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Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: BRAKE CONTROL / DYNAMIC CONTROL SYSTEMS: ELECTRONICALLY CONTROLLED BRAKE SYSTEM: C00632A,C05201C,C05202A,C052096; Yaw Rate Sensor Signal Stuck In Range; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

DTC	**C00632A**	**Yaw Rate Sensor Signal Stuck In Range**

DTC	**C05201C**	**Multi-axis Acceleration Sensor Module "A" Circuit Voltage Out of Range**

DTC	**C05202A**	**Multi-axis Acceleration Sensor Module "A" Signal Stuck In Range**

DTC	**C052096**	**Multi-axis Acceleration Sensor Module "A" Component Internal Failure**

DESCRIPTION

The airbag ECU assembly has a built-in yaw rate and acceleration sensor.

These DTCs are stored when the No. 2 skid control ECU (brake actuator assembly) receives an internal malfunction signal from the yaw rate and acceleration sensor (airbag ECU assembly).

The No. 2 skid control ECU (brake actuator assembly) receives signals from the yaw rate and acceleration sensor (airbag ECU assembly) via CAN communication.

HINT:

If there is a malfunction in the bus lines between the yaw rate and acceleration sensor (airbag ECU assembly) and the CAN communication system, DTC U012587 is output. When DTC U012587 is output together with C00632A, C05201C, C05202A and/or C052096, inspect and repair the trouble areas indicated by U012587 first.

DTCs may be stored if either of the following occurs:

- Yaw rate and acceleration sensor (airbag ECU assembly) installation abnormality.
- Yaw rate and acceleration sensor (airbag ECU assembly) signal malfunction.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
C00632A	Yaw Rate Sensor Signal Stuck In Range	A yaw rate sensor stuck malfunction status continues.	• Yaw rate sensor (airbag ECU assembly) installation • Yaw rate sensor (airbag ECU assembly)	Does not come on	Brake/EPB	A	Output ECU: No. 2 skid control ECU (brake actuator assembly)

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
C05201C	Multi-axis Acceleration Sensor Module "A" Circuit Voltage Out of Range	At a vehicle speed of 30 km/h (19 mph) or more, the difference between the forward and backward G calculated from the acceleration sensor value and that calculated from the vehicle speed sensor exceeds 0.35 G for 60 seconds or more.	• Acceleration sensor (airbag ECU assembly) installation • Acceleration sensor (airbag ECU assembly)	Comes on	Brake/EPB	A	• SAE Code: C051C (Case 3) • Output ECU: No. 2 skid control ECU (brake actuator assembly)
C05202A	Multi-axis Acceleration Sensor Module "A" Signal Stuck In Range	Any of the following is detected: • The acceleration sensor output value does not change 16 times or more as the vehicle speed drops from 30 km/h (19 mph) to 0 km/h (0 mph). • A GL1 stuck malfunction status continues. • A GL2 stuck malfunction status continues.	• Acceleration sensor (airbag ECU assembly) installation • Acceleration sensor (airbag ECU assembly)	Comes on	Brake/EPB	A	• SAE Code: C051C (Case 1 and 2) • Output ECU: No. 2 skid control ECU (brake actuator assembly)
C052096	Multi-axis Acceleration Sensor Module "A" Component Internal Failure	Either of the following is detected: • A signal indicating an acceleration sensor internal malfunction is received	• Acceleration sensor (airbag ECU assembly) installation • Acceleration sensor (airbag	Comes on	Brake/EPB	A	• SAE Code: C0520 • Output ECU: No. 2 skid control ECU (brake

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
		• Output values of GL1 and GL2 (front and rear, left and right) are outside permitted output range for 60 seconds or more.	ECU assembly)				actuator assembly)

MONITOR DESCRIPTION

C051C (Case 1):

When the vehicle stops after being driven and the output value of the yaw rate and acceleration sensor (airbag ECU assembly) does not change, the No. 2 skid control ECU (brake actuator assembly) judges that the yaw rate and acceleration sensor (airbag ECU assembly) is stuck, and illuminates the MIL and stores this DTC.

C051C (Case 2):

When the yaw rate and acceleration sensor (airbag ECU assembly) is stuck for a certain amount of time, the No. 2 skid control ECU (brake actuator assembly) judges that the yaw rate and acceleration sensor (airbag ECU assembly) is stuck, and illuminates the MIL and stores this DTC.

C051C (Case 3):

When at a certain vehicle speed or more, the difference between the longitudinal acceleration value output by the yaw rate and acceleration sensor (airbag ECU assembly) and the value calculated based on the vehicle speed differs by a certain value or more for a certain amount of time, the No. 2 skid control ECU (brake actuator assembly) judges that the yaw rate and acceleration sensor (airbag ECU assembly) is abnormal, and illuminates the MIL and stores this DTC.

C0520 (Case 1 and 2):

When the yaw rate and acceleration sensor (airbag ECU assembly) output values for the longitudinal and lateral axes are outside of the possible output range for a certain amount of time, the No. 2 skid control ECU (brake actuator assembly) judges that the yaw rate and acceleration sensor (airbag ECU assembly) is outside of the possible output range, and illuminates the MIL and stores this DTC.

C0520 (Case 3):

When a signal indicating that the yaw rate and acceleration sensor (airbag ECU assembly) has detected an internal malfunction during self-diagnosis is received, the No. 2 skid control ECU (brake actuator assembly) judges that the yaw rate and acceleration sensor (airbag ECU assembly) has an internal malfunction, and illuminates the MIL and stores this DTC.

MONITOR STRATEGY

Related DTCs	C051C (Case 1): Acceleration sensor range/Performance (acceleration sensor lock)

	C051C (Case 2): Acceleration sensor range/Performance (GL1, GL2 lock) C051C (Case 3): Acceleration sensor range/Performance (acceleration sensor output) C0520 (Case 1): Acceleration sensor (GL1, GL2) out of range C0520 (Case 2): Acceleration sensor GL2 out of range C0520 (Case 3): Acceleration sensor internal check
Required Sensors/Components(Main)	Yaw rate and acceleration sensor (airbag ECU assembly) Speed sensor
Required Sensors/Components(Related)	Speed sensor No. 2 skid control ECU (brake actuator assembly)
Frequency of Operation	Continuous
Duration	0.16 seconds: C051C (Case 1) 60 seconds: C051C (Case 3) and C0520 (Case 1 and 2) -: C051C (Case 2) and C0520 (Case 3)
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

C051C (Case 1)

Monitor runs whenever the following DTCs are not stored	C051C (Case 3): Acceleration sensor range/Performance (acceleration sensor output) C051E: Acceleration sensor intermittent/erratic C0520 (Case 1): Acceleration sensor (GL1, GL2) out of range C0520 (Case 2): Acceleration sensor GL2 out of range C0520 (Case 3): Acceleration sensor internal check U0125: Lost communication with multi-axis acceleration sensor module
All of the following conditions are met	A, B, C and D
A. Chassis dynamometer mode	Off
B. Following condition is met	More than 0.012 seconds
IGR voltage	3.5 V or higher
C. Communication status with yaw rate and acceleration sensor (airbag ECU assembly)	Valid
D. Acceleration slip condition	Off

C051C (Case 2)

Monitor runs whenever the following DTCs are not stored	C051C (Case 3): Acceleration sensor range/Performance (acceleration sensor output) C051E: Acceleration sensor intermittent/erratic C14D7: Acceleration sensor voltage circuit open C0520 (Case 1): Acceleration sensor (GL1, GL2) out of range C0520 (Case 2): Acceleration sensor GL2 out of range C0520 (Case 3): Acceleration sensor internal check U0125: Lost communication with multi-axis acceleration sensor module
All of the following conditions are met	A and B
A. Chassis dynamometer mode	Off
B. Following condition is met	More than 0.012 seconds
IGR voltage	3.5 V or higher

C051C (Case 3)

Monitor runs whenever the following DTCs are not stored	C051C (Case 1): Acceleration sensor range/Performance (acceleration sensor lock) C051C (Case 2): Acceleration sensor range/Performance (GL1, GL2 lock) C051C (Case 3): Acceleration sensor range/Performance (acceleration sensor output) C051E: Acceleration sensor intermittent/erratic C0520 (Case 1): Acceleration sensor (GL1, GL2) out of range C0520 (Case 2): Acceleration sensor GL2 out of range C0520 (Case 3): Acceleration sensor internal check U0125: Lost communication with multi-axis acceleration sensor module
All of the following conditions are met	A, B, C, D, E, F, G, H and I
A. Chassis dynamometer mode	Off
B. Following condition is met	More than 0.012 seconds
IGR voltage	3.5 V or higher
C. Vehicle speed	30 km/h (18.64 mph) or more
D. Communication status with yaw rate and acceleration sensor (airbag ECU assembly)	Valid
E. GS4S (CAN Data)	Off
F. GS5S (CAN Data)	Off
G. Acceleration slip condition	Off
H. Command to all ABS hold solenoids	Off
I. Command to all ABS release solenoids	Off

C0520 (Case 1)

Monitor runs whenever the following DTCs are not stored	C051C (Case 3): Acceleration sensor range/Performance (acceleration sensor output) C051E: Acceleration sensor intermittent/erratic

	C0520 (Case 1): Acceleration sensor (GL1, GL2) out of range C0520 (Case 2): Acceleration sensor GL2 out of range C0520 (Case 3): Acceleration sensor internal check C14D7: Acceleration sensor voltage circuit open U0125: Lost communication with multi-axis acceleration sensor module
All of the following conditions are met	A, B, C, D, E and F
A. Chassis dynamometer mode	Off
B. Communication status with yaw rate and acceleration sensor (airbag ECU assembly)	Valid
C. YGS1 (CAN Data)	Off
D. GS4S (CAN Data)	Off
E. GS5S (CAN Data)	Off
F. Following condition is met	More than 0.012 seconds
IGR voltage	3.5 V or higher

C0520 (Case 2)

Monitor runs whenever the following DTCs are not stored	C051C (Case 3): Acceleration sensor range/Performance (acceleration sensor output) C051E: Acceleration sensor intermittent/erratic C0520 (Case 1): Acceleration sensor (GL1, GL2) out of range C0520 (Case 2): Acceleration sensor GL2 out of range C0520 (Case 3): Acceleration sensor internal check C14D7: Acceleration sensor voltage circuit open U0125: Lost communication with multi-axis acceleration sensor module
All of the following conditions are met	A, B, C, D and E
A. Chassis dynamometer mode	Off
B. Communication status with yaw rate and acceleration sensor (airbag ECU assembly)	Valid
C. YGS1 (CAN Data)	Off
D. GS5S (CAN Data)	Off
E. Following condition is met	More than 0.012 seconds
IGR voltage	3.5 V or higher

C0520 (Case 3)

Monitor runs whenever the following DTCs are not stored	U0125: Lost communication with multi-axis acceleration sensor module
All of the following conditions are met	-
Communication status with yaw rate and acceleration sensor (airbag ECU assembly)	Valid

IGR voltage	3.5 V or higher

TYPICAL MALFUNCTION THRESHOLDS

C051C (Case 1)

When the vehicle speed is decreasing from more than 30 km/h (18.64 mph) to 0 km/h (0 mph), change in the output value of the acceleration sensor	Less than 0.30400615 m/s^2

C051C (Case 2)

Either of the following conditions is met	-
GL1 sensor lock status	On
GL2 sensor lock status	On

C051C (Case 3)

Absolute value of (Difference Gx and acceleration estimated from wheel speed)	More than 3.4323275 m/s^2

C0520 (Case 1)

Either of the following conditions A or B is met	More than 0.24 seconds
A. Both of the following conditions are met	-
Acceleration sensor acceleration1	29.41995 m/s^2 or more
Acceleration sensor acceleration2	29.41995 m/s^2 or more
B. Both of the following conditions are met	-
Acceleration sensor acceleration1	-29.41995 m/s^2 or more
Acceleration sensor acceleration2	-29.41995 m/s^2 or more

C0520 (Case 2)

Following condition is met	More than 0.996 seconds
Acceleration sensor acceleration2	29.41995 m/s^2 or more, or -29.41995 m/s^2 or less

C0520 (Case 3)

Either of the following conditions is met	-
GS1S (CAN Data)	On
GS2S (CAN Data)	On

COMPONENT OPERATING RANGE

C051C (Case 1)

Both of the following conditions are met	-

Chassis dynamometer mode	Off
Change in the output value of the acceleration sensor while driving the vehicle	0.30400615 m/s^2 or more

C051C (Case 2)

All of the following conditions are met	-
Chassis dynamometer mode	Off
Acceleration sensor internal check fail (C0520)	Not detected
GL1 sensor lock status	Off
GL2 sensor lock status	Off
Acceleration sensor output	Valid

C051C (Case 3)

Both of the following conditions are met	-
Chassis dynamometer mode	Off
Vehicle speed	5 km/h (3.11 mph) or more
Absolute value of (Difference Gx and acceleration estimated from wheel speed)	3.4323275 m/s^2 or less

C0520 (Case1 and 2)

All of the following conditions are met	A, B, C, D, E, F, G, H, I, J and K
A. Chassis dynamometer mode	Off
B. Communication status with yaw rate and acceleration sensor (airbag ECU assembly)	Valid
C. YGS1 (CAN Data)	Off
D. GS4S (CAN Data)	Off
E. GS5S (CAN Data)	Off
F. Test mode	Off
G. GX sensor lock	Off
H. GY sensor lock	Off
I. Acceleration sensor output	Valid
J. Following condition is met	More than 0.996 seconds
Acceleration sensor acceleration2	More than -7.84532 m/s^2, and 7.84532 m/s^2 less than
K. Either of the following conditions is met	More than 0.24 seconds
Acceleration sensor acceleration1	More than -7.84532 m/s^2, and 7.84532 m/s^2 less than
Acceleration sensor acceleration2	More than -7.84532 m/s^2, and 7.84532 m/s^2 less than
Absolute value of Gy	3.9226 m/s^2 less than

C0520 (Case 3)

All of the following conditions are met	-
Communication status with yaw rate and acceleration sensor (airbag ECU assembly)	Valid
YGS1 (CAN Data)	On
GS1S (CAN Data)	Off
GS2S (CAN Data)	Off

CONFIRMATION DRIVING PATTERN

NOTICE:

When performing the normal judgment procedure, make sure that the driver door is closed and is not opened at any time during the procedure.

HINT:

- After repair has been completed, clear the DTC and then check that the vehicle has returned to normal by performing the following All Readiness check procedure.
- When clearing the permanent DTCs, refer to the "CLEAR PERMANENT DTC" procedure.

1. Connect the GTS to the DLC3.
2. Turn the ignition switch to ON and turn the GTS on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off.
5. Turn the ignition switch to ON (READY) and turn the GTS on.
6. Drive the vehicle at a speed of 30 km/h (19 mph) or more for 60 seconds or more. [*]

HINT:

[*]: Normal judgment procedure.

The normal judgment procedure is used to complete DTC judgment and also used when clearing permanent DTCs.

7. Enter the following menus: Chassis / Brake/EPB* / Utility / All Readiness.

*: Electric Parking Brake System

8. Check the DTC judgment result.

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE, perform driving pattern again.

PROCEDURE

1.	**CHECK AIRBAG ECU ASSEMBLY INSTALLATION**

(a) Check that the yaw rate and acceleration sensor (airbag ECU assembly) has been installed properly.

HINT:

Click here INFO

OK:

The yaw rate and acceleration sensor (airbag ECU assembly) is tightened to the specified torque.

The yaw rate and acceleration sensor (airbag ECU assembly) is not installed in a tilted position.

OK ▶ **REPLACE AIRBAG ECU ASSEMBLY** INFO

NG ▶ **INSTALL AIRBAG ECU ASSEMBLY CORRECTLY**