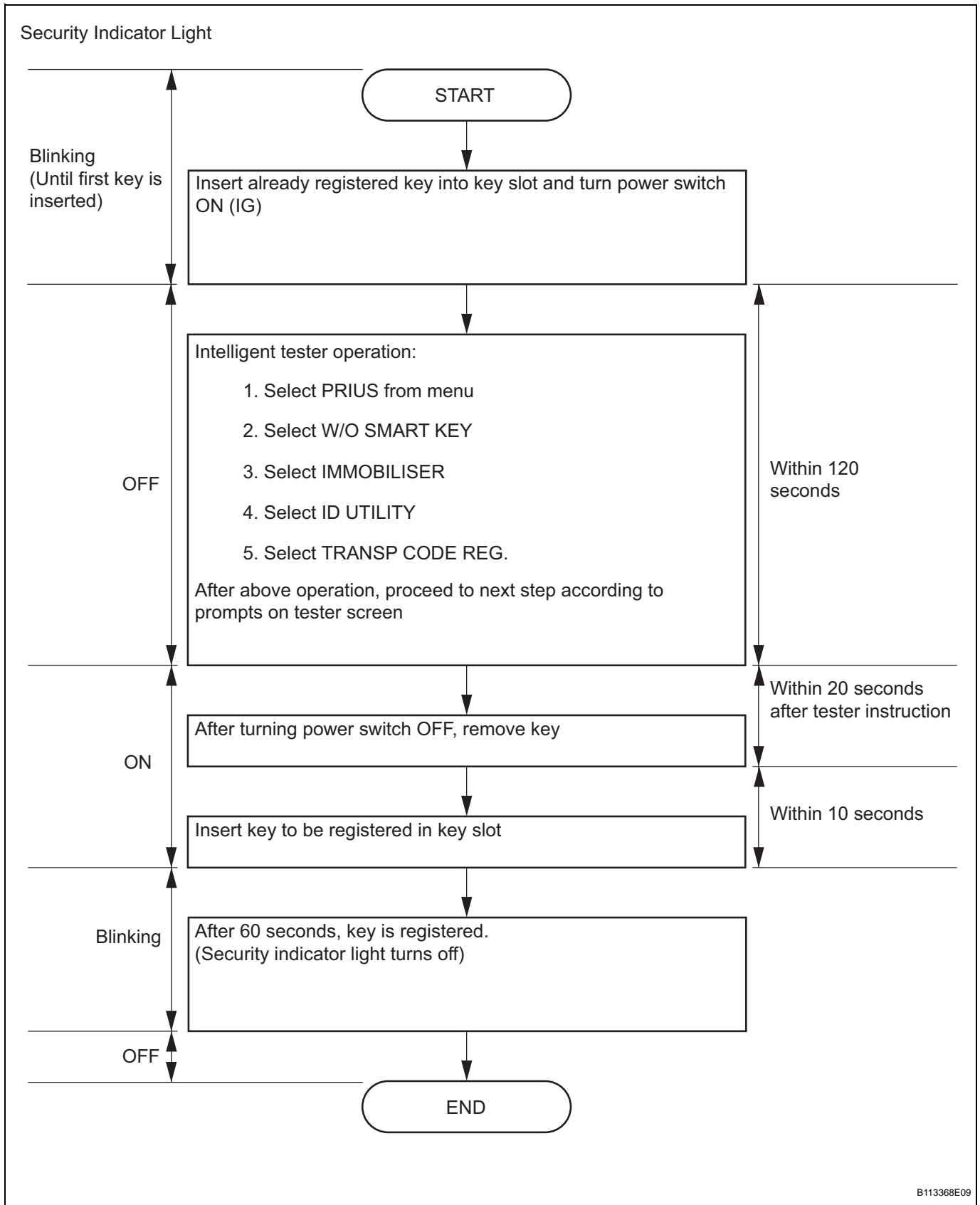
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4. REGISTRATION OF ADDITIONAL KEY (ADDITIONAL REGISTRATION)

(a) Register an additional key using the intelligent tester.

HINT:

- A maximum of 5 key codes can be registered.
- Registration mode will be ended if each step is not completed within the specified time.



EI

HINT:

- A brief outline of procedures for key code registration is shown above. For more detailed information, refer to the intelligent tester screen's instructions.

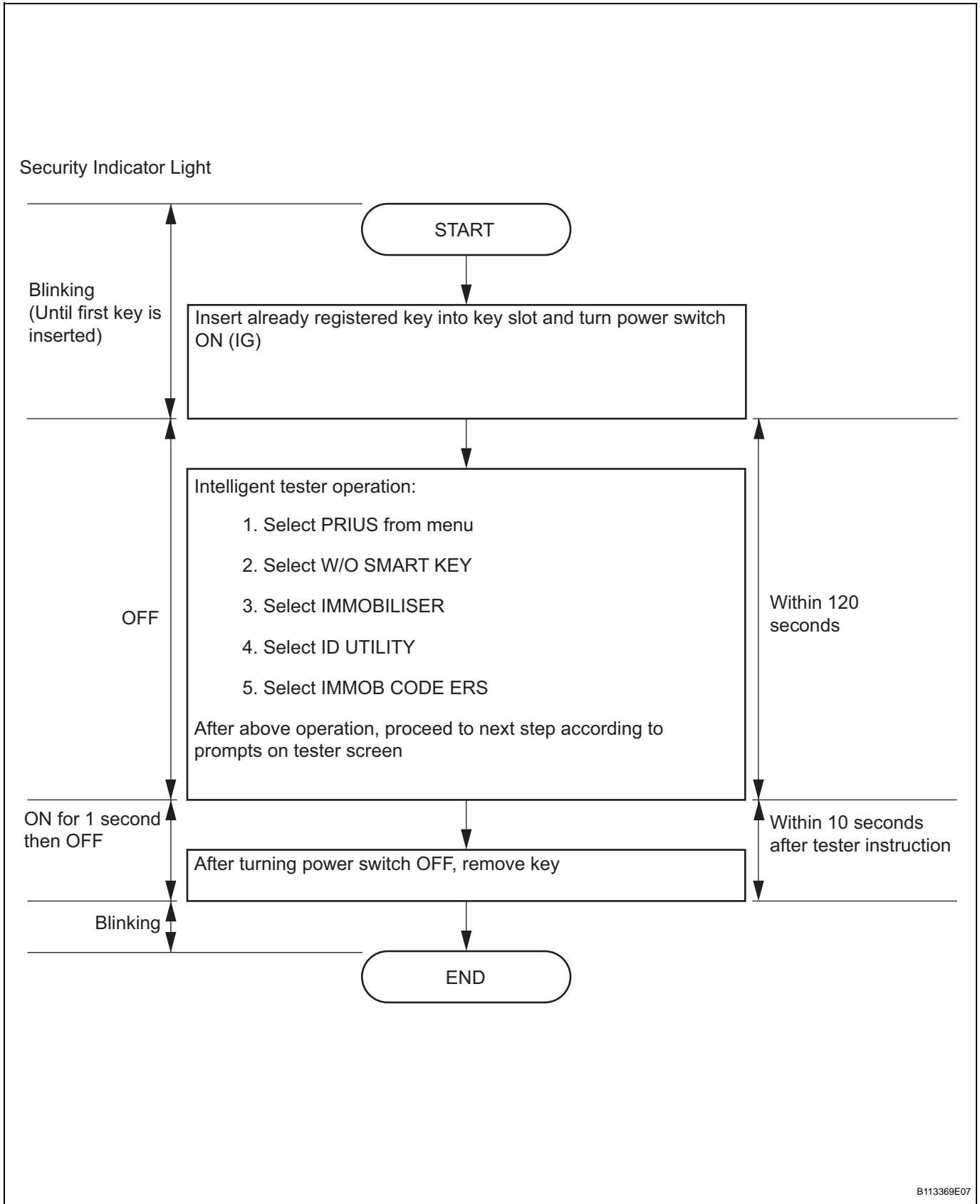
- When the immobiliser system is operating normally and key is pulled out, the security indicator light blinks continuously.
- If the key code registration has failed in automatic key code registration mode, code 2-1 will be output from the security indicator light. Trying to reregister an already registered key will cause code 2-2 to be output when the key is inserted. If the number of registered key codes exceeds the limit, code 2-3 will be output from the security indicator light. The output details are shown in the "KEY REGISTRATION IN AUTOMATIC REGISTRATION (NEW REGISTRATION)" procedures.

5. ERASURE OF KEY CODE

- (a) Erase the key codes using the intelligent tester.

HINT:

- All key codes are erased except for the key that is used to erase the key codes. In order to use a key whose code has been erased, a new key code must be registered.
- Registration will be canceled if each step is not completed within the specified time.



HINT:

- A brief outline of procedures for the key code erasure is shown above. For more detailed information, refer to the intelligent tester screen's instructions.

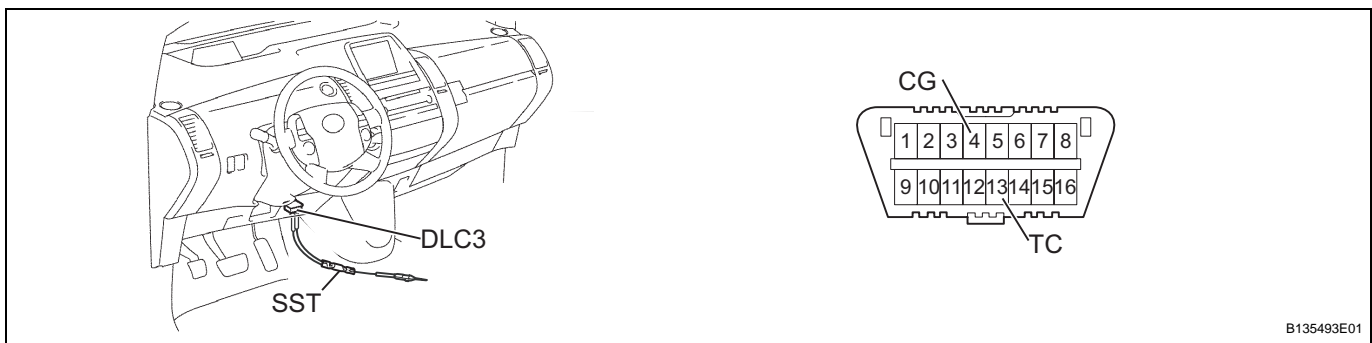
- When the immobiliser system is operating normally and key is pulled out, the security indicator light blinks continuously.

6. ECU COMMUNICATION ID REGISTRATION (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)

NOTICE:

- If the transponder key ECU and/or hybrid vehicle control ECU has been replaced, register the ECU communication ID to both ECUs in order to match their IDs.
 - The hybrid control system cannot be started unless the ECU communication ID matches.
 - When the transponder key ECU has been replaced, do not turn the power switch from ON to OFF 20 times or more consecutively. The ECU communication ID must be registered before such an occurrence or the transponder key ECU will need to be replaced. If the transponder key ECU is unable to recognize the hybrid vehicle control ECU, the hybrid control system will be unable to be started. If the transponder key ECU cannot recognize the hybrid vehicle control ECU, the transponder key ECU must be replaced again with a new one.
 - After the registration, pressing the power switch may not start the system on the first try. If so, press the power switch again.
 - After the hybrid control system is started, erase DTC B2799 (code for hybrid vehicle control ECU's immobiliser communication error) using either of the following:
 - Using the intelligent tester (see page EI-69).
 - Disconnect the battery for 30 seconds.
- (a) Register the ECU communication ID.
- (b) Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040



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- (c) Turn the power switch ON (IG) (do not start the hybrid control system) and leave it as is for 30 minutes.
- (d) Turn the power switch OFF and disconnect terminals TC and CG.

(e) Check that the hybrid control system starts.

**7. ECU COMMUNICATION ID REREGISTRATION
(TRANSPONDER KEY ECU - HYBRID VEHICLE
CONTROL ECU)**

NOTICE:

- **The ECU communication ID should be registered when the hybrid vehicle control ECU is replaced in order to match the ECU communication ID (transponder key ECU - hybrid vehicle control ECU).**
 - **The hybrid control system cannot be started unless the ECU communication ID (transponder key ECU - hybrid vehicle control ECU) matches.**
- (a) Insert the already registered key in the key slot and turn the power switch ON (READY) with the brake pedal depressed.
- (b) Check that the hybrid control system stays on for more than 3 seconds.

PROBLEM SYMPTOMS TABLE

HINT:

- Use the table below to help determine the cause of the problem symptom. 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.
- Inspect the fuses and relays related to this system before inspecting the suspected areas below.

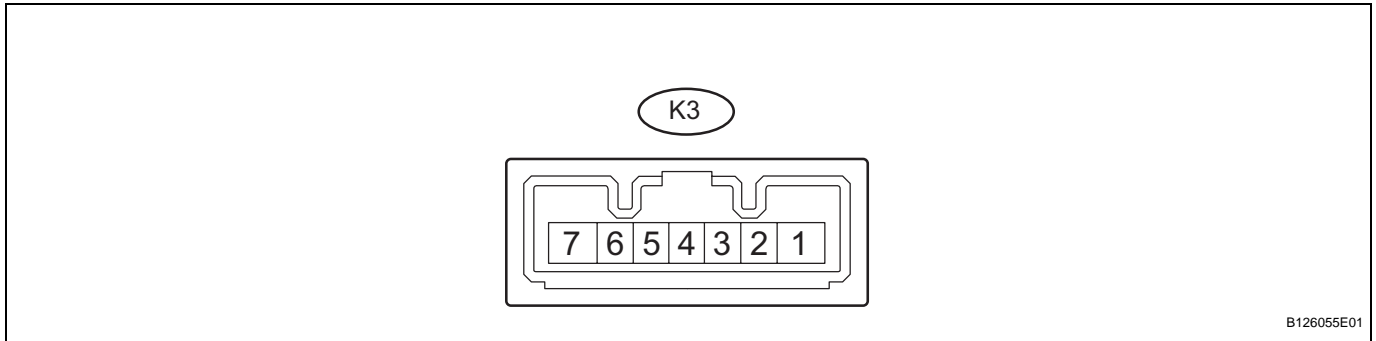


Engine immobiliser system

Symptom	Suspected area	See page
Hybrid control system does not start	1. Power source circuit	EI-89
	2. Hybrid control system	HV-21

TERMINALS OF ECU

1. CHECK KEY SLOT



B126055E01

- (a) Disconnect the K3 key slot connector.
- (b) Measure the resistance of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (K3-7) - Body ground	P - Body ground	Ground	Always	Below 1 Ω

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

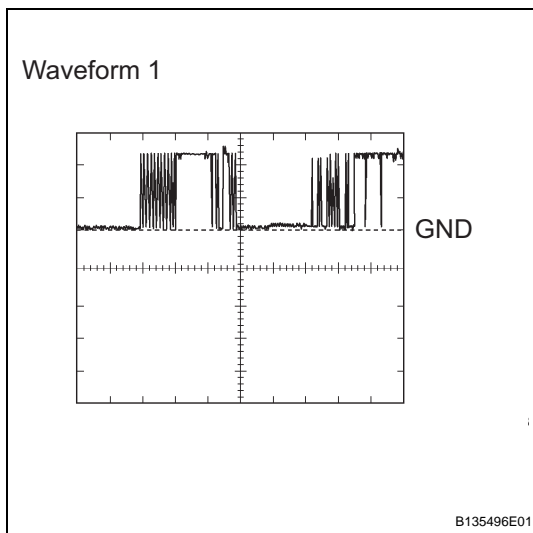
- (c) Reconnect the K3 key slot connector.
- (d) Measure the resistance and voltage of the connector.

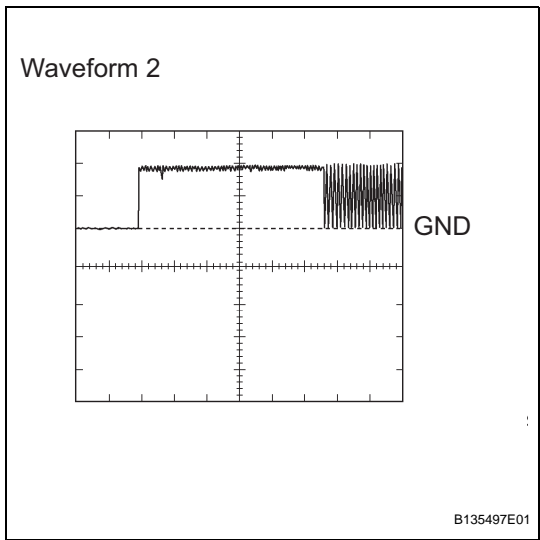
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (K3-7) - Body ground	P - Body ground	Ground	Always	Below 1 Ω
VC5 (K3-1) - GND (K3-7)	Y - P	Power source	No key in key slot	Below 1 V
			Key inserted	4.6 to 5.4 V
CODE (K3-4) - GND (K3-7)	L - P	Demodulated signal of key code data	No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 1)
TXCT (K3-5) - GND (K3-7)	LG - P	Key code output signal	No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 2)

If the result is not as specified, the key slot (amplifier) may have a malfunction.

- (e) Using an oscilloscope, check the waveform 1.
- Waveform 1 (Reference):**

Item	Content
Symbols (Terminal No.)	CODE (K3-4) - GND (K3-7)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted

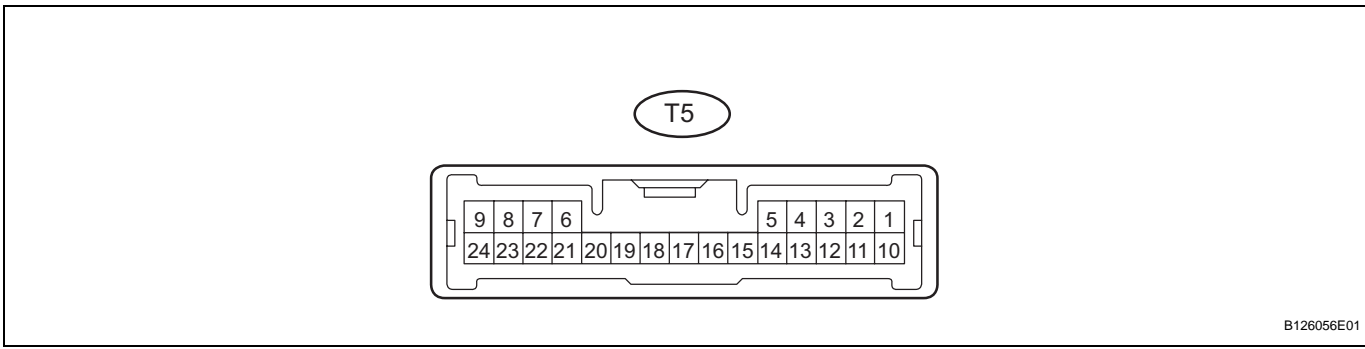




(f) Using an oscilloscope, check the waveform 2.
Waveform 2 (Reference):

Item	Content
Symbols (Terminal No.)	TXCT (K3-5) - GND (K3-7)
Tool Setting	2 V/DIV., 10 msec./DIV.
Condition	Key inserted

2. CHECK TRANSPONDER KEY ECU



- (a) Disconnect the T5 ECU connector.
- (b) Measure the resistance and voltage of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (T5-22) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
AGND (T5-7) - GND (T5-22)	P - W-B	Ground	Always	Below 1 Ω
CPUB (T5-3) - GND (T5-22)	L - W-B	+B (CPUB) power supply	Always	10 to 14 V
IG (T5-4) - GND (T5-22)	O - W-B	Ignition power supply	Power switch OFF	Blow 1 V
			Power switch ON (IG)	10 to 14 V
CUWS (T5-5) - GND (T5-22)	B - W-B	Halfway switch signal	No key in key slot	Below 1 Ω
			Key inserted	10 kΩ or higher

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

- (c) Reconnect the T5 ECU connector.
- (d) Measure the voltage of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
CUWS (T5-5) - GND (T5-22)	B - W-B	Halfway switch signal	No key in key slot	10 to 14 V
			Key inserted	Below 1 V
VC5 (T5-20) - GND (T5-22)	Y - W-B	Key slot power source	No key in key slot	Below 1 V
			Key inserted	4.6 to 5.4 V

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
CODE (T5-21) - GND (T5-22)	L - W-B	Transponder key amplifier communication signal	No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 1)
TXCT (T5-6) - GND (T5-22)	LG - P		No key in key slot	Below 1 V
			Key inserted	Pulse generation (see waveform 2)
HEV0 (T5-19) - GND (T5-22)	W - W-B	Hybrid vehicle control ECU output signal	Power switch OFF	Below 1 V
			Power switch ON (IG)	Pulse generation (see waveform 3)
HEV1 (T5-18) - GND (T5-22)	R - W-B	Hybrid vehicle control ECU input signal	Always	Pulse generation (see waveform 4)

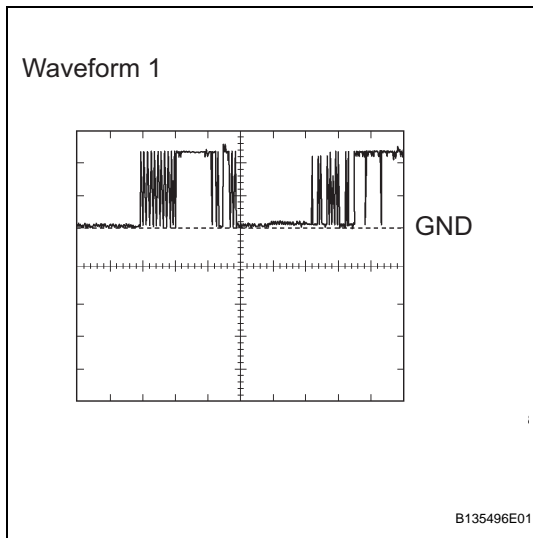
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If the result is not as specified, the ECU may have a malfunction.

(e) Using an oscilloscope, check the waveform 1.

Waveform 1 (Reference):

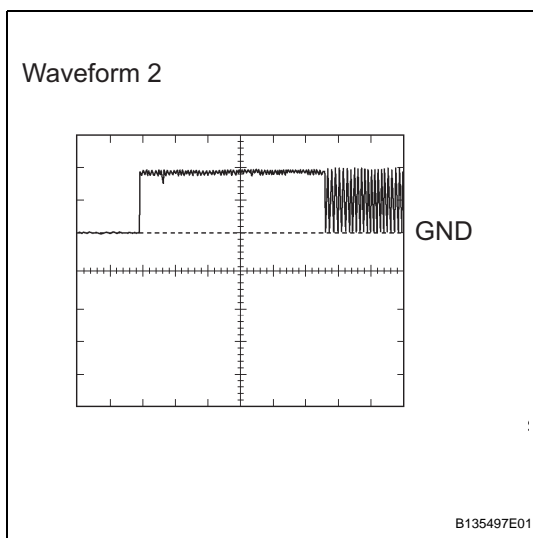
Item	Content
Symbols (Terminal No.)	CODE (T5-21) - GND (T5-22)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted



(f) Using an oscilloscope, check the waveform 2.

Waveform 2 (Reference):

Item	Content
Symbols (Terminal No.)	TXCT (T5-6) - GND (T5-22)
Tool Setting	2 V/DIV., 10 msec./DIV.
Condition	Key inserted

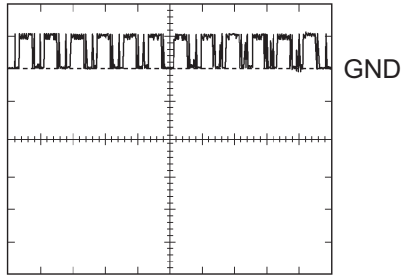


(g) Using an oscilloscope, check the waveform 3.

Waveform 3 (Reference):

Item	Content
Symbols (Terminal No.)	HEV0 (T5-19) - GND (T5-22)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Power switch ON (IG)

Waveform 3



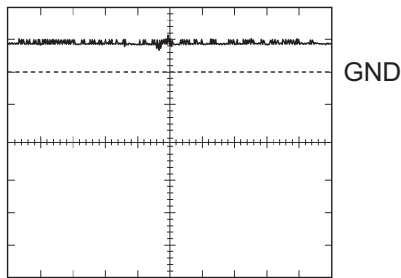
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(h) Using an oscilloscope, check the waveform 4.

Waveform 4 (Reference):

Item	Content
Symbols (Terminal No.)	HEV1 (T5-18) - GND (T5-22)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Always

Waveform 4



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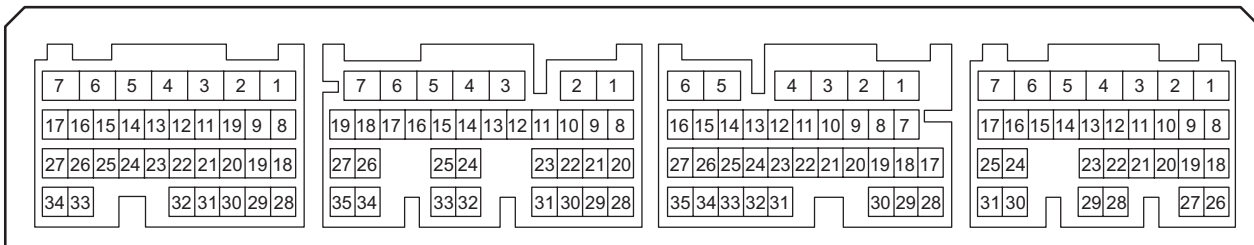
3. CHECK HYBRID VEHICLE CONTROL ECU

H17

H16

H15

H14



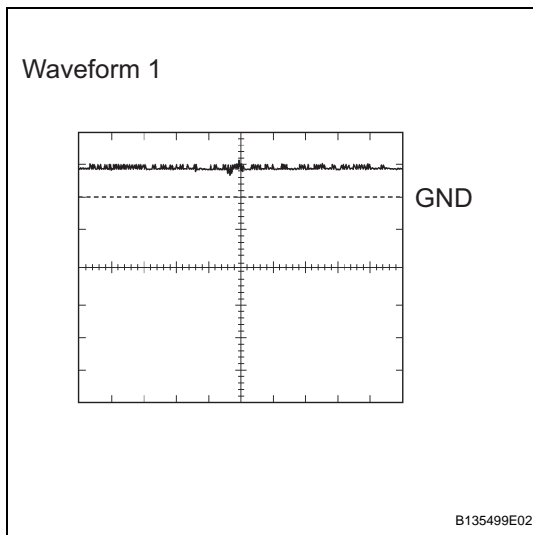
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- (a) Measure the resistance and voltage of the connectors.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND1 (H14-1) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
GND 2 (H14-4) - Body ground				
ST2 (H14-5) - GND1 (H14-1)	Y - W-B	Ignition ready control signal input	Hybrid control system stopped and power switch ON (READY)	10 to 14 V
IGSW (H14-7) - GND1 (H14-1)	O - W-B	Ignition start control signal input	Hybrid control system stopped and power switch ON (IG)	
BATT (H15-6) - GND1 (H14-1)	Y - W-B	Battery	Always	
+B1 (H16-7) - GND1 (H14-1)	L - W-B	Ignition power supply	Power switch ON (IG)	
+B2 (H16-6) - GND1 (H14-1)				
IMI (H14-18) - GND2 (H14-4)	W - W-B	Transponder key ECU input signal	Always	Pulse generation (see waveform 1)
IMO (H14-26) - GND2 (H14-4)	R - W-B	Transponder key ECU output signal	Power switch OFF	Below 1 V
			Power switch ON (IG)	Pulse generation (see waveform 2)

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

- (b) Using an oscilloscope, check the waveform 1.
Waveform 1 (Reference):

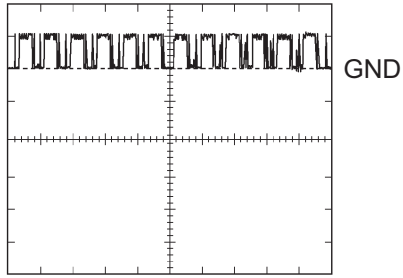


Item	Content
Symbols (Terminal No.)	IMI (H14-18) - GND2 (H14-4)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Always

(c) Using an oscilloscope, check the waveform 2.

Waveform 2 (Reference):

Waveform 2



B135498E02

Item	Content
Symbols (Terminal No.)	IMO (H14-26) - GND2 (H14-4)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Power switch ON (IG)

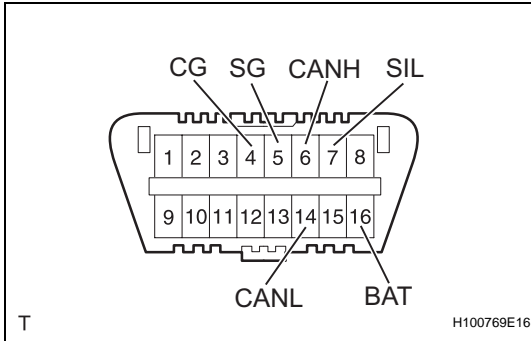
DIAGNOSIS SYSTEM

1. DESCRIPTION

- (a) The hybrid vehicle control ECU controls vehicle's immobiliser system function. Immobiliser system data and the Diagnostic Trouble Codes (DTCs) can be read through the vehicle's Data Link Connector 3 (DLC3). In some cases, a malfunction may be occurring in the immobiliser system even though the security indicator light is off. When the system seems to be malfunctioning, use the intelligent tester to check for malfunctions and perform repairs.

2. CHECK DLC3

- (a) The vehicle uses the ISO 15765-4 communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.



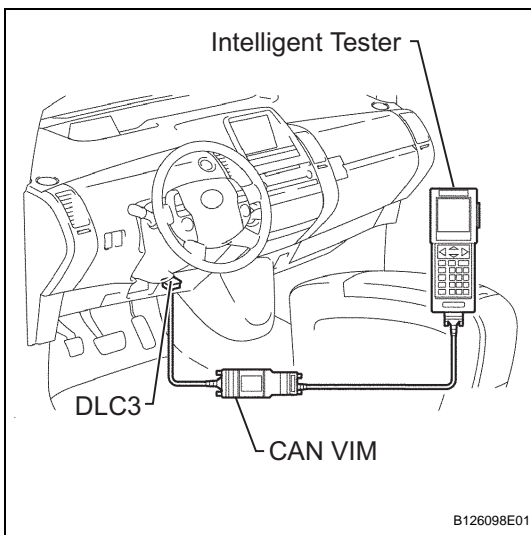
Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground		
BAT (16) - Body ground	Battery positive		
CANH (6) - CANL (14)	HIGH-level CAN bus line	Power switch OFF	54 to 69 Ω
CANH (6) - Battery positive			1 k Ω or higher
CANH (6) - CG (4)			1 k Ω or higher
CANL (14) - Battery positive	LOW-level CAN bus line		1 M Ω or higher
CANL (14) - CG (4)			1 M Ω or higher

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

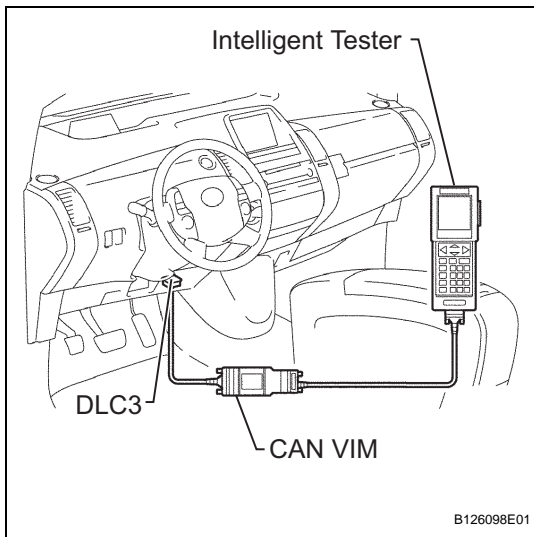
HINT:

Connect the cable of the intelligent tester (with CAN VIM) to the DLC3, turn the power switch ON (IG) and attempt to use the tester. If the screen displays the message UNABLE TO CONNECT TO VEHICLE, there is a problem either with the vehicle or with the tester.

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



B126098E01



DTC CHECK / CLEAR

1. CHECK DTC

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Read the DTCs by following the directions on the tester's screen.

2. CLEAR DTC

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Erase the DTCs by following the directions on the tester's screen.

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).
- (c) Read the DATA LIST by following the directions on the tester screen.

Transponder key ECU:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
KEY UNLK WRN SW	Unlock warning switch signal / ON or OFF	ON: Key is in key slot OFF: No key is in key slot	-
SHIFT POS	Shift position P signal / ON or OFF	ON: Shift position is P OFF: Shift position is not P	-
+B	Battery voltage / NORMAL or BREAK	NORMAL: Battery supply is normal BREAK: Battery supply is malfunctioning	-
ANTENNA COIL	Transponder key coil condition / NORMAL or FAIL	NORMAL: Transponder key coil is normal FAIL: Transponder key coil is malfunctioning	-
IMMOBILISER	Immobiliser system status / SET or UNSET	SET: Without key UNSET: Power switch ON (IG)	-
REMIT (START)	Hybrid control system starting control / OK or NG	OK: Hybrid control system starting is permitted NG: Hybrid control system is not permitted	-
G-CODE SUPPORT	G-code support / SUPPORT or NOT SUP	SUPPORT: G-code is supported NOT SUP: G-code is not supported	-
MASTER KEY	Key code signal / NOMATCH or MATCH	MATCH: Key code is send NOMATCH: Unmatched key code is sent	-
REGIST MAS CODE	Number of registered key / min.: 0; max.: 5	Number of registered key	-

2. PERFORM ACTIVE TEST

HINT:

Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time. The DATA LIST can be displayed during the ACTIVE TEST.

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch ON (IG).

- (c) Perform the ACTIVE TEST by following the directions on the tester's screen.

Transponder key ECU:

Item	Test Details	Diagnostic Note
NOT P-POS WARN	Shift p-pos warning is ON / OFF	-
METER CHIME	Meter chime is ON / OFF	-
METER BUZ	Meter buzzer is ON / OFF	-
SECURITY INDC	Turn security indicator light ON / OFF	-

DIAGNOSTIC TROUBLE CODE CHART**1. TRANSPONDER KEY ECU DTC CHART****Transponder key ECU**

DTC No.	Detection Item	Trouble Area	See page
B2784	Antenna Coil Open / Short	- Wire harness - Key slot - Transponder key ECU	EI-72
B2785	Communication Malfunction between ECUs Connected by LIN	- Wire harness - Transponder key ECU - Power source control ECU	EI-75
B2793	Transponder Chip Malfunction	Key (door control transmitter)	EI-77
B2794	Unmatched Encryption Code	Key (door control transmitter)	EI-78
B2795	Unmatched Key Code	Key (door control transmitter)	EI-79
B2796	No Communication in Immobiliser System	- Key (door control transmitter) - Key slot - Wire harness	EI-80
B2797	Communication Malfunction No. 1	- Key (door control transmitter) - Wire harness - Key slot	EI-83
B2798	Communication Malfunction No. 2	- Key (door control transmitter)	EI-80

2. HYBRID VEHICLE CONTROL ECU DTC CHART**Hybrid vehicle control ECU**

DTC No.	Detection Item	Trouble Area	See page
B2799-539	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-86
B2799-540	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-86
B2799-541	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-86
B2799-542	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-86
B2799-543	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-86
B2799-544	Engine Immobiliser System Malfunction	- Wire harness - Transponder key ECU - Hybrid vehicle control ECU	EI-86

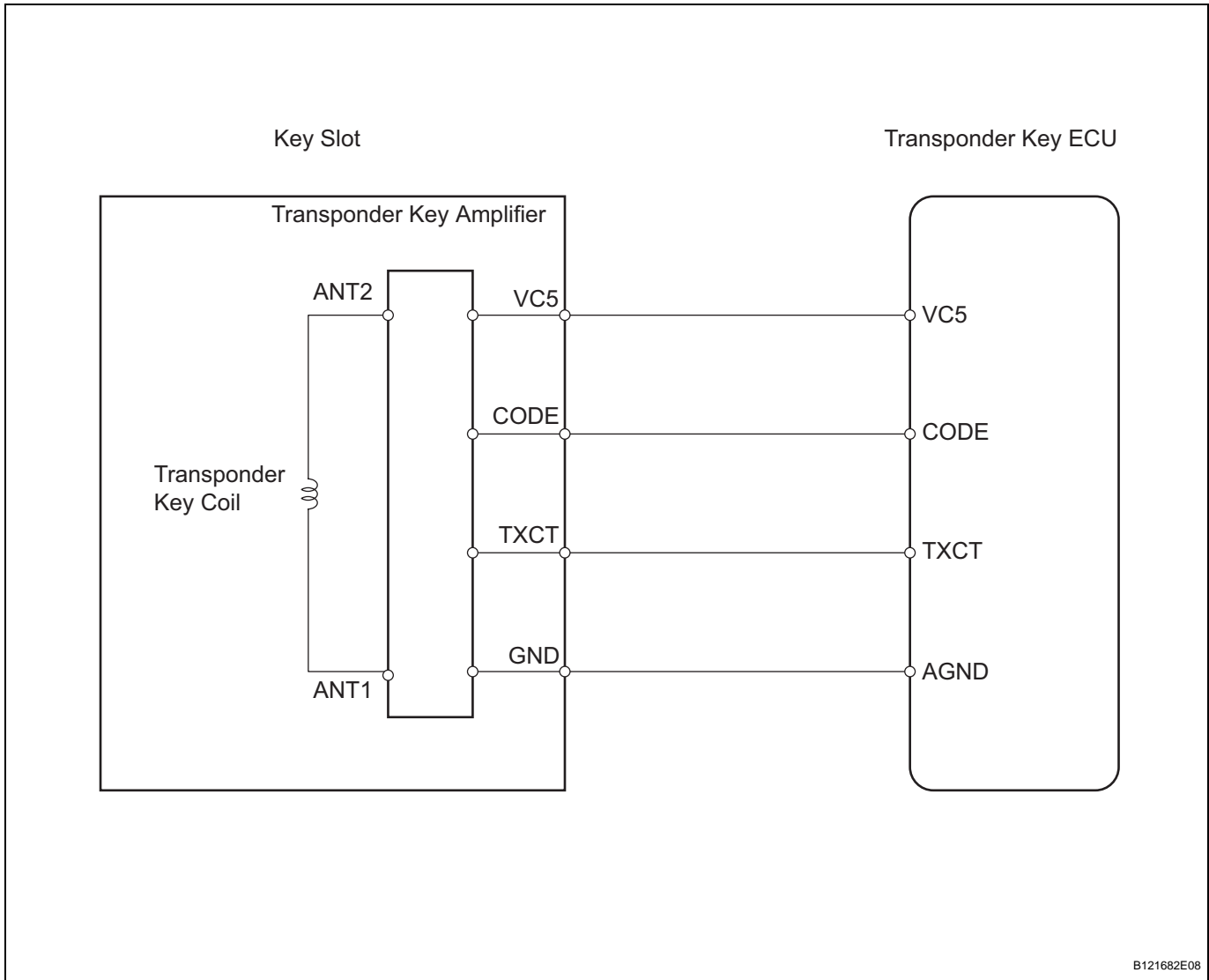
DTC	B2784	Antenna Coil Open / Short
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DESCRIPTION

This DTC is detected when a transponder key coil (antenna coil) is open/shorted.

DTC No.	DTC Detection Condition	Trouble Area
B2784	Antenna coil is open/shorted	<ul style="list-style-type: none"> Wire harness Key slot Transponder key ECU

E WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE OF INTELLIGENT TESTER (TRANSPONDER KEY COIL)

- (a) Check the DATA LIST for proper functioning of the transponder key coil.

Transponder key ECU:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
ANTENNA COIL	Transponder key coil condition / NORMAL or FAIL	NORMAL: Transponder key coil is normal FAIL: Transponder key coil is malfunctioning	-

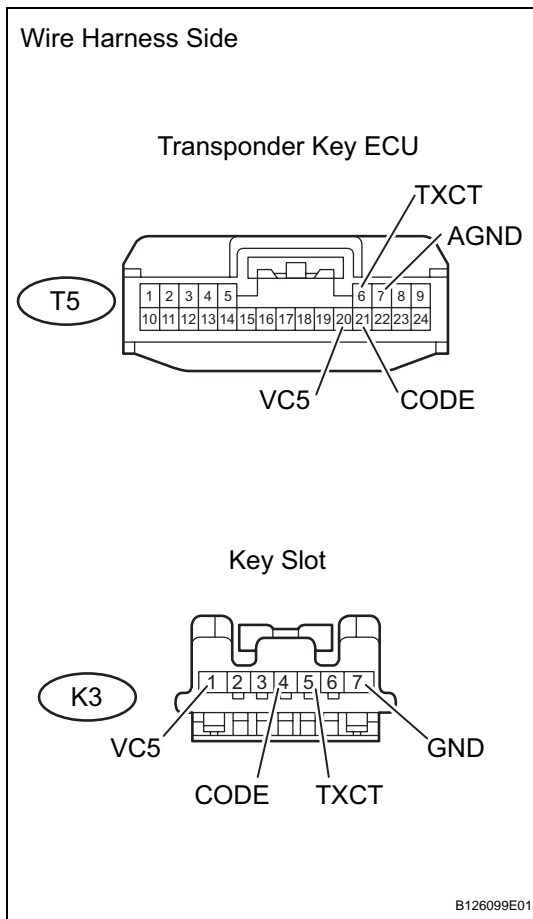
OK:

NORMAL (transponder key coil is normal) appears on screen.

OK

REPLACE TRANSPONDER KEY ECU

NG

2 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - KEY SLOT)

- (a) Disconnect the T5 ECU connector.
 (b) Disconnect the K3 key slot connector.
 (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-20 (VC5) - K3-1 (VC5)	Below 1 Ω
T5-21 (CODE) - K3-4 (CODE)	
T5-6 (TXCT) - K3-5 (TXCT)	
T5-7 (AGND) - K3-7 (GND)	10 k Ω or higher
T5-20 (VC5) or K3-1 (VC5) - Body ground	
T5-21 (CODE) or K3-4 (CODE) - Body ground	
T5-6 (TXCT) or K3-5 (TXCT) - Body ground	
T5-7 (AGND) or K3-7 (GND) - Body ground	

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

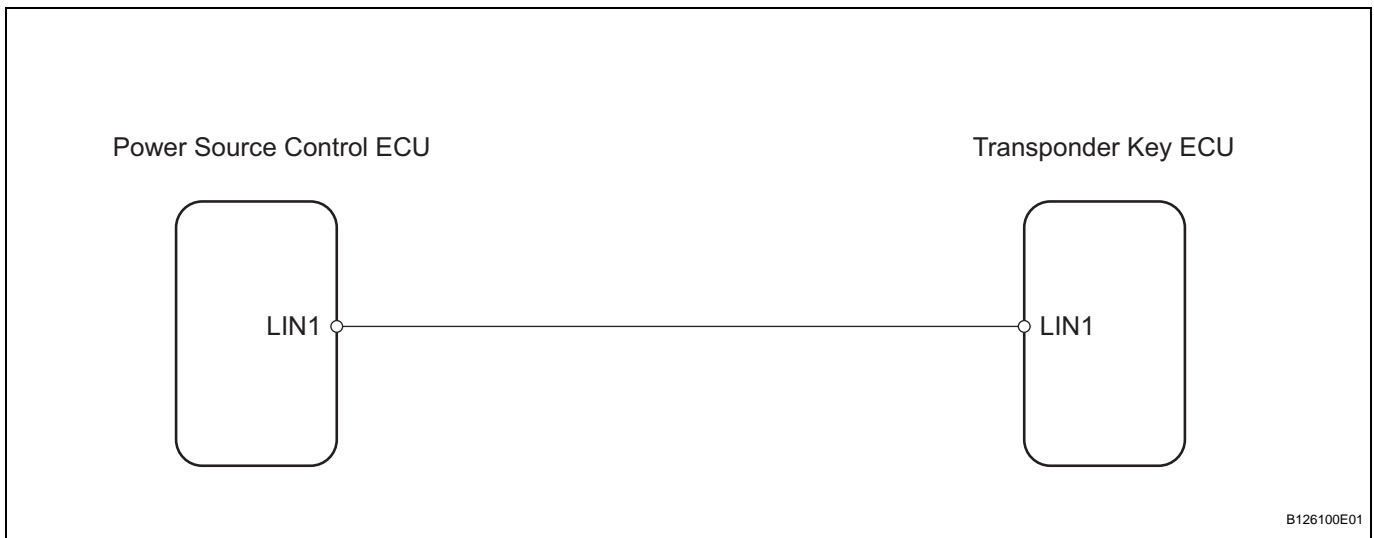
REPLACE KEY SLOT

DTC	B2785	Communication Malfunction between ECUs Connected by LIN
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DESCRIPTION

This DTC is output if communication between the transponder key ECU and power source control ECU is not possible.

DTC No.	DTC Detection Condition	Trouble Area
B2785	Communication between transponder key ECU and power source control ECU is not possible	<ul style="list-style-type: none"> • Wire harness • Power source control ECU • Transponder key ECU

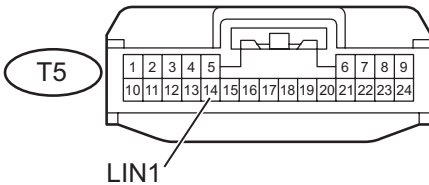
WIRING DIAGRAM

INSPECTION PROCEDURE

1 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - POWER SOURCE CONTROL ECU)

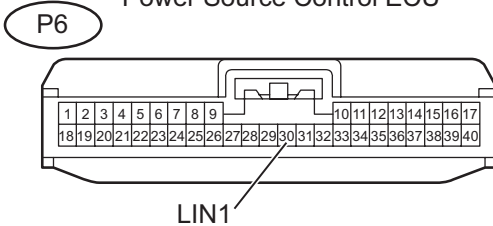
Wire Harness Side

Transponder Key ECU



LIN1

Power Source Control ECU



LIN1

B126101E01

- (a) Reconnect the T5 and P6 ECU connectors.
 (b) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-14 (LIN1) - P6-30 (LIN1)	Below 1 Ω
T5-14 (LIN1) or P6-30 (LIN1) - Body ground	10 k Ω or higher

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****2 CHECK TRANSPONDER KEY ECU (OPERATION)**

- (a) Temporarily replace the transponder key ECU with a new or normally functioning one.
 (b) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:**Power switch can be turned ON (ACC and IG) and hybrid control system can be started.****NG****REPLACE POWER SOURCE CONTROL ECU****OK****END (TRANSPONDER KEY ECU IS DEFECTIVE)**

DTC**B2793****Transponder Chip Malfunction****DESCRIPTION**

This DTC is output when: 1) during key code registration, a key malfunction occurs; or 2) the key code was unable to be registered properly. Follow the inspection procedure below.

DTC No.	DTC Detection Condition	Trouble Area
B2793	Transponder chip malfunction	Key (door control transmitter)

INSPECTION PROCEDURE**1****REREGISTER KEY**

- (a) Delete the DTC (see page [EI-69](#)).
- (b) Reregister the key (which caused this DTC to be output) with the transponder key ECU (see page [EI-54](#)).
- (c) Insert the same key into the key slot.
- (d) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned (ACC and IG) and hybrid control system can be started.

NG**REPLACE KEY****OK****END****EI**

DTC**B2794****Unmatched Encryption Code****DESCRIPTION**

This DTC is output when a key with an incomplete key code is inserted into the key slot.

DTC No.	DTC Detection Condition	Trouble Area
B2794	Key with incomplete key code is inserted	Key (door control transmitter)

INSPECTION PROCEDURE**EI****1****REREGISTER KEY**

- (a) Delete the DTC (see page [EI-69](#)).
- (b) Reregister the key (which caused this DTC to be output) with the transponder key ECU (see page [EI-54](#)).
- (c) Insert the same key into the key slot.
- (d) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned (ACC and IG) and hybrid control system can be started.

NG**REPLACE KEY****OK****END**

DTC**B2795****Unmatched Key Code****DESCRIPTION**

This DTC is output when a key with a key code that has not been registered in the ECU is inserted into the key slot.

DTC No.	DTC Detection Condition	Trouble Area
B2795	Key with unregistered code is inserted	Key (door control transmitter)

INSPECTION PROCEDURE**1****REREGISTER KEY**

- (a) Delete the DTC (see page [EI-69](#)).
- (b) Reregister the key (which caused this DTC to be output) with the transponder key ECU (see page [EI-54](#)).
- (c) Insert the same key into the key slot.
- (d) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned (ACC and IG) and hybrid control system can be started.

NG**REPLACE KEY****OK****END****EI**

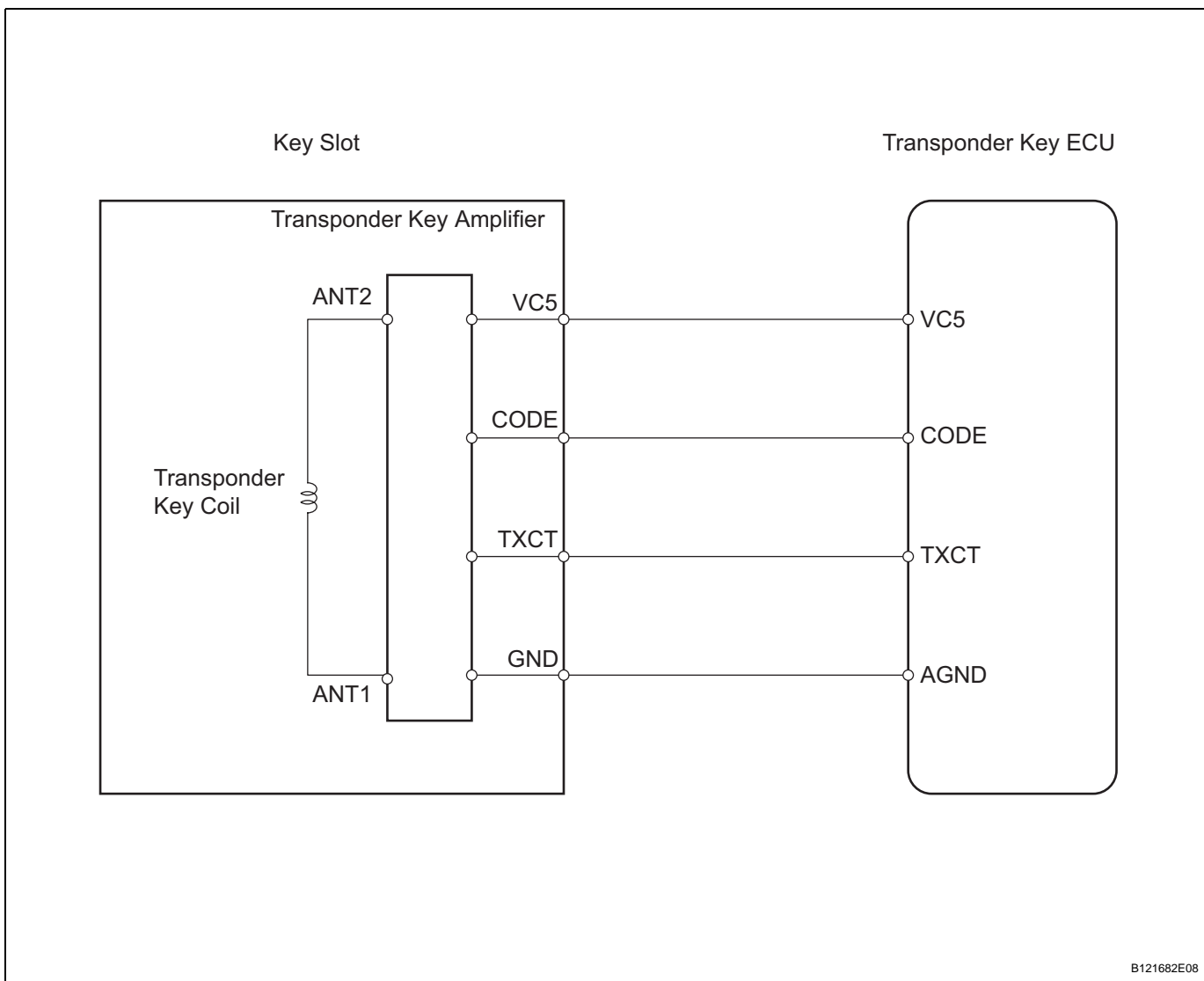
DTC	B2796	No Communication in Immobiliser System
DTC	B2798	Communication Malfunction No. 2

DESCRIPTION

When a key is inserted into the key slot but no communication occurs between the key and transponder key ECU, DTC B2796 is output. When a key is inserted into the key slot but a communication error occurs between the key and transponder key ECU, DTC B2798 is output.

DTC No.	DTC Detection Condition	Trouble Area
B2796	No communication	<ul style="list-style-type: none"> • Key (door control transmitter) • Wire harness • Key slot • Transponder key ECU
B2798	Communication error	Key (door control transmitter)

WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE OF INTELLIGENT TESTER (ENGINE IMMOBILISER SYSTEM)

- (a) Check the DATA LIST for proper functioning of the engine immobiliser system.

Transponder key ECU:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
IMMOBILISER	Engine immobiliser system status / SET or UNSET	SET: No key is in key slot UNSET: Power switch ON (IG)	-

OK:

"UNSET" (power switch ON (IG)) appears on screen.

OK**REPLACE TRANSPONDER KEY ECU****NG****2 CHECK DOOR CONTROL TRANSMITTER (OPERATION)**

- (a) Temporarily replace the door control transmitter with a new or normally functioning one.
(b) Check that change the power switch can be turned ON (IG).

OK:

Power switch can be turned ON (ACC and IG) and hybrid control system can be started.

OK**END (DOOR CONTROL TRANSMITTER IS DEFECTIVE)****NG****3 READ VALUE OF INTELLIGENT TESTER (TRANSPONDER KEY COIL)**

- (a) Check the DATA LIST for proper functioning of the transponder key coil.

Transponder key ECU:

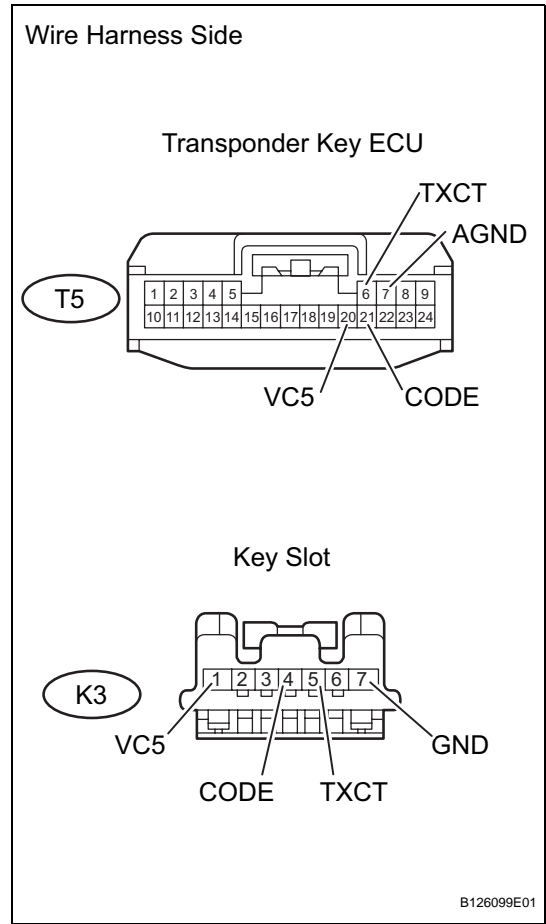
Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
ANTENNA COIL	Transponder key coil condition / NORMAL or FAIL	NORMAL: Transponder key coil is normal FAIL: Transponder key coil is malfunctioning	-

OK:

"NORMAL" (transponder key coil is normal) is appears on screen.

NG**REPLACE KEY SLOT****OK**

4 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - KEY SLOT)



- (a) Disconnect the T5 ECU connector.
- (b) Disconnect the K3 key slot connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-20 (VC5) - K3-1 (VC5)	Below 1 Ω
T5-21 (CODE) - K3-4 (CODE)	
T5-6 (TXCT) - K3-5 (TXCT)	
T5-7 (AGND) - K3-7 (GND)	
T5-20 (VC5) or K3-1 (VC5) - Body ground	10 kΩ or higher
T5-21 (CODE) or K3-4 (CODE) - Body ground	
T5-6 (TXCT) or K3-5 (TXCT) - Body ground	
T5-7 (AGND) or K3-7 (GND) - Body ground	

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5 CHECK KEY SLOT (OPERATION)

- (a) Temporarily replace the key slot with a new or normally functioning one.
- (b) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:

Power switch can be turned ON (ACC and IG) and hybrid control system can be started.

NG REPLACE TRANSPONDER KEY ECU

OK

END (KEY SLOT IS DEFECTIVE)

DTC**B2797****Communication Malfunction No. 1****DESCRIPTION**

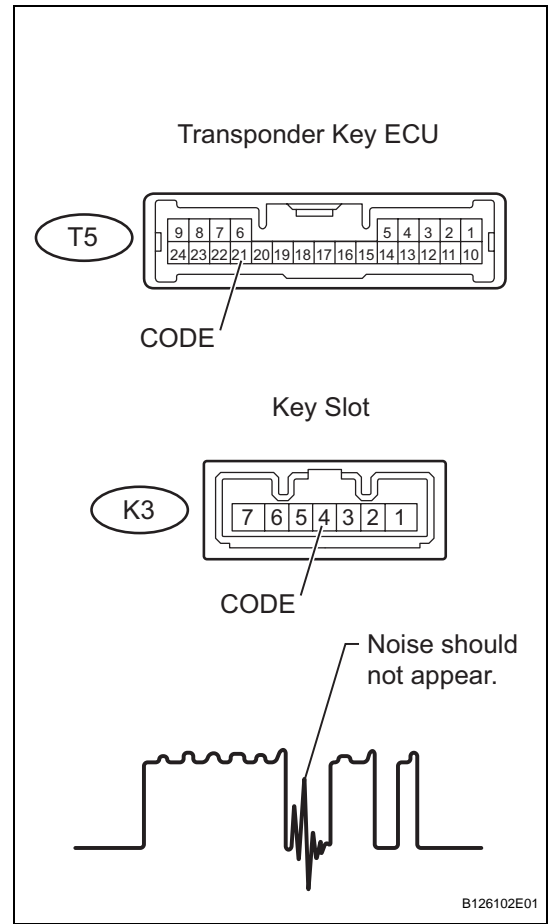
This DTC is output when a communication error occurs between the key slot and transponder key ECU. A possible reason for the communication error is that noise is occurring on the communication line. Following the inspection procedure below.

DTC No.	DTC Detection Condition	Trouble Area
B2797	Key has noise occurring on communication line	<ul style="list-style-type: none"> • Key (door control transmitter) • Wire harness • Key slot • Transponder key ECU

WIRING DIAGRAM

INSPECTION PROCEDURE

1 CHECK TRANSPONDER KEY ECU



(a) Using an oscilloscope or the intelligent tester, check for noise in the waveform between the terminals of the K3 key slot connector and T5 ECU connector.

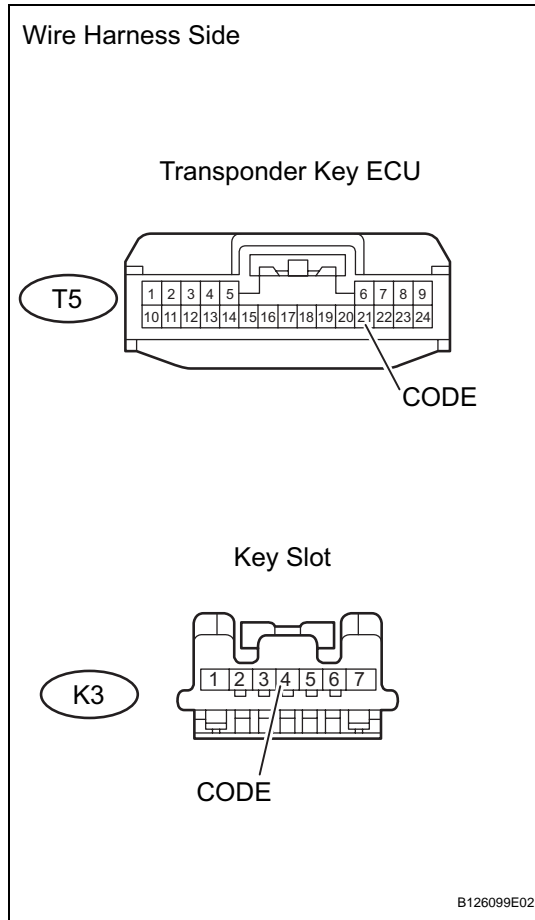
OK:

No noise is present (see illustration).

Tester Connection	Tool Setting	Condition	Specified Condition
T21-15 (CODE) - T20-4 (CODE)	5 V/DIV., 20 msec./DIV.	Key inserted	No noise is present

NG **FIND CAUSE OF NOISE AND REMOVE IT**

OK

2 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - KEY SLOT)

- Disconnect the T5 ECU connector.
- Disconnect the K3 key slot connector.
- Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T21-5 (CODE) - K3-4 (CODE)	Below 1 Ω

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****3 CHECK KEY SLOT (OPERATION)**

- Temporarily replace the key slot with a new or normally functioning one.
- Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

OK:**Power switch can be turned ON (ACC and IG) and hybrid control system can be turned.****NG****REPLACE TRANSPONDER KEY ECU****OK****END (KEY SLOT IS DEFECTIVE)**

DTC	B2799-539	Engine Immobiliser System Malfunction
DTC	B2799-540	Engine Immobiliser System Malfunction
DTC	B2799-541	Engine Immobiliser System Malfunction
DTC	B2799-542	Engine Immobiliser System Malfunction
DTC	B2799-543	Engine Immobiliser System Malfunction
DTC	B2799-544	Engine Immobiliser System Malfunction

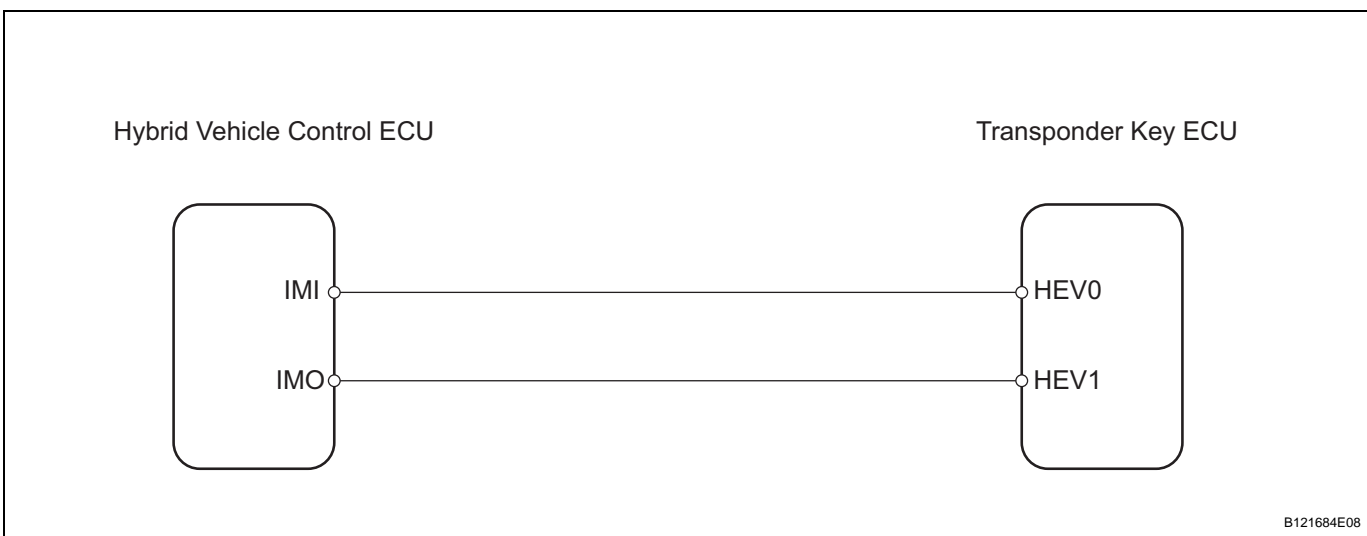
DESCRIPTION

These DTCs are detected when: 1) the wire harness between the transponder key ECU and hybrid vehicle control ECU is open or shorted, 2) the ECU communication IDs of the hybrid vehicle control ECU and transponder key ECU are different, 3) the start ON (READY) signal is delayed, or 4) the key codes are unmatched.

Before troubleshooting for these DTCs, make sure no transponder key ECU DTCs are present. If present, troubleshoot the transponder key ECU DTCs or hybrid vehicle control ECU DTCs first.

DTC No.	DTC Detection Condition	Trouble Area
B2799-539 B2799-540 B2799-541 B2799-542 B2799-543 B2799-544	When any of the following conditions are met: <ul style="list-style-type: none"> Wire harness between transponder key ECU and hybrid vehicle control ECU is open or short ECU communication IDs of hybrid vehicle control ECU and transponder key ECU are different ON (READY) signal is delayed more than 10 seconds from when power switch is turned to ON (READY) Key codes are unmatched 	<ul style="list-style-type: none"> Wire harness Transponder key ECU Hybrid vehicle control ECU

WIRING DIAGRAM



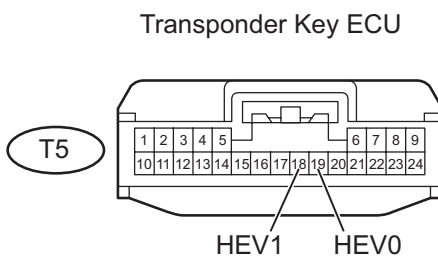
INSPECTION PROCEDURE

1 CHECK FOR DTC

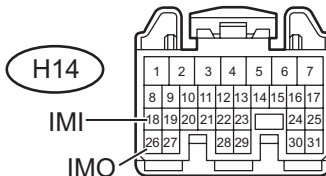
- (a) Delete the DTC (see page EI-69).
- (b) Check that no DTC is output.

OK:**DTC is not output.****OK****END****NG****2 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - HYBRID VEHICLE CONTROL ECU)**

Wire Harness Side



Hybrid Vehicle Control ECU



B126103E01

- (a) Disconnect the T5 and H14 ECU connectors.
- (b) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T5-19 (HEV0) - H14-18 (IMI)	Below 1 Ω
T5-18 (HEV1) - H14-26 (IMO)	
T5-19 (HEV0) or H14-18 (IMI) - Body ground	10 k Ω or higher
T5-18 (HEV1) or H14-26 (IMO) - Body ground	

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****3 CHECK TRANSPONDER KEY ECU (OPERATION)**

- (a) Temporarily replace the transponder key ECU with a new or normally functioning one.
- (b) Check that the power switch can be turned ON (ACC and IG) and the hybrid control system can be started.

EI

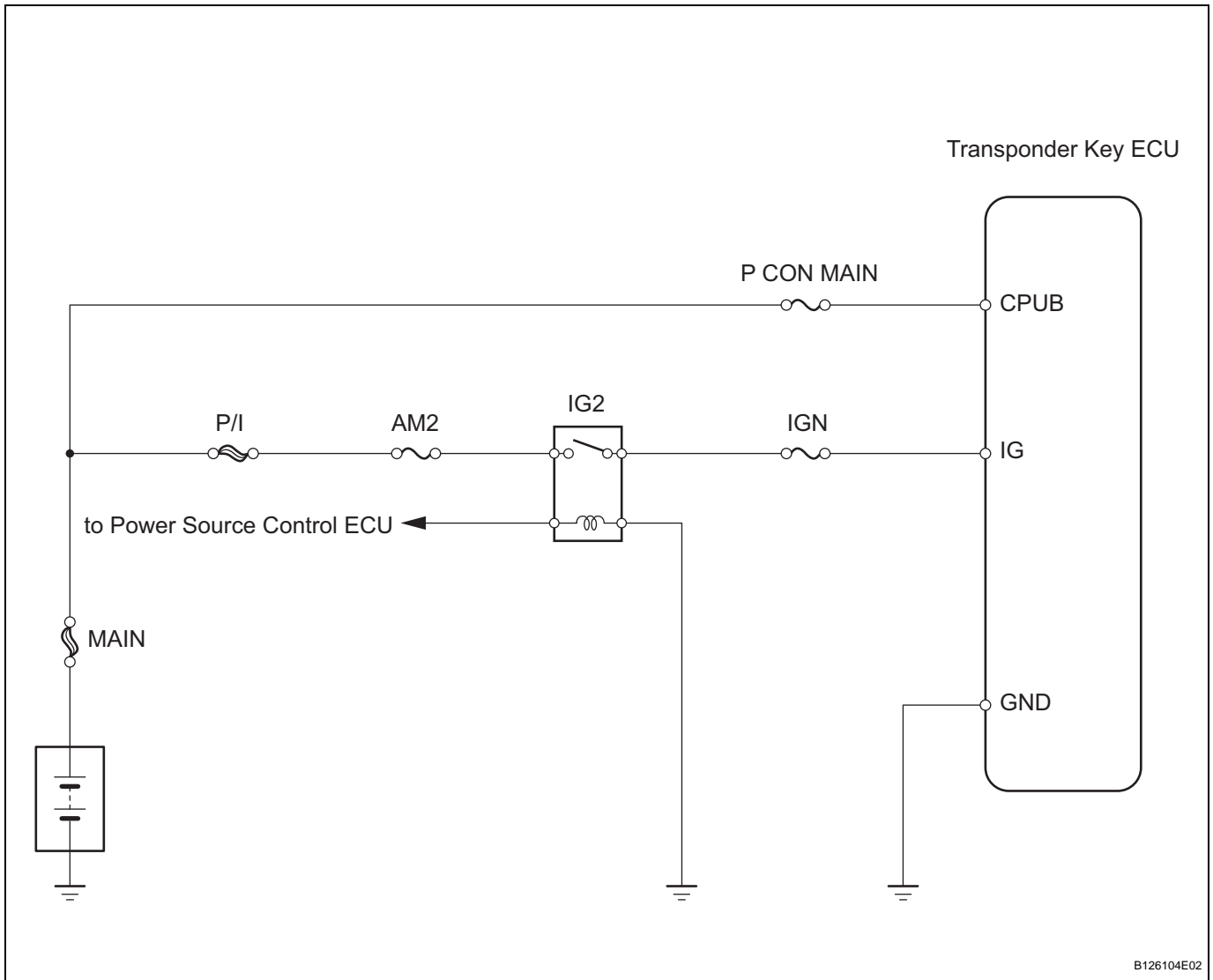
OK:**Power switch can be turned ON (ACC and IG) and hybrid control system can be started.****NG****REPLACE HYBRID VEHICLE CONTROL ECU****OK****END (TRANSPONDER KEY ECU IS DEFECTIVE)**

Power Source Circuit

DESCRIPTION

This circuit provides power to operate the transponder key ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK POWER SWITCH (OPERATION)

(a) Check that the power switch can be turned.

HINT:

- Without depressing the brake pedal, push the power switch repeatedly. Power switch should change as following: OFF → ON (ACC) → ON (IG) → OFF.

- With depressing the brake pedal, push the power switch repeatedly. Power switch should change as following: OFF → ON (ACC) → ON (IG) → ON (READY) → OFF.

NG

GO TO SMART KEY SYSTEM (for Starting)

OK

2 INSPECT FUSE (IGN, P CON MAIN, AM2)

- Remove the IGN fuse from the instrument panel junction block.
- Remove the P CON MAIN and AM2 fuses from the engine room junction block.
- Measure the resistance of the fuses.

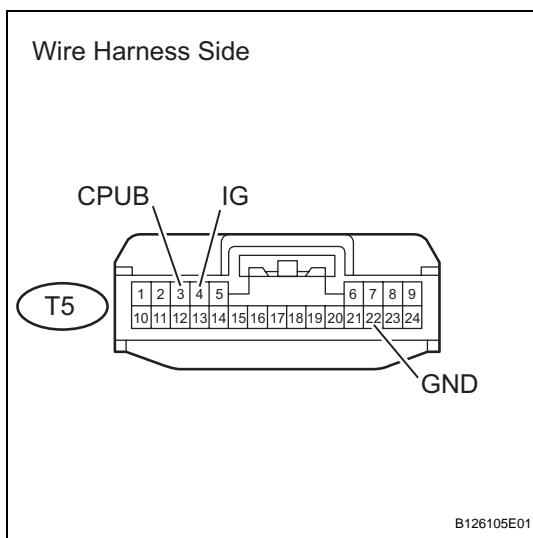
Standard resistance:**Below 1 Ω**

NG

REPLACE FUSE

OK

3 CHECK WIRE HARNESS (TRANSPONDER KEY ECU - BATTERY AND BODY GROUND)



- Disconnect the T5 ECU connector.
- Measure the resistance and voltage of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
T5-22 (GND) - Body ground	Below 1 Ω

Standard voltage

Tester Connection	Condition	Specified Condition
T5-4 (IG) - Body ground	Power switch ON (IG)	10 to 14 V
	Power switch OFF	Below 1 V
T5-3 (CPUB) - Body ground	Always	10 to 14 V

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REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE