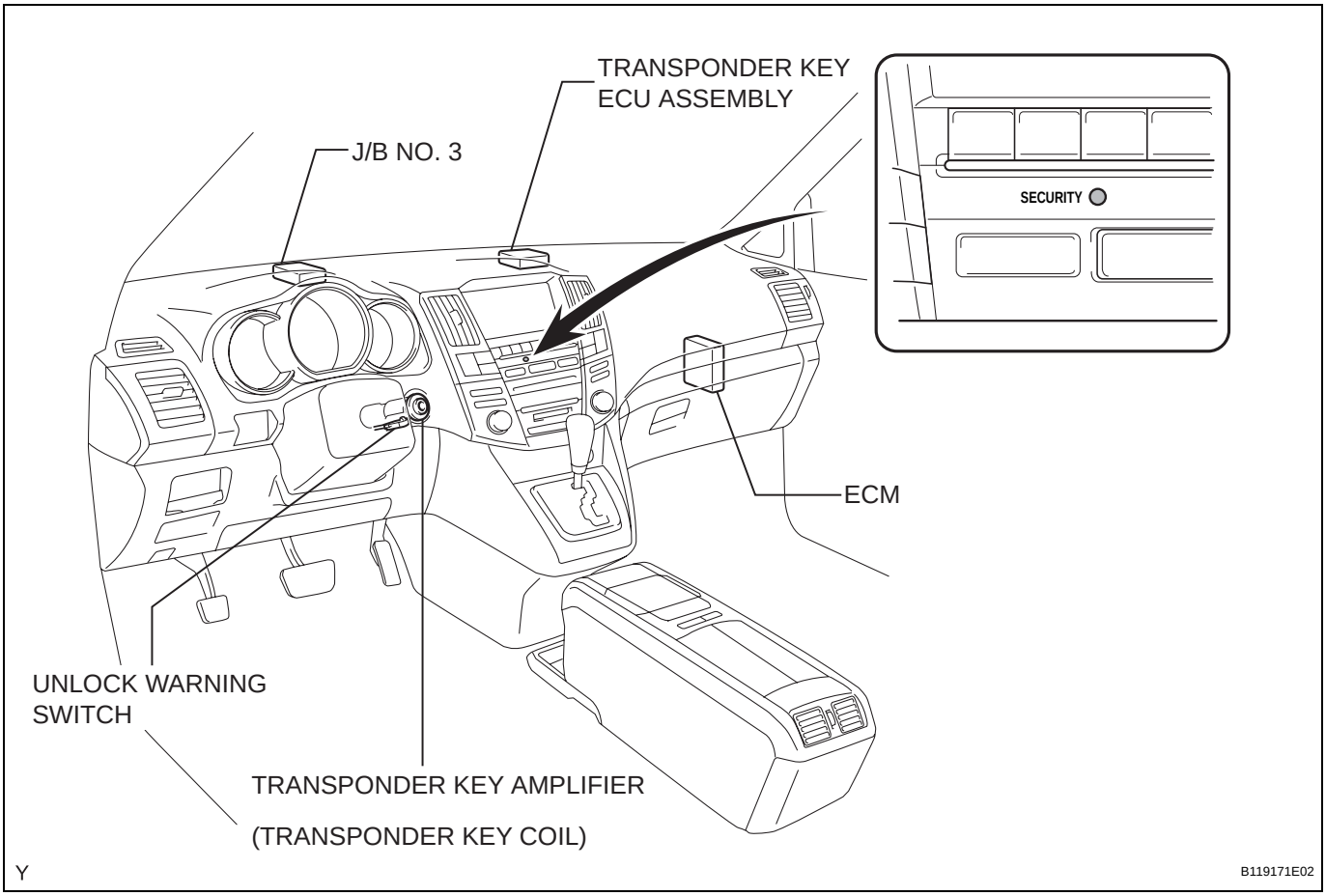
ENGINE IMMOBILISER SYSTEM

PRECAUTION

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

System Name	See procedure
Lighting System (Adaptive Front-Lighting System)	LI-17
Power Window Control System	WS-12
Power Back Door System	ED-33
Sliding Roof System	RF-4

PARTS LOCATION



SYSTEM DESCRIPTION

The engine immobiliser system has been designed to prevent the vehicle from being stolen. This system uses a transponder key ECU that stores the key code of the authorized ignition key. If an attempt is made to start the engine using a non-authorized key, the transponder key ECU sends a signal to the ECM to prohibit fuel delivery and ignition, effectively disabling the engine.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use this procedure to troubleshoot the engine immobiliser system.
- The intelligent tester should be used in steps 4, 5 and 7.

1	VEHICLE BROUGHT TO WORKSHOP

NEXT

2	CUSTOMER PROBLEM ANALYSIS CHECK AND SYMPTOM CHECK

NEXT

EI

3	CRANK ENGINE FOR MORE THAN 10 SECONDS

NEXT

4	CHECK FOR DTC

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Try to prompt the DTC (SFI system and engine immobiliser system) by simulating the original activity that the DTC suggested.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the DTC (SFI system) reoccurs, proceed to B.
  (3) If the DTC (engine immobiliser system) reoccurs, proceed to C.

B	Go to SFI SYSTEM
C	Go to step 8

A

5	READ VALUE OF INTELLIGENT TESTER ((IMMOBILISER ECU (TRANSPONDER KEY ECU ASSEMBLY) (SWITCH CONDITION))

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch ON and push the intelligent tester main switch ON.
(c) Select the item KEY SW in the DATA LIST and read its value displayed on the intelligent tester.

Transponder key ECU

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	-

NG → Go to DTC B2780

OK

6 PROBLEM SYMPTOMS TABLE

(a) If the fault is not listed on the problem symptoms table, proceed to A.
(b) If the fault is listed on the problem symptoms table, proceed to B.

B → Go to step 8

A

7 OVERALL ANALYSIS AND TROUBLESHOOTING

(a) Inspection with the intelligent tester (ECU DATA MONITOR).
(b) Inspection with the intelligent tester (ACTIVE TEST).
(c) Terminals of ECU (See page EI-10).

NEXT

8 ADJUST, REPAIR OR REPLACE

NEXT

9 CONFIRMATION TEST

NEXT

END

REGISTRATION

1. DESCRIPTION OF CODE REGISTRATION

HINT:

The key has 2 codes: The key code (immobiliser code) and the wireless code. Both of these codes need to be registered. Refer to page for the wireless code registration procedures.

(a) When adding master keys or sub keys (Additional registration):

(1) Register key code (immobiliser code) in the transponder key ECU.

Target ECU	See Procedure
Transponder key ECU	Procedure "A"

(b) When replacing the transponder key ECU (New registration):

(1) Register the key code (immobiliser code) in the transponder key ECU.

Target ECU	See Procedure
Transponder key ECU	Procedure "B"

(2) Register the ECU COMMUNICATION ID between the hybrid vehicle control ECU and the transponder key ECU.

Target ECU	See Procedure
Transponder key ECU	Procedure "C"

(c) When replacing the hybrid vehicle control ECU:

(1) Register the ECU COMMUNICATION ID between the hybrid vehicle control ECU and the transponder key ECU.

Target ECU	See Procedure
Transponder key ECU	Procedure "C"

2. KEY REGISTRATION IN AUTOMATIC REGISTRATION (PROCEDURE "B")

(a) The new registration of the key codes (immobiliser codes) is made automatically.

HINT:

- When installing a new transponder key ECU, the key codes (immobiliser codes) must be registered.
- A new transponder key ECU starts in the automatic key code registration mode. In this mode, a maximum of 4 key codes for 3 master keys and 1 sub key can be registered. Since the transponder key ECU can distinguish types of keys, any registration order is acceptable.

Automatic Key Code Registration (New Registration)

Procedure	Security Indicator Condition
1. Start (Procedure "D")	Blinking occurs until the first key is inserted.
2. Insert the key into the ignition key cylinder.	ON

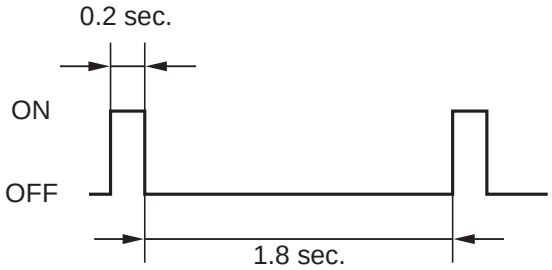
Procedure	Security Indicator Condition
3. Registration begins. HINT: The registration will be completed approx. 1 sec. after the key is inserted.	OFF HINT: Approx. 1 sec.
4. Remove the key.	ON HINT: When the maximum number of the key codes is registered, the security indicator remains off until the last key registered is removed. After it is removed, the security indicator starts blinking.
5. Register another key ? Yes: Go to procedure "D" No: Go to procedure "E"	
6. End (Procedure "E")	

HINT:

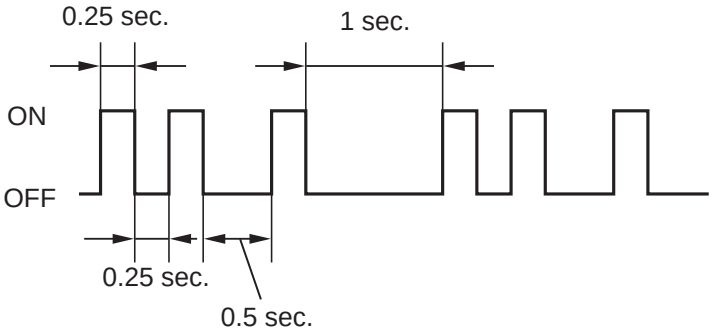
- When no key is inserted in the key cylinder while the system is in automatic key code registration mode, the security indicator remains on.
- When the immobiliser system is operating normally and the key is pulled out, the security indicator blinks continuously.
- If the key code registration has failed in the automatic key code registration mode, code 2-1 will be output from the security indicator. Trying to register 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. The output details are shown below.

Security Indicator:

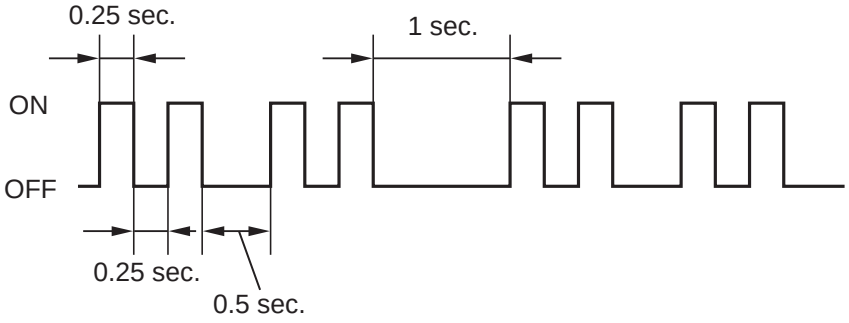
Normal (Immbiliser system is operating normally)



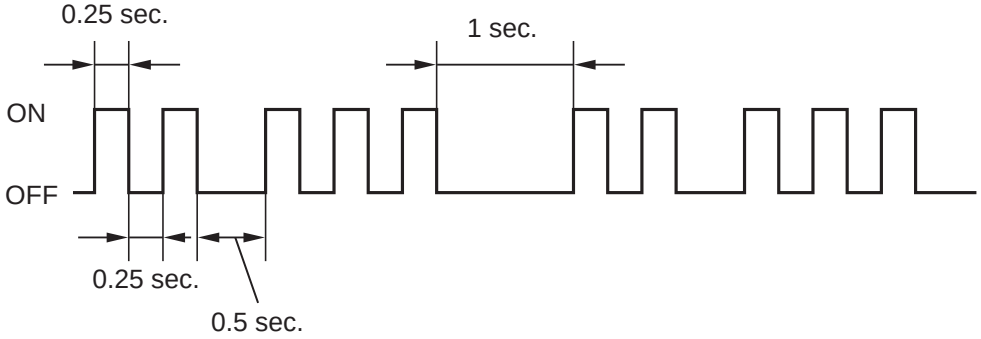
Code 2 - 1



Code 2 - 2



Code 2 - 3



N

B111593E01

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

3. REGISTRATION OF ADDITIONAL KEYS (PROCEDURE "A")

(a) Register an additional key by using the intelligent tester.
HINT:
- A maximum of 5 key codes and 3 sub key codes can be registered.
- Registration mode will end if any step is not completed within the specified time.
- When the ignition cylinder or the 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 it as master key. If necessary, use this master key to register other keys.

NOTICE:
When only the ignition key cylinder has been replaced, you can lock or unlock doors by wireless operation using the new key with built in transmitter but not by inserting it in the door key cylinder. Therefore, keep the original key for door lock or unlock operation in order to avoid malfunctions caused by a dead transmitter battery in the new key.

Additional Registration

Procedure	Time (Completion of operation)	Security Indicator Condition
1. Start	-	Indicator blinks until the first key is inserted.
2. Insert the already registered master-key in the ignition key cylinder and turn the ignition switch on.		
3. Intelligent tester operation (1) Select IMMOBILISER (2) Select ID UTILITY (3) Select IMMOB CODE REG HINT: After completing the above operation, proceed to the next step in accordance with the prompts on the tester screen.	Within 120 sec.	OFF
4. Remove the master key.	Within 20 sec. of the instruction on the tester.	ON
5. Insert the key to be registered in the ignition key cylinder.	Within 10 sec.	
6. After 60 sec. the key is registered. HINT: The security indicator goes off.	-	Blinking
7. Next		OFF
8. End		

NOTICE:
If the key code registration has failed in automatic key code registration mode, code 2-1 will be output from the security indicator. Trying to register 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. The output details are shown in procedure "B".
HINT:
- A brief outline of procedures for key code registration is shown above. For detailed information, please refer to the screen of the intelligent tester.
- When the immobiliser system is operating normally and the key is pulled out, the security indicator will blink.

4. ERASURE OF KEY CODE

(a) Erase key codes by using the intelligent tester.
HINT:
- All key codes will be erased except for the master-key which is used for erasing the key codes. In order to use a key for which the code has been erased, it is necessary to register the key code again.
- The registration operation will be cancelled if any step is not completed within the specified time.

Erasing Key Code

Procedure	Time (Operation Completion Time)	Security Indicator Condition
1. Start	-	Indicator blinks until the first key is inserted.
2. Insert the already registered master-key in the ignition key cylinder and turn the ignition switch on.		
3. Intelligent tester operation (1) Select IMMOBILISER (2) Select ID UTILITY (3) Select IMMOB CODE ERA HINT: After completing the above operation, proceed to the next step in accordance with the prompts on the tester screen.	Within 120 sec.	OFF
4. Remove the master key.	Within 10 sec. of the instruction on the tester..	ON for 1 sec. Then OFF.
5. Next	-	Blinking
6. End		

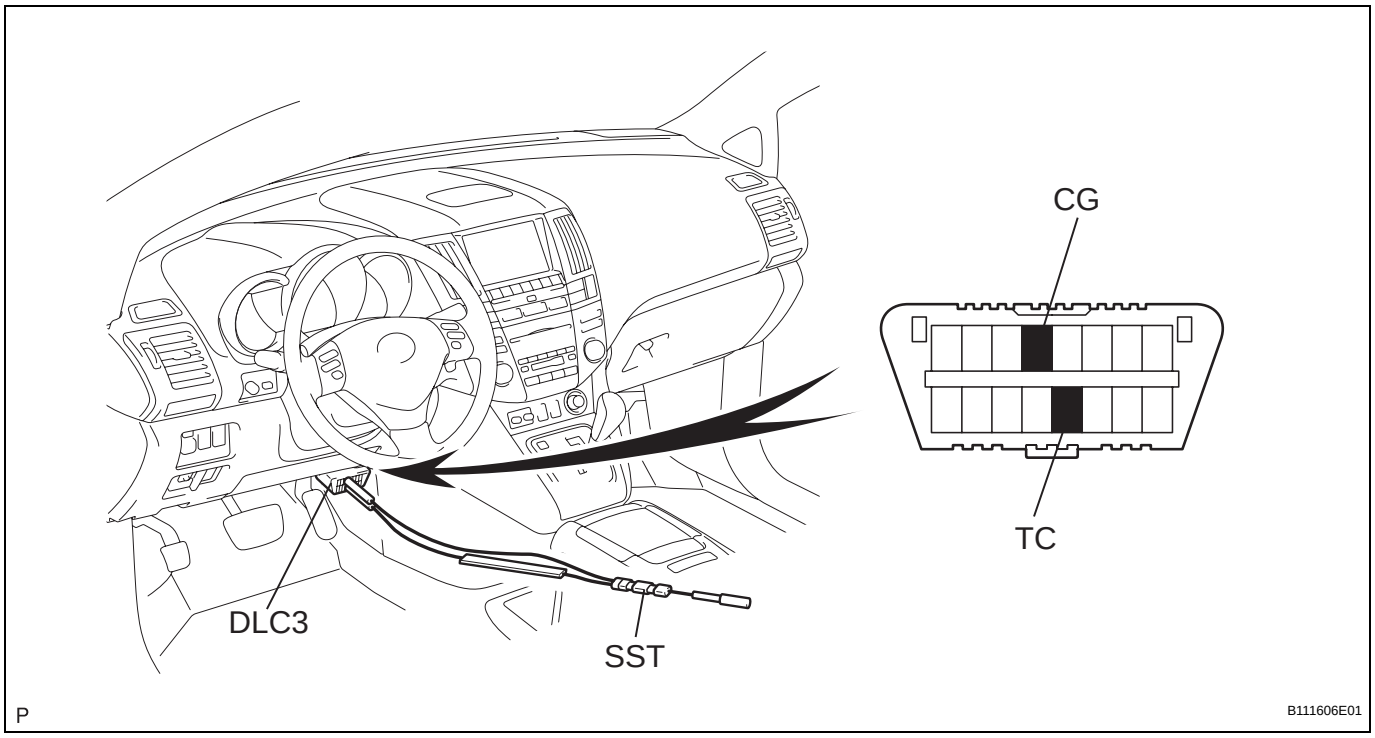
HINT:
- A brief outline of procedures for key code registration is shown above. For detailed information, please refer to the screen of the intelligent tester.
- When the immobiliser system is operating normally and the key is pulled out, the security indicator will blink.

5. ECU COMMUNICATION ID REGISTRATION (PROCEDURE "C")

NOTICE:

- **The ECU communication ID should be registered when the transponder key ECU and/or the hybrid vehicle control ECU is replaced in order to match it to the HYBRID VEHICLE CONTROL ECU COMMUNICATION ID.**
- **The hybrid control system cannot be started unless the HYBRID VEHICLE CONTROL ECU COMMUNICATION ID matches.**

(a) Register the ECU COMMUNICATION ID, after the transponder key ECU and/or the hybrid vehicle control ECU is replaced turn the ignition switch on.



(1) Using SST, connect terminals TC and CG of the DLC3.
SST 09843-18040

(2) Turn the ignition on and leave it as is for 30 minutes.

(3) Check that the hybrid control system starts.

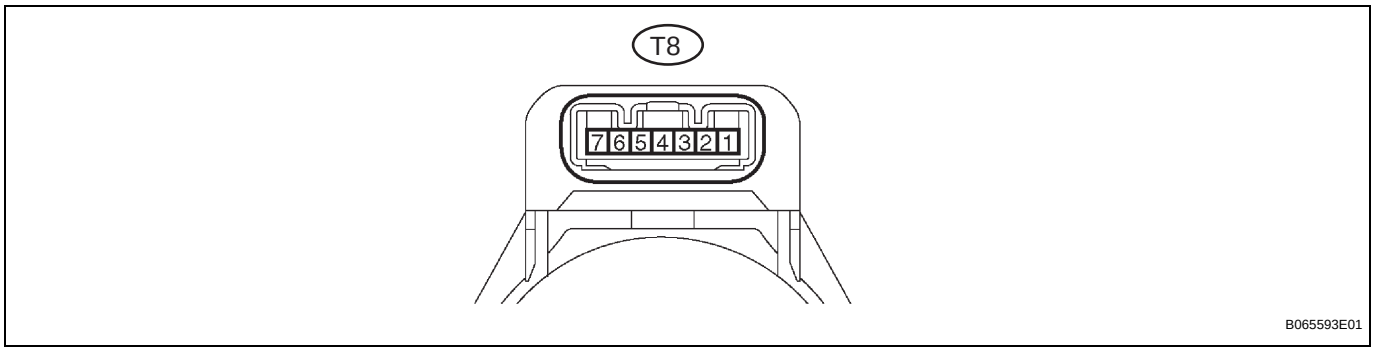
PROBLEM SYMPTOMS TABLE

ENGINE IMMOBILISER SYSTEM

Symptom	Suspected area	See page
Engine does not start	1. Key (Transponder chip malfunction)	EI-24
	2. Key (Unmatched encryption code)	EI-25
	3. Key (Unmatched key code)	EI-26
	4. Key (No communication in immobiliser system)	EI-27
	5. Key (Communication malfunction)	EI-31
	6. Transponder key amplifier (Antenna coil open / short)	EI-21
	7. Transponder key amplifier (No communication in immobiliser system)	EI-27
	8. Transponder key amplifier (Communication malfunction)	EI-31
	9. Transponder key ECU assembly (Key unlock waring switch malfunction)	EI-18
	10. Transponder key ECU assembly (Antenna coil open / short)	EI-21
	11. Transponder key ECU assembly (No communication in immobiliser system)	EI-27
	12. Transponder key ECU assembly (Communication malfunction)	EI-31
	13. Transponder key ECU assembly (Engine immobiliser system malfunction)	EI-34

TERMINALS OF ECU

1. CHECK TRANSPONDER KEY AMPLIFIER



(a) Disconnect the T8 amplifier connector and measure the resistance between the terminal of the wire harness side connector and body ground.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (T8-7) - Body ground	W - Body ground	Ground	Always	Below 1 Ω

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

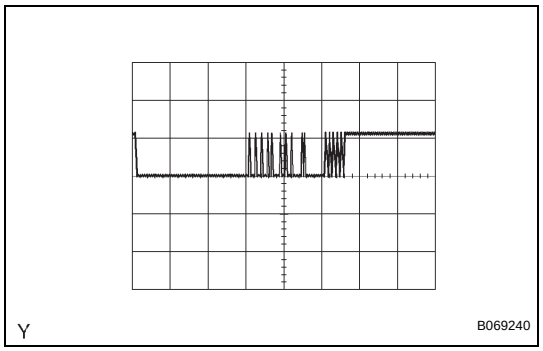
(b) Reconnect the T8 amplifier connector and measure the resistance and voltage of each terminal of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
VC5 (T8-1) - GND (T8-7)	P - W	Power source	No key is in ignition key cylinder	Below 1 V
			Key is in ignition key cylinder	4.6 to 5.4 V
CODE (T8-4) - GND (T8-7)	LG - W	Demodulated signal of key code date	No key is in ignition key cylinder	Below 1 V
			Key is in ignition key cylinder	Waveform 1
TXCT (T8-5) - GND (T8-7)	BR - W	Key code output signal	No key is in ignition key cylinder	Below 1 V
			Key is in ignition key cylinder	Waveform 2
GND (T8-7) - Body ground	W - Body ground	Ground	Always	Below 1 Ω

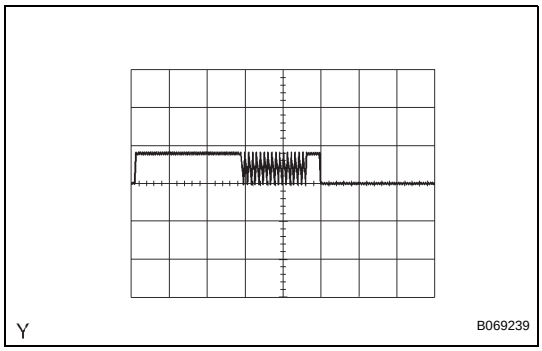
If the result is not as specified, the amplifier may have a malfunction.

(c) Inspect using an oscilloscope.

(1) Waveform 1 (Reference):



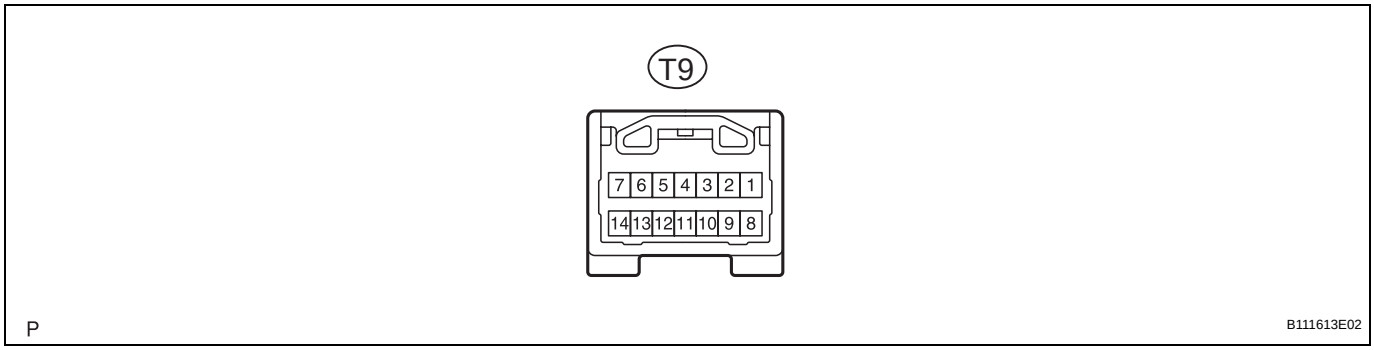
Terminal	CODE - GND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Key is in ignition key cylinder



(2) Waveform 2 (Reference):

Terminal	TXCT - GND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Key is in ignition key cylinder

2. CHECK TRANSPONDER KEY ECU ASSEMBLY



(a) Disconnect the T9 ECU connector and measure the resistance and voltage between each terminal of the wire harness side connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
CPUB (T9-1) - GND (T9-14)	V - W-B	Battery	Always	10 to 14 V
IG2 (T9-2) - GND (T9-14)	G - W-B	Ignition switch	Ignition switch off	Below 1 V
			Ignition switch on	10 to 14 V
KSW (T9-3) - GND (T9-14)	B - W-B	Unlock warning switch	No key is in ignition key cylinder	10 kΩ or higher
			Key is in ignition key cylinder	Below 1 Ω

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

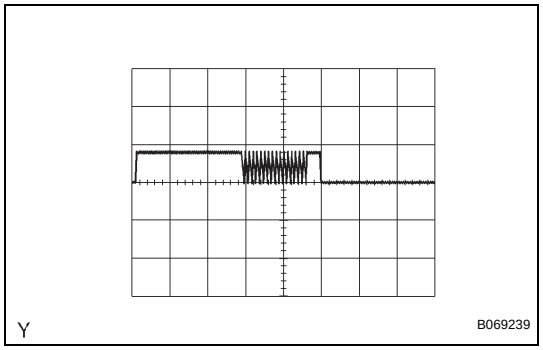
(b) Reconnect the T9 ECU connector and measure the voltage of each terminal of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
AGND (T9-13) - Body ground	W - Body ground	Ground	Always	Below 1 Ω
KSW (T9-3) - GND (T9-14)	B - W-B	Unlock warning switch	No key is in ignition key cylinder	10 to 14 V
			Key is in ignition key cylinder	Below 1 V
VC5 (T9-9) - AGND (T9-13)	P - W	Power source	Ignition switch off	Below 1 V
			Ignition switch on	4.6 to 5.4 V
TXCT (T9-12) - AGND (T9-13)	BR - W	Transponder key amplifier communication signal	No key is in ignition key cylinder	Below 1 V
			Key is in ignition key cylinder	Waveform 1
CODE (T9-10) - AGND (T9-13)	LG - W	Transponder key amplifier ground	No key is in ignition key cylinder	Below 1 V
			Key is in ignition key cylinder	Waveform 2

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
EFIO (T9-6) - GND (T9-14)	GR - W-B	Hybrid vehicle control ECU output signal	Ignition switch off	Below 1 V
			Ignition switch on	Waveform 3
EFII (T9-7) - GND (T9-14)	L - W-B	Hybrid vehicle control ECU input signal	Ignition switch off	Below 1 V
			Ignition switch on	Waveform 4

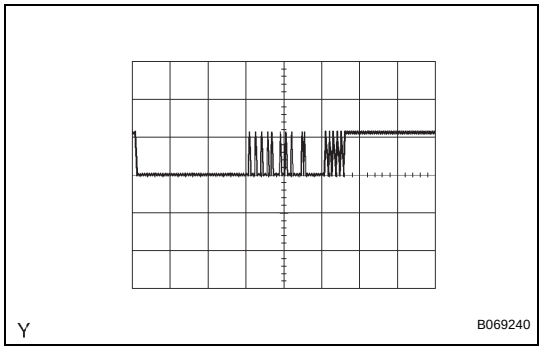
If the result is not as specified, the ECU may have a malfunction.

(c) Inspect using an oscilloscope.
(1) Wave form 1 (Reference):



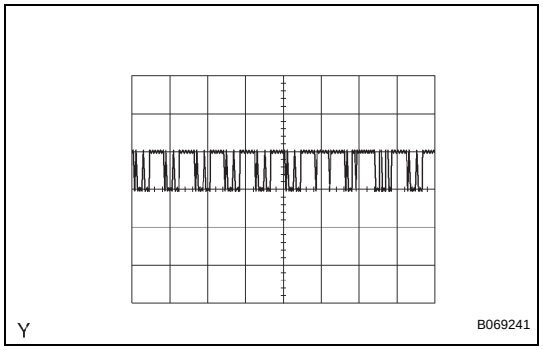
Terminal	TXCT - AGND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Key is in ignition key cylinder

(2) Wave form 2 (Reference):



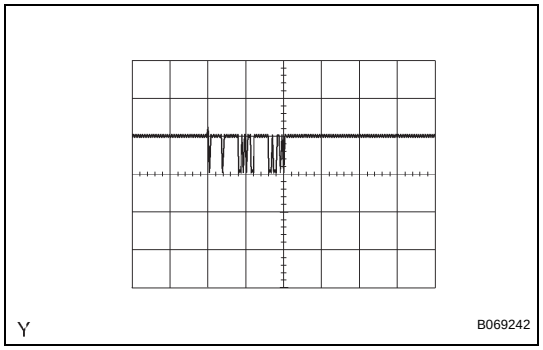
Terminal	CODE - AGND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Key is in ignition key cylinder

(3) Wave form 3 (Reference):



Terminal	EFIO - AGND
Tool Setting	10 V/DIV., 500ms/DIV.
Condition	Ignition switch on

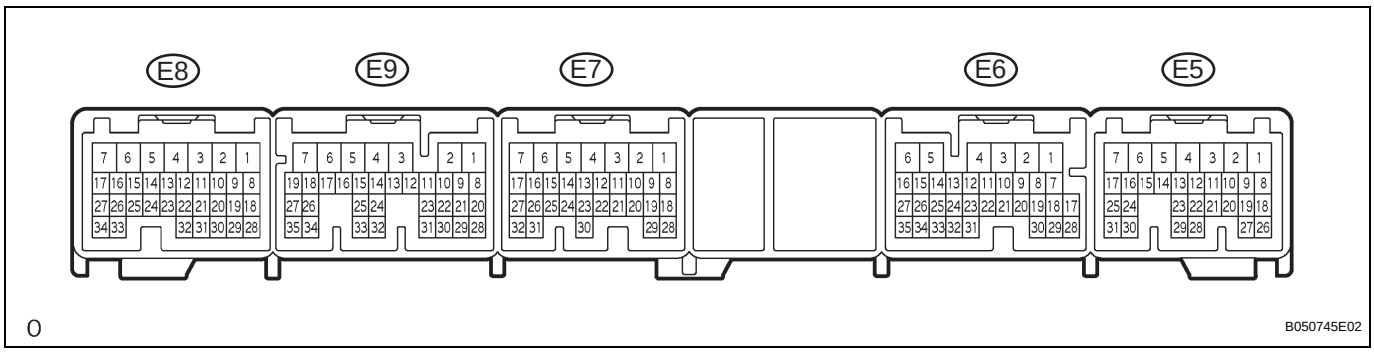
(4) Wave form 4 (Reference):



Terminal	EFII - AGND
Tool Setting	10 V/DIV., 500 ms/DIV.
Condition	Ignition switch on

EI

3. CHECK ECM



(a) Disconnect the E6 ECM connector and measure the resistance between the terminal of the wire harness side connector and body ground.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
E1 (E6-1) - Body ground	BR - Body ground	Ground	Always	Below 1 Ω

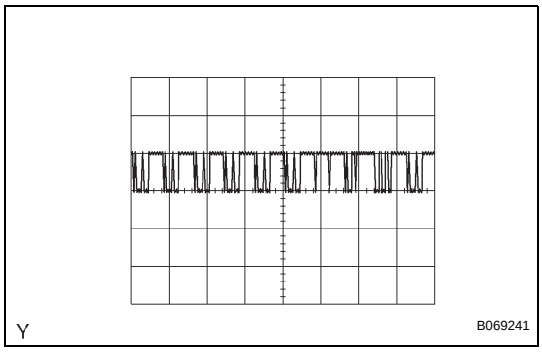
If the result is not as specified, there may be a malfunction on the wire harness side.

(b) Reconnect the E6 ECM. Measure the voltage between each terminal of the connector according to the value(s) in the table below.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
IMI (H29-22) - E1 (E6-1)	GR - BR	Transponder key ECU input signal	Ignition switch off	Below 1 V
			Ignition switch on	Waveform 1
IMO (H29-28) - E1 (E6-1)	L- BR	Transponder key ECU output signal	Ignition switch off	Below 1 V
			Ignition switch on	Waveform 2

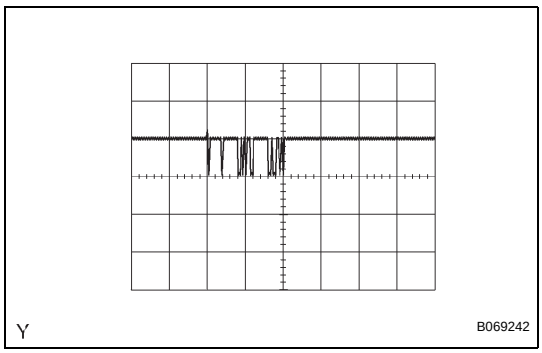
If the result is not as specified, there may be a malfunction on the wire harness side.

(c) Inspect using an oscilloscope.
(1) Waveform 1 (Reference):



Terminal	IMI - E1
Tool Setting	10 V/DIV., 500 ms/DIV.
Condition	Ignition switch on

(2) Waveform 2 (Reference):



Terminal	IMO - E1
Tool Setting	10 V/DIV., 500 ms/DIV.
Condition	Ignition switch on

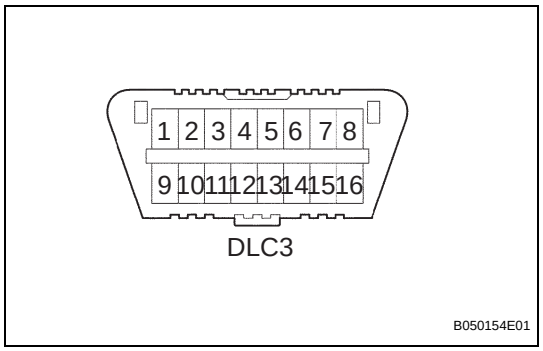
DIAGNOSIS SYSTEM

1. DESCRIPTION

(a) The ECM controls the function of the immobiliser system on the vehicle.
Data from the immobiliser system and the Diagnostic Trouble Code (DTC) can be read in the Data Link Connector 3 (DLC3) of the vehicle. When a malfunction occurs in the immobiliser system, even though the security indicator lamp does not come on, DTCs can be checked.
Therefore, when the immobiliser system seems to be a malfunction, use the intelligent tester to check for a malfunction and repair it.

2. CHECK DLC3

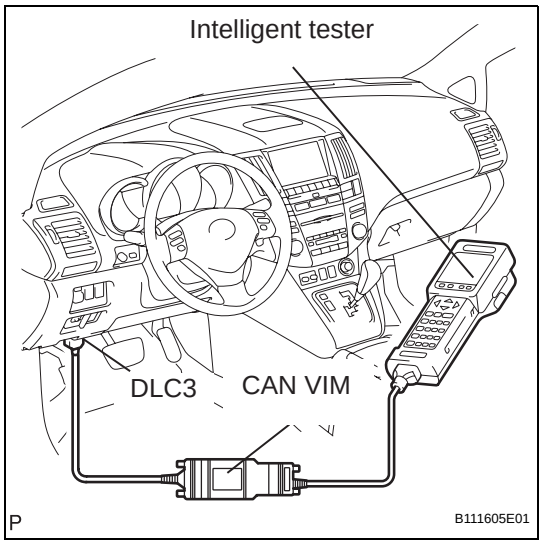
(a) The vehicle's ECM uses the ISO 9141-2 for communication protocol. The terminal arrangement of the DLC3 complies with the SAEJ1962 and matches the ISO 9141-2 format.



Tester Connection	Condition	Specified Condition
7 (Bus+line) - 5 (Signal ground)	During communication	Pulse generation
4 (Chassis ground) - Body ground	Always	Below 1 Ω
5 (Signal ground) - Body ground	Always	Below 1 Ω
16 (B+) - Body ground	Always	9 to 14 V

HINT:
If the screen displays a communication error message after you have connected the cable of the intelligent tester to the DLC3, turned the ignition switch ON and used the intelligent tester, the problem may be on the vehicle side or the tester side.

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



DTC CHECK / CLEAR

1. CHECK DTC

(a) Connect the intelligent tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch on.
(c) Turn the tester ON.
(d) Enter the following menu items: DIAGNOSIS / OBD/ MOBD / IMMOBILISER / DTC INFO / CURRENT CODES.
(e) Check the DTC(s) and freeze frame data, and then write down.
(f) Check the details of the DTC(s) (See page EI-17).

2. CLEAR THE DTC

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch on.
(c) Turn the tester ON.
(d) Enter the following menu items: DIAGNOSIS / OBD/ MOBD / IMMOBILISER / DTC INFO / CLEAR CODES.
(e) Press the YES button.

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the DATA LIST displayed on the intelligent tester, you can read the value of the switch, sensor, actuator, etc. without parts removal. Reading the DATA LIST as the first step in troubleshooting is one way to shorten the labor time.

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch on.
(c) Turn the tester ON.
(d) Enter the following menus: DIAGNOSIS / OBD/ MOBD / IMMOBILISER / DATA LIST.
(e) Check the values by referring to the table below.

Transponder key ECU:

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	-
IG SW	Ignition switch signal / ON or OFF	ON: Ignition switch on OFF: Ignition switch off	-
IMMOBILISER	Immobiliser system status / SET or UNSET	UNSET: Ignition switch on SET: Without key	-
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 data / NG or OK	NG: Incorrect data being sent. OK: Correct data being sent.	-
SUB KEY	Sub key code signal / NOMATH or MATCH	NOMATCH: Non matching sub key code is sent. MATCH: Sub key code is sent.	-
MASTER KEY	Master key code signal / NOMATH or MATCH	NOMATCH: Non matching master key code is sent. MATCH: Master key code is sent.	-
REGIST SUB CODE	Number of registered sub key / min. 0, max. 15	Number of registered sub key.	-
REGIST MAS CODE	Number of registered master key / min. 0, max. 15	Number of registered master key.	-
REG CODE SPAC	Memory space for key codes registration / NOT FUL or FULL	NOT FUL: More key code registration possible. FULL: No more key code registration possible.	-
+B	Power source / BRAKE or NORMAL	BRAKE: Power source open. NORMAL: Power source normal.	-
ANTENNA COIL	Antenna coil condition / NORMAL or FAIL	NORMAL: Antenna coil is normal. FAIL: Antenna coil is malfunctioning.	-

2. PERFORM ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows the relay, VSV, actuator, etc. to operate without removing any parts . Performing the ACTIVE TEST as the first step of troubleshooting is one way to shorten labor time.

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch on.
(c) Turn the tester ON.
(d) Enter the following menus: DIAGNOSIS / OBD/ MOBD / IMMOBILISER / ACTIVE TEST.

Transponder key ECU:

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

DIAGNOSTIC TROUBLE CODE CHART

If a trouble code is displayed during the DTC check, check the circuit listed for that code. For details of each code, turn the page mentioned below the "DTC No" in the DTC chart.

1. TRANSPONDER KEY ECU DIAGNOSTIC TROUBLE CODE CHART

DTC No.	Detection Item	Trouble Area	See page
B2780	Push Switch / Key Unlock Warning Switch Malfunction	1. Unlock warning switch assembly 2. Wire harness 3. Transponder key ECU assembly	EI-18
B2784	Antenna Coil Open / Short	1. Transponder key amplifier 2. Wire harness 3. Transponder key ECU assembly	EI-21
B2793	Transponder Chip Malfunction	Key	EI-24
B2794	Unmatched Encryption Code	Key	EI-25
B2795	Unmatched Key Code	Key	EI-26
B2796	No Communication in Immobiliser System	1. Key 2. Transponder key amplifier 3. Wire harness 4. Transponder key ECU assembly	EI-27
B2797	Communication Malfunction No. 1	1. Key 2. Transponder key amplifier 3. Wire harness 4. Transponder key ECU assembly	EI-31
B2798	Communication Malfunction No. 2	Key	EI-27

2. ECM DIAGNOSTIC TROUBLE CODE CHART

DTC No.	Detection Item	Trouble Area	See page
B2799	Engine Immobiliser System	1. Wire harness 2. Transponder key ECU assembly 3. ECM	EI-34

NOTICE:
The DTC for the immobiliser system is specified above. If other codes are output, check the DTC chart for the hybrid control system.

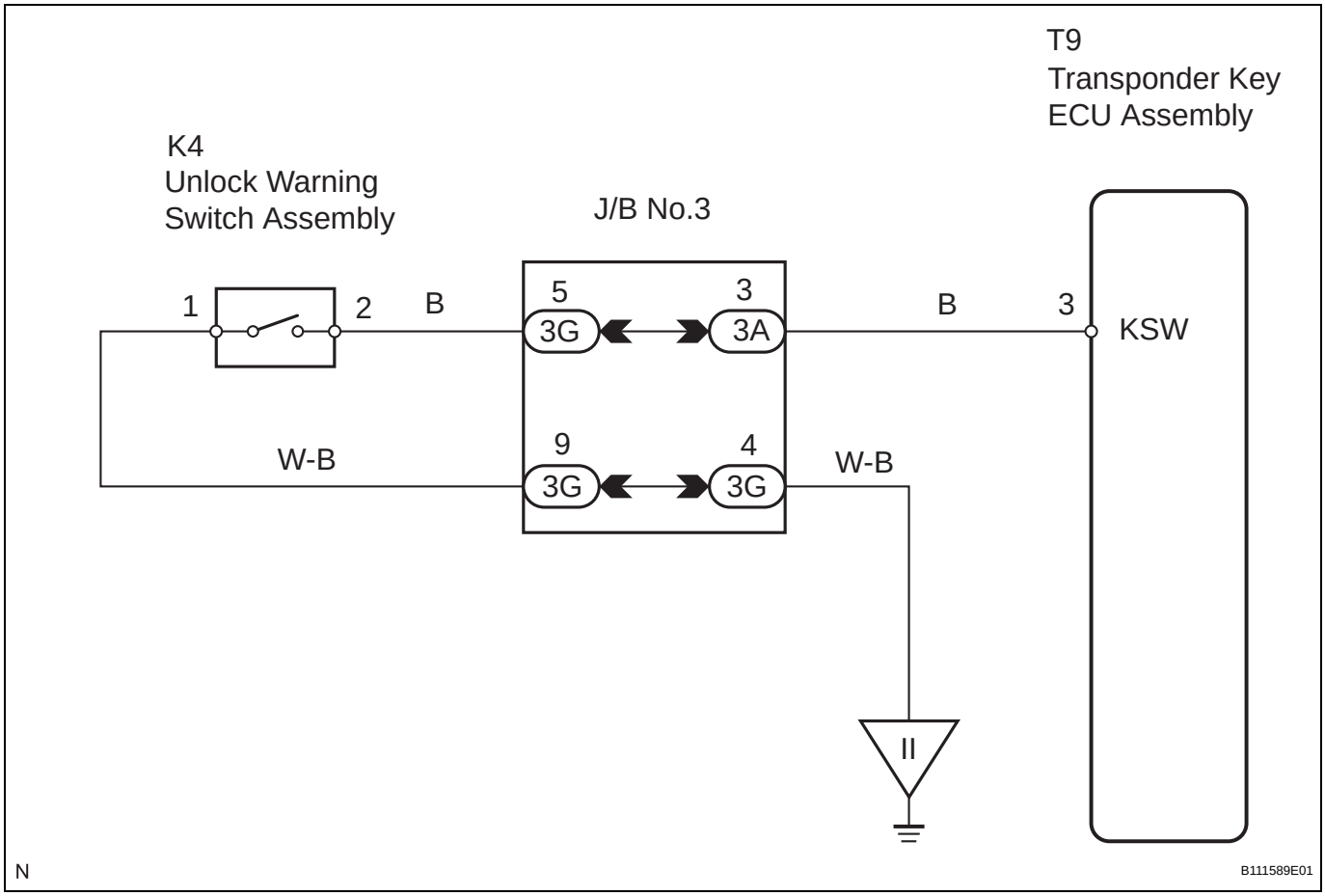
DTC	B2780	Push Switch / Key Unlock Warning Switch Malfunction

DESCRIPTION

This DTC will be output if the transponder key ECU does not detect that the unlock warning switch is on even when the ignition switch is on (Under the normal conditions, the unlock warning switch is on when the ignition switch is on).

DTC No.	DTC Detection Condition	Trouble Area
B2780	Unlock warning switch on is not detected when ignition switch is on	• Unlock warning switch assembly • Wire harness • Transponder key ECU assembly

WIRING DIAGRAM



1	READ VALUE OF INTELLIGENT TESTER

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch on and turn the intelligent tester main switch on.

(c) Select KEY SW in the DATA LIST and read the value displayed on the intelligent tester.

Transponder key ECU:

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	-

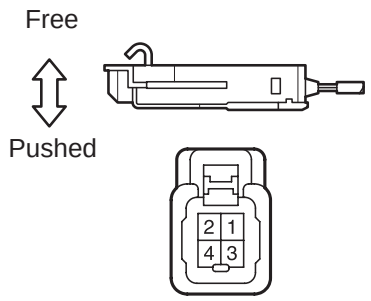
OK:
ON (Key is in ignition key cylinder) appears on the screen

OK → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

NG

2 INSPECT UNLOCK WARNING SWITCH ASSEMBLY

Unlock Warning Switch Assembly Connector Front View:



(a) Remove the unlock warning switch.
(b) Measure the resistance according to the value(s) in the table below.
Resistance

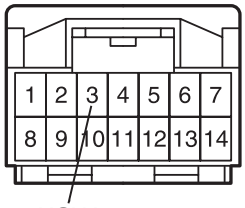
Tester Connection	Switch Condition	Specified Condition
1 - 2	Switch pushed (Key set)	Below 1 Ω
	Switch free (Key removed)	10 kΩ or higher

NG → **REPLACE UNLOCK WARNING SWITCH ASSEMBLY**

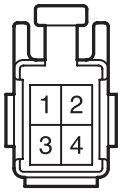
OK

3	CHECK HARNESS AND CONNECTOR (TRANSPONDER KEY ECU ASSEMBLY - UNLOCK WARNING SW ASSEMBLY)

Wire Harness Side Connector Front View:



KSW
T9 Transponder Key ECU Assembly



K4 Unlock Warning Switch Assembly

P B111594E02

(a) Disconnect the T9 ECU and K4 switch connectors.
(b) Measure the resistance according to the value(s) in the table below.

Resistance

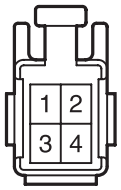
Tester Connection	Specified Condition
T9-3 (KSW) - K4-2	Below 1 Ω
T9-3 (KSW) - Body ground	10 kΩ or higher

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

OK

4	CHECK HARNESS AND CONNECTOR (UNLOCK WARNING SW ASSEMBLY - BODY GROUND)

Wire Harness Side Connector Front View:



K4 Unlock Warning Switch Assembly

P B111599E01

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

Resistance

Tester Connection	Specified Condition
K4-1 - Body ground	Below 1 Ω

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

OK

REPLACE TRANSPONDER KEY ECU ASSEMBLY

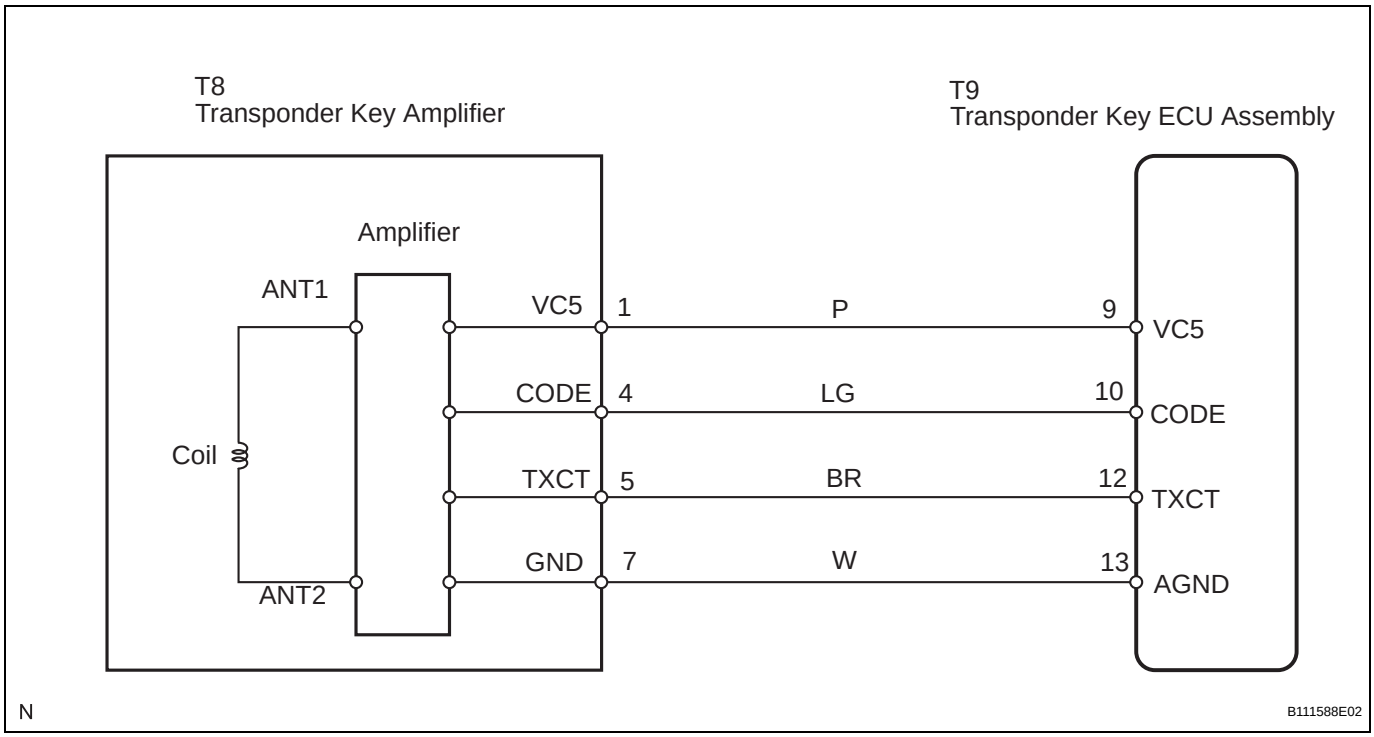
DTC	B2784	Antenna Coil Open / Short

DESCRIPTION

The transponder key coil is built into the transponder key amplifier and receives a key code signal from the transponder chip in the key. This signal is amplified by the amplifier, and output to the transponder key ECU.

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

WIRING DIAGRAM



EI

1	READ VALUE OF INTELLIGENT TESTER

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch on and turn the intelligent tester main switch on.
(c) Select ANTENNA COIL in the DATA LIST and read the value displayed on the intelligent tester.

Transponder key ECU:

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

OK:
NORMAL (Antenna coil is normal) appears on the screen.

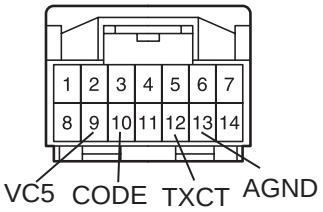
OK → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

NG

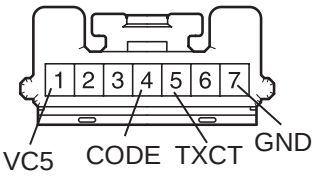
2 CHECK HARNESS AND CONNECTOR (TRANSPONDER KEY ECU ASSEMBLY - TRANSPONDER KEY AMPLIFIER)

Wire Harness Side Connector Front View:

T9 Transponder Key ECU Assembly



T8 Transponder Key Amplifier



P B111591E01

(a) Disconnect the T9 ECU and T8 switch connectors.
(b) Measure the resistance according to the value(s) in the table below.

Resistance

Tester Connection	Specified Condition
T9-9 (VC5) - T8-1 (VC5)	Below 1 Ω
T9-10 (CODE) - T8-4 (CODE)	
T9-12 (TXCT) - T8-5 (TXCT)	
T9-13 (AGND) - T8-7 (GND)	
T9-9 (VC5) - Body ground	10 kΩ or higher
T9-10 (CODE) - Body ground	
T9-12 (TXCT) - Body ground	
T9-13 (AGND) - Body ground	

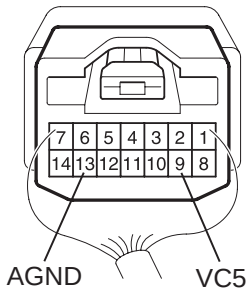
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 INSPECT TRANSPONDER KEY ECU ASSEMBLY

Wire Harness Side Connector Rear View:

T9
Transponder Key ECU Assembly



P B111616E04

(a) Reconnect the T9 ECU and T8 amplifier connectors.
(b) Measure the voltage according to the value(s) in the table below.

Voltage

Tester Connection	Condition	Specified Condition
T9-9 (VC5) - Body ground	No key is in ignition key cylinder	Below 1 V
	Key is in ignition key cylinder	4.6 to 5.4 V

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

Resistance

Tester Connection	Condition	Specified Condition
T9-13 (AGND) - Body ground	Always	Below 1 Ω

NG → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

OK

REPLACE TRANSPONDER KEY AMPLIFIER

DTC	B2793	Transponder Chip Malfunction

DESCRIPTION

This DTC is output when a malfunction is found in the key during the key code registration or the key code is not registered normally. Replace the key when the key code registration is not performed normally and this DTC is detected.

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

1 CHECK FOR DTC

(a) Delete the DTC (See page EI-15).
(b) Insert the key into the ignition key cylinder.
(c) Check that no code is output.
OK:
No DTC is output.

OK → **NO PROBLEM**

NG

2 RE-REGISTER KEY

(a) Delete the DTC (See page EI-15).
(b) Re-register the key (See page EI-3) and insert this key into the ignition key cylinder.
Check that the engine starts with the key.
OK:
The engine starts

OK → **END**

NG

REPLACE KEY

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
B2794	Key with incomplete key code inserted	Key

1	RE-REGISTER KEY

(a) Delete the DTC (See page EI-15).
(b) Re-register the key (See page EI-3) and insert this key into the ignition key cylinder.
Check that the engine starts with this key.
OK:
The engine starts

OK → **END**

NG

REPLACE KEY

DTC	B2795	Unmatched Key Code

DESCRIPTION

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

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

1	CHECK WHETHER HYBRID CONTROL SYSTEM STARTS WITH OTHER KEYS

(a) Insert the vehicle's other key into the ignition key cylinder.
(b) Check that the engine starts with this key.
OK:
The engine starts

OK → **NO PROBLEM (BECAUSE OF KEY REREGISTRATION)**

NG

REPLACE KEY

DTC	B2796	No Communication in Immobiliser System

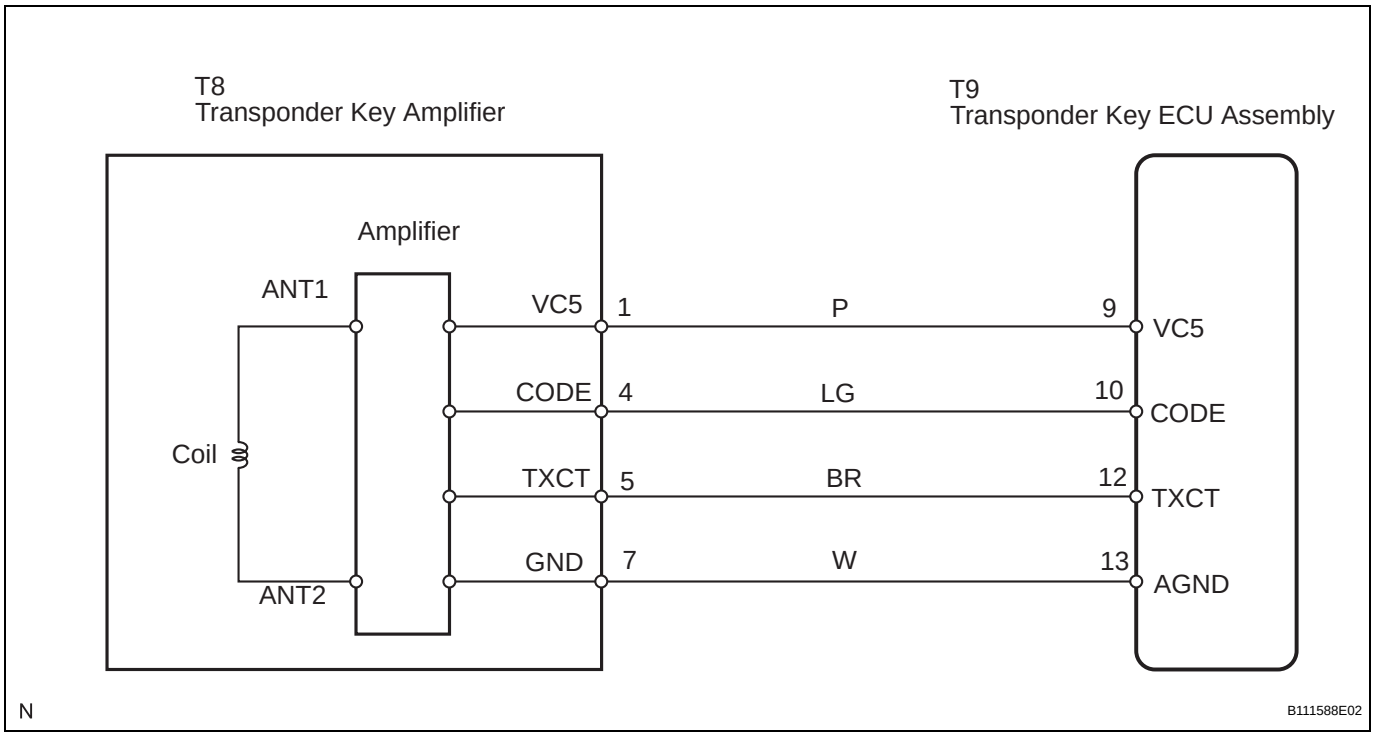
DTC	B2798	Communication Malfunction No. 2

DESCRIPTION

These codes are stored in the memory when a key that does not have a transponder chip is inserted or if communication between the key and transponder key ECU is impossible.

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



1	READ VALUE OF INTELLIGENT TESTER

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch on and turn the intelligent tester main switch on.
(c) Select IMMOBILISER in the DATA LIST and read the value displayed on the intelligent tester.

Transponder key ECU:

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

OK:
UNSET (Ignition switch on) appears on the screen.

OK → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

NG

2	CHECK WHETHER HYBRID CONTROL SYSTEM STARTS WITH OTHER KEYS

(a) Insert the vehicle's other key into the ignition key cylinder.
(b) Check that the engine starts with this key.
OK:
The engine starts

OK → **RE-REGISTER OR REPLACE KEY**

NG

3	READ VALUE OF INTELLIGENT TESTER

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch on and turn the intelligent tester main switch on.
(c) Select ANTENNA COIL in the DATA LIST and read the value displayed on the intelligent tester.

Transponder key ECU:

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

OK:
NORMAL (Antenna coil is normal) appears on the screen.

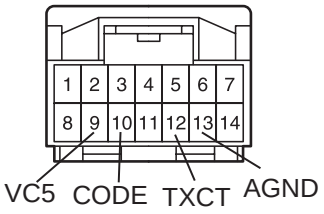
OK → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

NG

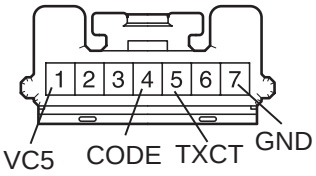
4 CHECK HARNESS AND CONNECTOR (TRANSPONDER KEY ECU ASSEMBLY - TRANSPONDER KEY AMPLIFIER)

Wire Harness Side Connector Front View:

T9 Transponder Key ECU Assembly



T8 Transponder Key Amplifier



P B111591E01

(a) Disconnect the T9 ECU and T8 amplifier connectors.
(b) Measure the resistance according to the value(s) in the table below.

Resistance

Tester Connection	Specified Condition
T9-9 (VC5) - T8-1 (VC5)	Below 1 Ω
T9-10 (CODE) - T8-4 (CODE)	
T9-12 (TXCT) - T8-5 (TXCT)	
T9-13 (AGND) - T8-7 (GND)	
T9-9 (VC5) - Body ground	10 kΩ or higher
T9-10 (CODE) - Body ground	
T9-12 (TXCT) - Body ground	
T9-13 (AGND) - Body ground	

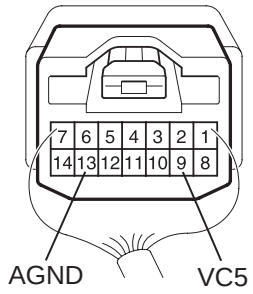
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT TRANSPONDER KEY ECU ASSEMBLY

Wire Harness Side Connector Rear View:

T9
Transponder Key ECU Assembly



P B111616E04

(a) Reconnect the T9 ECU and T8 amplifier connectors.
(b) Measure the voltage according to the value(s) in the table below.

Voltage

Tester Connection	Condition	Specified Condition
T9-9 (VC5) - Body ground	No key is in ignition key cylinder	Below 1 V
	Key is in ignition key cylinder	4.6 to 5.4 V

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

Resistance

Tester Connection	Condition	Specified Condition
T9-13 (AGND) - Body ground	Always	Below 1 Ω

NG → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

OK

6	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:
The engine starts.

NG → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

OK

END (TRANSPONDER KEY AMPLIFIER DEFEICTIVE)

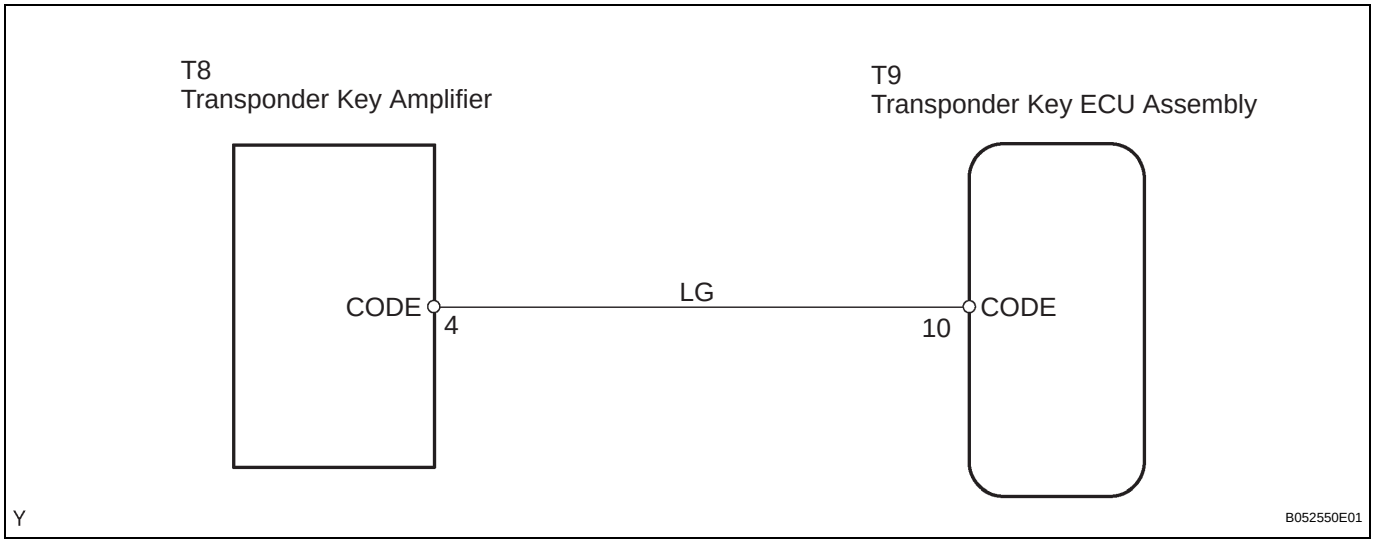
DTC	B2797	Communication Malfunction No. 1

DESCRIPTION

This DTC is output when an error occurs in normal communication.
HINT:
Some noise found in the communication line.

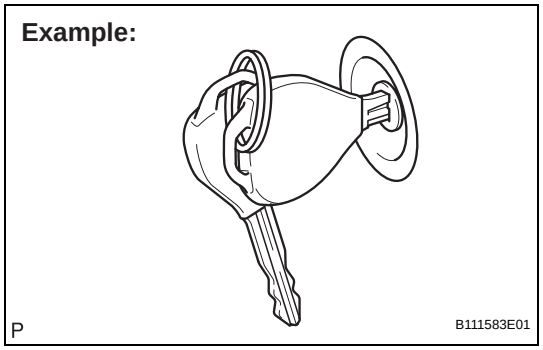
DTC No.	DTC Detection Condition	Trouble Area
B2797	Keys are positioned too close to each other, or noise occurred in communication line.	• Key • Transponder key amplifier • Wire harness • Transponder key ECU assembly

WIRING DIAGRAM



EI

1	CHECK KEY



(a) Check whether the ignition key being used is near other ignition keys, as shown in the illustration. Also, check whether 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

A

2	CHECK FOR DTC

(a) Delete the DTC (See page EI-15).
(b) Insert the key into the ignition key cylinder.

(c) Check that no code is output.
OK:
No DTC is output.

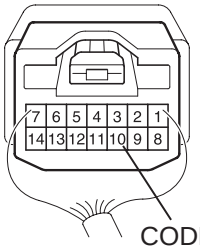
OK	**NO PROBLEM**

NG

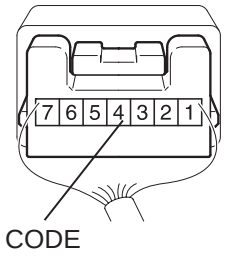
3 CHECK TRANSPONDER KEY AMPLIFIER

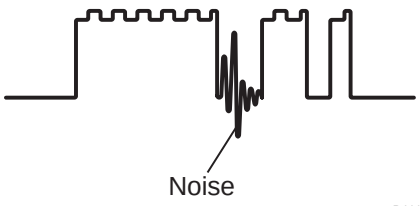
Wire Harness Side Connector Rear View:

T9
Transponder Key ECU Assembly



T8
Transponder Key Amplifier





P B111615E04

(a) Using an oscilloscope or the intelligent tester, check the waveform between the terminals of the T8 amplifier and T9 ECU connector.
Check that no noise is included in the waveform (an example of noise is shown on the left).
(b) Check that no noise is included in the waveform (an example of noise is shown on the left).
Result

Tester Connection	Specified Condition
T8-4 (CODE) - T9-10 (CODE)	**No noise is present**

Tool Setting	2 V/DIV., 20 ms/DIV.
Condition	Key inserted into ignition key cylinder.

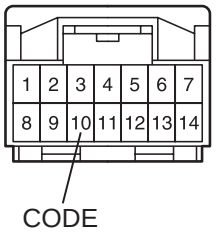
NG	**FIND CAUSE OF NOISE AND REMOVE NOISE**

OK

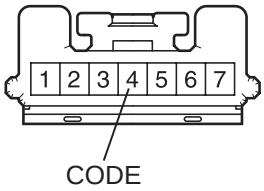
4	CHECK HARNESS AND CONNECTOR (TRANSPONDER KEY ECU - TRANSPONDER KEY AMPLIFIER)

Wire Harness Side Connector Front View:

T9 Transponder Key ECU Assembly



T8 Transponder Key Amplifier



P B111591E02

(a) Disconnect the T9 ECU and T8 amplifier connectors.
(b) Measure the resistance according to the value(s) in the table below.

Resistance

Tester Connection	Specified Condition
T9-10 (CODE) - T8-4 (CODE)	Below 1 Ω

NG → **REPAIR OR REPLACE HARNESS OR 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:

The engine starts

NG → **REPLACE TRANSPONDER KEY ECU ASSEMBLY**

OK

END (TRANSPONDER KEY AMPLIFIER DEFECTIVE)