Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002909J
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: THEFT DETERRENT / KEYLESS ENTRY: SMART KEY SYSTEM (for Start Function): TERMINALS OF ECU; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

TERMINALS OF ECU

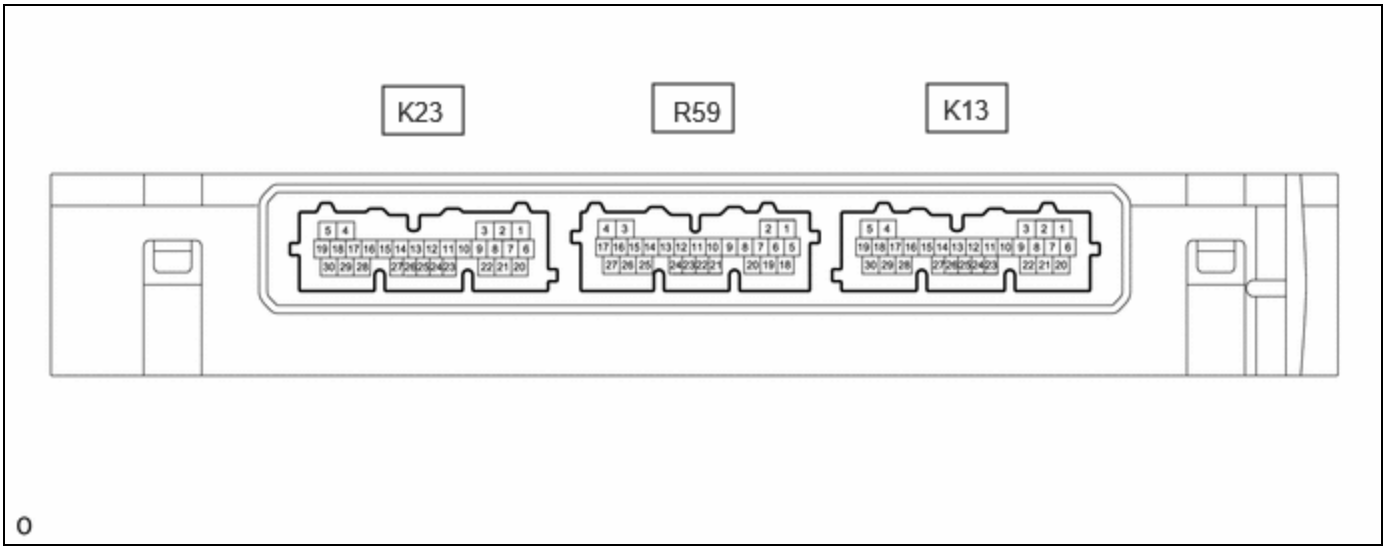
NOTICE:

- When performing an inspection, make sure that "ACC Customize" is set to "ON" using the multi-display.

  Click here INFO
- When "ACC Customize" is set to "ON" (ACC supply power enabled), the certification ECU (smart key ECU assembly) controls the ACC relay on and off. When "ACC Customize" is set to "OFF" (ACC supply power disabled), the certification ECU (smart key ECU assembly) and radio and display receiver assembly control the ACC relay on and off.

  Therefore, inspection conditions and results may differ depending on whether "ACC customize" is set to ON or OFF when inspecting ACC related terminals.

CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)



(a) Disconnect the K23 and K13 certification ECU (smart key ECU assembly) connectors.

(b) Measure the resistance and voltage according to the value(s) in the table below.

HINT:

Measure the values on the wire harness side with the connector disconnected.

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
K23-21 (STP1) - Body ground	Stop light switch signal	Brake pedal depressed → Brake pedal released	9 V or higher → 1 V or less	**Power Source Control** Stop Light Switch
K13-6 (+B) - K13-29 (E)	Power source	Ignition switch off	11 to 14 V	-
K13-14 (P) - K13-29 (E)	P position signal	Always	30 kΩ or higher	**Power Source Control**

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
				Shift P Signal Condition (Line)
K23-22 (CUTB) - Body ground	Dark current cut pin*	Ignition switch off	11 to 14 V	-
K13-29 (E) - Body ground	GND	Always	Below 1 Ω	-
K13-11 (SLP) - K13-29 (E)	GND	Always	Below 1 Ω	-
K13-23 (SSW3) - Body ground	SSW3 contact signal	Power switch pushed → Power switch not pushed	Below 15 Ω → 10 kΩ or higher	**Power Source Control** Push Start Switch 3
K13-27 (SSW2) - Body ground	SSW2 contact signal	Power switch pushed → Power switch not pushed	Below 15 Ω → 10 kΩ or higher	**Power Source Control** Push Start Switch 2
K13-19 (SSW1) - Body ground	SSW1 contact signal	Power switch pushed → Power switch not pushed	Below 15 Ω → 10 kΩ or higher	**Power Source Control** Push Start Switch 1

*: In order to prevent the vehicle auxiliary battery from being depleted when the vehicle is shipped long distances, a fuse that cuts unnecessary electrical load while the vehicle is being shipped is installed in the circuit. If the fuse is removed, the circuit becomes open. If the fuse that is between the vehicle auxiliary battery and terminal CUTB is removed and the circuit is open, the certification ECU (smart key ECU assembly) changes to a certain control mode (example: the transmission of radio waves every 0.25 seconds, which form the detection area, stops).

(c) Connect the K23 and K13 certification ECU (smart key ECU assembly) connectors.

(d) Measure the voltage and resistance, and check for pulses according to the value(s) in the table below.

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
K13-8 (LIN) - K13-29 (E)	LIN communication line	Ignition switch ON	Pulse generation	-
K13-14 (P) - K13-29 (E)	P position signal	Ignition switch ON and Shift position in P	Pulse generation (24 to 25 Hz or 30 to 31 Hz, High voltage: 9 V or more, Low voltage: below 1 V, duty ratio: 25 %)	**Power Source Control** Shift P Signal Condition (Line)
		Ignition switch ON and Shift position in N	Pulse generation (24 to 25 Hz or 30 to 31 Hz, High voltage: 9 V or	

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
			more, Low voltage: below 1 V, duty ratio: 55 %)	
		Ignition switch ON and Shift position in other then P or N	Pulse generation (24 to 25 Hz or 30 to 31 Hz, High voltage: 9 V or more, Low voltage: below 1 V, duty ratio: 40 %)	
K13-23 (SSW3) - K13-29 (E)	SSW3 contact signal	Power switch not pushed → Power switch pushed	9 V or higher → 1 V or less	**Power Source Control** Push Start Switch 3
K13-27 (SSW2) - K13-29 (E)	SSW2 contact signal	Power switch not pushed → Power switch pushed	9 V or higher → 1 V or less	**Power Source Control** Push Start Switch 2
K13-19 (SSW1) - K13-29 (E)	SSW1 contact signal	Power switch not pushed → Power switch pushed	9 V or higher → 1 V or less	**Power Source Control** Push Start Switch 1
K13-21 (ACCD) - K13-29 (E)	ACC signal	Ignition switch off → Ignition switch ACC	1 V or less → 8.5 V or higher	**Power Source Control** ACC Relay Monitor
K23-11 (IGRD) - K13-29 (E)	IG signal	Ignition switch off → Ignition switch ON	1 V or less → 9 V or higher	**Power Source Control** IGR Relay Circuit (Outside) Monitor
K23-24 (IGPD) - K13-29 (E)	IG signal	Ignition switch off → Ignition switch ON	1 V or less → 9 V or higher	**Power Source Control** IGP Relay Circuit (Outside) Monitor
K23-13 (SPD) - K13-29 (E)	Vehicle speed signal	Vehicle being driven at approx. 5 km/h (3 mph)	Pulse generation (See waveform 1)	**Power Source Control**

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
				Vehicle Running Condition (Line)
K23-2 (ST2) - K13-29 (E)	STSW signal	With the brake pedal depressed, the power switch is pressed and held → After approx. 3 sec. has elapsed, the power switch is released	8.5 V or higher → 1 V or less	-
K13-4 (CLG5) - K13-29 (E)	Output to No. 1 indoor electrical key antenna assembly (front floor)	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly not inside vehicle 3. Within 30 seconds of closing any door	Pulse generation (See waveform 2)	-
K13-5 (CG5B) - K13-29 (E)	Output to No. 1 indoor electrical key antenna assembly (front floor) (terminal on opposite side of component from CLG5 output terminal)	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly not inside vehicle 3. Within 30 seconds of closing any door	Pulse generation (See waveform 2)	-
R59-10 (CLG7) - K13-29 (E)	Output to No. 2 indoor electrical key antenna assembly (rear floor)	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly not inside vehicle 3. Within 30 seconds of closing any door	Pulse generation (See waveform 2)	-
R59-9 (CG7B) - K13-29 (E)	Output to No. 2 indoor electrical key antenna assembly (rear floor) (terminal on opposite side of component from CLG7 output terminal)	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly not inside vehicle 3. Within 30 seconds of closing any door	Pulse generation (See waveform 2)	-
K13-30 (AGND) - Body ground	Transponder key amplifier ground	Always	Below 1 Ω	-

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
K13-12 (ANT1) - K13-30 (AGND)	Signal input / output from transponder key coil (transponder key coil built into power switch)	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed	Pulse generation (Type A: See waveform 3, Type B: See waveform 5)	**Smart Key** Encrypt Code Difference
K13-13 (ANT2) - K13-30 (AGND)	Signal input / output from transponder key coil (transponder key coil built into power switch)	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed	Pulse generation (Type A: See waveform 4, Type B: See waveform 5)	
K13-25 (IND) - K13-29 (E)	Security indicator output	Ignition switch off → ON	Pulse generation → Below 2 V	-
R59-20 (WCSW) - K13-29 (E)*	Wireless charger system stop signal	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly inside vehicle 3. Ignition switch off → ACC or ON	Below 1 V → 4.5 to 6 V (For 1 second after ignition switch to ACC or ON)	-

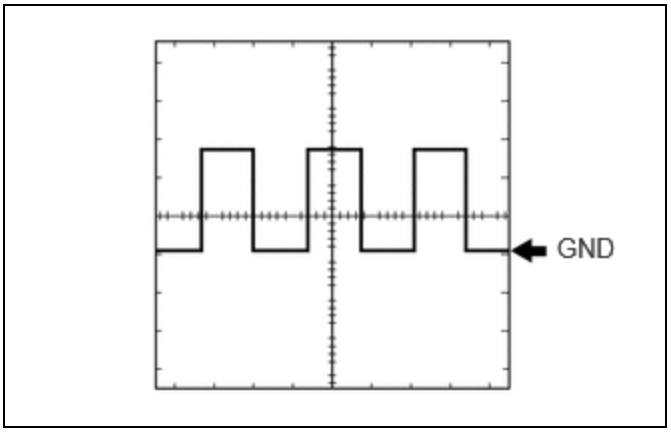
*: w/ Wireless Charging System

(e) Using an oscilloscope, check the waveform of the ECU.

NOTICE:

The oscilloscope waveform shown in the illustration is an example for reference only. Noise, chattering, etc. are not shown.

(1) Waveform 1



Measurement Condition

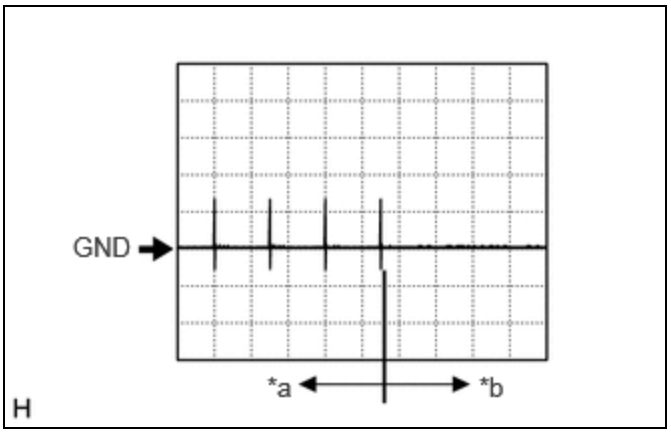
ITEM	CONTENT
Tester Connection	K23-13 (SPD) - K13-29 (E)
Tool Setting	5 V/DIV., 20 ms./DIV.
Condition	Vehicle being driven at approx. 5 km/h (3 mph)

HINT:

The wavelength becomes shorter as the vehicle speed increases.

(2) Waveform 2

Type A:

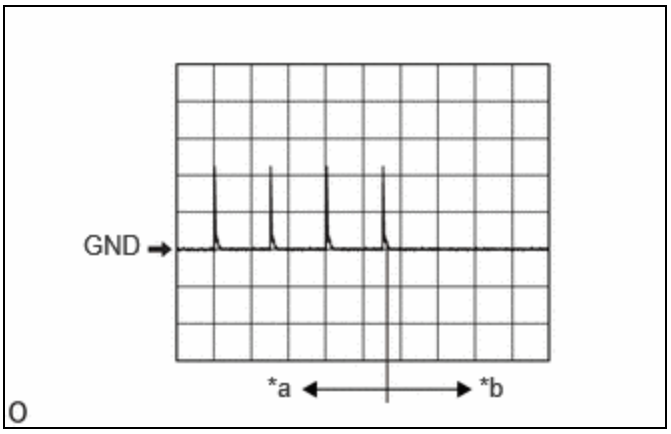


*a	For 30 seconds after any door closed
*b	After 30 seconds or more have elapsed since any door closed

Measurement Condition

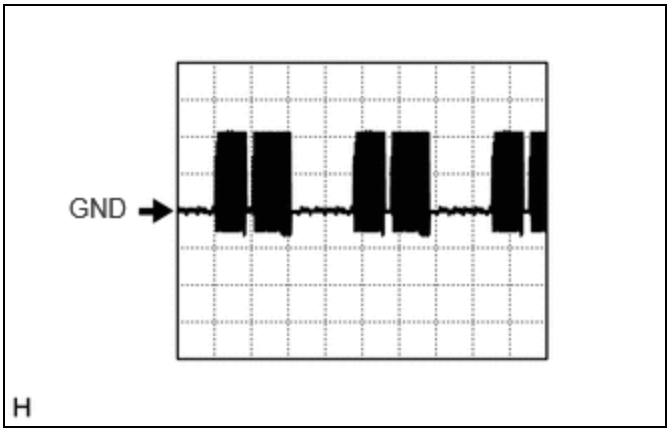
ITEM	CONTENT
Tester Connection	K13-4 (CLG5) - K13-29 (E) K13-5 (CG5B) - K13-29 (E) R59-10 (CLG7) - K13-29 (E) R59-9 (CG7B) - K13-29 (E)
Tool Setting	5 V/DIV., 500 ms/DIV.
Condition	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly not inside vehicle 3. Within 30 seconds of closing any door

Type B:



*a	For 30 seconds after any door closed
*b	After 30 seconds or more have elapsed since any door closed

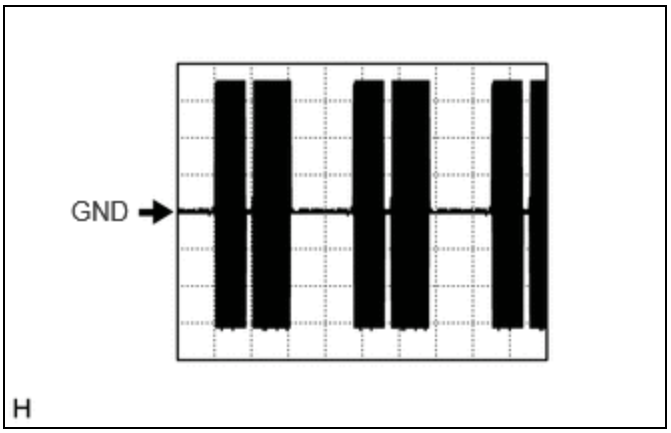
(3) Waveform 3 (Type A)



Measurement Condition

ITEM	CONTENT
Tester Connection	K13-12 (ANT1) - K13-30 (AGND)
Tool Setting	5 V/DIV., 200 ms./DIV.
Condition	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed

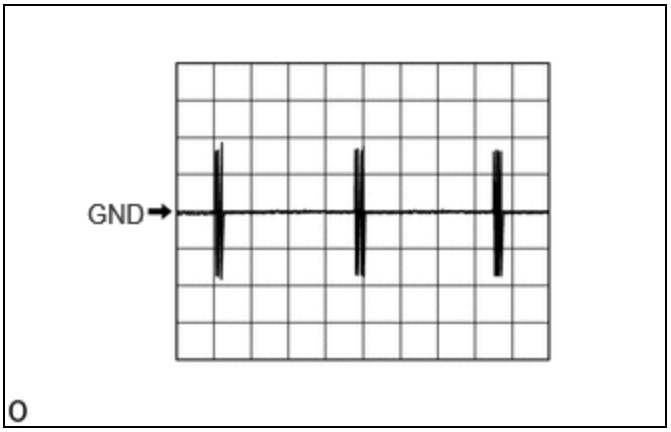
(4) Waveform 4 (Type A)



Measurement Condition

ITEM	CONTENT
Tester Connection	K13-13 (ANT2) - K13-30 (AGND)
Tool Setting	20 V/DIV., 200 ms./DIV.
Condition	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed

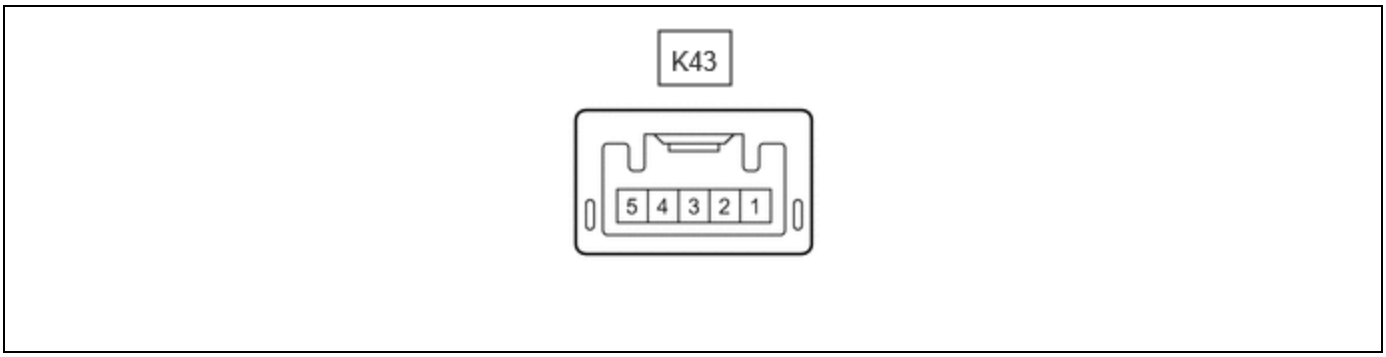
(5) Waveform 5 (Type B)



Measurement Condition

ITEM	CONTENT
Tester Connection	K13-13 (ANT2) - K13-30 (AGND)
Tool Setting	20 V/DIV., 200 ms./DIV.
Condition	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed

CHECK ID CODE BOX (IMMOBILISER CODE ECU)



(a) Disconnect the K43 ID code box (immobiliser code ECU) connector.

(b) Measure the voltage and resistance according to the value(s) in the table below.

HINT:

Measure the values on the wire harness side with the connector disconnected.

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
K43-1 (+B) - Body ground	Power source	Ignition switch off	11 to 14 V	-
K43-5 (GND) - Body ground	Ground	Always	Below 1 Ω	

(c) Connect the K43 ID code box (immobiliser code ECU) connector.

(d) Measure the voltage and check for pulses according to the value(s) in the table below.

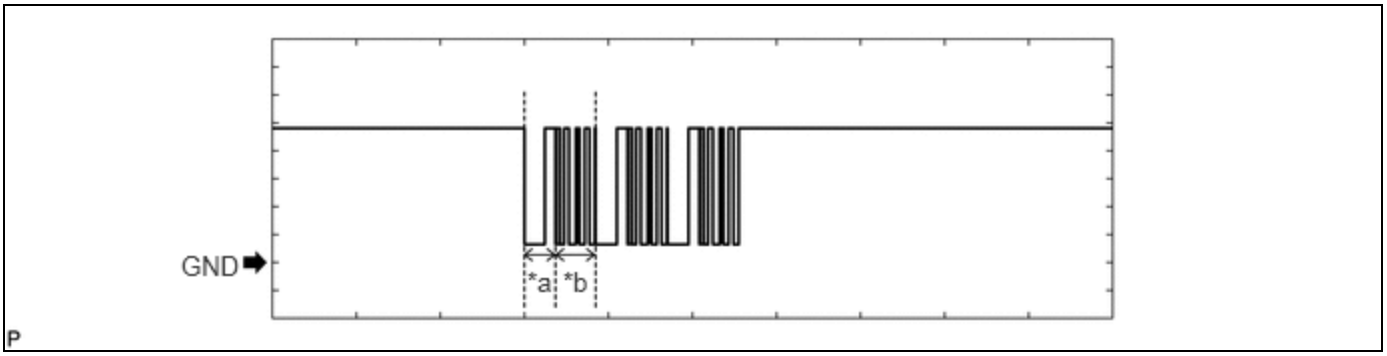
TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
K43-3 (EFII) - K43-5 (GND)	EFI communication input (Signal input from hybrid vehicle control ECU to ID code box (immobiliser code ECU))	Ignition switch off	11 to 14 V	**Smart Key** EFI Code Receive
K43-3 (EFII) - K43-5 (GND)	EFI communication input (Signal input from hybrid vehicle control ECU to ID code box (immobiliser code ECU))	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery	Pulse generation (See waveform 1)	
K43-4 (EFIO) - K43-5 (GND)	EFI communication output (Signal output from ID code box (immobiliser code ECU) to hybrid vehicle control ECU)	Ignition switch off	Below 1 V	
K43-4 (EFIO) - K43-5 (GND)	EFI communication output (Signal output from ID code box (immobiliser code ECU) to hybrid vehicle control ECU)	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery	Pulse generation (See waveform 2)	
K43-2 (LIN1) - K43-5 (GND)	LIN communication line	Ignition switch ON	Pulse generation	-

(e) Using an oscilloscope, check the waveform.

NOTICE:

The waveform shown in the illustration is an example for reference only. Noise, chattering, etc. are not shown.

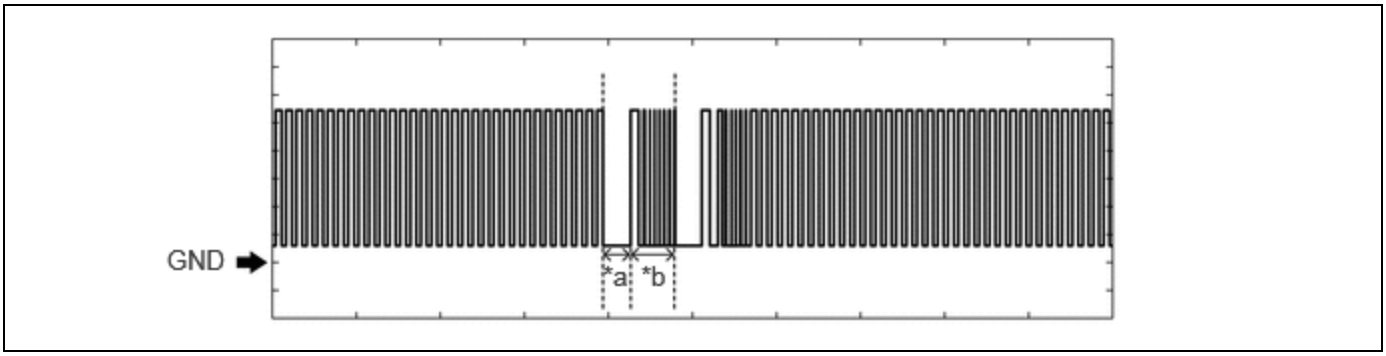
(1) Waveform 1



*a	Approximately 160 ms.	*b	Approximately 270 ms.

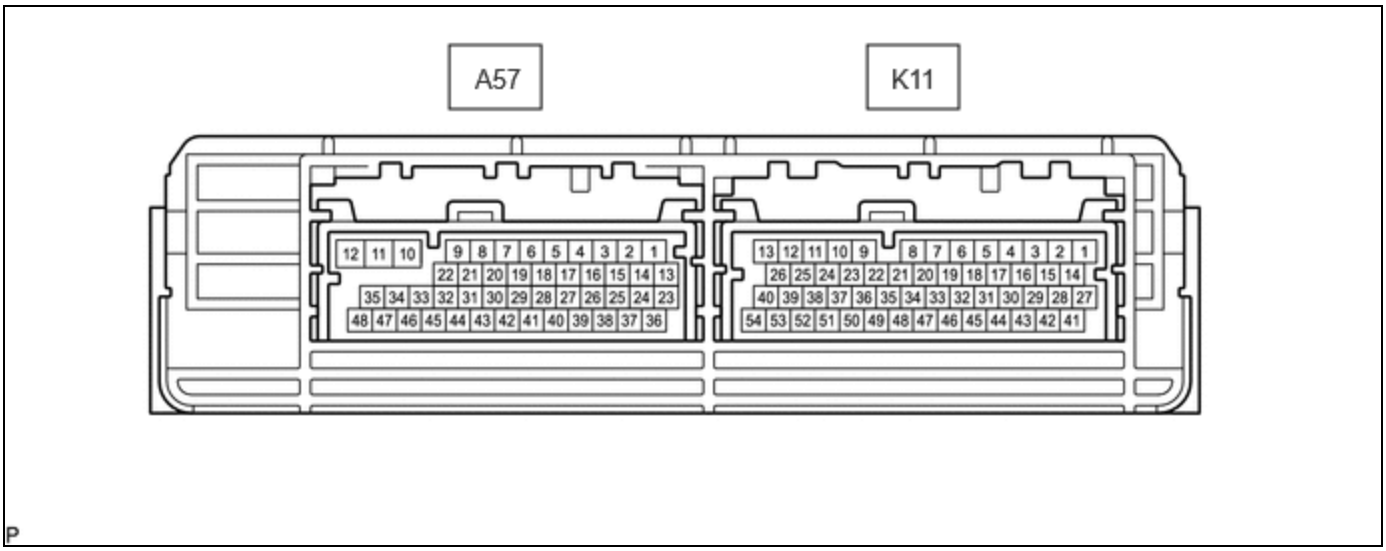
ITEM	CONTENT
Tester Connection	K43-3 (EFII) - K43-5 (GND)
Tool Setting	2 V/DIV., 500 ms./DIV.
Condition	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery

(2) Waveform 2



*a	Approximately 160 ms.	*b	Approximately 270 ms.

ITEM	CONTENT
Tester Connection	K43-4 (EFIO) - K43-5 (GND)
Tool Setting	2 V/DIV., 500 ms./DIV.
Condition	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery



CHECK HYBRID VEHICLE CONTROL ECU

(a) Measure the voltage and resistance, and check for pulses according to the value(s) in the table below.

TERMINAL NO. (SYMBOL)	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
K11-26 (IGP) - K11-1 (E1)	Ignition power supply	Ignition switch ON	11 to 14 V	-
A57-8 (IGR) - K11-1 (E1)	Ignition power supply	Ignition switch ON	11 to 14 V	-

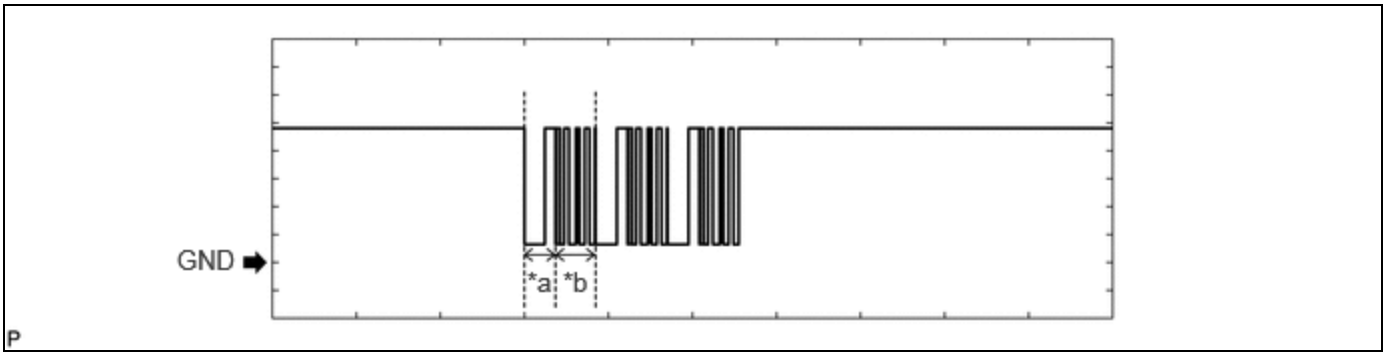
TERMINAL NO. (SYMBOL)	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
K11-1 (E1) - Body ground	Ground	Always	Below 1 Ω	-
K11-39 (IMO) - K11-1 (E1)	EFI communication output (Signal output from hybrid vehicle control ECU to ID code box (immobiliser code ECU))	Ignition switch off	11 to 14 V	• EFI Code Receive • Start Request
K11-39 (IMO) - K11-1 (E1)	EFI communication output (Signal output from hybrid vehicle control ECU to ID code box (immobiliser code ECU))	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery	Pulse generation (See waveform 1)	
K11-53 (IMI) - K11-1 (E1)	EFI communication input (Signal input from ID code box (immobiliser code ECU) to hybrid vehicle control ECU)	Ignition switch off	11 to 14 V → 1 V or less	
K11-53 (IMI) - K11-1 (E1)	EFI communication input (Signal input from ID code box (immobiliser code ECU) to hybrid vehicle control ECU)	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery	Pulse generation (See waveform 2)	
K11-11 (ST2) - K11-1 (E1)	Hybrid control system start request signal	With the brake pedal depressed, the power switch is pressed and held → After approx. 3 sec. has elapsed, the power switch is released	8.5 V or higher → 1.0 V or less	-

(b) Using an oscilloscope, check the waveform.

NOTICE:

The waveform shown in the illustration is an example for reference only. Noise, chattering, etc. are not shown.

(1) Waveform 1 (Reference)

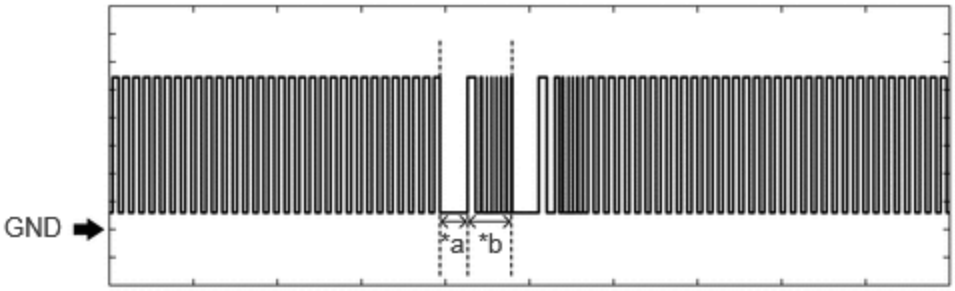


*a	Approximately 160 ms.	*b	Approximately 270 ms.

Measurement Condition

ITEM	CONTENT
Tester Connection	K11-39 (IMO) - K11-1 (E1)
Tool Setting	2 V/DIV., 500 ms./DIV.
Condition	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery

(2) Waveform 2 (Reference)



*a	Approximately 160 ms.	*b	Approximately 270 ms.

Measurement Condition

ITEM	CONTENT
Tester Connection	K11-53 (IMI) - K11-1 (E1)
Tool Setting	2 V/DIV., 500 ms./DIV.
Condition	Within 3 seconds of hybrid control system start or within 3 seconds of ignition switch turned to ON after cable disconnected and reconnected to auxiliary battery

CHECK POWER SWITCH

H

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

TERMINAL NO. (SYMBOL)	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
K66-3 (GND) - Body ground	Transponder key amplifier ground	Always	Below 1 Ω	-

(b) Measure the voltage and check for pulses according to the value(s) in the table below.

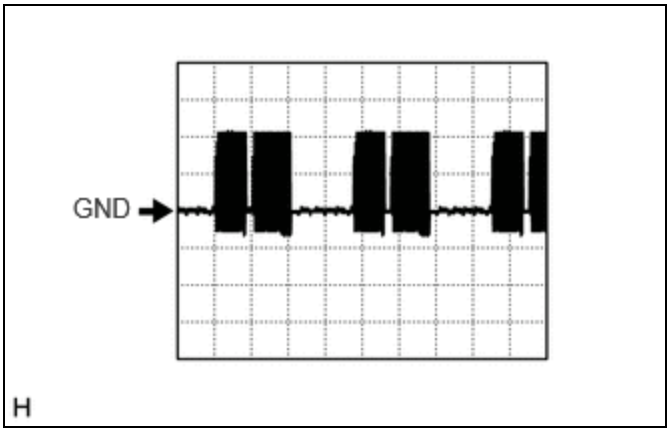
TERMINAL NO. (SYMBOL)	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM/DTC
K66-1 (ANT1) - K66-3 (GND)	Signal input / output from transponder key coil (transponder key coil built into power switch)	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed	Pulse generation (Type A: See waveform 1, Type B: See waveform 3)	**Smart Key** • BCC Malfunction • Abnormal Status • Encrypt Code Difference • Different Serial Number • Frame Error • No Response **HINT:** If immobiliser key code verification communication is not performed correctly, the malfunction may be indicated by one or more of the Data List items listed above
K66-7 (ANT2) - K66-3 (GND)	Signal input / output from transponder key coil (transponder key coil built into power switch)	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed	Pulse generation (Type A: See waveform 2, Type B: See waveform 3)	
K66-11 (SS3) - K66-3 (GND)	SS3 contact signal **HINT:** Backup for SS1. Behaves the same way as SS1.	Power switch not pushed → Power switch pushed	9 V or higher → Below 1 V	Power Source Control • Push Start Switch 3
K66-6 (SS2) - K66-3 (GND)	SS2 contact signal **HINT:** Backup for SS1. Behaves the same way as SS1.	Power switch not pushed → Power switch pushed	9 V or higher → Below 1 V	Power Source Control • Push Start Switch 2
K66-12 (SS1) - K66-3 (GND)	SS1 contact signal	Power switch not pushed → Power switch pushed	9 V or higher → Below 1 V	Power Source Control • Push Start Switch 1

(c) Using an oscilloscope, check the waveform.

NOTICE:

The waveform shown in the illustration is an example for reference only. Noise, chattering, etc. are not shown.

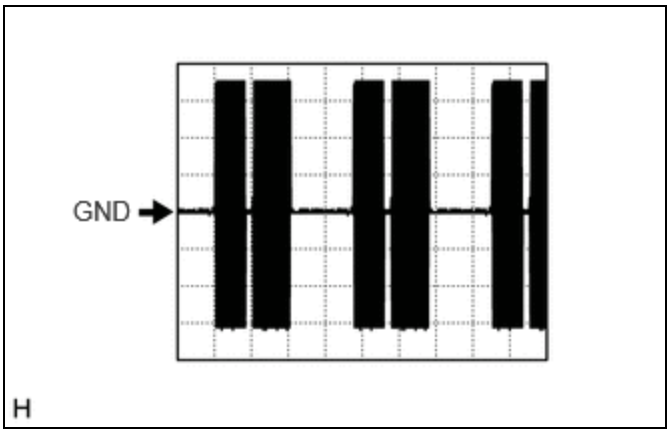
(1) Waveform 1 (Reference) (Type A)



Measurement Condition

ITEM	CONTENT
Tester Connection	K66-1 (ANT1) - K66-3 (GND)
Tool Setting	5 V/DIV., 200 ms./DIV.
Condition	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed

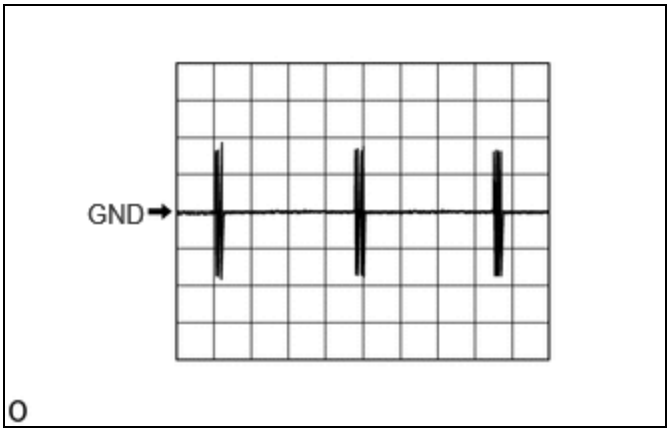
(2) Waveform 2 (Reference) (Type A)



Measurement Condition

ITEM	CONTENT
Tester Connection	K66-7 (ANT2) - K66-3 (GND)
Tool Setting	20 V/DIV., 200 ms./DIV.
Condition	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed

(3) Waveform 3 (Reference) (Type B)



Measurement Condition

ITEM	CONTENT
Tester Connection	K66-1 (ANT1) - K66-3 (GND) K66-7 (ANT2) - K66-3 (GND)
Tool Setting	20 V/DIV., 200 ms./DIV.
Condition	Ignition switch off, electrical key transmitter sub-assembly not in cabin, within 30 seconds of power switch pressed

SMART KEY SYSTEM (for Entry Function)

Click here INFO