Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM1000000029H14
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: METER / GAUGE / DISPLAY: METER / GAUGE SYSTEM: Speed Signal Circuit; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

Speed Signal Circuit

DESCRIPTION

SPEED SIGNAL CIRCUIT CONTROL

(a) The wheel speed sensors produce an output that varies according to the vehicle speed.

(b) The wheel speed sensor output is received by the No. 2 skid control ECU (brake actuator assembly) which uses this information to create the vehicle speed signal.

(c) The vehicle speed signal is output from the No. 2 skid control ECU (brake actuator assembly) to the certification ECU (smart key ECU assembly) and then to the combination meter assembly.

(d) To create this signal, 12 V is output from terminal SI of the combination meter assembly to the certification ECU (smart key ECU assembly).

(e) The pulse signal is created by switching the transistor in the certification ECU (smart key ECU assembly) on and off, making the voltage on the wire drop to 0 V.

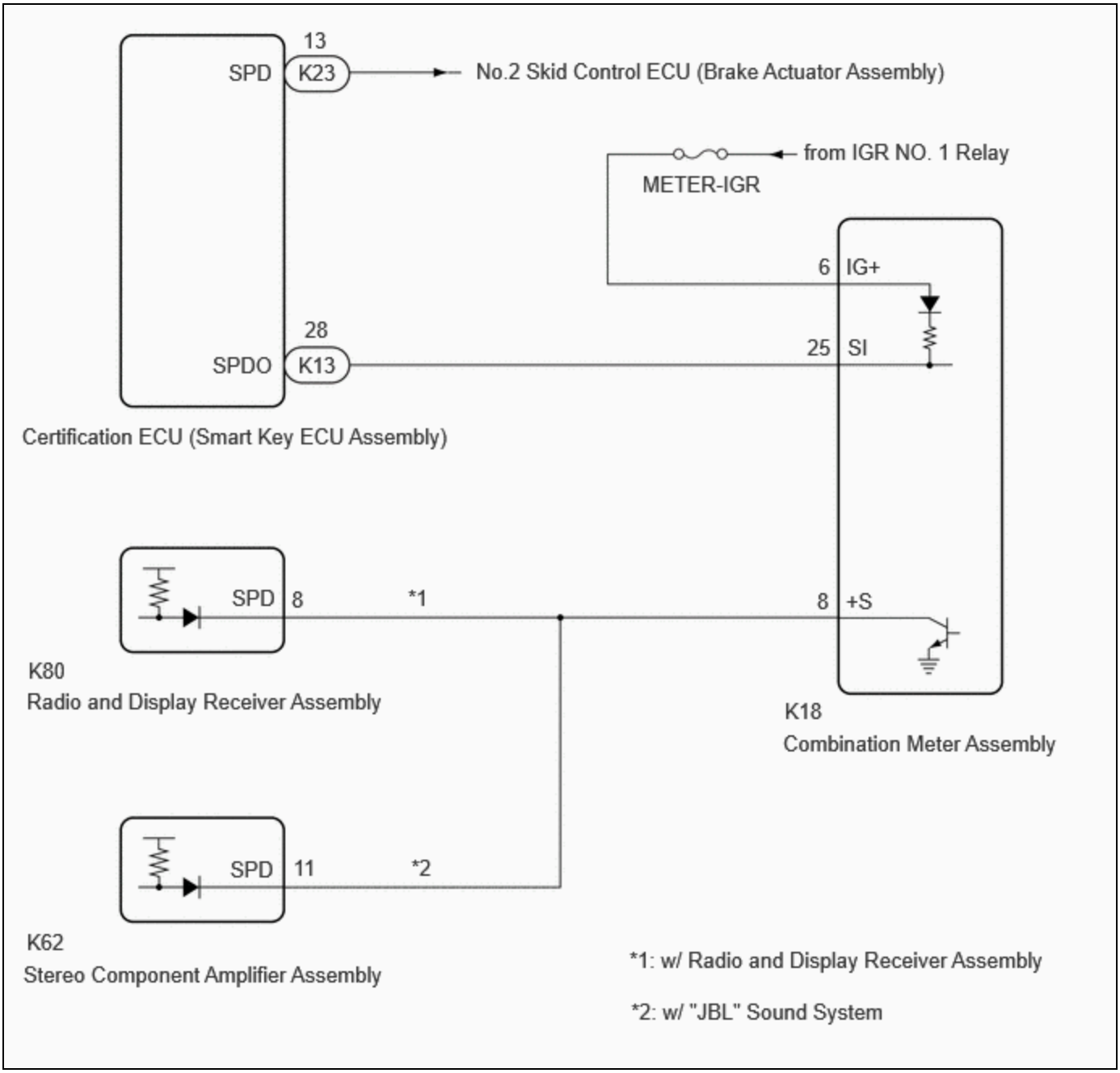
(f) A similar system is used for the output of this signal from the combination meter assembly via terminal +S.

(g) A voltage of 12 V or 5 V is applied to terminal +S from each ECU or relay that is connected to this terminal.

(h) The transistor in the combination meter assembly is controlled by the signal from the certification ECU (smart key ECU assembly). When this transistor is turned on, this transistor makes the voltage supplied by the various ECUs (via their respective internal resistors) drop to 0 V.

(i) Each ECU connected to terminal +S of the combination meter assembly controls its respective system based on this pulse signal.

WIRING DIAGRAM



CAUTION / NOTICE / HINT

NOTICE:

- When replacing the combination meter assembly, always replace it with a new one. If a combination meter assembly which was installed to another vehicle is used, the information stored in it will not match the information from the vehicle and a DTC may be stored.
- When replacing any of the following ECUs, update the ECU security key.

  Click here INFO

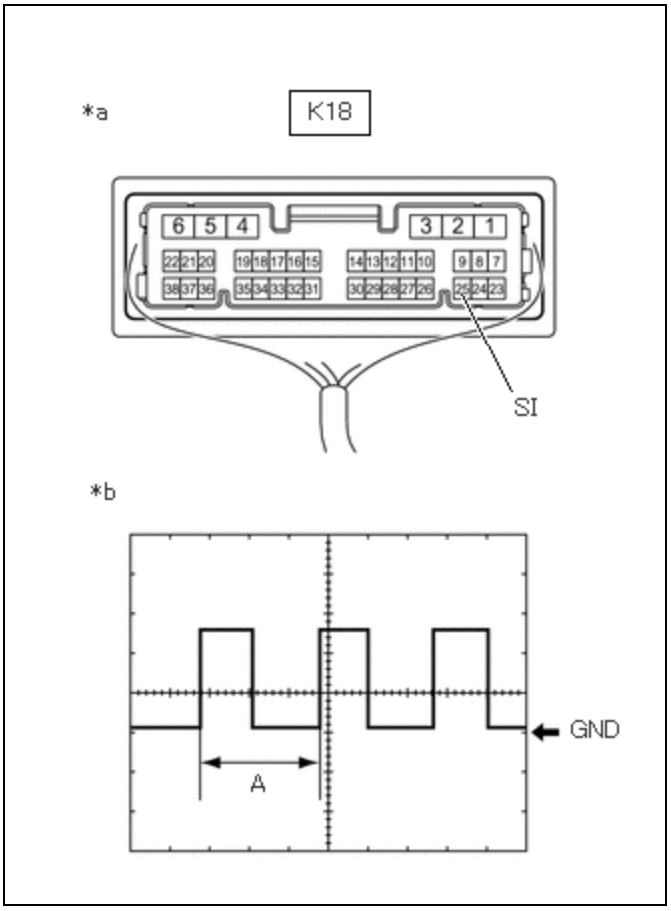
  - Combination meter assembly
  - Certification ECU (smart key ECU assembly)
- When the electronically controlled brake system is malfunctioning, a correct vehicle speed signal may not be received. Before preforming this procedure, confirm that the electronically controlled brake system is not malfunctioning.

  Click here INFO
- Before replacing any of the following ECUs, refer to Service Bulletin.

- Certification ECU (smart key ECU assembly)

PROCEDURE

1.	**INSPECT COMBINATION METER ASSEMBLY (INPUT WAVEFORM)**



*a	Component with harness connected (Combination Meter Assembly)
*b	Input Waveform

(a) Check the signal waveform according to the condition(s) in the table below.

ITEM	CONDITION
Tester connection	K18-25 (SI) - Body ground
Tool setting	5 V/DIV., 20 ms./DIV.
Condition	Ignition switch ON, wheel being rotated

NOTICE:

Perform the inspection from the back of the connector with the connector connected.

HINT:

When the system is functioning normally, one wheel revolution generates 4 pulses. As the vehicle speed increases, the width indicated by (A) in the illustration narrows.

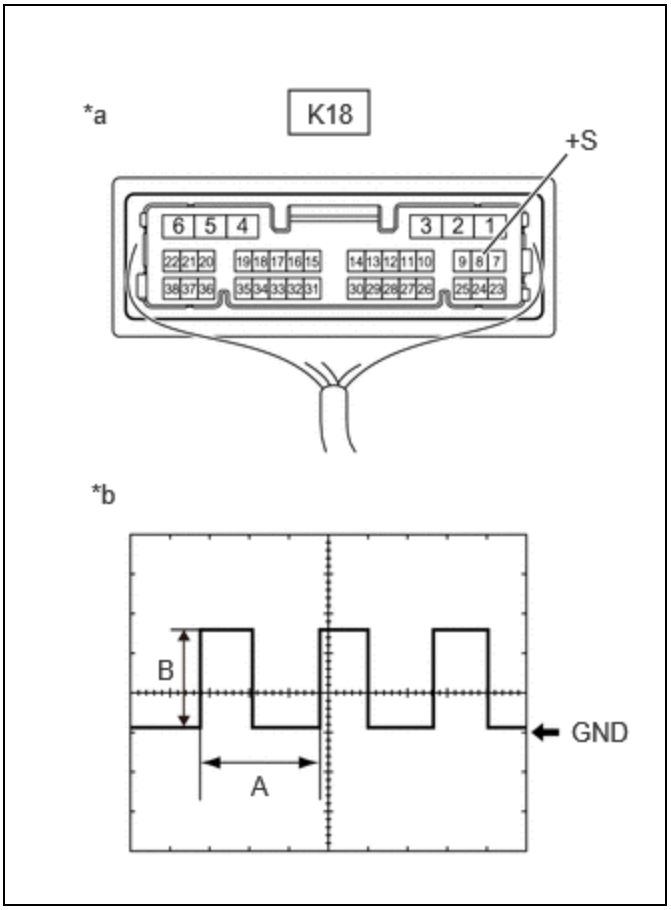
Result	PROCEED TO
The measured waveform is similar to that in the illustration	A
The measured waveform is not similar to that in the illustration (Stuck low)	B
The measured waveform is not similar to that in the illustration (Stuck high)	C

B ▶ **GO TO STEP 6**

C ▶ **GO TO STEP 9**

A

2.	**INSPECT COMBINATION METER ASSEMBLY (OUTPUT WAVEFORM)**



*a	Component with harness connected (Combination Meter Assembly)

*b	Output Waveform

(a) Check the signal waveform according to the condition(s) in the table below.

ITEM	CONDITION
Tester connection	K18-8 (+S) - Body ground
Tool setting	5 V/DIV., 20 ms./DIV.
Condition	Ignition switch ON, wheel being rotated

NOTICE:

Perform the inspection from the back of the connector with the connector connected.

HINT:

- When the system is functioning normally, one wheel revolution generates 4 pulses. As the vehicle speed increases, the width indicated by (A) in the illustration narrows.
- The waveform (B) changes depending on the connected ECUs.

Result	PROCEED TO
The measured waveform is similar to that in the illustration	A
The measured waveform is not similar to that in the illustration (Stuck low)	B
The measured waveform is not similar to that in the illustration (Stuck high)	C

B ▶ **GO TO STEP 4**

C ▶ **REPLACE COMBINATION METER ASSEMBLY**

A ▼

3.	**CHECK HARNESS AND CONNECTOR (EACH ECU - COMBINATION METER ASSEMBLY)**

(a) Disconnect the K80*1 radio and display receiver assembly connector.

(b) Disconnect the K62*2 stereo component amplifier assembly connector.

(c) Disconnect the K18 combination meter assembly connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(K80,K18,K62)
Click Connector(K80)
Click Connector(K18)
Click Connector(K62)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
K80-8 (SPD) - K18-8 (+S)*1	Always	Below 1 Ω
K62-11 (SPD) - K18-8 (+S)*2	Always	Below 1 Ω

*1: w/ Radio and Display Receiver Assembly
*2: w/ "JBL" Sound System

OK ▶ **CHECK THE VOLTAGE AT TERMINAL SPD OF EACH ECU**

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

4.	**INSPECT EACH ECU (INTERNAL SHORT)**

(a) Disconnect one of the connectors below.

NOTICE:

After disconnecting a connector, perform all steps with all other devices connected.

CONNECTOR	ECU
K80*1	Radio and display receiver assembly
K62*2	Stereo component amplifier assembly

*1: w/ Radio and Display Receiver Assembly
*2: w/ "JBL" Sound System

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

NOTICE:

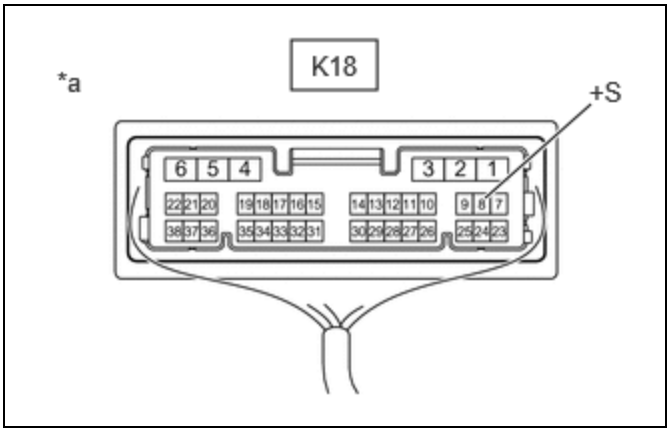
- Make sure to perform this inspection with the wheels stopped.
- Perform the inspection from the back of the connector with the connector connected.

Standard Voltage:

EWD INFO

Click Location & Routing(K18)
Click Connector(K18)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
K18-8 (+S) - Body ground	Ignition switch ON	4.5 to 14 V



*a	Component with harness connected (Combination Meter Assembly)

(c) Repeat steps (a) and (b) for each connected ECU.

HINT:

If the waveform changes to the waveform shown in the illustration after disconnecting a connector, an internal short in the disconnected ECU is suspected.

Result	PROCEED TO
After performing the inspection procedure for all connectors, the voltage did not change to the specified voltage	A
When disconnecting the connector of the radio and display receiver assembly, the voltage changed to the specified voltage (w/ Radio and Display Receiver Assembly)	B
When disconnecting the connector of the stereo component amplifier assembly, the voltage changed to the specified voltage (w/ "JBL" Sound System)	C

B ▶ **REPLACE RADIO AND DISPLAY RECEIVER ASSEMBLY**

C ▶ **REPLACE STEREO COMPONENT AMPLIFIER ASSEMBLY**

Click here INFO

A ▼

5.	**CHECK HARNESS AND CONNECTOR (EACH ECU - COMBINATION METER ASSEMBLY)**

(a) Disconnect the K80*1 radio and display receiver assembly connector.

(b) Disconnect the K62*2 stereo component amplifier assembly connector.

(c) Disconnect the K18 combination meter assembly connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(K80,K62,K18)
Click Connector(K80)
Click Connector(K62)
Click Connector(K18)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
K80-8 (SPD)*1 or K62-11 (SPD)*2 - K18-8 (+S)	Always	Below 1 Ω
K80-8 (SPD)*1, K62-11 (SPD)*2 or K18-8 (+S) - Body ground	Always	10 kΩ or higher

*1: w/ Radio and Display Receiver Assembly
*2: w/ "JBL" Sound System

OK ▶ **REPLACE COMBINATION METER ASSEMBLY**

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

6.	**CHECK FOR DTC (SMART ACCESS SYSTEM WITH PUSH-BUTTON START (FOR START FUNCTION))**

(a) Check if smart access system with push-button start (for start function) DTCs are output.

Body Electrical > Power Source Control > Trouble Codes

RESULT	PROCEED TO
DTCs are not output	A
DTCs are output	B

B ▶ **GO TO SMART ACCESS SYSTEM WITH PUSH-BUTTON START (FOR START FUNCTION)**

Click here INFO

A

7.	**INSPECT COMBINATION METER ASSEMBLY**

HINT:

This procedure is performed to check the diode inside the combination meter assembly.

(a) Remove the combination meter assembly.

Click here INFO

(b) Measure the internal resistance of the combination meter assembly.

Standard Resistance:

EWD INFO

Click Location & Routing(K18)
Click Connector(K18)

TESTER CONNECTION	TESTER CONNECTION	CONDITION	MEASURED VALUE
K18-6 (IG+) - K18-25 (SI)	• Positive (+) tester probe → K18-6 (IG+) • Negative (-) tester probe → K18-25 (SI)	Always	A
K18-6 (IG+) - K18-25 (SI)	• Positive (+) tester probe → K18-25 (SI) • Negative (-) tester probe → K18-6 (IG+)	Always	B

OK:

There is a large difference between the measured value (A) and the measured value (B).

NG ▶ **REPLACE COMBINATION METER ASSEMBLY**

OK ▼

8.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - COMBINATION METER ASSEMBLY)**

(a) Disconnect the K13 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the K18 combination meter assembly connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(K13,K18)
Click Connector(K13)
Click Connector(K18)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
K13-28 (SPDO) or K18-25 (SI) - Body ground	Always	10 kΩ or higher

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

Click here INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

9.	**CHECK FOR DTC (SMART ACCESS SYSTEM WITH PUSH-BUTTON START (FOR START FUNCTION))**

(a) Check if smart access system with push-button start (for start function) DTCs are output.

Body Electrical > Power Source Control > Trouble Codes

RESULT	PROCEED TO
DTCs are not output	A
DTCs are output	B

B ▶ **GO TO SMART ACCESS SYSTEM WITH PUSH-BUTTON START (FOR START FUNCTION)**

Click here INFO

A

10.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - COMBINATION METER ASSEMBLY)**

(a) Disconnect the K13 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the K18 combination meter assembly connector.

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

Standard Resistance:

EWD INFO

Click Location & Routing(K13,K18)
Click Connector(K13)
Click Connector(K18)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
K13-28 (SPDO) - K18-25 (SI)	Always	Below 1 Ω

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

Click here INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**