ENGINE IMMOBILISER SYSTEM

PRECAUTION

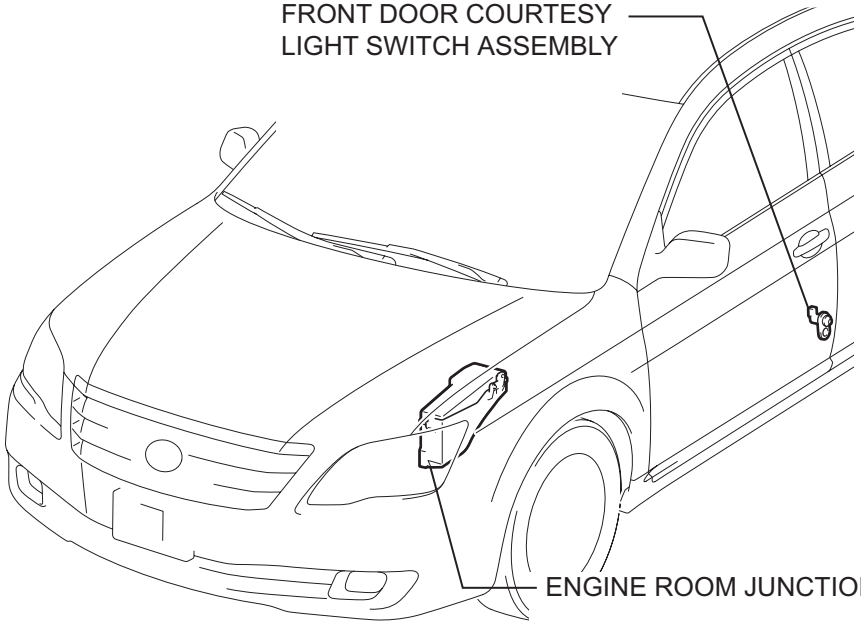
1. PRECAUTION FOR DISCONNECTING BATTERY TERMINAL

NOTICE:

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

System Name	See Procedure
Power Window Control System	IN-29
Sliding Roof System	

PARTS LOCATION



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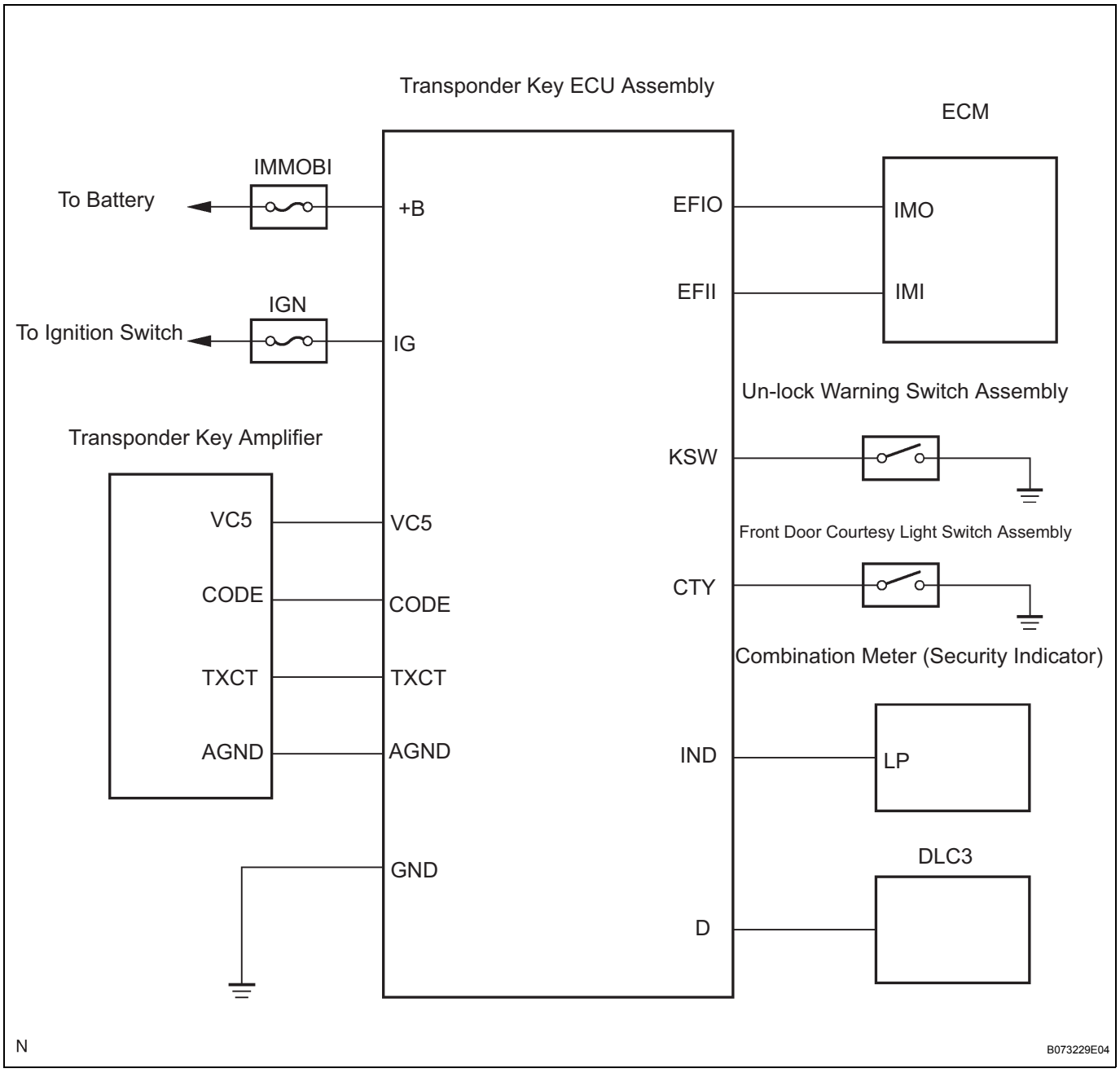
SYSTEM DIAGRAM



SYSTEM DESCRIPTION

1. ENGINE IMMOBILISER SYSTEM DESCRIPTION

(a) The engine immobiliser system is designed to prevent the vehicle from being stolen. This system uses a transponder key ECU assembly 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.

2. FUNCTION OF MAIN COMPONENT

Component	Outline
Transponder key coil/amplifier	When key is inserted in ignition key cylinder, key coil receives key code. Then amplifier amplifies ID code and outputs it to transponder key ECU assembly.
Un-lock warning switch assembly	Detects if key is in ignition key cylinder and outputs results to transponder key ECU assembly.
ECM	Through SFI communication, ECM receives ID verification results from transponder key ECU assembly. ECM also verifies ECUs. Then judgement of whether or not to immobilise engine is made.
Security indicator	Depending on operation of theft warning ECU (theft deterrent ECU), interior security indicator light comes on or starts blinking.

3. SYSTEM FUNCTION

(a) When the transponder key ECU assembly detects that the key unlock warning switch is ON, the ECU provides current to the transponder key coil and produces 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 code signal. The transponder key coil receives this signal, the transponder key amplifier 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, previously registered in the ECU, and then communicates the results to the ECM using 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 does not immobilise the engine and the engine starting controls (fuel injection control and ignition control) enter standby mode; and 2) the ECU transmits a security indicator signal that communicates "indicator off" to the theft warning ECU (theft deterrent ECU). Then, the theft warning ECU turns off the security indicator light.

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

3	CRANK ENGINE FOR MORE THAN 10 SECONDS

NEXT

4	CHECK FOR DTCS

(a) Check for DTCs and note any codes that are output.
(b) Delete the DTC.
(c) Recheck for DTCs. Based on the DTC output, try to force output of the same SFI system DTC or engine immobiliser system DTC by simulating the operation indicated by the DTC.
  (1) If the DTC does not reoccur, proceed to A.
  (2) If the SFI system DTC reoccurs, proceed to B.
  (3) If the engine immobiliser system DTC reoccurs, proceed to C.

B	Go to SFI SYSTEM
C	Go to step 8

A

5	READ VALUE OF INTELLIGENT TESTER

(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 and push the intelligent tester main switch ON.
(c) Read the DATA LIST according to the display on the tester.

OK:
ON (Key is in ignition key cylinder

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**

EI

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) DATA LIST/ACTIVE TEST (See page EI-19)
  (1) Inspection with the intelligent tester (DATE LIST).
  (2) Inspection with the intelligent tester (ACTIVE TEST).
(b) Terminals of ECU (See page EI-13)

NEXT

8 ADJUST, REPAIR OR REPLACE

NEXT

9 CONFIRMATION TEST

NEXT

END

REGISTRATION

1. PERFORM NEW CODE REGISTRATION

(a) When adding master keys and sub-keys (additional registration):

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

Target ECU	See procedure
Transponder key ECU assembly	Procedure "A"

(b) When replacing the transponder key ECU assembly (automatic registration):

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

Target ECU	See procedure
Transponder key ECU assembly	Procedure "B"

(2) Register the ECU COMMUNICATION ID between the ECM and the transponder key ECU assembly.

Target ECU	See procedure
ECM	Procedure "C"

(c) When replacing the ECM:

(1) Register the ECU COMMUNICATION ID between the ECM and the transponder key ECU assembly.

Target ECU	See procedure
Transponder key ECU assembly	Procedure "C"

(d) Erasure of key code:

(1) Erase the key code.

Target ECU	See procedure
Transponder key ECU assembly	Procedure "D"

2. PERFORM KEY REGISTRATION

(a) When an ignition key is inserted into the ignition cylinder, the key code (immobiliser code) registration is automatic. In this mode, a maximum of 4 key codes for 3 master keys and 1 sub-key can be registered. Any order of registration for the master keys and sub-keys is fine because the transponder key ECU assembly can distinguish the types of keys.

HINT:

- When a new transponder key ECU assembly is installed, key codes (immobiliser codes) must be registered with ignition keys.
- New transponder key ECU assemblies are automatically set to automatic key code registration mode.

Automatic Key Code Registration (PROCEDURE "B")

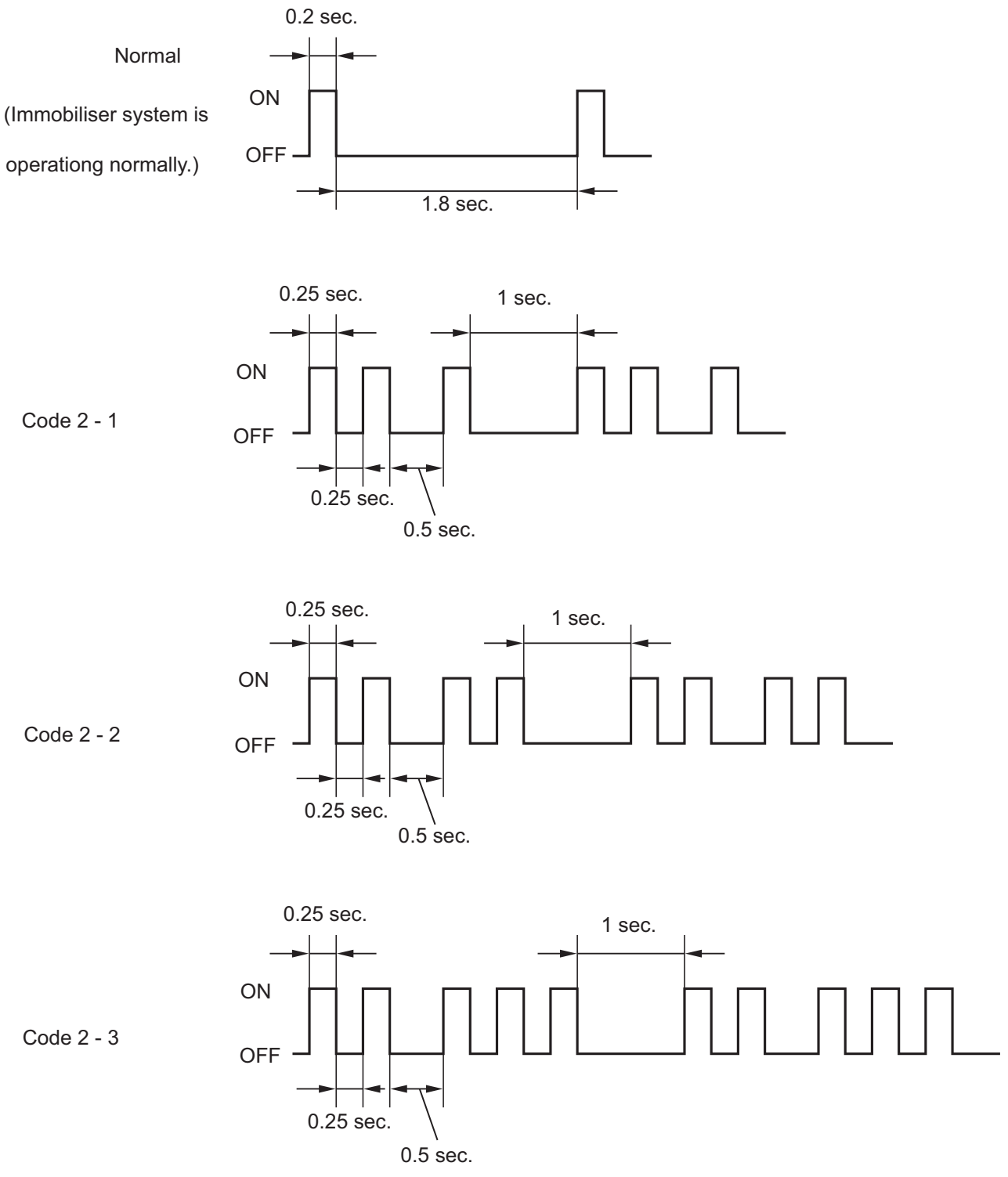
Procedure	Security Indicator Condition
1. Start (Procedure "D")	Blinking occurs until the first key is inserted.
2. Insert the key into the ignition key cylinder.	ON

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:

- In automatic key code registration mode, when no key is inserted in the ignition key cylinder, 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 automatic key code registration mode, code 2-1 will be output from the security indicator. Trying to re-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:



(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. PERFORM REGISTRATION OF ADDITIONAL KEY

(a) Register additional keys by using the intelligent tester.

HINT:

- A maximum of 5 master key codes and 3 sub-key codes can be registered.
- Registration mode will end if each 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 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 is 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 a battery in the new master key's transmitter module fails, the original master key can be used to lock and unlock doors through the door key cylinder.

EI

Additional Registration (PROCEDURE "A")

Procedure	Time (Completion of operation)	Security indicator Condition
1. Start 2. Insert the already registered master key in the ignition key cylinder and turn the ignition switch on.	-	The indicator will blink until the first key is inserted.
3. Intelligent tester operation: (1) Select IMMOBILISER. (2) Select ID UTILITY. (3) Select TRANS 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: Security indicator goes off.	-	Blinking
7. Next		OFF
8. End		

HINT:

- A brief outline of procedures for key code registration is shown on this page. Refer to the intelligent tester screen instructions for more information.
- 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 automatic key code registration mode, code 2-1 will be output from the security indicator. Trying to re-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 step 2 (new registration).

4. ERASURE OF KEY CODE

(a) Erase key codes using the intelligent tester.

HINT:

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

Erasing Key Code (PROCEDURE "D")

Procedure	Time (Completion of operation)	Security Indicator Condition
1. Start	-	The indicator will blink 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 TRANS 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 10 sec. of the instruction on the tester.	ON for 1 sec. then OFF
5. Next	-	Blinking
6. End		

HINT:

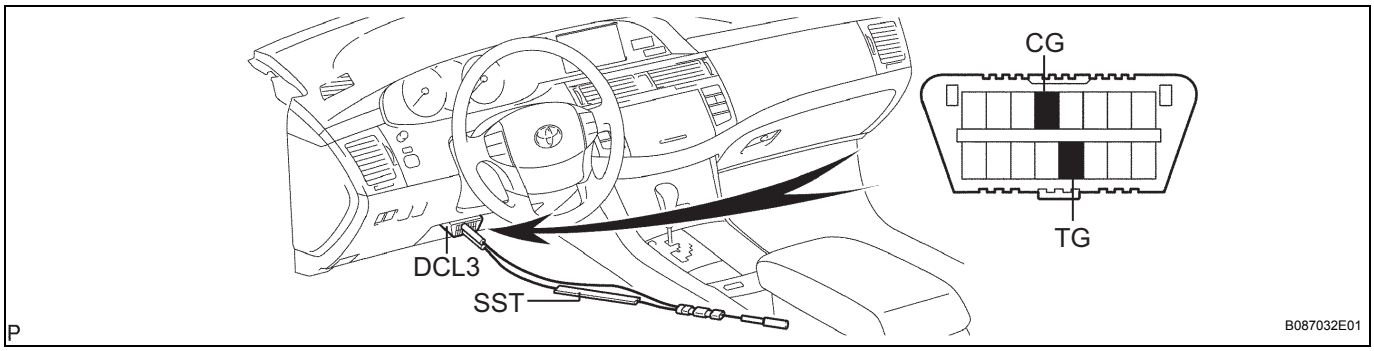
- A brief outline of procedures for key code registration is shown on this page. Refer to the intelligent tester screen's instructions for more information.
- When the immobiliser system is operating normally and the key is pulled out, the security indicator blinks continuously.

5. ECU COMMUNICATION ID REGISTRATION

NOTICE:

- **The ECU COMMUNICATION ID should be registered when the transponder key ECU assembly and/or the ECM is replaced in order to match these ECM COMMUNICATION ID.**
- **The engine cannot be started unless the ECM COMMUNICATION ID matches.**

(a) Register the ECU Communication ID (PROCEDURE "C")



(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 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:

- Inspect the fuse and relay before confirming the suspected area in the table below.
- Inspect each malfunction circuit in numerical order for the corresponding symptom.

If any malfunction still exists even after checking and confirming that all the circuits are normal, replace the ECU.

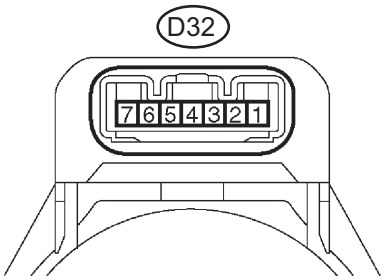
ENGINE IMMOBILISER SYSTEM

Symptom	Suspected area	See page
Immobiliser is not set. (Engine starts with key codes other than the registered key code.)	1. Door courtesy switch circuit	EI-40
	2. Transponder key ECU assembly	-
Engine does not start.	1. Key	EI-19
	2. Key unlock warning switch circuit	EI-22
	3. Transponder key amplifier circuit	EI-25
	4. Transponder key ECU assembly	-
	5. ECM	-
Security indicator is always ON.	1. Security indicator light	EI-38
	2. Transponder key ECU assembly	-
Security indicator is always ON. (Although code has been registered in the automatic registration mode, indicator does not go off.)	1. Transponder key amplifier circuit	EI-25
	2. Transponder key ECU assembly	-
Security indicator is OFF.	1. Security indicator light circuit	EI-38
	2. Transponder key ECU assembly	-
Security indicator is abnormally blinking.	Transponder key ECU assembly	-
No code is output.	1. ECU power source circuit	EI-42
	2. Diagnosis circuit	EI-44
	3. Transponder key ECU assembly	-

TERMINALS OF ECU

1. CHECK TRANSPONDER KEY AMPLIFIER

Connector Front View:



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(a) Disconnect the D32 amplifier connector.
(b) Measure the resistance between the terminal of the wire harness side connector and body ground.

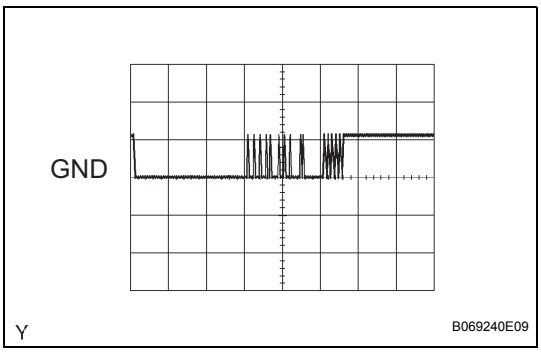
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
AGND (D32-7) - Body ground	V - Body ground	Ground	Always	Below 1 Ω

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

(c) Reconnect the D32 amplifier connector.
(d) Measure the voltage of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
VC5 (D32-1) - AGND (D32-7)	W - V	Power source	No key in ignition key cylinder → Key inserted	0 V → 4.6 to 5.4 V
CODE (D32-4) - AGND (D32-7)	LG - V	Demodulated signal of key code data	No key in ignition key cylinder → Key inserted	Pulse generation (see waveform 1)
TXCT (D32-5) - AGND (D32-7)	BR - V	Key code output signal	No key in ignition key cylinder → Key inserted	Pulse generation (see waveform 2)

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



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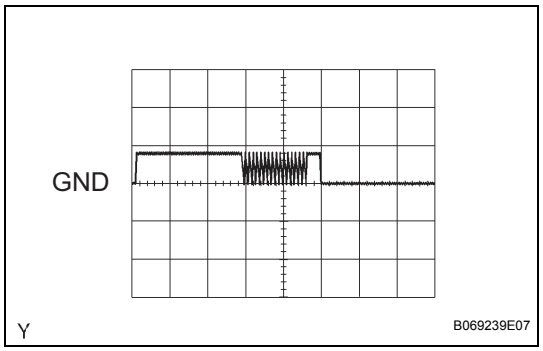
(e) Inspect using an oscilloscope.
(1) Waveform 1 (Reference):

Terminal	CODE - GND
Tool Setting	10 V/DIV., 20 ms/DIV.
Condition	No key in ignition key cylinder → Key inserted

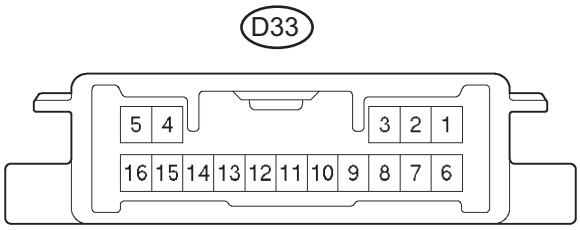


(2) Waveform 2 (Reference):

Terminal	TXCT - GND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	No key in ignition key cylinder → Key inserted

2. CHECK TRANSPONDER KEY ECU ASSEMBLY

Connector Front View:



(a) Disconnect the D33 ECU connector, and measure the voltage and resistance between each terminal of the wire harness side connector.

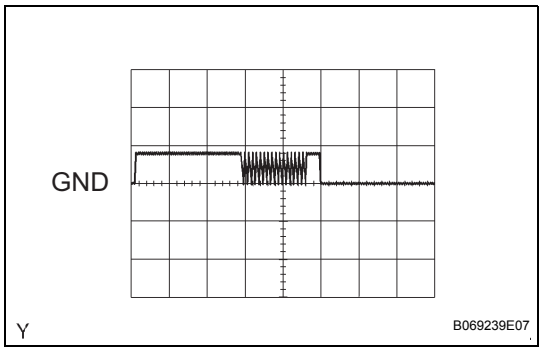
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
+B (D33-1) - GND (D33-16)	Y - W-B	Battery	Always	10 to 14 V
IG (D33-2) - AGND (D33-5)	G - V	Ignition switch	Ignition switch OFF → ON	Below 1 V → 10 to 14 V
GND (D33-16) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω

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

(b) Reconnect the D33 ECU connector, and measure the voltage between each terminal of the connector.

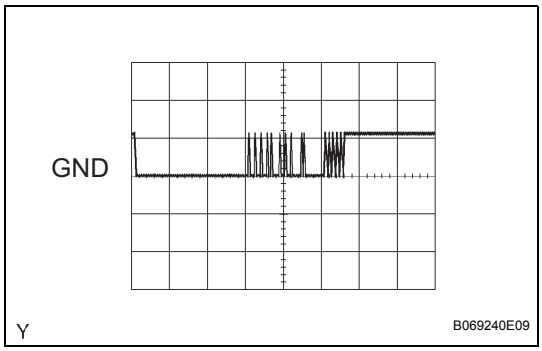
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
KSW (D33-3) - GND (D33-16)	B - W-B	Unlock warning switch	No key in ignition key cylinder → Key inserted	10 to 14 V → Below 1 V
TXCT (D33-4) - AGND (D33-5)	BR - V	Transponder key amplifier communication signal	Ignition switch ON	Waveform 1
CTY (D33-7) - GND (D33-16)	L - W-B	Courtesy signal	Driver side door is open → closed	10 to 14 V → Below 1 V
IND (D33-8) - GND (D33-16)	P - W-B	Security indicator signal	Engine immobiliser system SET → UNSET	3 to 5V → Below 1 V
D (D33-9) - GND (D33-16)	O - W-B	Diagnosis tester communication	Ignition switch ON	Pulse generation
EFII (D33-12) GND (D33-16)	L - W-B	ECM input signal	Ignition switch ON	Waveform 4
EFIO (D33-13) - GND (D33-16)	BR - W-B	ECM output signal	Ignition switch ON	Waveform 3
VC5 (D33-14) - AGND (D33-5)	W - V	Power source	Ignition switch OFF → ON	Below 1 V → 4.6 to 5.4 V
CODE (D33-15) - AGND (D33-5)	LG - V	Transponder key amplifier ground	Ignition switch ON	Waveform 2

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



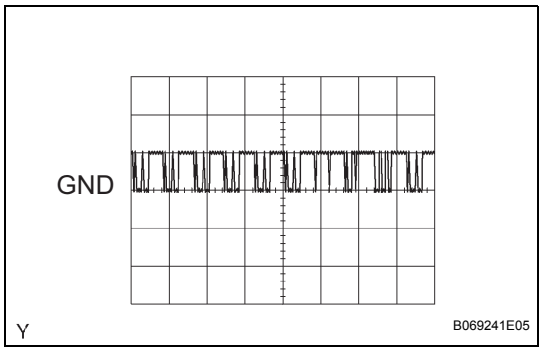
(c) Inspect using an oscilloscope.
(1) Waveform 1 (Reference):

Terminal	TXCT - GND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Ignition switch ON



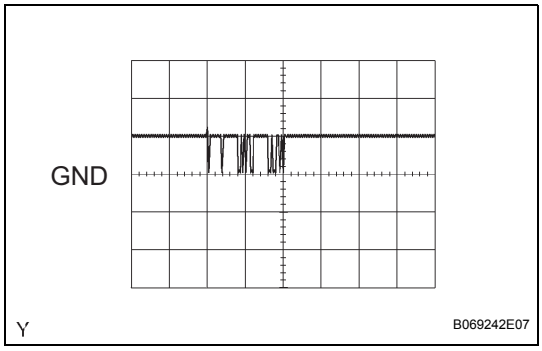
(2) Waveform 2 (Reference):

Terminal	CODE - GND
Tool Setting	5 V/DIV., 20 ms/DIV.
Condition	Ignition switch ON



(3) Waveform 3 (Reference):

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



(4) Waveform 4 (Reference):

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

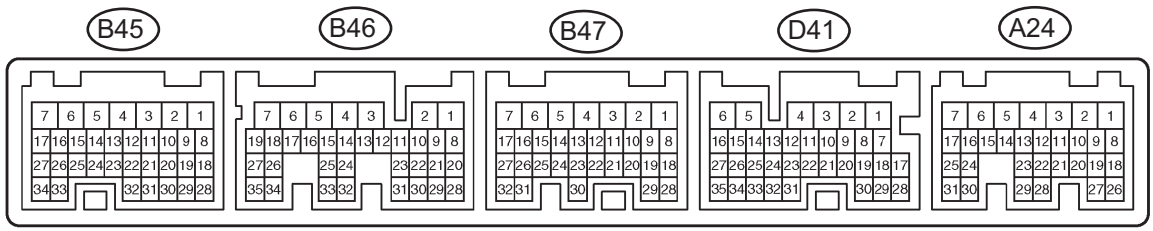
(d) Measure the resistance between each terminal of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
AGND (D33-5) - GND (D33-16)	V - W-B	Amplifier ground circuit	Always	Below 1 Ω

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

3. CHECK ECM

Connector Front View:



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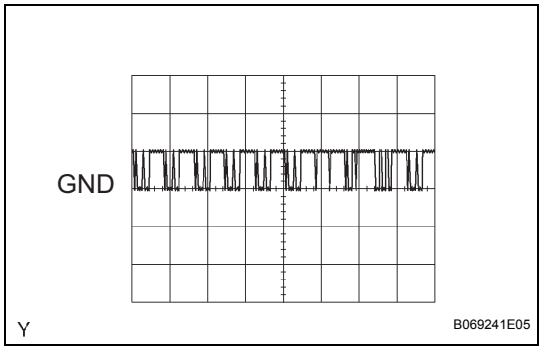
(a) Disconnect the B45 and D41 ECM connectors.
(b) Measure the voltage and resistance between each terminal of the wire harness side connectors and body ground.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
IMO (D41-15) - E01 (B45-7)	BR - W-B	Transponder key ECU input signal	No key in ignition key cylinder → Key inserted	Pulse generation (see waveform 1)
IMI (D41-16) - E01 (B45-7)	L - W-B	Transponder key ECU output signal	No key in ignition key cylinder → Key inserted	Pulse generation (see waveform 2)
E01 (B45-7) - Body ground	W-B - Body groubd	Ground	Always	Below 1 Ω

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):



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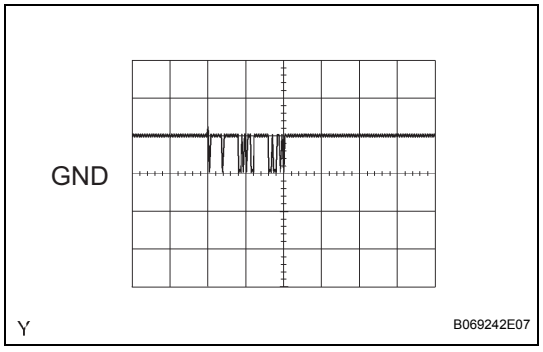
Terminal	IMI - GND
Tool Setting	10 V/DIV., 500 ms/DIV.
Condition	No key in ignition key cylinder → Key inserted

(2) Waveform 2 (Reference):



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Terminal	IMO - GND
Tool Setting	10 V/DIV., 500 ms/DIV.
Condition	No key in ignition key cylinder → Key inserted

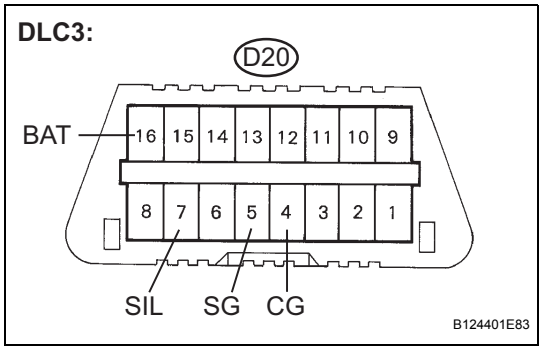
EI

DIAGNOSIS SYSTEM

1. DESCRIPTION

(a) The ECM controls the vehicle's immobiliser system functions. Immobiliser system data and Diagnostic Trouble Code (DTCs) can be read through the vehicle's Data Link Connector 3 (DLC3). In some cases, a malfunction may be occurring in the immobiliser system even though the security indicator light is not illuminated. When the system seems to be malfunctioning, use the intelligent tester to check for malfunctions and perform repairs.

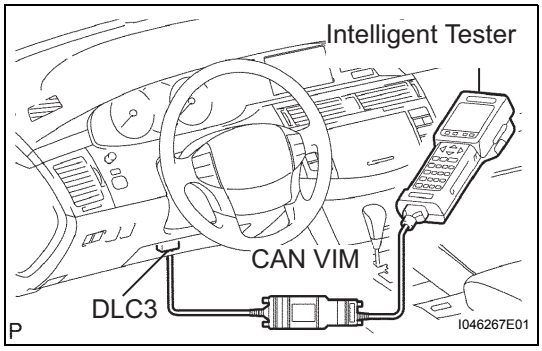
2. CHECK DLC3



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

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Constant
SG	5	Signal ground	Body ground	Below 1 Ω	Constant
BAT	16	Battery positive	Body ground	11 to 14 V	Constant

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



(b) Connect the cable of the intelligent tester (with CAN VIM) to the DLC3, turn the ignition switch ON and attempt to use the intelligent tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem may be on the vehicle side or 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. Consult the Service Department listed in the tester's instruction manual.

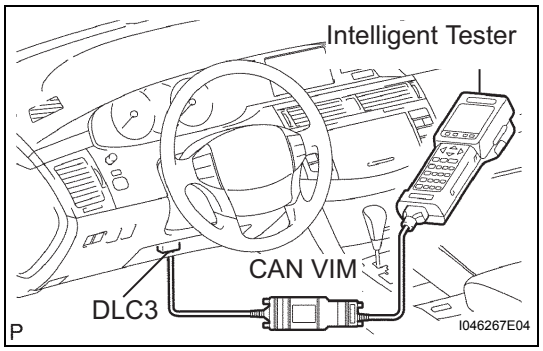
3. CHECK BATTERY VOLTAGE

(a) Check the battery voltage.

Voltage:

11 to 14 V

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



DTC CHECK / CLEAR

1. CHECK DTC (USING INTELLIGENT TESTER)

(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) Read the DTCs by following the directions on the tester screen.
HINT:
Refer to the intelligent tester operator's manual for further details.

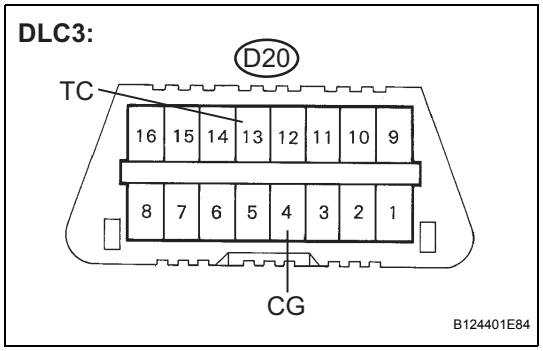
2. CHECK DTC (USING SST CHECK WIRE)

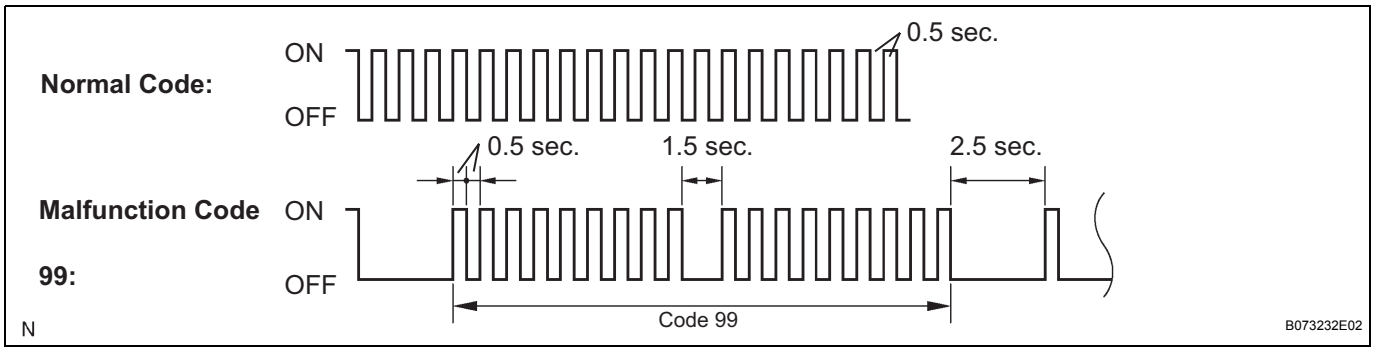
HINT:
Perform this procedure when a malfunction occurs in communication between ECM and transponder key ECU assembly, and communication line.

(a) Using SST check wire, connect terminals TC and CG of the DLC3.

(b) Turn the ignition switch to the ON position.
SST 09843-18040

(c) Read the DTCs from the blinking of the check engine indicator light.



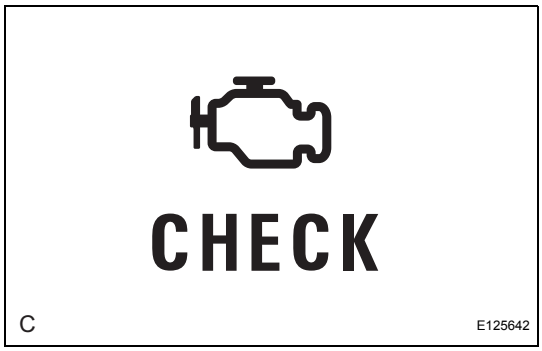


3. CLEAR DTC (USING INTELLIGENT TESTER)

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.

(b) Turn the ignition switch ON.

(c) Erase the DTCs by following the directions on the tester screen.
HINT:
Refer to the intelligent tester operator's manual for further details.



4. CLEAR DTC (USING SST CHECK WIRE)

(a) Turn the ignition switch OFF.

(b) Disconnect the battery terminals or the EFI No.1 fuse.

(c) Connect the battery terminals or the EFI No.1 fuse, and then turn the ignition switch to the ON position.

(d) Check that the normal code is indicated after connecting the fuse.

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

Using the intelligent tester 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 shorten labor time.

(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) Read the DATA LIST according to the display on the tester.

Transponder key ECU:

Item	Measurement Item/Display (Range)	Normal Condition	Diagnostic Note
KEY SW	Unlock warning switch signal/ON or OFF	OFF: Key is in ignition key cylinder ON: No key is in ignition key cylinder	-
IG SW	Ignition switch signal/ON or OFF	OFF: Ignition switch is OFF or ACC position ON: Ignition switch is in the ON position	-
IMMOBILISER	Immobiliser system status/SET or UNSET	UNSET: Without key SET: Ignition switch ON	-
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 sending OK: Correct data sending	-
SUB KEY	Sub-key code signal/NOMATCH or MATCH	NOMATCH: Unmatched sub-key code is sent MATCH: Sub-key code is sent	-
MASTER KEY	Master key code signal/ NOMATCH or MATCH	NOMATCH: Unmatched 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 SPACE	Memory space for key codes registration/NOT FUL or FULL	NOT FUL: Possible to register more key codes FULL: Cannot register any more key codes	-
+B	Power source/BREAK or NORMAL	BREAK: Power source open Normal: Power source normal	-
ANTENNA COIL	Transponder key amplifier coil condition/NORMAL or FAIL	Normal: Antenna coil is normal FAIL: Antenna coil is malfunctioning	-
G-CODE SUPPORT	SUPPORT or NOT SUP	-	*1
G-CODE DECISION	YES or NO	-	*2

*1: Diagnostic Note

- If the engine does not start using the registered key while the display on the intelligent tester shows "SUPPORT", there may be a problem with the ECM and the transponder key ECU.

- If the engine does not start using the registered key while the display on the intelligent tester shows "NON SUP", there may be a problem with the transponder key ECU.

*2: Diagnostic Note

- YES indicates that the registration of the ECU communication ID for the ECM and the transponder key ECU has been completed.
- NO indicates that the registration of the ECU communication ID for the ECM and the transponder key ECU has not been completed.

2. ACTIVE TEST

HINT:

Performing the intelligent tester 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 shorten the labor time. THE DATA LIST can be displayed during the ACTIVE TEST.

(a) Connect the intelligent tester (with CAN VIM) to the DLC3.
(b) Turn the ignition switch ON.
(c) Perform the ACTIVE TEST according to the display on the tester.

Transponder key ECU:

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

DIAGNOSTIC TROUBLE CODE CHART

1. TRANSPONDER KEY ECU DTC CHART

DTC No.	Detection Item	Trouble Area	See page
B2780	Push Switch / Key Unlock Warning Switch Malfunction	1. Un-lock warning switch assembly 2. Wire harness 3. Transponder key ECU assembly	EI-22
B2784	Antenna Coil Open / Short	1. Wire harness 2. Transponder key amplifier 3. 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	1. Key 2. Transponder key amplifier 3. Wire harness 4. Transponder key ECU assembly	EI-30
B2797	Communication Malfunction No. 1	1. Key 2. Wire harness 3. Transponder key amplifier 4. Transponder key ECU assembly	EI-33
B2798	Communication Malfunction No. 2	Key	EI-30

2. ECM DTC CHART

DTC No.	Detection Item	Trouble Area	See page
B2799/99	Engine Immobiliser System Malfunction	1. Wire harness 2. ECM	EI-36

NOTICE:
The DTCs for the immobiliser system are specified above. If other codes are output, check the DTCs chart for the engine control system.

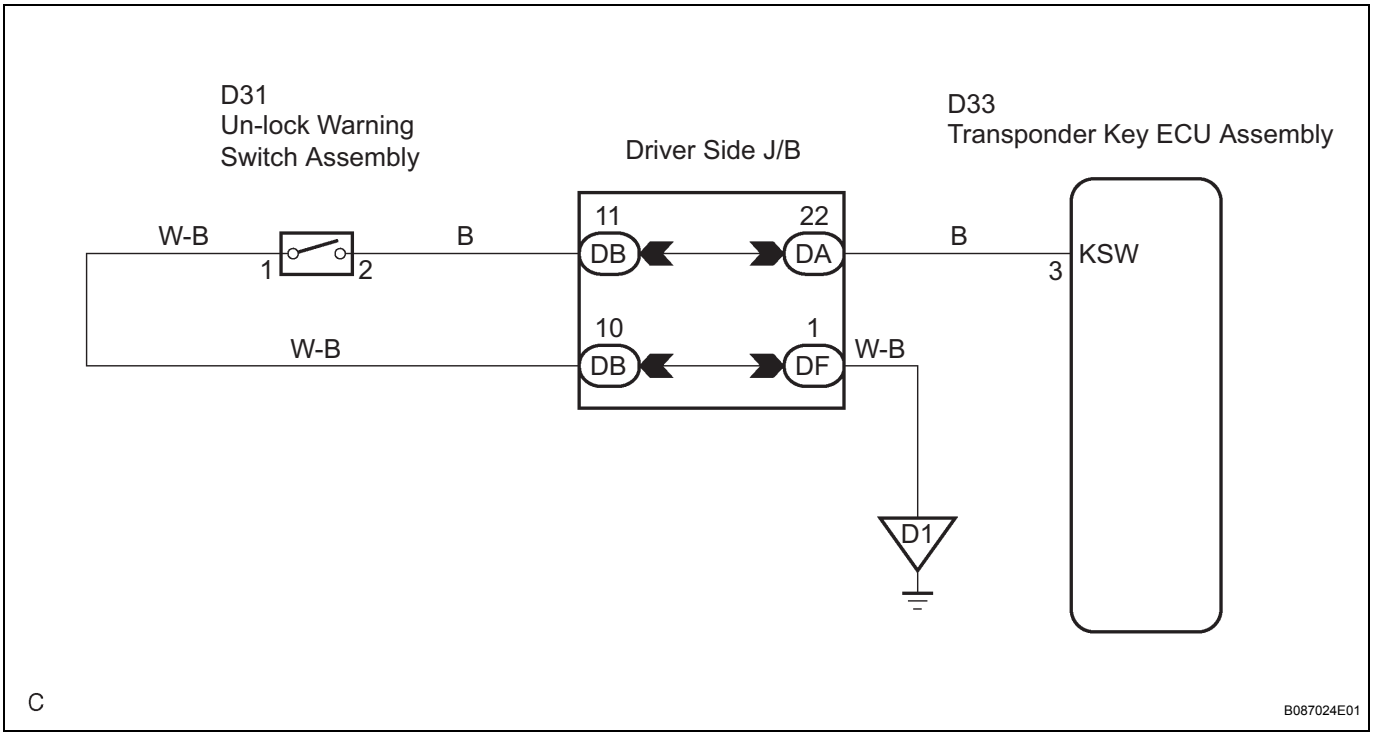
DTC	B2780	Push Switch / Key Unlock Warning Switch Malfunction

DESCRIPTION

This DTC will be output if the transponder key ECU assembly does not detect that the un-lock warning switch is ON even when the ignition switch is ON. Under normal conditions, the un-lock warning switch assembly is ON when the ignition switch is ON.

DTC No.	DTC Detection Condition	Trouble Area
B2780	Un-lock warning switch ON is not detected when ignition switch is ON	• Un-lock warning switch assembly • Wire harness • Transponder key ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF INTELLIGENT TESTER

(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 with a key that cannot start the engine.

(c) Read the DATA LIST according to the display on the tester.

Transponder key ECU:

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

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

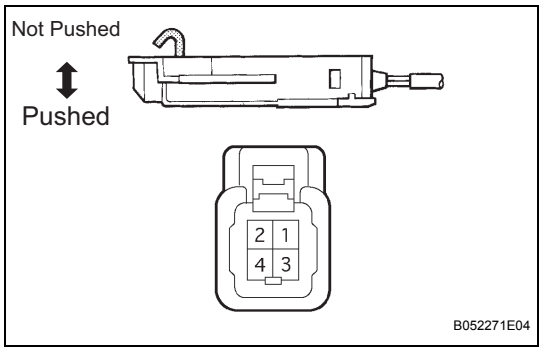
EI

NG → **Go to step 2**

OK →

REPLACE TRANSPONDER KEY ECU ASSEMBLY

2 INSPECT UN-LOCK WARNING SWITCH ASSEMBLY



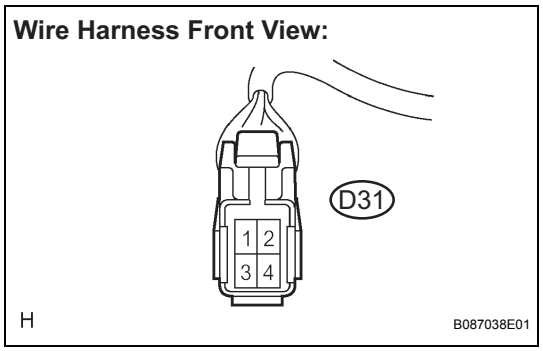
(a) Remove the un-lock warning switch assembly.
(b) Measure the resistance according to the value(s) in the table below.
Resistance

Tester Connection	Condition	Specified Condition
D31-1 - D31-2	Pushed	Below 1 Ω
D31-1 - D31-2	Not pushed	10 kΩ or higher

NG → **REPLACE UN-LOCK WARNING SWITCH ASSEMBLY**

OK →

3 CHECK HARNESS AND CONNECTOR (UN-LOCK WARNING SWITCH ASSEMBLY - BODY GROUND)



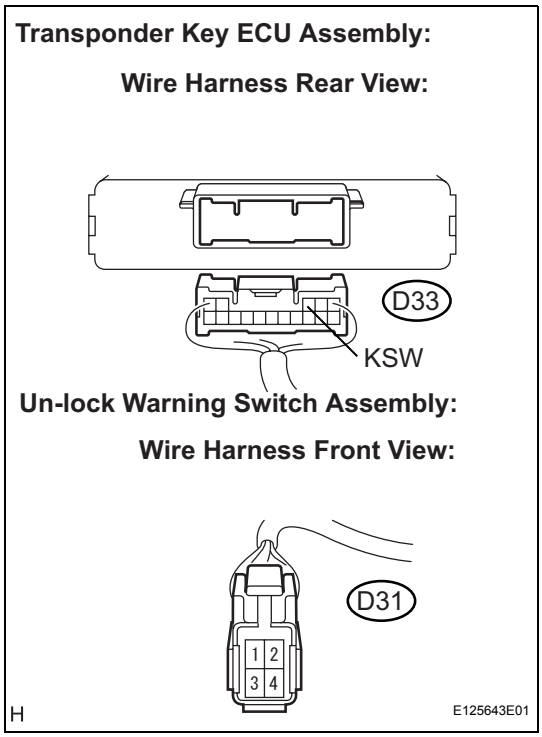
(a) Disconnect the D31 switch connector.
(b) Measure the resistance according to the value(s) in the table below.
Resistance

Tester Connection	Condition	Specified Condition
D31-1 - Body ground	Always	Below 1 Ω

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

OK →

4	CHECK HARNESS AND CONNECTOR (TRANSPONDER KEY ECU ASSEMBLY - UN-LOCK WARNING SWITCH)



(a) Disconnect the D33 ECU and D31 switch connectors.
(b) Measure the resistance according to the value(s) in the table below.

Resistance

Tester Connection	Condition	Specified Condition
D33-3 (KSW) - D31-2	Always	Below 1 Ω
D31-2 - Body ground	Always	10 kΩ or higher

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

OK

REPLACE TRANSPONDER KEY ECU ASSEMBLY

DTC	B2784	Antenna Coil Open / Short

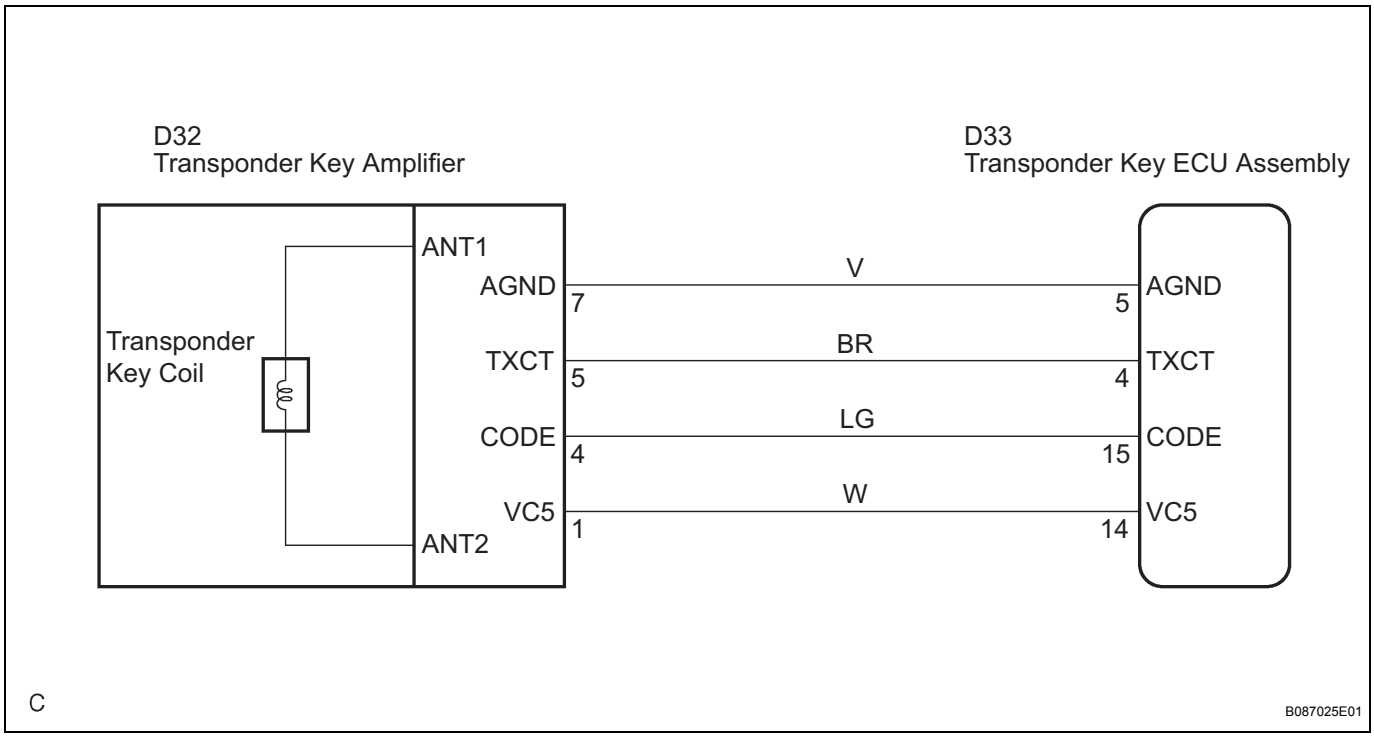
DESCRIPTION

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, then it is output to the transponder key ECU assembly.

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

EI

WIRING DIAGRAM



INSPECTION PROCEDURE

1	READ VALUE OF INTELLIGENT TESTER

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch ON with a key that does not start the engine.
(c) Select the item "ANTENNA COIL" 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 abnormal	-

OK:

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

NG → Go to step 2

OK

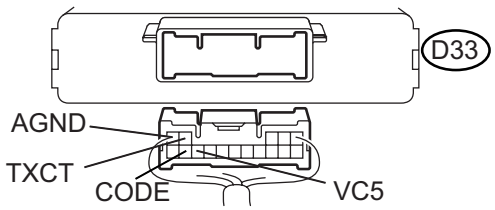
REPLACE TRANSPONDER KEY ECU ASSEMBLY

EI

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

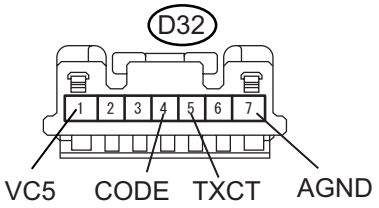
Transponder Key ECU Assembly:

Wire Harness Rear View:



Transpoder Key Amplifier:

Wire Harness Front View:



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(a) Disconnect the D33 ECU and D32 amplifier connectors.
(b) Measure the resistance according to the value(s) in the table below.

Resistance

Tester Connection	Condition	Specified Condition
D33-4 (TXCT) - D32-5 (TXCT)	Always	Below 1 Ω
D33-5 (AGND) - D32-7 (AGND)	Always	Below 1 Ω
D33-14 (VC5) - D32-1 (VC5)	Always	Below 1 Ω
D33-15 (CODE) - D32-4 (CODE)	Always	Below 1 Ω
D33-4 (TXCT) - Body ground	Always	10 kΩ or higher
D33-5 (AGND) - Body ground	Always	10 kΩ or higher
D33-14 (VC5) - Body ground	Always	10 kΩ or higher
D33-15 (CODE) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE TRANSPONDER KEY AMPLIFIER