

ENGINE IMMOBILISER SYSTEM

PRECAUTION

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

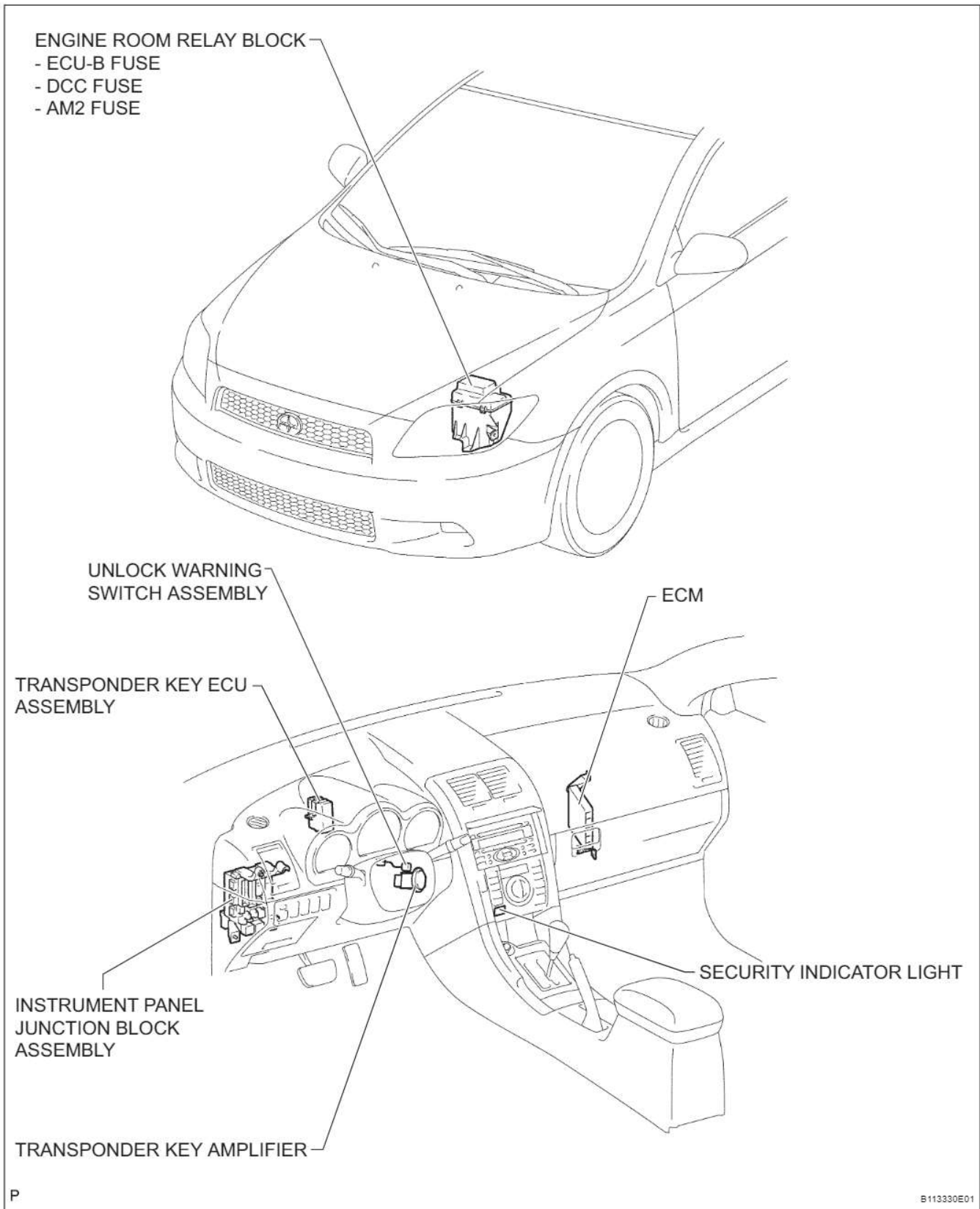
System Name	See procedure
Power Window Control System (w/ Jam Protection Function)	IN-23
Sliding Roof System	

EI

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ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

PARTS LOCATION



SYSTEM DESCRIPTION

1. ENGINE IMMOBILISER SYSTEM DESCRIPTION

- The engine immobiliser system is designed to prevent the vehicle from being stolen. This system uses a transponder key ECU that stores the key codes of authorized ignition keys. If an attempt is made to start the engine using an unauthorized key, the ECU sends a signal to the ECM to prohibit fuel delivery and ignition, effectively disabling the engine.
- When the ECU detects that the unlock warning switch is ON, the ECU provides current to the transponder key coil and produce a faint electric wave. A transponder chip in the key grip receives the faint electric wave. Upon receiving the faint electric wave, the transponder chip outputs a key ID codes signal. The transponder key coil receives this signal, the transponder key amplifies it, and then the signal is transmitted to the ECU. The ECU matches the key's ID code with the vehicle's ID code, which was previously registered in the ECU, and then communicates with the ECM using the SFI communication.
- After the identification results show that the key's ID code matches the vehicle's ID code and the ECU has confirmed their match: 1) the immobiliser system is canceled the engine and the engine starting systems (fuel injection control and ignition control) enter standby mode; and 2) the ECU turns off the security indicator light.

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HOW TO PROCEED WITH TROUBLESHOOTING

- HINT:
- Using the procedure to troubleshoot the engine immobiliser system.
 - *: Use the intelligent tester.

EI

1

VEHICLE BROUGHT TO WORKSHOP

NEXT

2

INSPECT BATTERY VOLTAGE

Standard voltage:
11 to 14 V
If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

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CRANK ENGINE FOR MORE THAN 10 SECONDS

NEXT

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CHECK FOR DTC*

- (a) Check for DTCs and note any codes that are output (see page [EI-21](#)).
- (b) Delete the DTC.
- (c) Recheck for DTCs. Based on the DTC output above, try to force output of the same SFI system DTC or engine immobiliser system DTC by simulating the operation indicated by the DTC.

Result:

Result	Proceed to
DTC output does not reoccur	A
SFI system DTC output reoccurs	B
Engine immobiliser system DTC output reoccurs	C

B

Go to SFI SYSTEM

C

Go to step 7

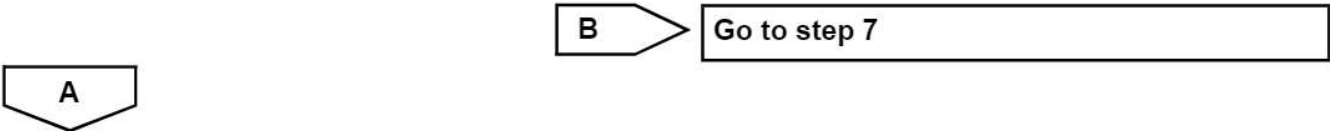
A

5

PROBLEM SYMPTOMS TABLE

Result:

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



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OVERALL ANALYSIS AND TROUBLESHOOTING*

- (a) DATA LIST / ACTIVE TEST (see page EI-19)
- (b) Terminals of ECU (see page EI-13)
- (c) On-vehicle inspection (see page EI-42)

NEXT

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ADJUST, REPAIR AND REPLACE

NEXT

8

CONFIRMATION TEST

NEXT

END

REGISTRATION

1. DESCRIPTION OF CODE REGISTRATION

HINT:

- The key has 2 codes: the key code (immobiliser code), the wireless code. All of these code types need to be registered. Refer to the following key code registration procedures and the wireless code registration procedures.
- The key code is needed when the transponder key ECU, ECM, or key is replaced with a new one.

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 specified after troubleshooting the engine immobiliser system.

HINT:

- The following procedures indicated in the table below require the use of the intelligent tester:
New key ID registration
Additional key ID registration
Key ID erasure
ECU code registration
- If all of the registered keys are not available, replacement of the transponder key ECU is also required.
- A maximum of 5 key codes for 3 master keys and 2 sub-keys can be registered.

Part to be replaced	Procedure
Transponder key ECU	1. Replace transponder key ECU 2. Reregister all keys (new key ID registration) 3. Using SST (09843-018040), connect terminals TC and CG of DLC3 4. Turn ignition switch ON and leave it as is for 30 minutes
ECM	1. Replace ECM 2. Using SST (09843-018040), connect terminals TC and CG of DLC3 3. Turn ignition switch ON and leave it as is for 30 minutes
Key	1. Using remaining key, erase key code of lost key (key ID erasure) 2. Register additional keys as necessary (additional key ID registration)

3. KEY REGISTRATION IN AUTOMATIC REGISTRATION (NEW REGISTRATION)

- (a) When an ignition key is inserted into the ignition key cylinder, the key code (immobiliser code) registration is automatic. In this mode, a maximum of 5 key codes for 3 master keys and 2 sub-keys can be registered. Any order of registration for the master keys and sub-key can be registered because the transponder key ECU can distinguish between different types of keys.

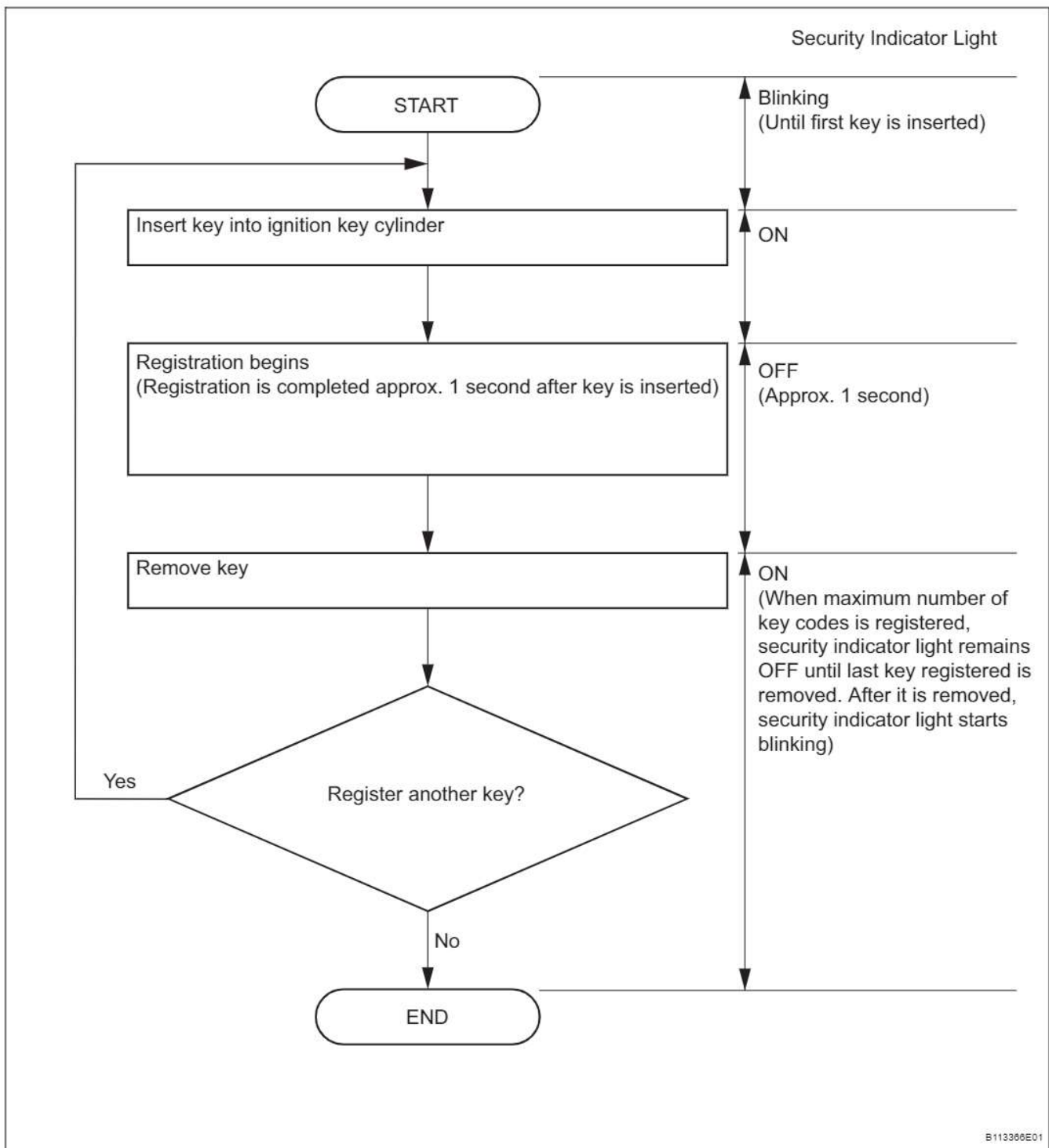
HINT:

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

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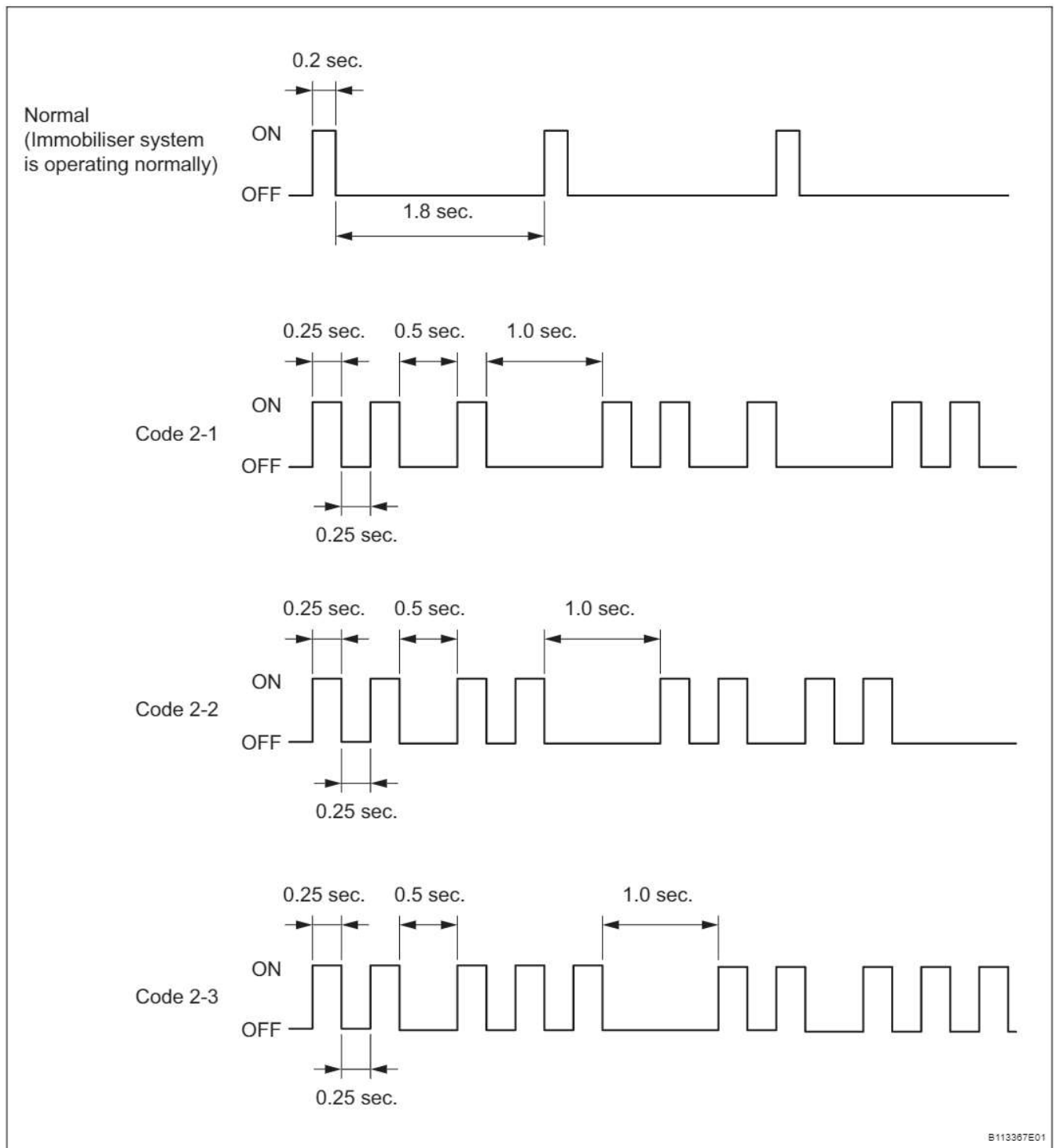
ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

**HINT:**

- When no key is inserted into the ignition key cylinder 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.

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM**EI-9**

- 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.

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ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

- (b) Finish the automatic key code registration mode.

HINT:

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

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

4. REGISTRATION OF ADDITIONAL KEY (ADDITIONAL REGISTRATION)

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

HINT:

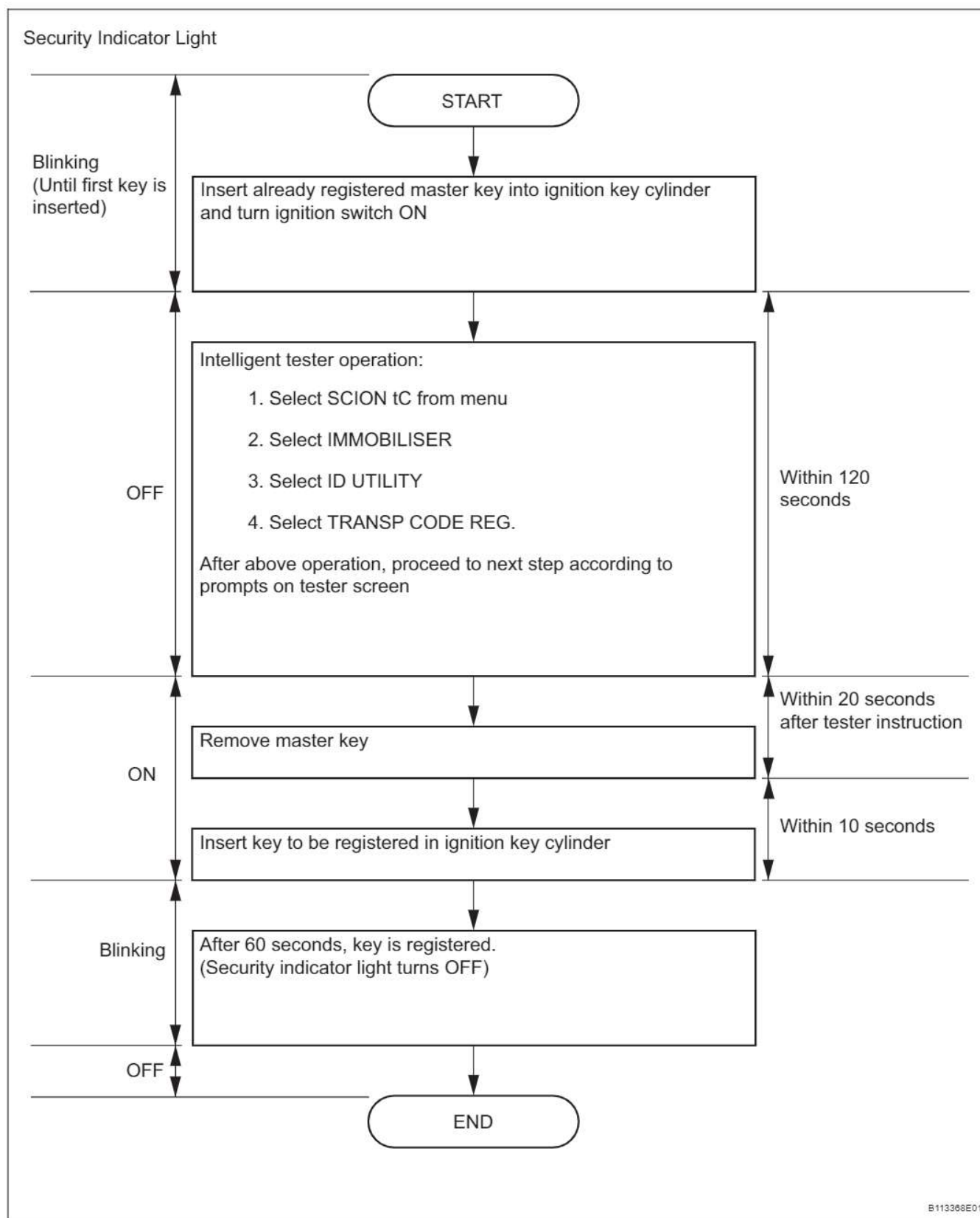
- A maximum of 5 key codes and 3 sub-key codes can be registered.
- Registration mode will be ended if each step is not completed within the specified time.
- When the ignition key cylinder or the door key cylinder set is replaced, remove the transmitter module from the original master key. Then install this transmitter module to a new key and use the new key as the master key. If necessary, use this master key to register other keys.

NOTICE:

When the ignition key cylinder has been replaced, locking and unlocking doors are possible with the new master key's transmitter module (taken from the original master key). However, the new master key will not be able to lock and unlock doors through the door key cylinder. Keep the original master key. If the new master key's transmitter module's battery fails, the original master key can be used to lock and unlock doors through the door key cylinder.

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

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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.

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- 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

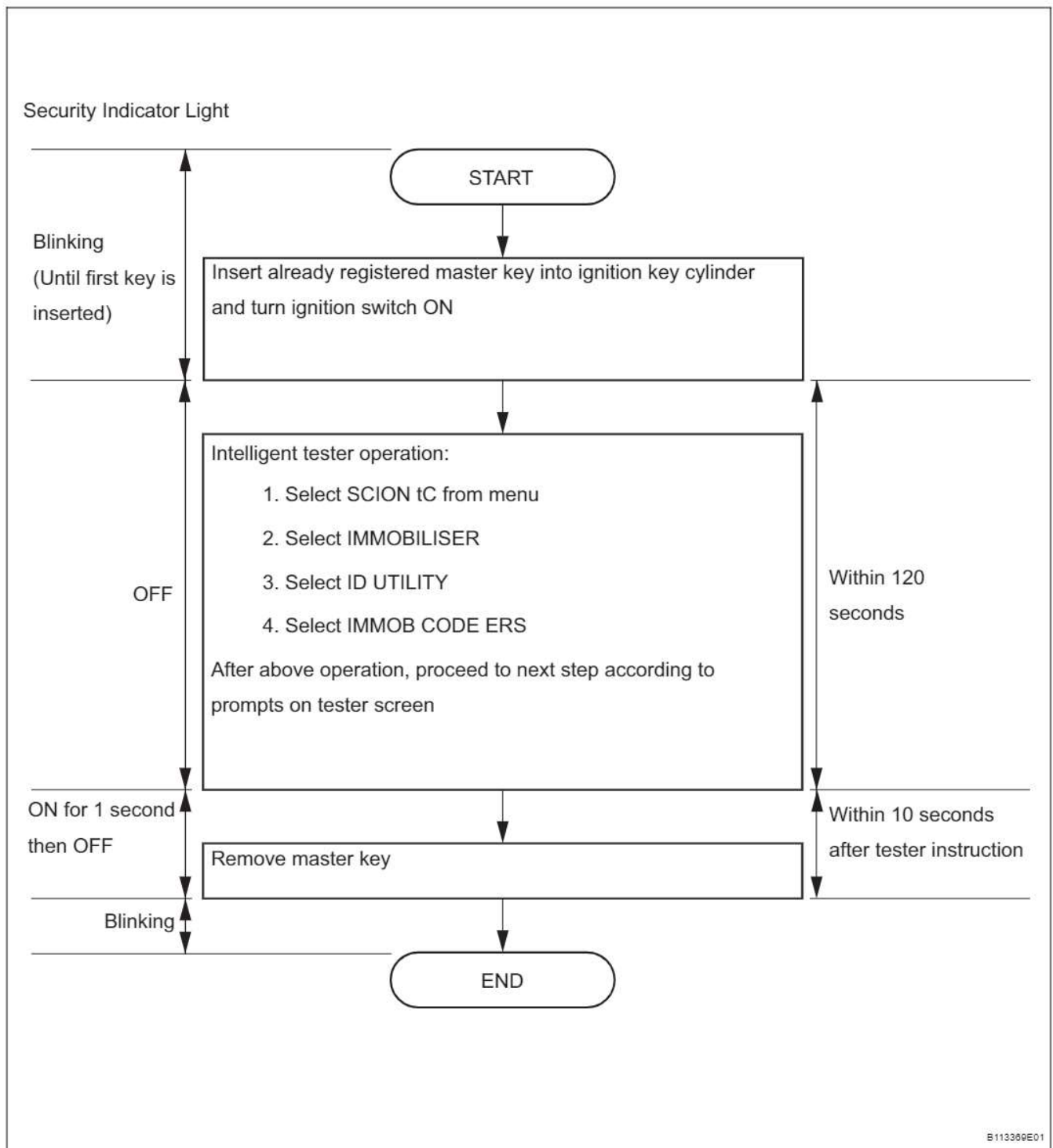
- (a) Erase the key codes using the intelligent tester.

HINT:

- All key codes are erased except for the master 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.

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

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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.

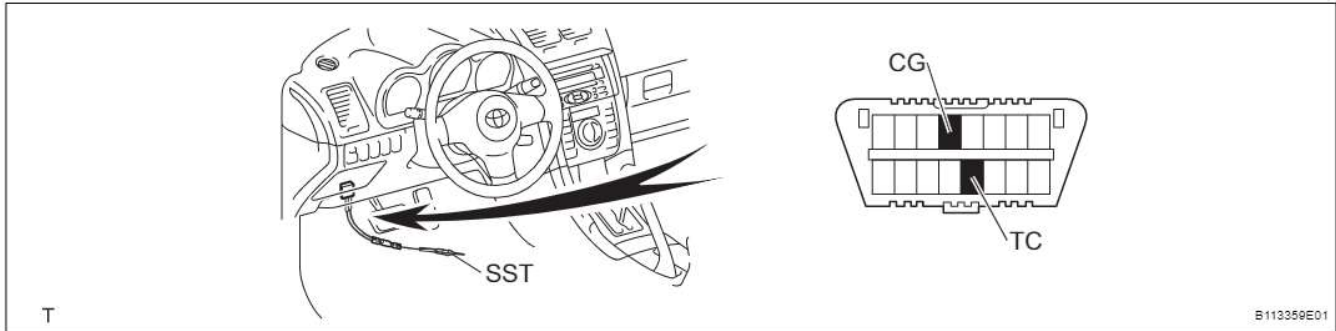
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ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

6. ECU COMMUNICATION ID REGISTRATION

NOTICE:

- If the transponder key ECU and / or ECM has been replaced, register the ECU COMMUNICATION ID to both in order to match their IDs.
- The engine cannot be started unless the ECU COMMUNICATION ID matches.



- (a) Register the ECU COMMUNICATION ID.
- (1) Using SST, connect terminals TC and CG of the DLC3.
SST 09843-18040
 - (2) Turn the ignition switch ON (do not start the engine) and leave it as is for 30 minutes.
 - (3) Turn the ignition switch OFF and disconnect terminals TC and CG.
 - (4) Check that the engine starts.

PROBLEM SYMPTOMS TABLE

HINT:
Use the table below to help determine the cause of the problem symptom. The potential cases of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected area in the order they are listed. Replace parts as necessary.

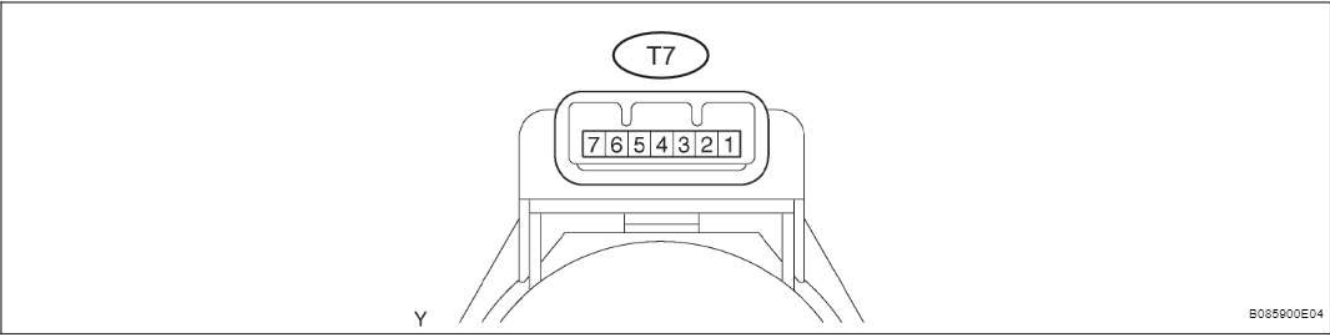
ENGINE IMMOBILISER SYSTEM

Symptom	Suspected Area	See page
Engine does not start	1. Power source circuit	EI-38
	2. SFI system	ES-6



TERMINALS OF ECU

1. CHECK TRANSPONDER KEY AMPLIFIER



- (a) Disconnect the T7 amplifier connector.
- (b) Measure the resistance of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (T7-7) - Body ground	V - Body ground	Ground	Always	Below 1 Ω

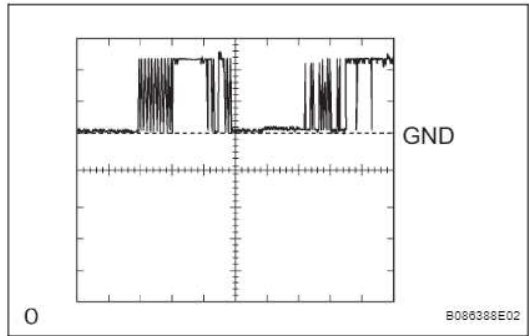
If the result is not as specified, there may be a malfunction on the wire harness side.

- (c) Reconnect the T7 amplifier connector.
- (d) Measure the resistance and voltage of the connector.

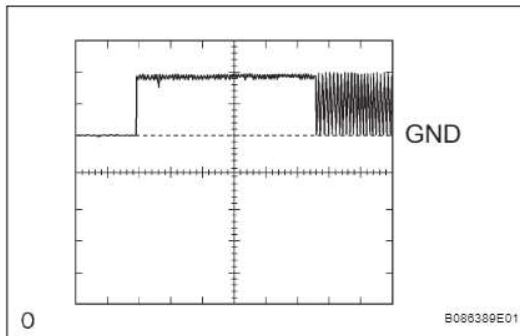
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (T7-7) - Body ground	V - Body ground	Ground	Always	Below 1 Ω
VC5 (T7-1) - GND (T7-7)	L - V	Power source	No key in ignition key cylinder	Below 1 V
			Key inserted	4.6 to 5.4 V
CODE (T7-4) - GND (T7-7)	Y - V	Demodulated signal of key code data	No key in ignition key cylinder	Below 1 V
			Key inserted	Pulse generation (see waveform 1)
TXCT (T7-5) - GND (T7-7)	R - V	Key code output signal	No key in ignition key cylinder	Below 1 V
			Key inserted	Pulse generation (see waveform 2)

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

- (e) Inspect using an oscilloscope.
 - (1) Waveform 1 (Reference)



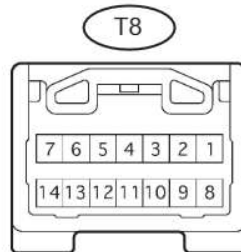
Item	Content
Symbols (Terminal No.)	CODE (T7-4) - GND (T7-7)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted



(2) Waveform 2 (Reference)

Item	Content
Symbols (Terminal No.)	TXCT (T7-5) - GND (T7-7)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted

2. CHECK TRANSPONDER KEY ECU ASSEMBLY



- Disconnect the T8 ECU connector.
- Measure the voltage and resistance of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
AGND (T8-13) - Body ground	V - Body ground	Ground	Always	Below 1 Ω
GND (T8-14) - Body ground	BR-W - Body ground	Ground	Always	Below 1 Ω
+B (T8-1) - GND (T8-14)	P - BR-W	Power source supply	Always	10 to 14 V
IG (T8-2) - GND (T8-14)	LG - BR-W	Ignition power supply	Ignition switch OFF	Below 1 V
			Ignition switch ON	10 to 14 V
KSW (T8-10) - GND (T8-14)	B - BR-W	Unlock warning switch	No key in ignition key cylinder	10 kΩ or higher
			Key inserted	Below 1 Ω

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

- (c) Reconnect the T8 ECU connector.
- (d) Measure the voltage of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
KSW (T8-10) - GND (T8-14)	B - BR-W	Unlock warning switch	No key in ignition key cylinder	10 to 14 V
			Key inserted	Below 1 V
VC5 (T8-8) - GND (T8-14)	L - BR-W	Power source of transponder key amplifier	Ignition switch OFF	Below 1 V
			Ignition switch ON	4.6 to 5.4 V
CODE (T8-11) - AGND (T8-13)	Y - V	Transponder key amplifier communication signal	Ignition switch OFF	Below 1 V
			Ignition switch ON	Pulse generation (see waveform 1)
TXCT (T8-12) - AGND (T8-13)	R - V	Transponder key amplifier communication signal	Ignition switch OFF	Below 1 V
			Ignition switch ON	Pulse generation (see waveform 2)

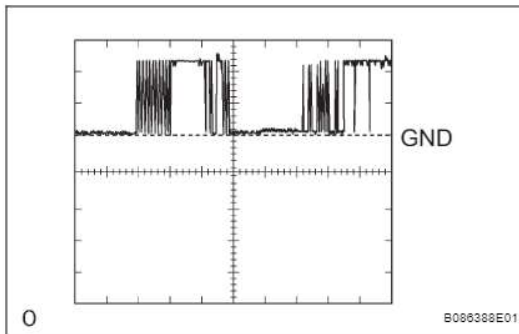
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Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
EFIO (T8-6) - GND (T8-14)	O - BR-W	ECM output signal	Ignition switch OFF	Below 1 V
			Ignition switch ON	Pulse generation (see waveform 3)
EFII (T8-7) - GND (T8-14)	GR - BR-W	ECM output signal	Ignition switch OFF	Below 1 V
			Ignition switch ON	Pulse generation (see waveform 4)
CTY (T8-4) - GND (T8-14)	BR - BR-W	Door courtesy switch	Driver side door fully closed	10 to 14 V
			Driver side door open	Below 1 V
IND (T8-3) - GND (T8-14)	B - BR-W	Security indicator light	Engine immobiliser system set (indicator is blinking)	Alternating between 10 to 14 V (0.2 sec.) and below 1 V (1.8 sec.)

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

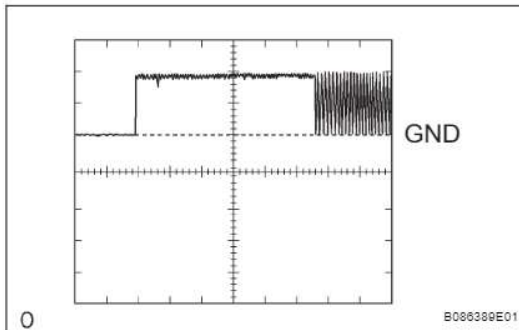
(e) Inspect using an oscilloscope.

(1) Waveform 1 (Reference)



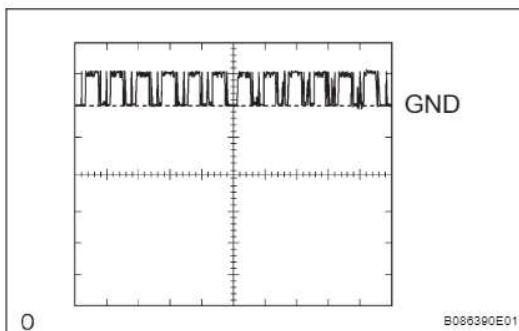
Item	Content
Symbols (Terminal No.)	CODE (T8-11) - AGND (T8-13)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted

(2) Waveform 2 (Reference)



Item	Content
Symbols (Terminal No.)	TXCT (T8-12) - AGND (T8-13)
Tool Setting	2 V/DIV., 20 msec./DIV.
Condition	Key inserted

(3) Waveform 3 (Reference)

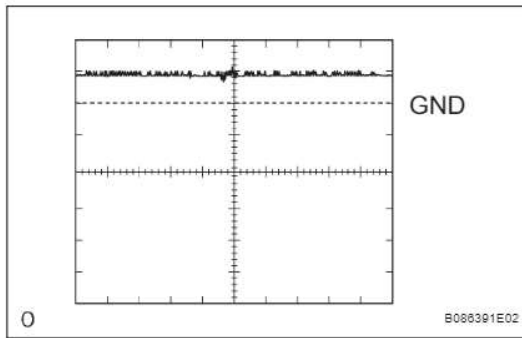


Item	Content
Symbols (Terminal No.)	EFIO (T8-6) - GND (T8-14)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Ignition switch ON

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

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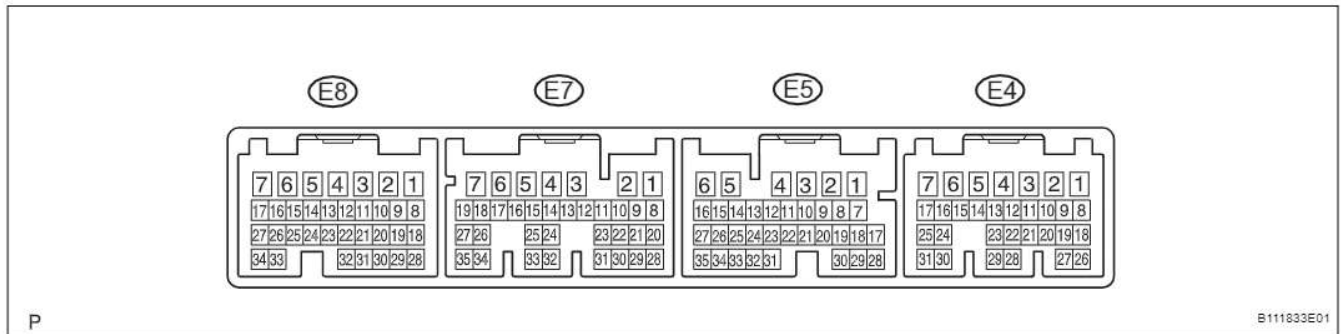
(4) Waveform 4 (Reference)



Item	Content
Symbols (Terminal No.)	EFII (T8-7) - GND (T8-14)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Ignition switch ON

3. CHECK ECM

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

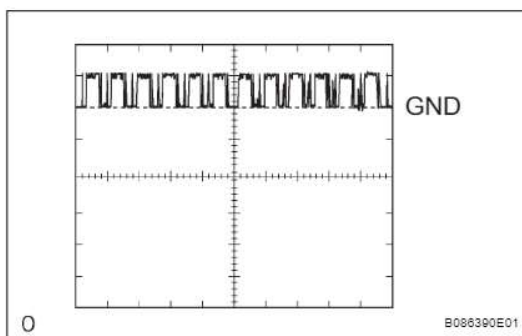
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
E01 (E8-7) - Body ground	B - Body ground	Ground	Always	Below 1 Ω
E0M (E4-29)* - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
E02 (E8-6) - Body ground	P - Body ground	Ground	Always	Below 1 Ω
E1 (E8-3) - Body ground	L - Body ground	Ground	Always	Below 1 Ω
BATT (E4-3) - E1 (E8-3)	V - L	Battery	Always	10 to 14 V
+B (E4-1) - E1 (E8-3)	GR - L	Ignition power supply	Ignition switch ON	10 to 14 V
IMI (E5-16) - E1 (E8-3)	O - W-B	Transponder key ECU input signal	Ignition switch OFF	Below 1 V
			Ignition switch ON	Pulse generation (see waveform 1)
IMO (E5-15) - E1 (E8-3)	GR - W-B	Transponder key ECU output signal	Ignition switch OFF	Below 1 V
			Ignition switch ON	Pulse generation (see waveform 2)

*: for Malfunction Indicator Lamp

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

(b) Inspect using an oscilloscope.

(1) Waveform 1 (Reference)

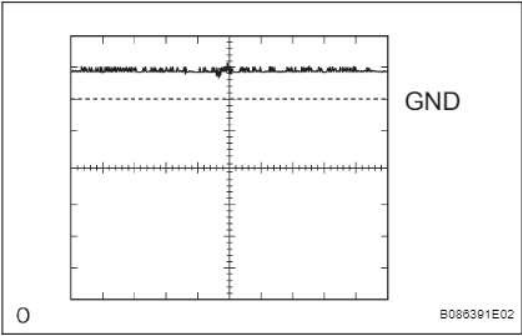


Item	Content
Symbols (Terminal No.)	IMI (E5-27) - E1 (E8-3)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Ignition switch ON

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ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

(2) Waveform 2 (Reference)



Item	Content
Symbols (Terminal No.)	IMO (E5-26) - E1 (E8-3)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Ignition switch ON

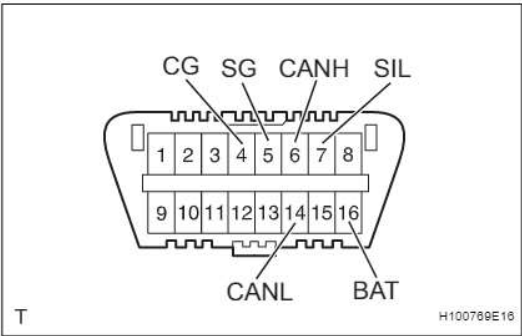
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DIAGNOSIS SYSTEM

1. DESCRIPTION
- (a) The transponder key ECU controls the vehicle's immobiliser system functions. Immobiliser system data and Diagnostic Trouble Codes (DTCs) can be read using the intelligent tester after it is attached to the Data Link Connector 3 (DLC3). In some cases, a malfunction may be occurring in the immobiliser system even though the security indicator light is not illuminated.
If the system seems to be malfunctioning, use the intelligent tester to inspect the operation of the system before performing repairs.

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

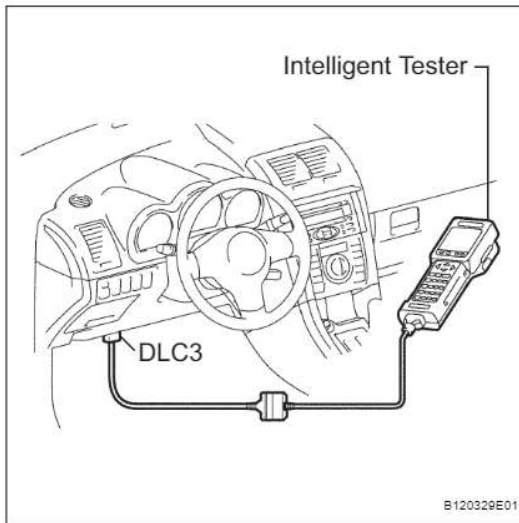


Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	10 to 14 V
CANH (6) - CANL (14)	CAN bus line	Ignition switch OFF*	54 to 69 Ω
CANH (6) - CG (4)	HIGH-level CAN bus line	Ignition switch OFF*	200 Ω or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Ignition switch OFF*	200 Ω or higher
CANH (6) - BAT (16)	HIGH-level CAN bus line	Ignition switch OFF*	6 kΩ or higher
CANL (14) - BAT (16)	LOW-level CAN bus line	Ignition switch OFF*	6 kΩ or higher

NOTICE:
*: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the ignition switch, any other switches or the doors.
If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

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- (b) Connect the cable of the intelligent tester (with CAN VIM) to the DLC3, turn the ignition switch to the ON position and attempt to use the intelligent tester. If the screen displays a communication error message, a problem exists in the vehicle side of the tester side.

HINT:

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

DTC CHECK / CLEAR**1. CHECK DTC**

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch ON.
- Read the DTCs by following the directions on the tester's screen.

HINT:

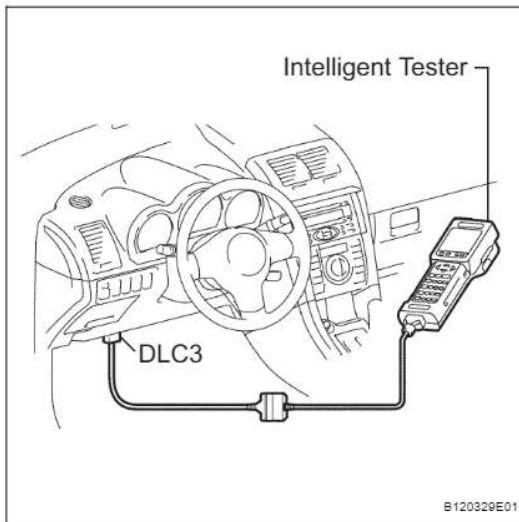
Refer to the intelligent tester operator's manual for further details.

2. CLEAR DTC

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch ON.
- Erase the DTCs by following the directions on the tester's screen.

HINT:

Refer to the intelligent tester operator's manual for further details.



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.

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch ON.
- Read the DATA LIST by following the directions on the tester screen.

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Transponder key ECU assembly:

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
KEY SW	Unlock warning switch signal / ON or OFF	OFF: No key is in ignition key cylinder ON: Key is in ignition key cylinder	-
IG SW	Ignition switch signal / ON or OFF	OFF: Ignition switch OFF or ACC ON: Ignition switch ON	-
IMMOBILISER	Immobiliser system status / SET or UNSET	UNSET: Ignition switch ON SET: No key is in ignition key cylinder	-
PERMIT (START)	Engine starting control / OK or NG	OK: Engine starting is permitted NG: Engine starting is not permitted	-
RESPONSE	Transponder chip data / NG or OK	NG: Data error OK: Data OK	-
FRAME	Transponder chip data / NG or OK	NG: Data error OK: Data OK	-
SERIAL NUMBER	Transponder chip data / NG or OK	NG: Data error OK: Data OK	-
ENCRYPT CODE	Transponder chip data / NG or OK	NG: Data error OK: Data OK	-
STATUS	Transponder chip data / NG or OK	NG: Data error OK: Data OK	-
BCC	Transponder chip signal / NG or OK	NG: Incorrect data sent OK: Correct data sent	-
SUB KEY	Sub-key code signal / NO MATCH or MATCH	NOMATCH: Unmatched sub-key code is sent MATCH: Registered sub-key code is sent	-
MASTER KEY	Master key code signal / NOMATCH or MATCH	NOMATCH: Unmatched master key code is sent MATCH: Registered master key code is sent	-
REGIST SUB CODE	Number of registered sub-keys / min.: 0, max.: 3	Number of registered sub-keys	-
REGIST MAS CODE	Number of registered master keys / min.: 0, max.: 5	Number of registered master keys	-
REG CODE SPACE	Memory space for key code registration / NOT FUL or FULL	NOT FUL: Possible to register more key codes FULL: Cannot register any more key codes	-
+B	+B judgment / NORMAL or BREAK	NORMAL: Battery supply is normal BREAK: Battery supply is malfunctioning	-

EI-24**ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM**

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
ANTENNA C10L	Transponder key coil condition / NORMAL or FAIL	NORMAL: Transponder key coil is normal FAIL: Transponder key coil is malfunctioning	-

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 to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Perform the ACTIVE TEST by following the directions on the tester screen.

Transponder key ECU assembly:

Item	Test Details	Diagnostic Note
SECURITY INDIC	Turn security indicator light ON/OFF	-

EI

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM**EI-25****DIAGNOSTIC TROUBLE CODE CHART****1. TRANSPONDER KEY ECU ASSEMBLY DTC CHART****TRANSPONDER KEY ECU ASSEMBLY**

DTC Code	Detection Item	Trouble Area	See page
B2780	Push Switch / Key Unlock Warning Switch Malfunction	- Unlock warning switch assembly - Wire harness - Transponder key ECU assembly	EI-22
B2784	Antenna Coil Open / Short	- Wire harness - Transponder key amplifier - Transponder key ECU assembly	EI-25
B2793	Transponder Chip Malfunction	Key	EI-27
B2794	Unmatched Encryption Code	Key	EI-28
B2795	Unmatched Key Code	Key	EI-29
B2796	No Communication in Immobiliser System	- Key - Wire harness - Transponder key amplifier - Transponder key ECU assembly	EI-30
B2797	Communication Malfunction No. 1	- Key - Wire harness - Transponder key amplifier - Transponder key ECU assembly	EI-33
B2798	Communication Malfunction No. 2	Key	EI-30

2. ECM DTC CHART**NOTICE:**

The DTC for the immobiliser system is specified. If other codes are output, check the DTC chart of the SFI system.

ECM

DTC Code	Detection Item	Trouble Area	See page
B2799	Engine Immobiliser System Malfunction	- Wire harness - ECM	EI-36

EI

EI-26

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

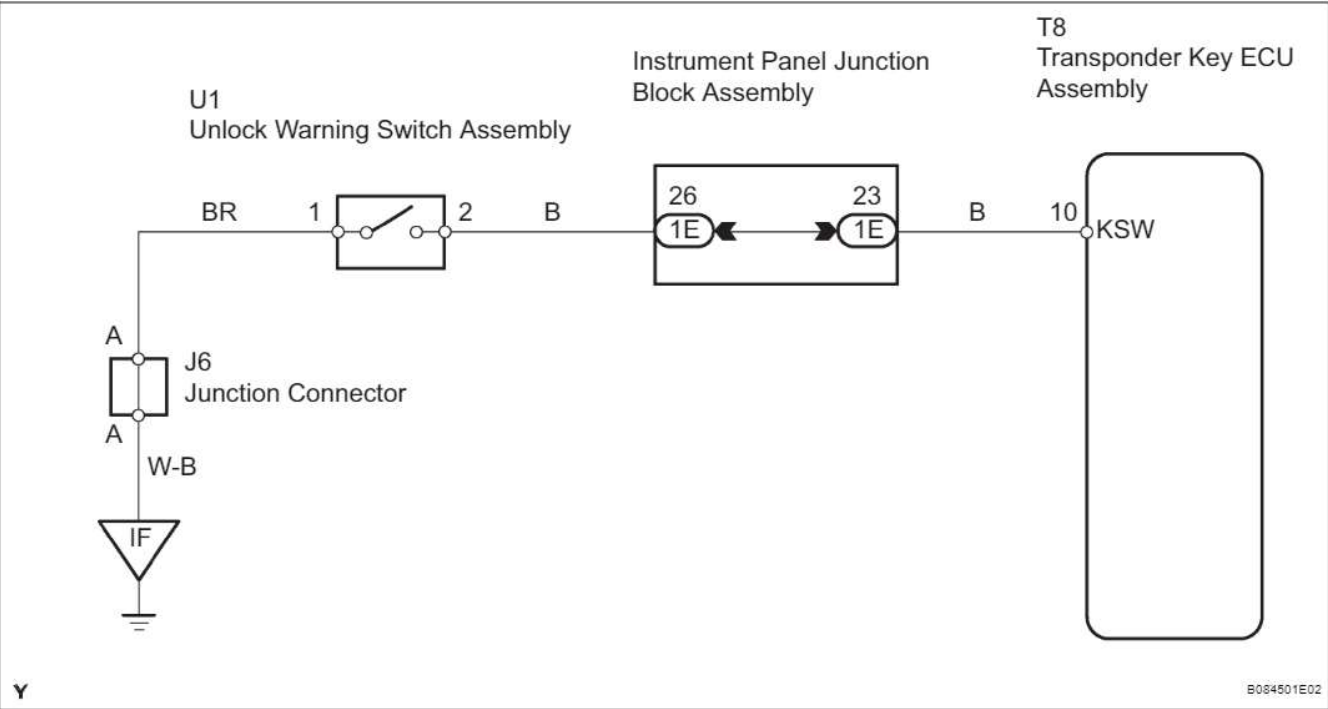
DTC	B2780	Push Switch / Key Unlock Warning Switch Malfunction
-----	-------	---

DESCRIPTION

This DTC will be output when the key is inserted into the ignition key cylinder, but the transponder key ECU does not detect the ON condition of the unlock warning switch. Normally, inserting the key into the ignition key cylinder turns ON the unlock warning switch, which is then detected by the ECU.

DTC No.	DTC Detection Condition	Trouble Area
B2780	Unlock warning switch ON condition is not detected when key is in ignition key cylinder	- Unlock warning switch assembly - Wire harness - Transponder key ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF INTELLIGENT TESTER (UNLOCK WARNING SWITCH ASSEMBLY)
---	---

- (a) Check the DATA LIST for proper functioning of the unlock warning switch.

Transponder key ECU assembly

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
KEY SW	Unlock warning switch signal / ON or OFF	ON: Key is in ignition key cylinder OFF: No key is in ignition key cylinder	-

OK:
ON (key is in ignition key cylinder) appears on the screen.

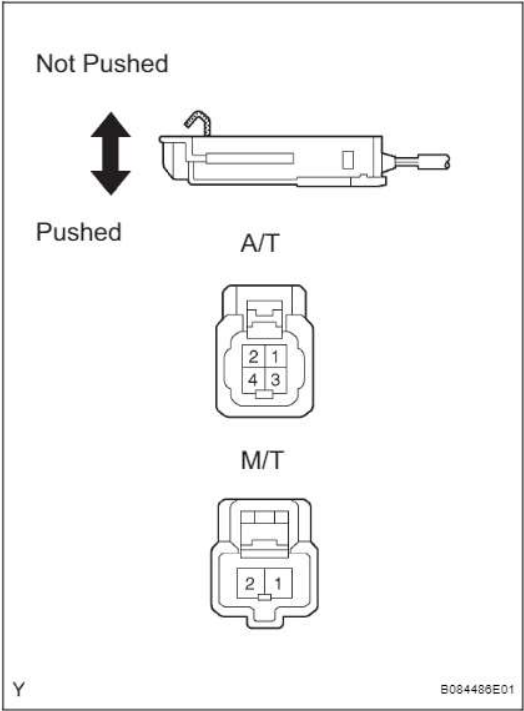
OK

REPLACE TRANSPONDER KEY ECU ASSEMBLY

NG

2

INSPECT UNLOCK WARNING SWITCH ASSEMBLY



- (a) Remove the unlock warning switch.
(b) Measure the resistance of the switch.
Standard resistance

Tester Connection	Switch Condition	Specified Condition
1 - 2	Pushed	Below 1 Ω
	Not pushed	10 kΩ or higher

NG

REPLACE UNLOCK WARNING SWITCH ASSEMBLY

EI

OK

EI-28

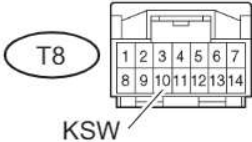
ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

3

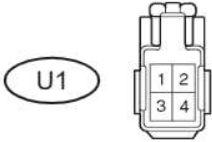
CHECK WIRE HARNESS (UNLOCK WARNING SWITCH - TRANSPONDER KEY ECU AND BODY GROUND)

Wire Harness Side

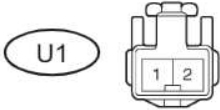
Transponder Key ECU Assembly



Unlock Warning Switch Assembly (A/T)



Unlock Warning Switch Assembly (M/T)



B084512E01

- (a) Disconnect the U1 switch connector.
- (b) Disconnect the T8 ECU connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T8-10 (KSW) - U1-2	Below 1 Ω
U1-1 - Body ground	

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE TRANSPONDER KEY ECU ASSEMBLY

DTC	B2784	Antenna Coil Open / Short
-----	-------	---------------------------

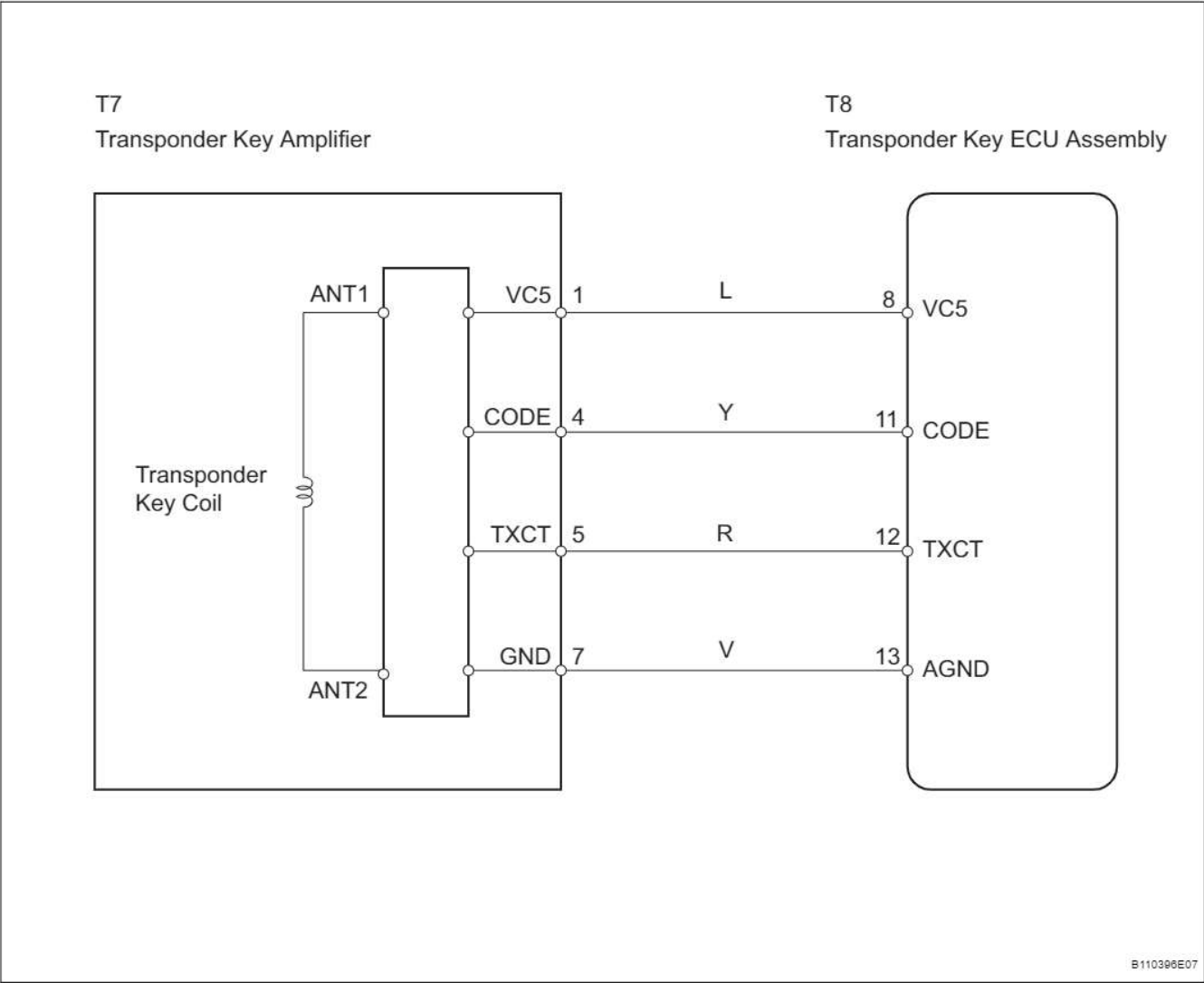
DESCRIPTION

This DTC is detected when the transponder key coil is open or short circuited.

DTC No.	DTC Detection Condition	Trouble Area
B2784	Transponder key coil open / short	• Wire harness • Transponder key amplifier • Transponder key ECU assembly

EI

WIRING DIAGRAM



EI-30

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

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 assembly

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

OK:

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

OK

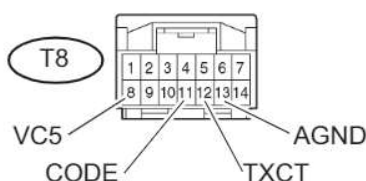
REPLACE TRANSPONDER KEY ECU ASSEMBLY

NG

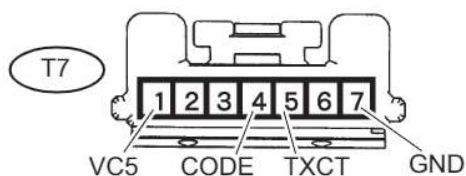
2 CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSEMBLY - TRANSPONDER KEY AMPLIFIER)

Wire Harness Side

Transponder Key ECU Assembly



Transponder Key Amplifier



B064974E11

- (a) Disconnect the T8 ECU connector.
(b) Disconnect the T7 amplifier connector.
(c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T8-8 (VC5) - T7-1 (VC5)	Below 1 Ω
T8-11 (CODE) - T7-4 (CODE)	
T8-12 (TXCT) - T7-5 (TXCT)	
T8-13 (AGND) - T7-7 (GND)	
T8-8 (VC5) or T7-1 (VC5) - Body ground	10 k Ω or higher
T8-11 (CODE) or T7-4 (CODE) - Body ground	
T8-12 (TXCT) or T7-5 (TXCT) - Body ground	
T8-13 (ANGD) or T7-7 (GND) - Ground ground	

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE TRANSPONDER KEY AMPLIFIER

DTC	B2793	Transponder Chip Malfunction
-----	-------	------------------------------

DESCRIPTION

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

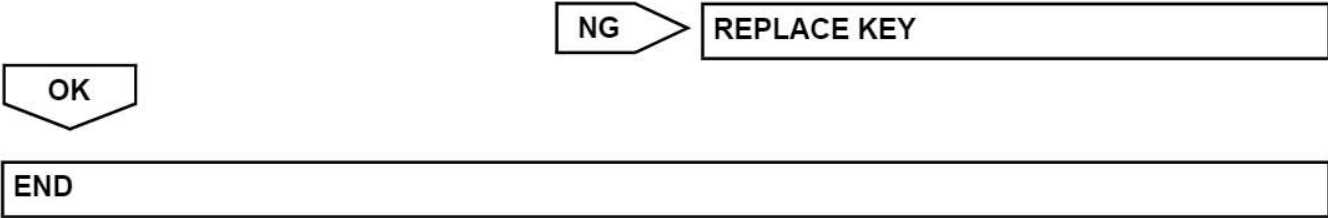
DTC No.	DTC Detection Condition	Trouble Area
B2793	Transponder chip malfunction	Key

INSPECTION PROCEDURE

EI

1	REREGISTER KEY
---	----------------

- (a) Delete the DTC (see page [EI-19](#)).
- (b) Reregister the key and insert this key into the ignition key cylinder. Check that the engine starts with the key.
- OK:
- Engine starts.



EI-32

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

DTC	B2794	Unmatched Encryption Code
-----	-------	---------------------------

DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
B2784	Key with incomplete key code is inserted	key

EI

INSPECTION PROCEDURE

1	REREGISTER KEY
---	----------------

- (a) Delete the DTC (see page [EI-19](#)).
- (b) Reregister the key and insert this key into the ignition key cylinder. Check that the engine starts with the key.

OK:
Engine starts.



DTC	B2795	Unmatched Key Code
-----	-------	--------------------

DESCRIPTION

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

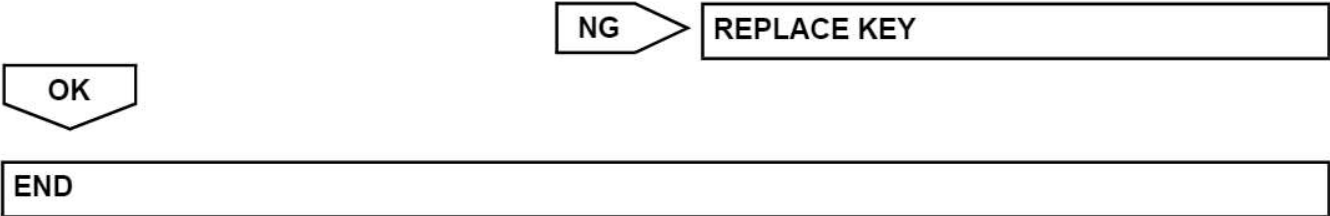
DTC No.	DTC Detection Condition	Trouble Area
B2795	Key with unregistered key code is inserted	Key

INSPECTION PROCEDURE

EI

1	REREGISTER KEY
---	----------------

- (a) Delete the DTC (see page [EI-19](#)).
- (b) Reregister the key and insert this key into the ignition key cylinder. Check that the engine starts with the key.
- OK:
- Engine starts.



EI-34

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

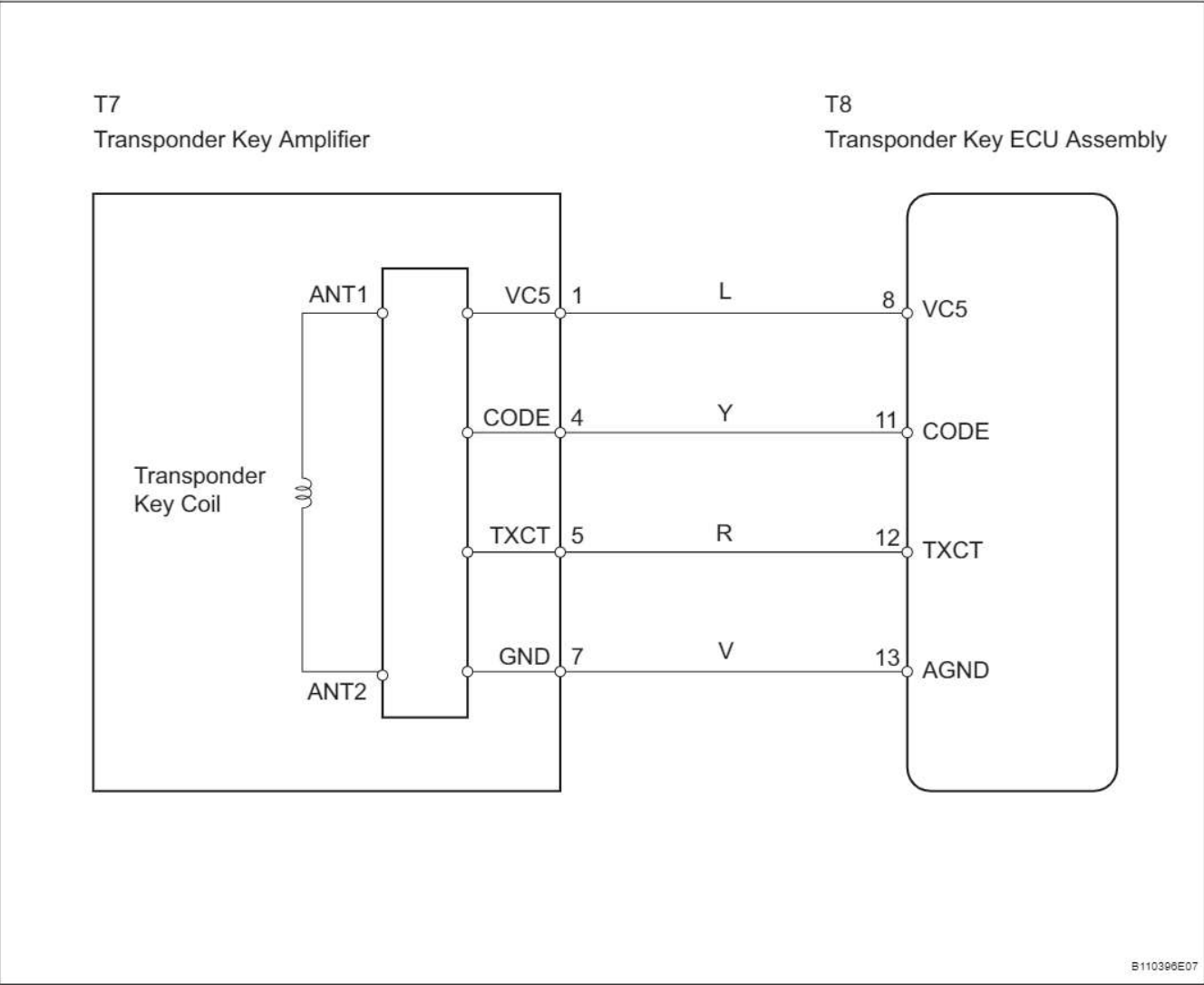
DTC	B2796	No Communication in Immobiliser System
DTC	B2798	Communication Malfunction No. 2

DESCRIPTION

This DTC is output when a key that does not have a transponder chip is inserted into the ignition key cylinder or if communication between the key, transponder key amplifier and transponder key ECU is not possible.

DTC No.	DTC Detection Condition	Trouble Area
B2796	No communication	• Key • Wire harness • Transponder key amplifier • Transponder key ECU assembly
B2798	Communication error	Key

WIRING DIAGRAM



ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

EI-35

INSPECTION PROCEDURE

1 READ VALUE OF INTELLIGENT TESTER (IMMOBILISER SYSTEM)

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

Transponder key ECU assembly:

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
IMMOBILISER	Immobiliser system status / SET or UNSET	SET: Without key UNSET: Ignition switch ON	-

OK:

UNSET (ignition switch ON) appears on the screen.

OK

Go to step 3

NG

2 CHECK WHETHER ENGINE STARTS WITH OTHER KEYS

- (a) Check if the engine starts with the vehicle's other keys.

OK:

Engine starts.

OK

REPLACE TRANSPONDER KEY ECU ASSEMBLY

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 assembly:

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: Antenna coil is malfunctioning	-

OK:

NORMAL (transponder key coil) appears on the screen.

OK

REPLACE TRANSPONDER KEY ECU ASSEMBLY

NG

EI-36

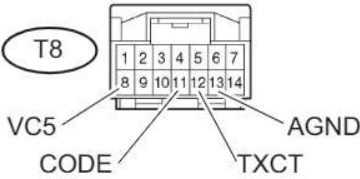
ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

4

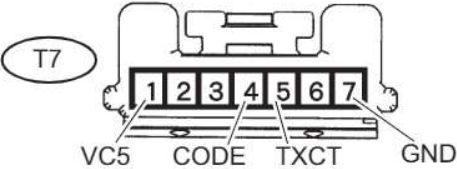
CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSEMBLY - TRANSPONDER KEY AMPLIFIER)

Wire Harness Side

Transponder Key ECU Assembly



Transponder Key Amplifier



OK

(a) Disconnect the T8 ECU connector.

(b) Disconnect the T7 amplifier connector.

(c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T8-8 (VC5) - T7-1 (VC5)	Below 1 Ω
T8-11 (CODE) - T7-4 (CODE)	
T8-12 (TXCT) - T7-5 (TXCT)	
T8-13 (AGND) - T7-7 (GND)	
T8-8 (VC5) or T7-1 (VC5) - Body ground	10 kΩ or higher
T8-11 (CODE) or T7-4 (CODE) - Body ground	
T8-12 (TXCT) or T7-5 (TXCT) - Body ground	
T8-13 (ANGD) or T7-7 (GND) - Ground ground	

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5

CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

(a) After replacing the transponder key amplifier with a normally functioning transponder key amplifier, check that the engine starts.

OK:
Engine starts.

NG

REPLACE TRANSPONDER KEY ECU ASSEMBLY

OK

END (TRANSPONDER KEY AMPLIFIER DEFECTIVE)

https://cardiagn.com/engine-immobilizer-07-scion-tc/

36/47

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

DTC	B2797	Communication Malfunction No. 1
-----	-------	---------------------------------

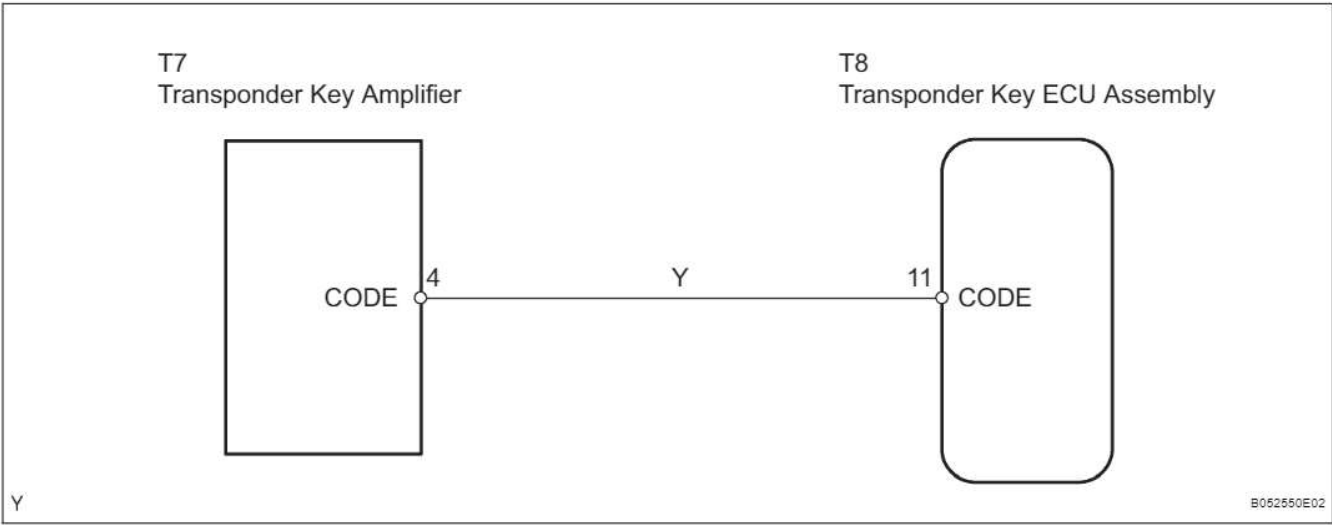
DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
B2797	Keys are positioned too close to each other, or noise occurred in communication line	• Key • Wire harness • Transponder key amplifier • Transponder key ECU assembly

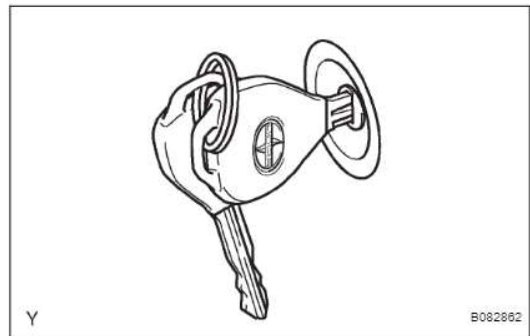
EI

WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK KEY
---	-----------



- (a) Check if the ignition key being used is near other ignition keys, as shown in the illustration. Also, check if the key ring is in contact with the key grip.

Result:

Result	Proceed to
Key is near other keys and / or key ring is in contact with key grip	A
Key is not near other keys and / or key ring is not in contact with key grip	B

B

Go to step 3

EI-38

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

A

2

CHECK FOR DTC

- (a) Separate the keys from each other or remove the key ring.
- (b) Delete the DTC (see page EI-19).
- (c) Insert a key into the ignition key cylinder. Then remove it. Repeat for all the other keys.
- (d) Check that no code is output.

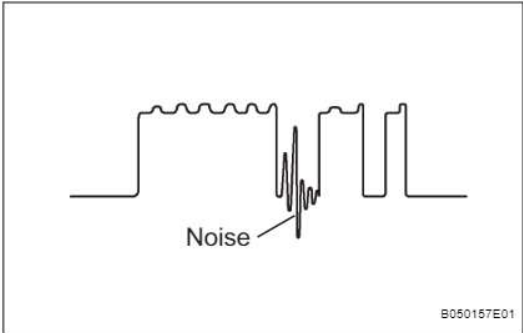
OK

END

NG

3

CHECK TRANSPONDER KEY AMPLIFIER



- (a) Using an oscilloscope or the intelligent tester, check for noise in the waveform between the terminals of the T7 amplifier connector and T8 ECU connector.
- OK:**
No noise is present (see illustration).

Tester Connection	Tool Setting	Condition	Specified Condition
T8-11 (CODE) - T7-4 (CODE)	2 V/DIV., 20 msec./DIV.	Ignition switch ON	No noise is present

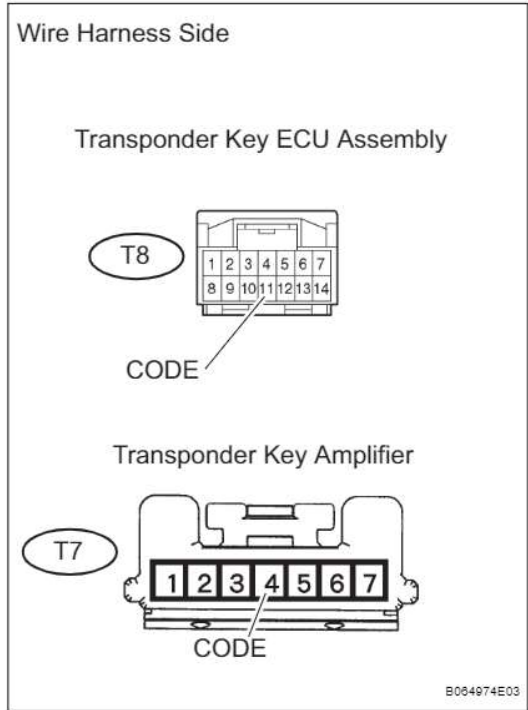
NG

FIND CAUSE OF NOISE AND REMOVE IT

OK

4

CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSEMBLY - TRANSPONDER KEY AMPLIFIER)



- (a) Disconnect the T8 ECU connector.
- (b) Disconnect the T7 amplifier connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T8-11 (CODE) - T7-4 (CODE)	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5

CHECK OPERATION OF TRANSPONDER KEY AMPLIFIER

- (a) After replacing the transponder key amplifier with a normally functioning transponder key amplifier, check that the engine starts.

OK:

Engine starts.

NG

REPLACE TRANSPONDER KEY ECU ASSEMBLY

OK

END (TRANSPONDER KEY AMPLIFIER IS DEFECTIVE)

EI-40

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

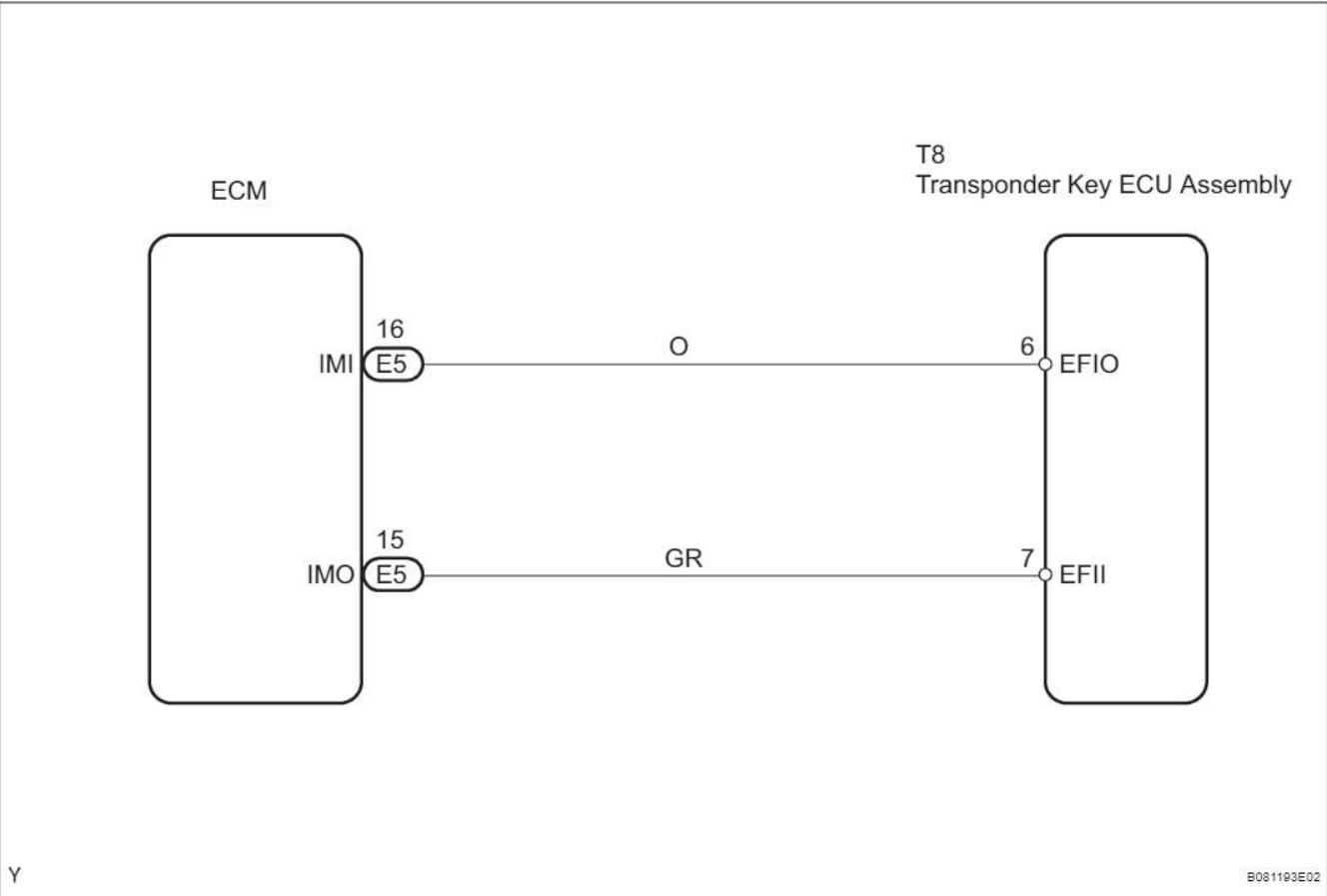
DTC	B2799	Engine Immobiliser System Malfunction
-----	-------	---------------------------------------

DESCRIPTION

This DTC is output when one of the following occurs: 1) the ECM detects errors in its own communications with the transponder key ECU: 2) the ECM detects errors in the communication lines: or 3) the ECU communication ID between the transponder key ECU and ECM is different and an engine start is attempted.

DTC No.	DTC Detection Condition	Trouble Area
B2799	One of following conditions is met: - Error in communication between ECM and transponder key ECU assembly - Error in communication lines - Communication ID is different during communication with transponder key ECU assembly	- Wire harness - ECM

WIRING DIAGRAM



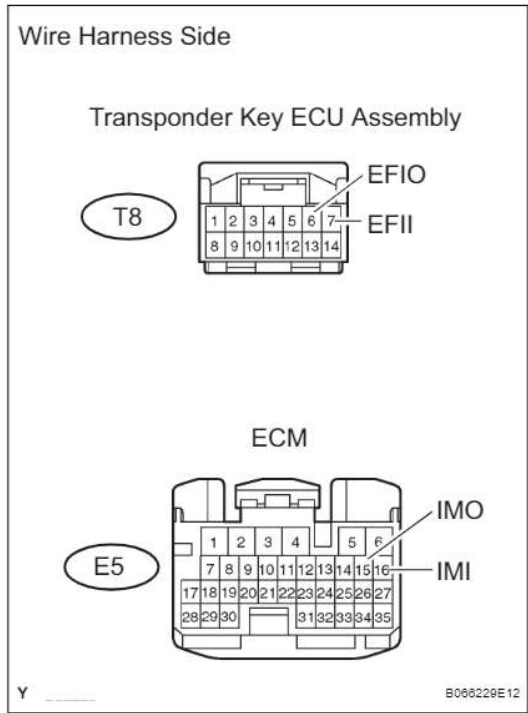
INSPECTION PROCEDURE

HINT:

Before troubleshooting for this DTC, make sure no transponder key ECU DTCs are present. If present, troubleshoot the transponder key ECU DTCs first.

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM

1 CHECK WIRE HARNESS (TRANSPONDER KEY ECU ASSEMBLY - ECM)



- (a) Disconnect the T8 ECU connector.
- (b) Disconnect the E5 ECM connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
T8-6 (EFIO) - E5-16 (IMI)	Below 1 Ω
T8-7 (EFII) - E5-15 (IMO)	
T8-6 (EFIO) or E5-16 (IMI) - Body ground	10 kΩ or higher
T8-7 (EFII) or E5-15 (IMO) - Body ground	

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

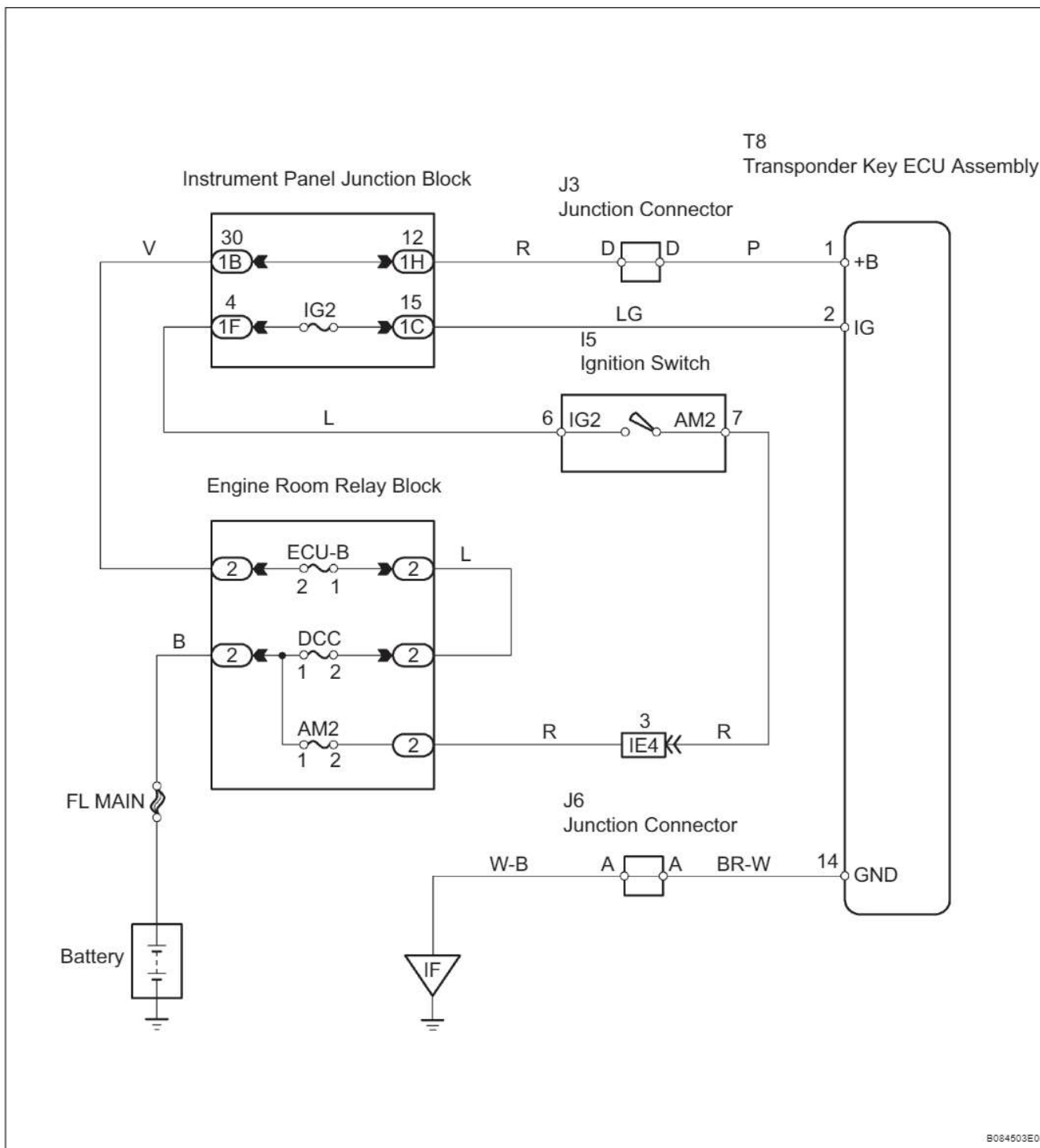
OK

REPLACE ECM

EI-42

ENGINE IMMOBILISER – ENGINE IMMOBILISER SYSTEM**Power Source Circuit****DESCRIPTION**

This circuit provides power to operate the transponder key ECU.

WIRING DIAGRAM

INSPECTION PROCEDURE

1

INSPECT FUSE (IG2, ECU-B, AM2, DCC)

- (a) Remove the IG2 fuse from the instrument panel junction block.
- (b) Remove the ECU-B, DCC and AM2 fuses from the engine room relay block.
- (c) Measure the resistance of the fuses.

Standard resistance:
Below 1 Ω

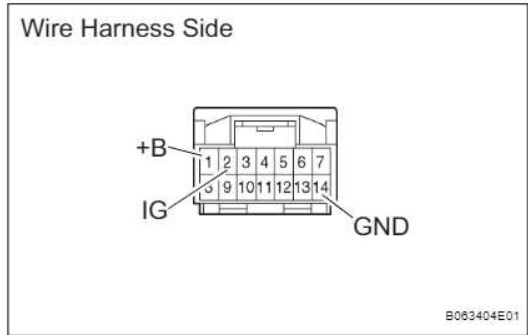
OK

NG

REPLACE FUSE

2

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



- (a) Disconnect the T8 ECU connector.
- (b) Measure the resistance and voltage of the wire harness and connector.

Standard resistance

Tester Connection	Specified Condition
T8-14 (GND) - Body ground	Below 1 Ω

Standard voltage

Tester Connection	Condition	Specified Condition
T8-2 (IG) - Body ground	Ignition switch OFF	Below 1 V
	Ignition switch ON	10 to 14 V
T8-1 (+B) - Body ground	Always	

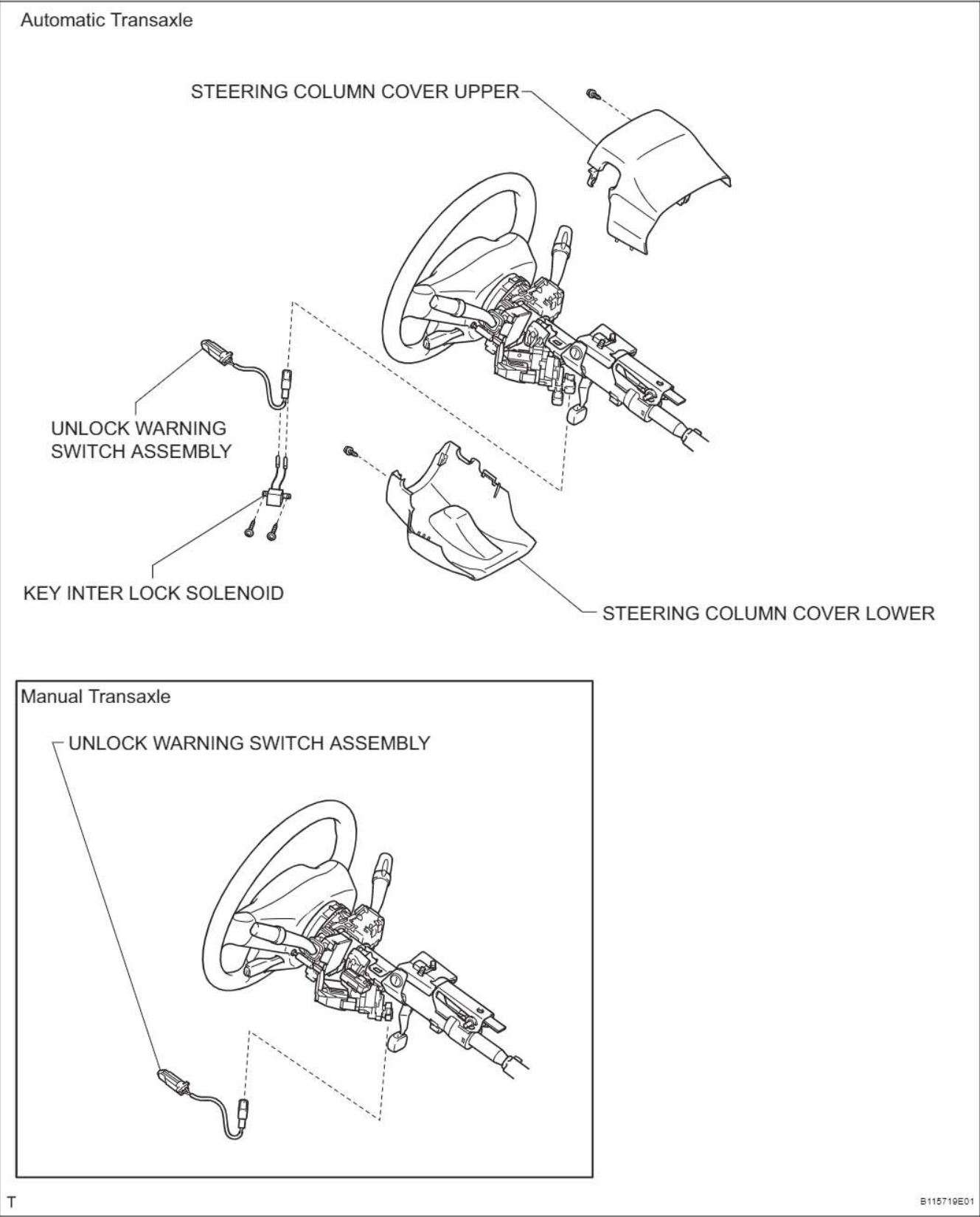
OK

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

REPLACE TRANSPONDER KEY ECU ASSEMBLY

UNLOCK WARNING SWITCH
COMPONENTS



REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

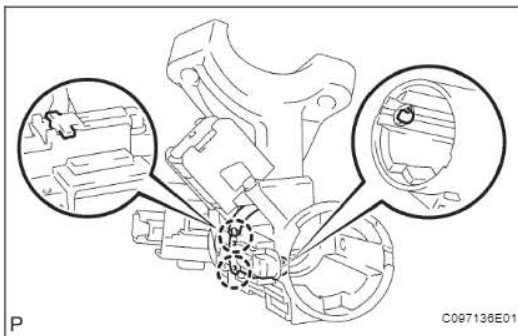
2. REMOVE STEERING COLUMN COVER

- (a) Remove the 2 screws, steering column cover lower and steering column cover upper.

HINT:

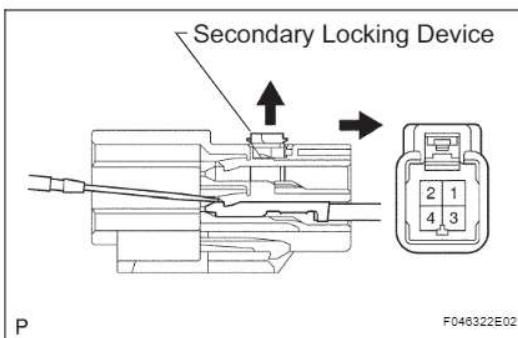
- Tilt the steering column assembly to the lowermost position when removing the steering column cover upper.
- Tilt it to the uppermost position when removing the steering column cover lower.

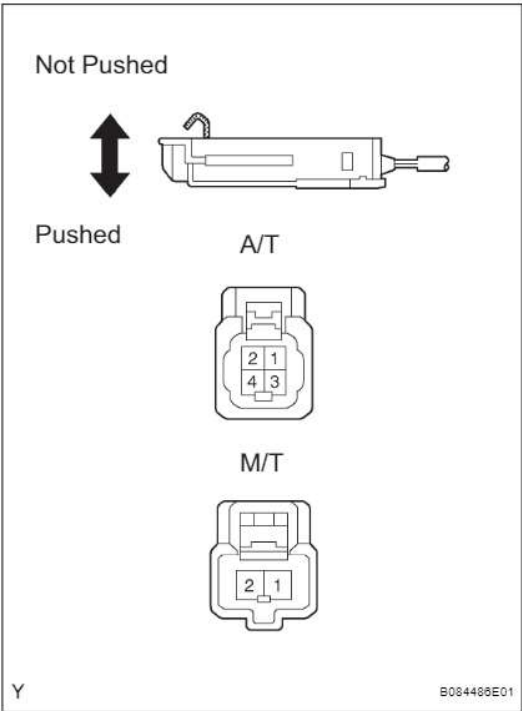
EI



3. REMOVE UNLOCK WARNING SWITCH ASSEMBLY

- (a) Disconnect the unlock warning switch connector from the ignition switch.
- (b) Remove the unlock warning switch assembly by pushing up on the center part and disengaging the 2 claws.
- (c) Manual transaxle:
Remove the clamp from the steering column upper bracket assembly.
- (d) Automatic transaxle:
Disengage the secondary locking device.
- (e) Automatic transaxle:
Using a screwdriver, disengage the locking lug of terminals 3 and 4, and pull the terminals out from the unlock warning switch assembly connector rear side.





INSPECTION

1. INSPECT UNLOCK WARNING SWITCH ASSEMBLY

(a) Measure the resistance of the switch.

Standard resistance

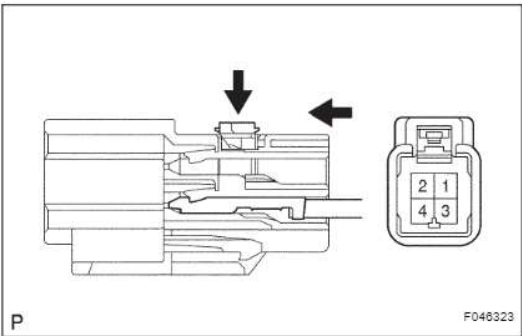
Tester Connection	Switch Condition	Specified Condition
1 - 2	Pushed	Below 1 Ω
	Not pushed	10 kΩ or higher

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

INSTALLATION

1. INSTALL UNLOCK WARNING SWITCH ASSEMBLY

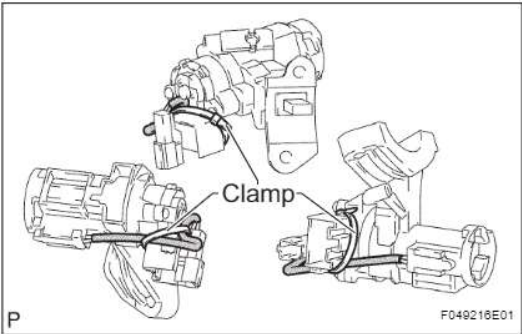
- (a) Install the unlock warning switch assembly.
- (b) Automatic transaxle:
Connect terminals 3 and 4 of the unlock warning switch connector.
- (c) Connect the unlock warning switch assembly connector to the ignition switch.



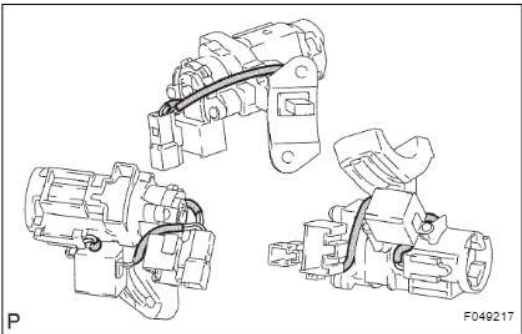
- (d) Manual transaxle:
Secure the unlock warning switch wire harness to the steering column upper bracket with a new clamp as shown in the illustration.

NOTICE:

Do not overtighten the clamp when securing the wire harness as the wire harness could be cut.



- (e) Automatic transaxle:
Secure the unlock warning switch wire harness to the steering column upper bracket as shown in the illustration.



2. INSTALL STEERING COLUMN COVER

- (a) Install the steering column cover lower and steering column cover upper with the 2 screws.

HINT:

- Tilt the steering column assembly to the lowermost position when installing the steering column cover upper.
- Tilt it to the uppermost position when installing the steering column cover lower.

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**4. PERFORM INITIALIZATION**

- (a) Perform initialization (see page [IN-23](#)).

NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

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