Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM1000000028X47
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: BRAKE CONTROL / DYNAMIC CONTROL SYSTEMS: ELECTRONICALLY CONTROLLED BRAKE SYSTEM: C137BA2; Brake System Control Module "A" System Voltage System Voltage Low; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

DTC	**C137BA2**	**Brake System Control Module "A" System Voltage System Voltage Low**

DESCRIPTION

If a malfunction is detected in the power supply circuit, the No. 2 skid control ECU (brake actuator assembly) stores this DTC and the fail-safe function prohibits operation of ABS, brake assist, regenerative brake cooperative control, etc.

This DTC is stored when the +BS, IG1 or IG2 terminal voltage meets one of the DTC detection conditions due to a malfunction in the power supply or charging circuit such as the auxiliary battery or DC/DC converter circuit, etc.

This DTC is cleared when the voltage at terminal +BS, IG1 and IG2 returns to normal.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
C137BA2	Brake System Control Module "A" System Voltage System Voltage Low	Any of the following is detected: • When the voltage at terminal +BS is less than 8.5 V, the master cylinder pressure sensor is invalid for 10 seconds or more. • When the voltage at terminal +BS is less than 8.5 V, the brake pedal stroke sensor assembly is invalid for 10 seconds or more. • When the +BS terminal voltage is	• Wire harness and connector • No. 2 skid control ECU (brake actuator assembly)	Comes on	Brake/EPB	A	• SAE Code: C137C • 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
		below 9.5 V, the power source voltage for all speed sensors is continuously low for 60 seconds or more. • When the vehicle speed is 3 km/h (2 mph) or more, the voltage at terminal IG1 or terminal IG2 is excessively low for 10 seconds or more. • When the +BS terminal voltage is below 9.5 V and the solenoid relay is ON, the relay contact is OFF continuously for 1.22 seconds or more. • When the +BS terminal voltage is below 9.5 V, motor fail-safe relay overcurrent continues for 1.05					

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
		seconds or more.					

MONITOR DESCRIPTION

Case 1:

When the voltage of IG1 or IG2 is excessively low, the No. 2 skid control ECU (brake actuator assembly) detects that the power supply voltage is excessively low, the MIL is illuminated and a DTC is stored.

Case 2:

When the power supply voltage to all speed sensors is excessively low, the No. 2 skid control ECU (brake actuator assembly) judges that the power supply voltage is excessively low, the MIL is illuminated and a DTC is stored.

Case 3, 4 and 5:

When the voltage at terminal +BS is less than 8.5 V and the data of the master cylinder pressure sensor, brake pedal stroke sensor assembly or wheel cylinder pressure sensor is invalid for a certain amount of time, the No. 2 skid control ECU (brake actuator assembly) judges that the power supply voltage is excessively low, the MIL is illuminated and a DTC is stored.

Case 6:

When the power supply voltage of the solenoid is excessively low for a certain amount of time, the No. 2 skid control ECU (brake actuator assembly) judges that the output of the solenoid relay is abnormal due to excessively low voltage, the MIL is illuminated and a DTC is stored.

Case 7:

The No. 2 skid control ECU (brake actuator assembly) monitors the current of the motor fail-safe relay. When overcurrent is detected in the motor circuit, the No. 2 skid control ECU (brake actuator assembly) judges that the motor output is abnormal due to excessively low voltage, the MIL is illuminated and a DTC is stored.

MONITOR STRATEGY

Related DTCs	Brake system voltage input out of range low
Required Sensors/Components(Main)	No. 2 skid control ECU (brake actuator assembly)
Required Sensors/Components(Related)	No. 2 skid control ECU (brake actuator assembly) Speed sensor
Frequency of Operation	Continuous
Duration	1 second: Case 6 and 7 10 seconds: Case 1, 3, 4 and 5 60 seconds: Case 2
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Case 1

Monitor runs whenever the following DTCs are not stored	C1021 (Case 1): Brake system voltage input out of range low C137C (Case 2, 3, 4, 6 and 7): Brake system voltage input out of range low
All of the following conditions are met	A, B, C, D and E
A. IGR voltage	3.5 V or more
B. Vehicle speed	Higher than 3 km/h (1.86 mph)
C. IGP voltage	3.5 V or more
D. +BS voltage	9.5 V or more
E. Either of the following conditions is met	a or b
a. Both of the following conditions are met	-
Communication status with ECM	Valid
Ready state	On
b. Communication status with ECM	Invalid

Case 2

Monitor runs whenever the following DTCs are not stored	C1021 (Case 1): Brake system voltage input out of range low
Both of the following conditions are met	-
IGR voltage	3.5 V or more
+BS voltage	Less than 9.5 V

Case 3

Monitor runs whenever the following DTCs are not stored	C0540 (Case 1) :Pressure sensor verify communication C0540 (Case 2 to 4) Pressure sensor range check C056B: Pressure sensor intermittent/erratic C122E: Pressure sensor input out of range low C122F: Pressure sensor input out of range high P2531: Brake system voltage input open circuit
All of the following conditions are met	A, B and C
A. +BS voltage	Less than 8.5 V
B. Master cylinder pressure sensor start state	On
C. Both of the following conditions are met	a and b
a. History of ready state on	On
b. Either of the following conditions is met	-
Ready state	On
Communication status with ECM	Invalid

Case 4

Monitor runs whenever the following DTCs are not stored	P2531: Brake system voltage input open circuit
Both of the following conditions are met	A and B

A. +BS voltage	Less than 8.5 V
B. Both of the following conditions are met	a and b
a. History of ready state on	On
b. Either of the following conditions is met	-
Ready state	On
Communication status with ECM	Invalid

Case 5

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	A, B and C
A. +BS voltage	Less than 8.5 V
B. Wheel cylinder pressure sensor start state	On
C. Both of the following conditions are met	a and b
a. History of ready state on	On
b. Either of the following conditions is met	-
Ready state	On
Communication status with ECM	Invalid

Case 6

Monitor runs whenever the following DTCs are not stored	C0597: (Case 1) ABS hold solenoid circuit stuck C0597: (Case 2 to 5) ABS hold solenoid performance C1021 (Case 1): Brake system voltage input out of range low C12A7: ABS hold solenoid (FL) circuit low C12A8: ABS hold solenoid (FL) circuit high C12B2: ABS release solenoid (FL) circuit low C12B3: ABS release solenoid (FL) circuit high C12BD: ABS hold solenoid (FR) circuit low C12BE: ABS hold solenoid (FR) circuit high C12C8: ABS release solenoid (FR) circuit low C12C9: ABS release solenoid (FR) circuit high C12D3: ABS hold solenoid (RL) circuit low C12D4: ABS hold solenoid (RL) circuit high C12DE: ABS release solenoid (RL) circuit low C12DF: ABS release solenoid (RL) circuit high C12E9: ABS hold solenoid (RR) circuit low C12EA: ABS hold solenoid (RR) circuit high C12F4: ABS release solenoid (RR) circuit low C12F5: ABS release solenoid (RR) circuit high C12F6: ABS hold solenoid other functional C12F7: ABS hold solenoid other functional C137C (Case 1 to 4 and 7): Brake system voltage input out of range low C137D: Brake system voltage input out of range high C13BF: SM solenoid other functional

	C13C2: SM1 solenoid circuit low C13C3: SM1 solenoid circuit high C13CB: SM2 solenoid circuit low C13CC: SM2 solenoid circuit high C143B: Brake system voltage solenoid relay stuck C143C: Brake system voltage open circuit
Diagmask during the cranking	Off

Case 7

Monitor runs whenever the following DTCs are not stored	C052B: ABS pump motor performance C052D: ABS pump motor circuit high C052E: ABS pump motor open circuit C1021 (Case 1): Brake system voltage input out of range low C137C (Case 1 to 4 and 6): Brake system voltage input out of range low
Initial check end state	Valid

TYPICAL MALFUNCTION THRESHOLDS

Case 1

Either of the following conditions is met	-
IGR voltage	10 V or less
IGP voltage	10 V or less

Case 2

All of the following conditions are met	-
FR wheel speed sensor power voltage	Less than 4.1 V
FL wheel speed sensor power voltage	Less than 4.1 V
RR wheel speed sensor power voltage	Less than 4.1 V
RL wheel speed sensor power voltage	Less than 4.1 V

Case 3

Master cylinder pressure sensor data validity	Invalid

Case 4

Stroke sensor data validity	Invalid

Case 5

Wheel cylinder pressure sensor data validity	Invalid

Case 6

Both of the following conditions are met	-
Power supply for solenoid voltage	Less than 6 V
+BS voltage	Less than 9.5 V

Case 7

All of the following conditions are met	-
History of blocking motor relay	Off
Command to motor fail-safe relay	On
Motor circuit current	264 A or more
+BS voltage	Less than 9.5 V

COMPONENT OPERATING RANGE

Case 1

Both of the following conditions are met	-
IGR voltage	Higher than 10 V
IGP voltage	Higher than 10 V

Case 2, 6 and 7

+BS voltage	9.5 V or more

Case 3

All of the following conditions are met	A, B and C
A. +BS voltage	8.5 V or more
B. Either of the following conditions is met	a or b
a. Ready state	Off
b. Both of the following conditions are met	-
Ready state	On
IGR voltage	Higher than 10 V
C. Master cylinder pressure sensor data validity	Valid

Case 4

All of the following conditions are met	A, B and C
A. +BS voltage	8.5 V or more
B. Either of the following conditions is met	a or b
a. Ready state	Off
b. Both of the following conditions are met	-
Ready state	On

IGR voltage	Higher than 10 V
C. Stroke sensor data validity	Valid

Case 5

All of the following conditions are met	A, B and C
A. +BS voltage	8.5 V or more
B. Either of the following conditions is met	a or b
a. Ready state	Off
b. Both of the following conditions are met	-
Ready state	On
IGR voltage	Higher than 10 V
C. Wheel cylinder pressure sensor data validity	Valid

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 3 km/h (2 mph) for 1 minute. [*]

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.

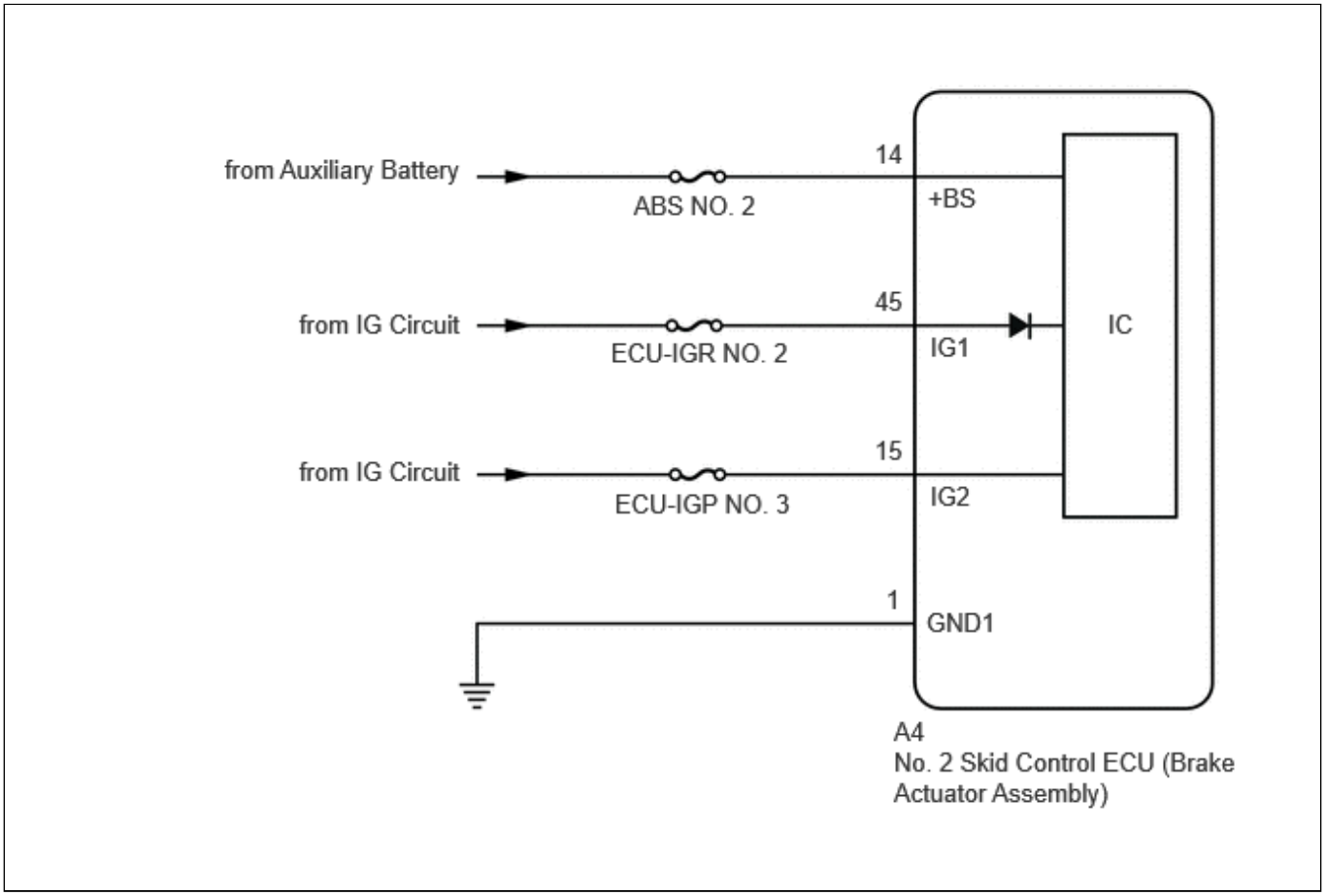
*: Electric Parking Brake System

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.

WIRING DIAGRAM



CAUTION / NOTICE / HINT

NOTICE:

- Inspect the fuses for circuits related to this system before performing the following procedure.
- Before performing troubleshooting, make sure to confirm that the auxiliary battery voltage is normal.

Click here INFO

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (IG1 TERMINAL)**

Procedure1

(a) 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-procedure1

(b) Disconnect the A4 No. 2 skid control ECU (brake actuator assembly) connector.

Procedure2

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

OK:

No deformation or corrosion.

Pre-procedure2

(d) Turn the ignition switch to ON.

Procedure3

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

Standard Voltage:

EWD INFO

Click Location & Routing(A4)
Click Connector(A4)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A4-45 (IG1) - Body ground	Ignition switch ON	11 to 14 V	V

Post-procedure1

(f) None

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

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (IG2 TERMINAL)**

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

Standard Voltage:

EWD INFO

Click Location & Routing(A4)
Click Connector(A4)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A4-15 (IG2) - Body ground	Ignition switch ON	11 to 14 V	V

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

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (+BS TERMINAL)**

Pre-procedure1

(a) Turn the ignition switch off.

Procedure1

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

Standard Voltage:

EWD INFO

Click Location & Routing(A4)
Click Connector(A4)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A4-14 (+BS) - Body ground	Always	11 to 14 V	V

Post-procedure1

(c) None

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

OK ▼

4.	**CHECK HARNESS AND CONNECTOR (GND1 TERMINAL)**

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

Standard Resistance:

EWD INFO

Click Location & Routing(A4)
Click Connector(A4)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A4-1 (GND1) - Body ground	1 minute or more after disconnecting the cable from the negative (-) auxiliary battery terminal	Below 1 Ω	Ω

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

OK ▼

5.	**CLEAR DTC**

Pre-procedure1

(a) Reconnect the A4 No. 2 skid control ECU (brake actuator assembly) connector.

Procedure1

(b) Clear the DTCs.

Chassis > Brake/EPB > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off.

NEXT

6.	**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/EPB > Trouble Codes

RESULT	PROCEED TO
C137BA2 is not output	A
C137BA2 is output	B

Post-procedure1

(c) None

A **USE SIMULATION METHOD TO CHECK**

B **REPLACE BRAKE ACTUATOR ASSEMBLY** INFO