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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: C13D900; Brake Pressure Too Low (Brake Booster); 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

DTC	**C13D900**	**Brake Pressure Too Low (Brake Booster)**

DESCRIPTION

The No. 1 skid control ECU (brake booster with master cylinder assembly) controls the brake fluid pressure of the master cylinder based on the output of the brake fluid pressure sensor.

DTCs may be stored if one of the following occurs:

NOTICE:

DTCs output by the No. 1 skid control ECU that illuminate the MIL are stored in both the No. 1 and No. 2 skid control ECUs. However, permanent DTCs are stored only in the No. 2 skid control ECU.

- Brake fluid leaks.
- Foreign matter enters a solenoid valve.
- Line pressure drops during air bleeding.
- Brake pads are replaced.
- Rotors are replaced.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
C13D900	Brake Pressure Too Low (Brake Booster)	Fluid pressure control performance degraded (pressure excessively low)	• Brake fluid leaks • Wire harness and connector • No. 1 skid control ECU (brake booster with master cylinder assembly)	Comes on	Brake/EPB	A	• SAE Code: C13D9 • Output ECU: Both skid control ECUs

MONITOR DESCRIPTION

The No. 1 skid control ECU (brake booster with master cylinder assembly) monitors the relationship between the specified increase or decrease in servo pressure and the target brake fluid pressure. When the brake pedal is depressed and the relationship between the servo pressure and the target brake fluid pressure is outside of the normal range, the No. 1 skid control ECU (brake booster with master cylinder assembly) judges that the increasing pressure is abnormal and illuminates the MIL and stores a DTC. Furthermore, when the brake pedal is released or while braking is being performed and the relationship between the servo pressure and the target brake fluid pressure is outside of the normal range, the No. 1 skid control ECU (brake booster with master cylinder assembly) judges that the decreasing pressure is abnormal and illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	C13D9: Brake pressure too low
Required Sensors/Components(Main)	No. 2 skid control ECU (brake actuator assembly) Brake actuator (brake booster with master cylinder assembly)
Required Sensors/Components(Related)	Stop light switch assembly No. 2 skid control ECU (brake actuator assembly) Brake actuator (brake booster with master cylinder assembly)
Frequency of Operation	Continuous
Duration	0.072 seconds
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	C053D: Pressure sensor invalid data C0540 (Case 1): Pressure sensor verify communication C0540 (Case 2 to 4): Pressure sensor range check C056B: Pressure sensor intermittent/erratic C05A1 (Case 1): Servo pressure sensor lost communication C05A1 (Case 2): Servo pressure sensor internal malfunction C05A1 (Case 3): Servo pressure sensor invalid data C05A2: Servo pressure sensor exceeded learning limit C05C0: Brake pedal position sensor learning not complete C05C1: Brake pedal position sensor learning not complete C0639 (Case 1): Stroke simulator pressure sensor Lost communication C0639 (Case 2): Stroke simulator pressure sensor internal check C0639 (Case 3): Stroke simulator pressure sensor invalid data C063C: Stroke simulator pressure sensor exceeded learning limit C1100 (Case 1): Brake pedal position sensor voltage circuit/open C1100 (Case 2): Brake pedal position sensor invalid data C1103 (Case 1): Brake pedal position sensor voltage circuit/open C1103 (Case 2): Brake pedal position sensor invalid data C1168: Stroke simulator pressure sensor intermittent/erratic C116A: Stroke simulator pressure sensor voltage circuit low C116B: Stroke simulator pressure sensor voltage circuit high C116C: Brake position / stroke simulator pressure correlation C116D: Brake pressure control solenoid (SLM1) stuck on C121F: Brake system voltage performance C122E: Pressure sensor input out of range low C122F: Pressure sensor voltage circuit high C129B: Rotation angle sensor range/performance C12B4 (Case 1): Brake booster motor not rotate C12B4 (Case 2): Brake booster motor performance (motor current) C12BF (Case 1) to (Case 4): Brake booster motor performance (motor upper circuit) C12BF (Case 5) to (Case 9): Brake booster motor performance (motor drive circuit)

	C12FA: Brake system voltage power supply relay open circuit C12FB: Brake system voltage power supply relay circuit high C1345: Brake pressure control solenoid open current learning not complete C13BB: Brake booster motor range/performance C1498: Servo pressure sensor voltage circuit low C1499: Servo pressure sensor voltage circuit high C14C4: Servo pressure sensor intermittent/erratic C14CE: High pressure hydraulic tube air bleeding not complete C14F3 (Case 1 to 3) Brake pressure control solenoid (SLM1) circuit open C14F3 (Case 4 to 5) Brake pressure control solenoid (SLM1) circuit low C14F4 (Case 1 to 2): Brake pressure control solenoid (SLM2) circuit high (solenoid OFF current) C14F4 (Case 3 to 6): Brake pressure control solenoid (SLM2) circuit high (IC data) C14F4 (Case 7 to 8): Brake pressure control solenoid (SLM2) circuit high (solenoid ON current) C14FC (Case 1 to 3) Brake pressure control solenoid (SLM2) circuit open C14FC (Case 4 to 5) Brake pressure control solenoid (SLM2) circuit low C14FD (Case 1 to 2): Brake pressure control solenoid (SLM1) circuit high (solenoid OFF current) C14FD (Case 3 to 6): Brake pressure control solenoid (SLM1) circuit high (IC data) C14FD (Case 7 to 8): Brake pressure control solenoid (SLM1) circuit high (solenoid ON current) C1509: Brake pressure control solenoid (SSA) circuit low C150A: Brake pressure control solenoid (SSA) circuit high C150F: Brake pressure control solenoid (SGH) circuit low C1510: Brake pressure control solenoid (SGH) circuit high P057A: Brake pedal position sensor invalid data P057C: Brake pedal position sensor open circuit P057D: Brake pedal position sensor circuit high P057E: Brake pedal position sensor intermittent/erratic P05DB: Brake pedal position sensor invalid data P05DD: Brake pedal position sensor open circuit P05DE: Brake pedal position sensor circuit high P05DF: Brake pedal position sensor intermittent/erratic P05E0: Brake pedal position sensor "A"/"B" correlation U0129: Lost communication with BSCM (CH1) U025E: Lost communication with BSCM2 (CH1)
Both of the following conditions are met	-
Brake-by-wire controlled mode	On
Brake	On

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met	A or B

A. All of the following conditions are met	a, b and c
a. Servo pressure sensor fail	Not detected
b. Either of the following conditions is met	1 or 2
1. Difference between target brake pressure and servo pressure	Higher than 4 MPa (40.7 kgf/cm2, 580 psi)
ABS/TRAC/VSC operation	On
2. Difference between target brake pressure and servo pressure	Higher than 1.5 MPa (15.2 kgf/cm2, 217 psi)
ABS/TRAC/VSC operation	Off
c. Delay of servo pressure increase	More than 0.3 to 4.584 seconds
B. All of the following conditions are met	a, b, c, d and e
a. Master cylinder pressure sensor fail	Not detected
b. Communication between ECU1 and ECU2	Valid
c. ESC assist	Off
d. Either of the following conditions is met	1 or 2
1. Difference between target brake pressure and servo pressure	Higher than 4 to 6.25 MPa (40.7 to 63.7 kgf/cm2, 580 to 906 psi)
ABS/TRAC/VSC operation	On
2. Difference between target brake pressure and servo pressure	Higher than 1.5 to 3.75 MPa (15.2 to 38.2 kgf/cm2, 217 to 543 psi)
ABS/TRAC/VSC operation	Off
e. Delay of servo pressure increase	More than 0.3 to 4.584 seconds

COMPONENT OPERATING RANGE

All of the following conditions are met	-
Brake-by-wire controlled mode	On
Brake	On
BSCM2 fail (C121F)	Not detected
Brake system voltage fail (C12FA, C12FB)	Not detected
Brake pedal position sensor fail (C05C0, C05C1, C1100, C1103, P057A, P057C, P057D, P057E, P05DB, P05DD, P05DE, P05DF, P05E0)	Not detected
Pressure sensor fail (C053D, C0540, C056B, C122E, C122F, C05A1, C05A2, C1498, C1499, C14C4, C116A, C116B, C0639, C063C, C1168, C116C)	Not detected
CAN communication fail (U0129, U025E)	Not detected
Brake pressure control solenoid fail (C1345, C14F4, C14FD, C150A, C1510, C14F3, C14FC, C1509, C150F, C116D, C14CE)	Not detected
Brake booster motor fail (C12BF, C13BB, C12B4)	Not detected
Rotation angle sensor fail (C129B)	Not detected

Servo pressure	0.5 MPa (5.1 kgf/cm2, 73 psi) or higher
Servo pressure sensor malfunction criteria	Not met
Master cylinder pressure	0.5 MPa (5.1 kgf/cm2, 73 psi) or higher
Master cylinder pressure sensor malfunction criteria	Not met

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. Wait for 2 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.

CAUTION / NOTICE / HINT

NOTICE:

Make sure to wait 5 minutes or more with the ignition switch turned off before removing the integration control supply or disconnecting any supply power circuit from the integration control supply, in order for the voltage to be discharged and self-diagnosis to run.

PROCEDURE

1.	**CUSTOMER PROBLEM ANALYSIS (CHECK CONDITION WHEN MALFUNCTION OCCURRED) AND FREEZE FRAME DATA**

Pre-procedure1

(a) Interview the customer to check the vehicle conditions when the brake system warning light (yellow indicator) illuminated.

Procedure1

(b) Using the GTS, check for Freeze Frame Data that is recorded when a DTC is stored.

HINT:

Click here INFO

Chassis > Brake Booster > Trouble Codes

HINT:

Freeze Frame Data is only stored once when a DTC is stored.

Post-procedure1

(c) None

NEXT

2.	**CLEAR DTC**

Pre-procedure1

(a) None

Procedure1

(b) Clear the DTCs.

Chassis > Brake Booster > Clear DTCs
Chassis > Brake/EPB > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off.

NEXT

3.	**CHECK DTC**

Pre-procedure1

(a) Based on the Freeze Frame Data and interview with the customer, attempt to reproduce the conditions when the malfunction occurred.

Procedure1

(b) Check if the same DTC is output.

Chassis > Brake Booster > Trouble Codes

RESULT	PROCEED TO
Only C13D900 is output	A
C13D900 and other DTCs are output	B

Post-procedure1

(c) None

B ▶ **REPAIR CIRCUITS INDICATED BY OUTPUT DTCS**

A

4.	**CHECK DTC**

(a) Check the DTCs that are output.

Chassis > Brake/EPB > Trouble Codes

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

B ▶ **REPAIR CIRCUITS INDICATED BY OUTPUT DTCS**

A

5.	**CHECK FOR FLUID LEAK**

(a) Based on the Freeze Frame Data or interview with the customer, inspect the following items for brake fluid leaks:

- The brake lines from the brake booster with master cylinder assembly to each wheel cylinder.
- The main body of the brake booster with master cylinder assembly and brake actuator assembly.

OK:

There are no fluid leaks.

NG ▶ **REPAIR OR REPLACE APPLICABLE PART**

OK ▼

6.	**CLEAR DTC**

Pre-procedure1

(a) None

Procedure1

(b) Clear the DTCs.

Chassis > Brake Booster > Clear DTCs
Chassis > Brake/EPB > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off.

NEXT ▼

7.	**PERFORM AIR BLEEDING**

HINT:

Click here INFO

NEXT ▼

8.	**CHECK BRAKE BOOSTER WITH MASTER CYLINDER ASSEMBLY (ACTUATOR SIDE)**

Pre-procedure1

(a) Turn the ignition switch off.

Procedure1

(b) Make sure that there is no looseness at the locking part and the connecting part of the connectors.

OK:

The connector is securely connected.

Pre-procedure2

(c) Disconnect the A3 No. 1 skid control ECU (brake booster with master cylinder assembly) connector.

Procedure2

(d) Check both the connector case and the terminals for deformation and corrosion.

OK:
No deformation or corrosion.

Post-procedure1

(e) None

NG ▶ **REPLACE BRAKE BOOSTER WITH MASTER CYLINDER ASSEMBLY**

Click here INFO

OK ▼

9.	**CHECK HARNESS AND CONNECTOR (VEHICLE SIDE)**

Pre-procedure1

(a) Reconnect the A3 No. 1 skid control ECU (brake booster with master cylinder assembly) connector.

Procedure1

(b) Measure the voltage and resistance on the wire harness side.

HINT:

Click here INFO

OK:
Voltage and resistance readings are all normal.

Post-procedure1

(c) None

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

OK ▼

10.	**CLEAR DTC**

Pre-procedure1

(a) None

Procedure1

(b) Clear the DTCs.

Chassis > Brake Booster > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off.

NEXT

11.	**RECONFIRM DTC**

Pre-procedure1

(a) Based on the Freeze Frame Data and interview with the customer, attempt to reproduce the conditions when the malfunction occurred.

Procedure1

(b) Check if the same DTC is output.

Chassis > Brake Booster > Trouble Codes

HINT:

If the system returns to normal, it is suspected that a DTC was stored due to a poor connection of a terminal in a connector, air in the system, etc.

RESULT	PROCEED TO
C13D900 is not output	A
C13D900 is output	B

Post-procedure1

(c) None

A **USE SIMULATION METHOD TO CHECK**

B **REPLACE BRAKE BOOSTER WITH MASTER CYLINDER ASSEMBLY**

Click here INFO