Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002908G
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: THEFT DETERRENT / KEYLESS ENTRY: SMART KEY SYSTEM (for Entry Function): TERMINALS OF ECU; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

TERMINALS OF ECU

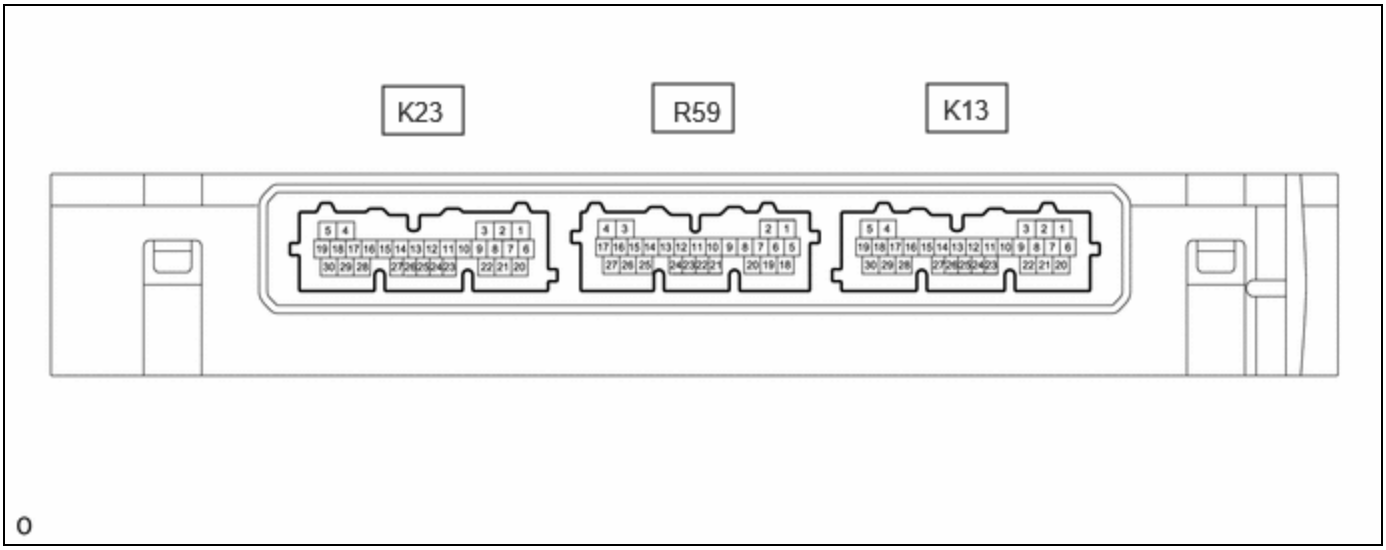
NOTICE:

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

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
K13-29 (E) - Body ground	Ground	Always	Below 1 Ω	-
K13-6 (+B) - K13-29 (E)	Power supply	Ignition switch off	11 to 14 V	-
K23-22 (CUTB) - K13-29 (E)	Dark current cut pin*	Ignition switch off	11 to 14 V	-

*: 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 check for pulses according to the value (s) in the table below.

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
K23-24 (IGPD) - K13-29 (E)	IG power supply	Ignition switch off → ON	Below 1 V → 9 V or higher	**Power source control** IGP Relay Circuit (Outside) Monitor
K23-11 (IGRD) - K13-29 (E)	IG power supply	Ignition switch off → ON	Below 1 V → 9 V or higher	**Power source control** IGR Relay Circuit (Outside) Monitor
K13-21 (ACCD) - K13-29 (E)	ACC power supply	Ignition switch off → ACC	Below 1 V → 8.5 V or higher	**Power source control** ACC Relay Monitor
K13-16 (CLG1) - K13-29 (E)	Output to driver door electrical key antenna (request signal (challenge) is sent to door electrical key antenna from certification ECU (smart key ECU assembly) to form detection area)	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought inside detection area*1)	Pulse generation (See waveform 1)	-
		Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle	Pulse generation (See waveform 2)	-

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
		4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*1)		
K13-16 (CLG1) - K13-29 (E)	Input to driver door lock sensor (front door outside handle assembly (for driver door) lock sensor on signal is sent to the certification ECU (smart key ECU assembly))	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*1) 5. Driver door lock sensor touched	Pulse generation (See waveform 3)	**Smart Key** Driver Side Lock Sensor
K13-16 (CLG1) - K13-29 (E)	Input to driver door unlock sensor (when system is in unlock standby mode and unlock sensor is touched, door electrical key antenna sends unlock sensor input signal (sensing) to certification ECU (smart key ECU assembly))	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors locked 4. Electrical key transmitter sub-assembly not near the vehicle 5. Driver door unlock sensor touched	Pulse generation (See waveform 4)	**Smart Key** Driver Side Unlock Sensor
K13-15 (CG1B) - K13-29 (E)	Output to driver door electrical key antenna (terminal on opposite side of component from CLG1 output terminal)	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless	Pulse generation (See waveform 5)	-

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
		operation (electrical key transmitter sub-assembly brought inside detection area*1)		
		Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*1)	Pulse generation (See waveform 6)	-
K13-10 (CLG2) - K13-29 (E)*2	Output to front passenger door electrical key antenna (request signal (challenge) is sent to door electrical key antenna from certification ECU (smart key ECU assembly) to form detection area)	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought inside detection area*1)	Pulse generation (See waveform 1)	-
		Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-	Pulse generation (See waveform 2)	-

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
		assembly brought outside detection area*1)		
K13-10 (CLG2) - K13-29 (E)*2	Input to front passenger door lock sensor (front door outside handle assembly (for front passenger door) lock sensor on signal is sent to the certification ECU (smart key ECU assembly))	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*1) 5. Front passenger door lock sensor touched	Pulse generation (See waveform 3)	**Smart Key** Passenger Side Lock Sensor
K13-10 (CLG2) - K13-29 (E)*2	Input to front passenger door unlock sensor (when system is in unlock standby mode and unlock sensor is touched, door electrical key antenna sends unlock sensor input signal (sensing) to certification ECU (smart key ECU assembly))	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors locked 4. Electrical key transmitter sub-assembly not near the vehicle 5. Front passenger door unlock sensor touched	Pulse generation (See waveform 4)	**Smart Key** Passenger Side Unlock Sensor
K13-9 (CG2B) - K13-29 (E)*2	Output to front passenger door electrical key antenna (terminal on opposite side of component from CLG2 output terminal)	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought	Pulse generation (See waveform 5)	-

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
		inside detection area*1)		
		Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*1)	Pulse generation (See waveform 6)	-
R59-4 (CLG8) - K13-29 (E)*2	Output to electrical key antenna (outside luggage compartment)	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. Back door opener switch assembly off → on	Pulse generation (See waveform 7)	-
R59-3 (CG8B) - K13-29 (E)*2	Output to electrical key antenna (outside luggage compartment) (terminal on opposite side of component from CLG8 output terminal)	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. Back door opener switch assembly off → on	Pulse generation (See waveform 8)	-
R59-16 (TSW5) - K13-29 (E)	Back door opener switch assembly (open switch) signal input	Back door opener switch assembly (open switch) off → on	Pulse generation (See waveform 9)	**Smart Key** Trunk Lid/Back Door Unlock Switch
R59-17 (TSW6) - K13-29 (E)*2	Back door opener switch assembly (lock switch) signal input	Back door opener switch assembly (lock switch) off → on	Pulse generation	**Smart Key**

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
			(See waveform 9)	Trunk Lid/Back Door Lock Switch
R59-21 (RCO) - K13-29 (E)	Output to electrical key and tire pressure monitoring system receiver assembly (Power supply for electrical key and tire pressure monitoring system receiver assembly. Certification ECU (smart key ECU assembly) outputs 5 V when receiver starts operating.)	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside detection area but kept inside wireless function operational area 3. Lock or unlock switch of electrical key transmitter sub-assembly not pressed → pressed	Pulse generation (See waveform 10)	-
R59-11 (RDAM) - K13-29 (E)	Electrical key and tire pressure monitoring system receiver assembly verifies data received from electrical key transmitter sub-assembly. Electrical key and tire pressure monitoring system receiver assembly sends data from electrical key transmitter sub-assembly to certification ECU (smart key ECU assembly) (Electrical key and tire pressure monitoring system receiver assembly intermittently grounds 12 V signal from certification ECU (smart key ECU assembly)).	Proceed: 1. Ignition switch off 2. All doors locked 3. Electrical key transmitter sub-assembly not inside vehicle 4. Electrical key transmitter sub-assembly brought outside detection area but kept inside wireless function operational area 5. Lock or unlock switch of electrical key transmitter sub-assembly not pressed → pressed	Pulse generation (See waveform 11)	-
R59-12 (CSEL) - K13-29 (E)	Communication channel switching circuit	Procedure: 1. Ignition switch off 2. All doors closed	Below 1 V → Pulse generation	-

*1: For details about the entry function detection area, refer to Operation Check.

Click here INFO

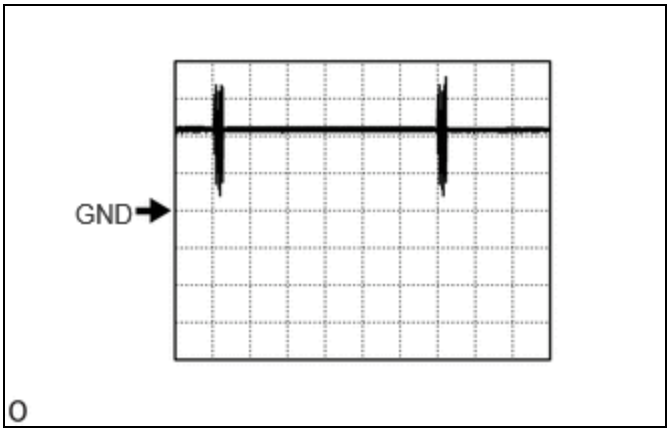
*2: w/ Front Passenger Door Entry Function

(e) Using an oscilloscope, check waveform 1.

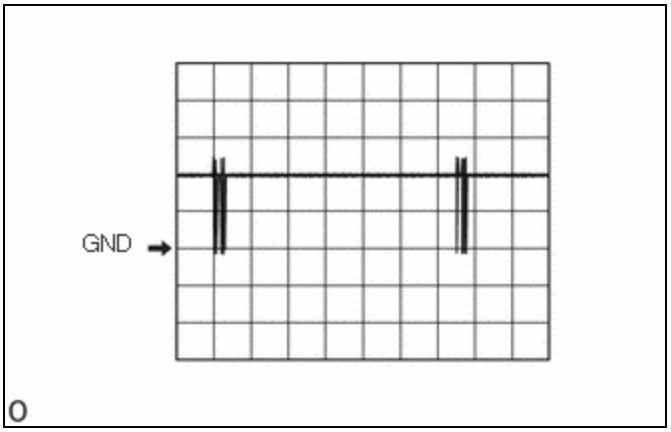
NOTICE:

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

Type A:



Type B:



Waveform 1 (Reference)

ITEM	CONTENT
Tester Connection	K13-16 (CLG1) - K13-29 (E) K13-10 (CLG2) - K13-29 (E)*1
Tool Setting	5 V/DIV., 500 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought inside detection area*2)

*1: w/ Front Passenger Door Entry Function

*2: For details about the entry function detection area, refer to Operation Check.

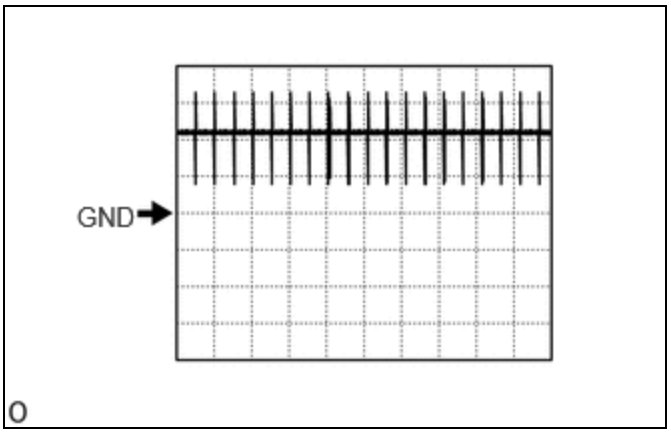
Click here INFO

(f) Using an oscilloscope, check waveform 2.

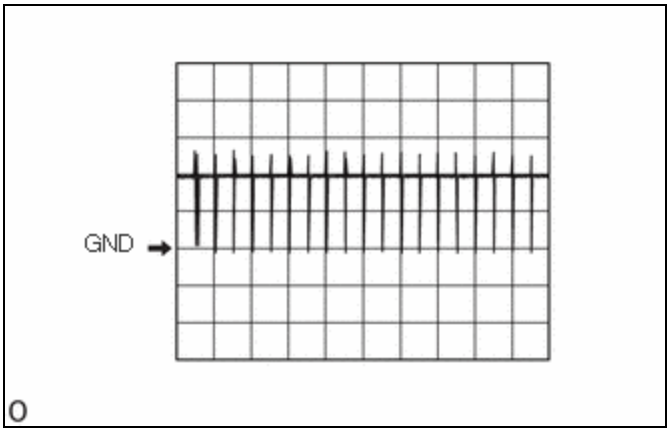
NOTICE:

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

Type A:



Type B:



Waveform 2 (Reference)

ITEM	CONTENT
Tester Connection	K13-16 (CLG1) - K13-29 (E) K13-10 (CLG2) - K13-29 (E)*1
Tool Setting	5 V/DIV., 500 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*2)

*1: w/ Front Passenger Door Entry Function

*2: For details about the entry function detection area, refer to Operation Check.

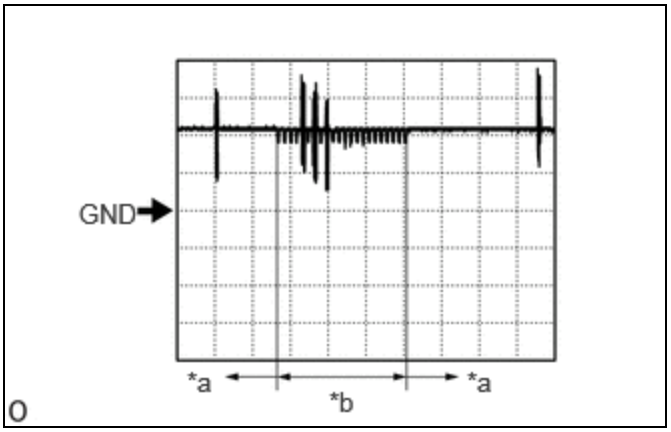
Click here INFO

(g) Using an oscilloscope, check waveform 3.

NOTICE:

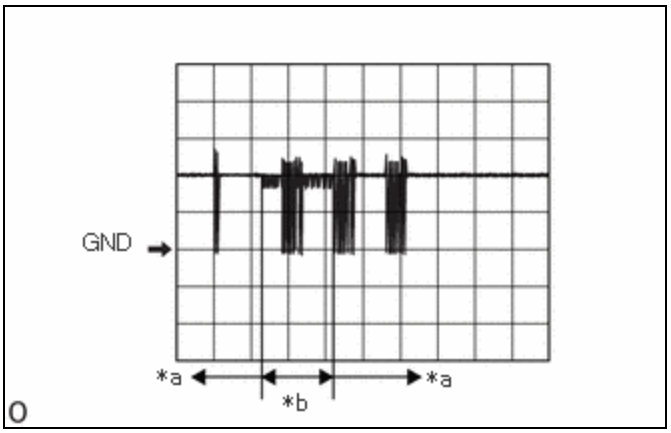
The oscilloscope waveform shown in the illustration is an example for reference only. Noise, chattering, etc. are not shown.

Type A:



*a	Lock sensor not touched
*b	Lock sensor touched

Type B:



*a	Lock sensor not touched
*b	Lock sensor touched

Waveform 3 (Reference)

ITEM	CONTENT
Tester Connection	K13-16 (CLG1) - K13-29 (E)
Tool Setting	5 V/DIV., 100 ms./DIV.
Condition	Procedure:

ITEM	CONTENT
	1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*1) 5. Driver door lock sensor not touched → touched

ITEM	CONTENT
Tester Connection	K13-10 (CLG2) - K13-29 (E)*2
Tool Setting	5 V/DIV., 100 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*1) 5. Front passenger door lock sensor not touched → touched

*1: For details about the entry function detection area, refer to Operation Check.

Click here INFO

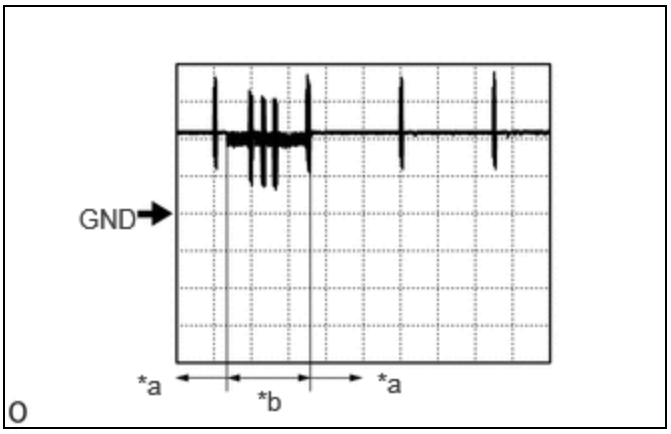
*2: w/ Front Passenger Door Entry Function

(h) Using an oscilloscope, check waveform 4.

NOTICE:

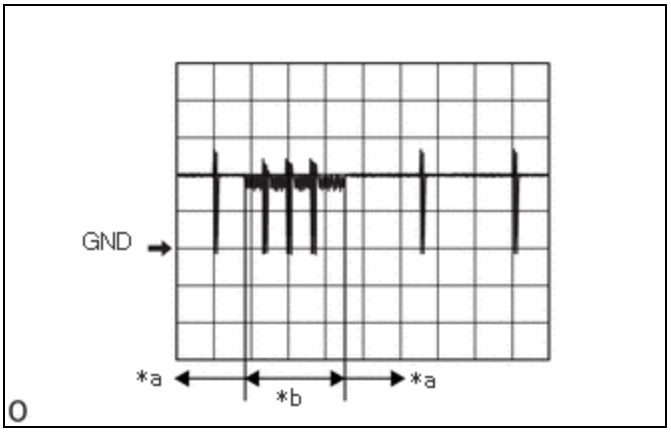
The oscilloscope waveform shown in the illustration is an example for reference only. Noise, chattering, etc. are not shown.

Type A:



*a	Unlock sensor not touched
*b	Unlock sensor touched

Type B:



*a	Unlock sensor not touched
*b	Unlock sensor touched

Waveform 4 (Reference)

ITEM	CONTENT
Tester Connection	K13-16 (CLG1) - K13-29 (E)
Tool Setting	5 V/DIV., 100 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors locked 4. Electrical key transmitter sub-assembly not near the vehicle 5. Driver door unlock sensor not touched → touched

ITEM	CONTENT
Tester Connection	K13-10 (CLG2) - K13-29 (E)*
Tool Setting	5 V/DIV., 100 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors locked 4. Electrical key transmitter sub-assembly not near the vehicle 5. Front passenger door unlock sensor not touched → touched

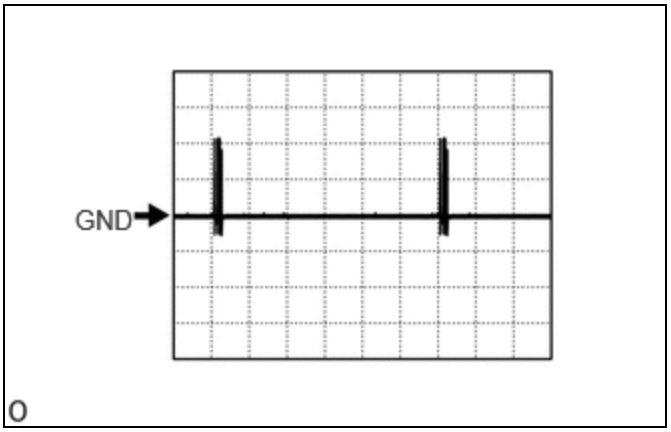
*: w/ Front Passenger Door Entry Function

(i) Using an oscilloscope, check waveform 5.

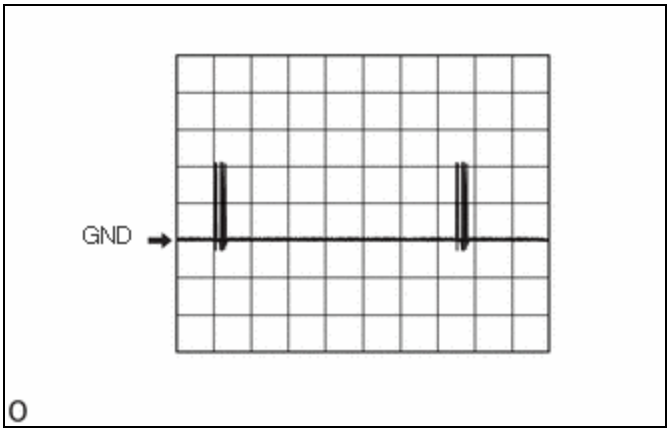
NOTICE:

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

Type A:



Type B:



Waveform 5 (Reference)

ITEM	CONTENT
Tester Connection	K13-15 (CG1B) - K13-29 (E) K13-9 (CG2B) - K13-29 (E)*1
Tool Setting	5 V/DIV., 500 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought inside detection area*2)

*1: w/ Front Passenger Door Entry Function

*2: For details about the entry function detection area, refer to Operation Check.

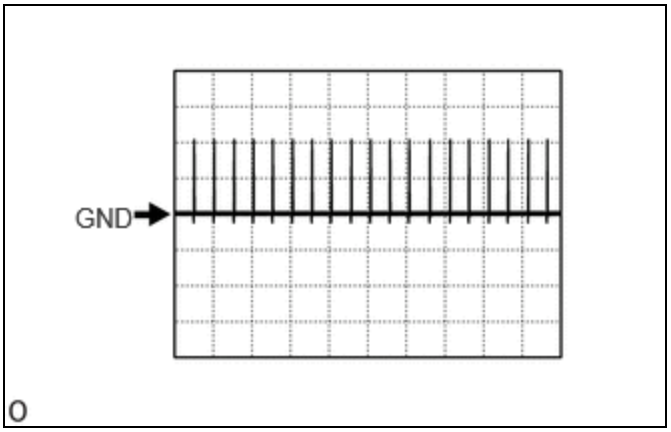
Click here INFO

(j) Using an oscilloscope, check waveform 6.

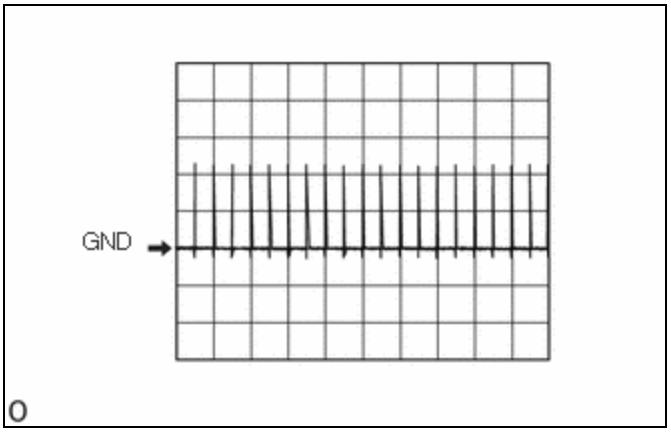
NOTICE:

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

Type A:



Type B:



Waveform 6 (Reference)

ITEM	CONTENT
Tester Connection	K13-15 (CG1B) - K13-29 (E) K13-9 (CG2B) - K13-29 (E)*1
Tool Setting	5 V/DIV., 500 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. All doors closed 3. Electrical key transmitter sub-assembly not inside vehicle 4. All doors locked through wireless operation (electrical key transmitter sub-assembly brought outside detection area*2)

*1: w/ Front Passenger Door Entry Function

*2: For details about the entry function detection area, refer to Operation Check.

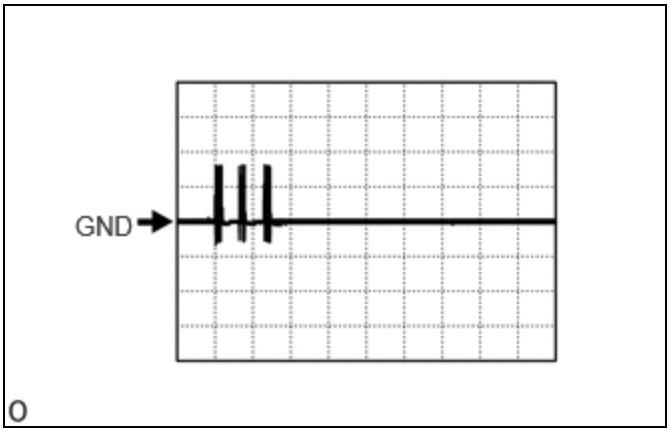
Click here INFO

(k) Using an oscilloscope, check waveform 7. (w/ Front Passenger Door Entry Function)

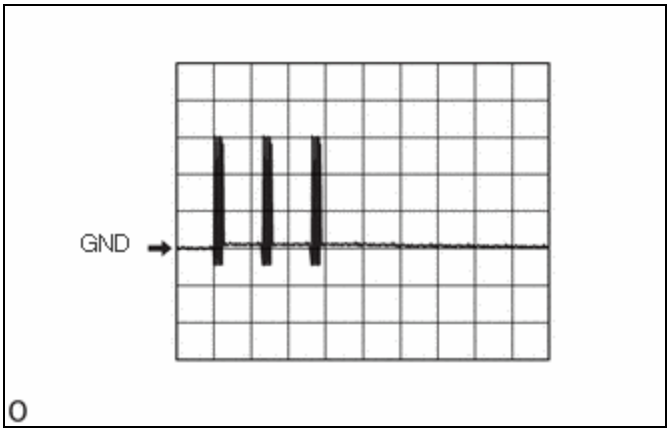
NOTICE:

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

Type A:



Type B:



Waveform 7 (Reference)

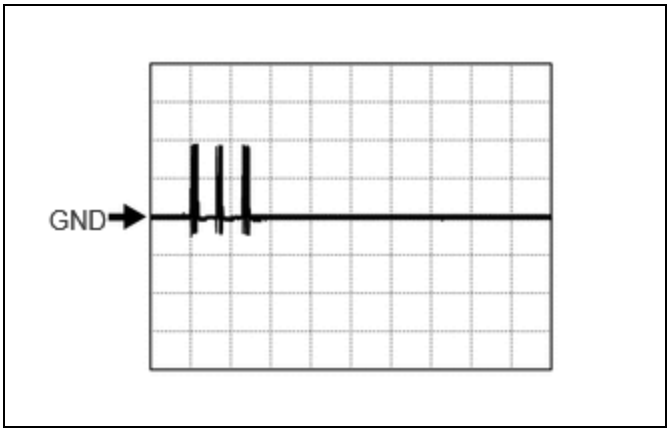
ITEM	CONTENT
Tester Connection	R59-4 (CLG8) - K13-29 (E)
Tool Setting	5 V/DIV., 50 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. Back door opener switch assembly off → on

(l) Using an oscilloscope, check waveform 8. (w/ Front Passenger Door Entry Function)

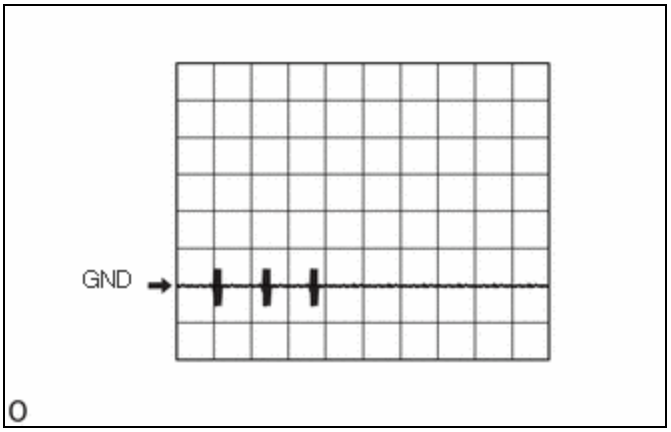
NOTICE:

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

Type A:



Type B:



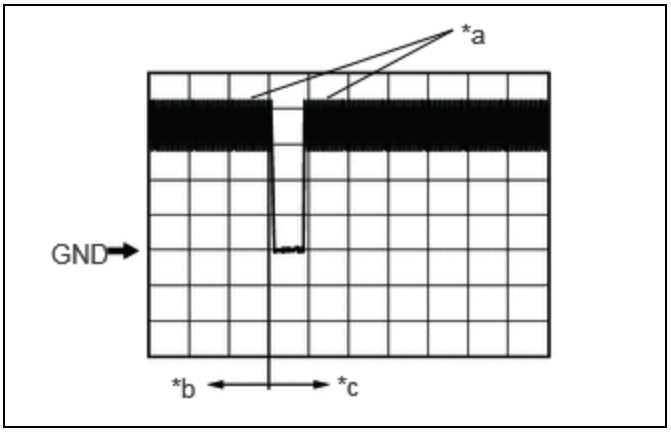
Waveform 8 (Reference)

ITEM	CONTENT
Tester Connection	R59-3 (CG8B) - K13-29 (E)
Tool Setting	5 V/DIV., 50 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside vehicle 3. All doors closed 4. Back door opener switch assembly off → on

(m) Using an oscilloscope, check waveform 9.

NOTICE:

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



*a	Checking for switch on signal at short intervals
*b	Before back door opener switch assembly pressed
*c	After back door opener switch assembly pressed

Waveform 9 (Reference)

ITEM	CONTENT
Tester Connection	R59-16 (TSW5) - K13-29 (E)
Tool Setting	2 V/DIV., 500 ms./DIV.
Condition	Back door opener switch assembly (open switch) off → on

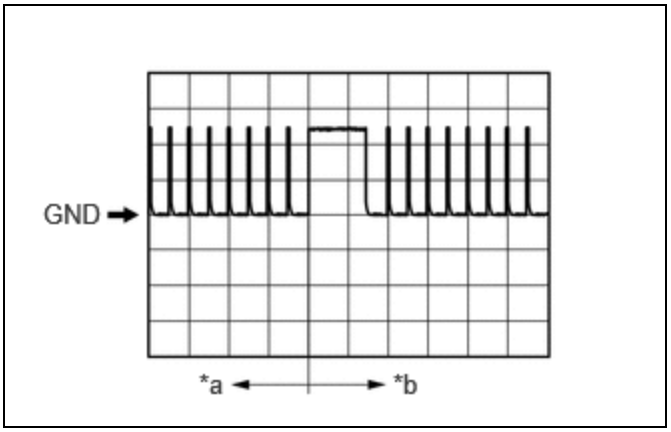
ITEM	CONTENT
Tester Connection	R59-17 (TSW6) - K13-29 (E)*
Tool Setting	2 V/DIV., 500 ms./DIV.
Condition	Back door opener switch assembly (lock switch) off → on

*: w/ Front Passenger Door Entry Function

(n) Using an oscilloscope, check waveform 10.

NOTICE:

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



*a	Before lock or unlock switch of electrical key transmitter sub-assembly pressed
*b	After lock or unlock switch of electrical key transmitter sub-assembly pressed

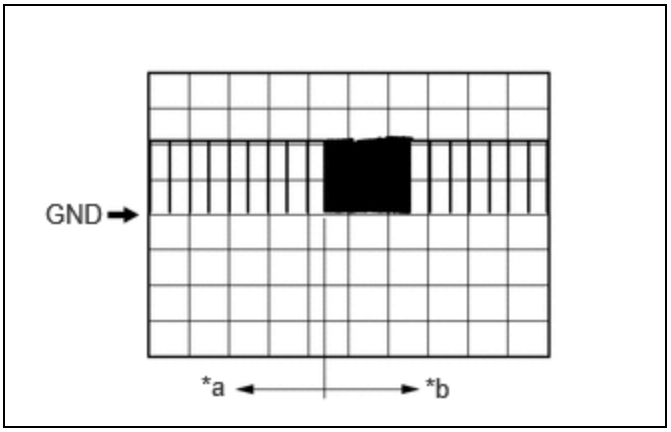
Waveform 10 (Reference)

ITEM	CONTENT
Tester Connection	R59-21 (RCO) - K13-29 (E)
Tool Setting	2 V/DIV., 500 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. Electrical key transmitter sub-assembly brought outside detection area but kept inside wireless function operational area 3. Lock or unlock switch of electrical key transmitter sub-assembly not pressed → pressed

(o) Using an oscilloscope, check waveform 11.

NOTICE:

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

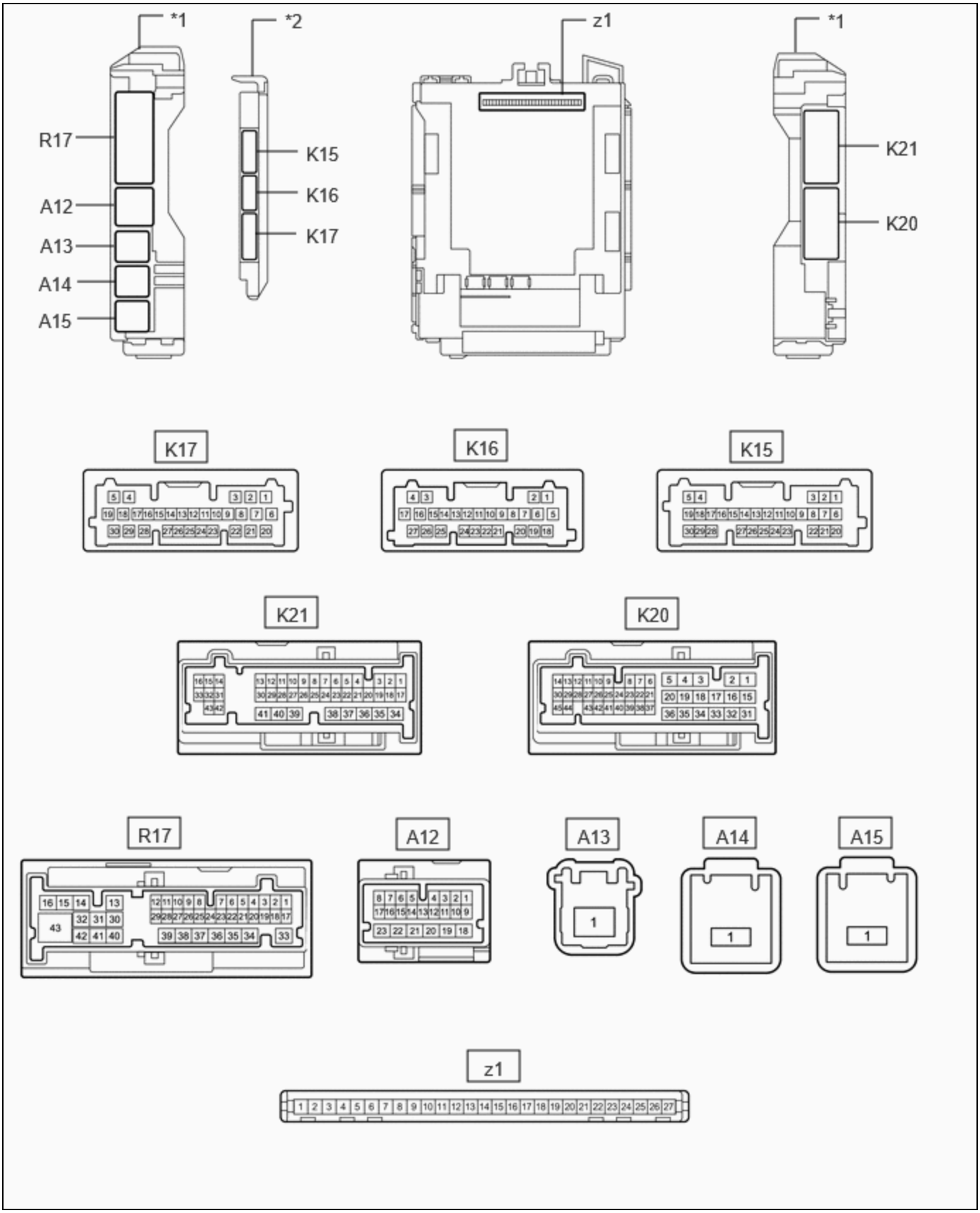


*a	Before lock or unlock switch of electrical key transmitter sub-assembly pressed

*b	After lock or unlock switch of electrical key transmitter sub-assembly pressed

Waveform 11 (Reference)

ITEM	CONTENT
Tester Connection	R59-11 (RDAM) - K13-29 (E)
Tool Setting	5 V/DIV., 500 ms./DIV.
Condition	Procedure: 1. Ignition switch off 2. All doors locked 3. Electrical key transmitter sub-assembly not inside vehicle 4. Electrical key transmitter sub-assembly brought outside detection area but kept inside wireless function operational area 5. Lock or unlock switch of electrical key transmitter sub-assembly not pressed → pressed



*1	Power Distribution Box Assembly	*2	Main Body ECU (Multiplex Network Body ECU)

CHECK POWER DISTRIBUTION BOX ASSEMBLY AND MAIN BODY ECU (MULTIPLEX NETWORK BODY ECU)

(a) Remove the main body ECU (multiplex network body ECU) from the power distribution box assembly.

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

TESTER CONNECTION	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
z1-13 (GND1) - Body ground	Ground	Always	Below 1 Ω
z1-26 (BECU) - Body ground	Auxiliary battery power supply (for CPU)	Ignition switch off	11 to 14 V

SMART KEY SYSTEM (for Start Function)

Click here INFO

POWER DOOR LOCK SYSTEM

Click here INFO

WIRELESS DOOR LOCK CONTROL SYSTEM

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POWER BACK DOOR SYSTEM (w/ Power Back Door System)

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