Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM1000000028X45
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: BRAKE CONTROL / DYNAMIC CONTROL SYSTEMS: ELECTRONICALLY CONTROLLED BRAKE SYSTEM: C12F812,C12F814; ECB Solenoid Control "A" Circuit Short to Battery; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

DTC	**C12F812**	**ECB Solenoid Control "A" Circuit Short to Battery**

DTC	**C12F814**	**ECB Solenoid Control "A" Circuit Short to Ground or Open**

DESCRIPTION

The main relay is built into the No. 1 skid control ECU (brake booster with master cylinder assembly).

The main relay supplies power to the switching solenoid and the linear solenoid.

The main relay remains on for approximately 4 minutes after the ignition switch is turned off and the input of brake pedal operation signals stops, and supplies power to the system to keep it ready to operate.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
C12F812	ECB Solenoid Control "A" Circuit Short to Battery	The BS terminal voltage is 3.3 V or more for 4.5 seconds or more, when operation of the main relay is requested.	• Short in main relay circuit • Main relay internal stuck • Wire harness and connector • No. 1 skid control ECU (brake booster with master cylinder assembly)	Comes on	Brake/EPB	A	• SAE Code: C12FB • Output ECU: Both skid control ECUs • ECB: Electronically Controlled Brake System
C12F814	ECB Solenoid Control "A" Circuit Short to Ground or Open	Either of the following is detected: • When the ignition switch is turned to	• Open or short in main relay circuit • Wire harness	Comes on	Brake/EPB	A	• SAE Code: C12FA • Output ECU: Both skid control ECUs • ECB: Electronically Controlled

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
		ON (READY): The BS terminal voltage is less than 3.8 V for 0.05 seconds or more, when the IGR terminal voltage is 9.5 V or more and operation of the main relay is requested. • When the ignition switch is off: The BS terminal voltage is less than 3.8 V for 0.05 seconds or more, when operation of the main relay is requested.	and connector • No. 1 skid control ECU (brake booster with master cylinder assembly)				Brake System

MONITOR DESCRIPTION

The No. 2 skid control ECU (brake actuator assembly) monitors the voltage at BS terminal.

When the main relay is instructed to be on and the voltage at BS terminal is within the range of an open circuit malfunction (voltage is practically equal to that when off), or when the main relay is instructed to be off and the voltage of the BS terminal is within the range of a short circuit malfunction (voltage is practically equal to that when on), an open circuit or short circuit is judged respectively and the MIL is illuminated and stores a DTC.

MONITOR STRATEGY

Related DTCs	C12FA: Brake system voltage power supply relay open circuit C12FB: Brake system voltage power supply relay circuit high
Required Sensors/Components(Main)	No. 2 skid control ECU (brake actuator assembly)
Required Sensors/Components(Related)	No. 2 skid control ECU (brake actuator assembly)
Frequency of Operation	Continuous
Duration	0.054 seconds: C12FA (Case 1 and 2) 0.204 seconds: C12FA (Case 3) 4.5 seconds: C12FB
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

C12FA (Case 1)

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	A, B, C and D
A. Ignition switch	Off
B. BS (linear)	Valid
C. Command to main relay	On
D. Either of the following conditions is met	a, b or c
a. Both of the following conditions are met	More than 0.198 seconds
+BS cut MOS	Valid
+BS cut MOS voltage	Higher than 7.4 V
b. Main relay ON experience	Off
c. +BS cut MOS voltage	Higher than 7.8 V

C12FA (Case 2)

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	A, B, C, D and E
A. Ignition switch	ON (READY)
B. BS (linear)	Valid
C. Command to main relay	On
D. Either of the following conditions is met	a or b
a. All of the following conditions are met	1 and 2
1. Both of the following conditions are met	More than 0.198 seconds
+BS cut MOS	Valid
+BS cut MOS voltage	Higher than 7.4 V
2. Both of the following conditions are met	More than 0.198 seconds
IGR	Valid

IGR voltage	Higher than 9.5 V
b. Main relay ON experience	Off
E. +BS cut MOS voltage	Higher than 7.8 V

C12FA (Case 3)

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	A, B and C
A. Either of the following conditions is met	-
ECU status	Premain
ECU status	Final check
B. Command to main relay	On
C. BS (linear) voltage	9.5 V or higher

C12FB (Case 1)

Monitor runs whenever the following DTCs are not stored	None
Both of the following conditions are met	-
Solenoid relay output	Valid
Command to main relay	Off

C12FB (Case 2)

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	A and B
A. Either of the following conditions is met	-
ECU status	Premain
ECU status	Final check
B. Command to main relay	Off

TYPICAL MALFUNCTION THRESHOLDS

C12FA (Case 1 and 2)

Following condition is met	More than 0.012 seconds
BS voltage	Below 3.3 V

C12FA (Case 3)

BS voltage	Below 0.42 x VM1 V

C12FB (Case 1)

Following condition is met	More than 0.012 seconds
Solenoid relay output voltage	4.8 V or higher

C12FB (Case 2)

Following condition is met	More than 0.012 seconds
Solenoid relay output voltage	3.3 V or higher

COMPONENT OPERATING RANGE

C12FA (Case 1 and 2) and C12FB (Case 1)

All of the following conditions are met	-
Premain	Finished
Final check	Finished
BM voltage	7.1 V or higher
Brake system voltage fail (C12FB)	Not detected
Brake pressure control solenoid fail (C14F3, C14F4, C14FC, C14FD, C1509, C150A, C150F, C1510)	Not detected
BSCM2 fail (C121F)	Not detected
Brake booster motor fail (C12BF, C13BB)	Not detected
BS voltage	3.3 V or higher

C12FA (Case 3)

All of the following conditions are met	A, B, C, D, E, F, G, H, I, J and K
A. Either of the following conditions is met	-
ECU status	Premain
ECU status	Final check
B. Command to main relay	On
C. BS (linear) voltage	9.5 V or higher
D. Premain	Finished
E. Final check	Finished
F. BM voltage	7.1 V or higher
G. Brake system voltage fail (C12FB)	Not detected
H. Brake pressure control solenoid fail (C14F3, C14F4, C14FC, C14FD, C1509, C150A, C150F, C1510)	Not detected
I. BSCM2 fail (C121F)	Not detected
J. Brake booster motor fail (C12BF, C13BB)	Not detected
K. BS voltage	0.42 x VM1 V or higher

C12FB (Case 1)

All of the following conditions are met	-
Premain	Finished
Final check	Finished

BM voltage	7.1 V or higher
Brake system voltage fail (C12FA)	Not detected
Brake pressure control solenoid fail (C14F3, C14F4, C14FC, C14FD, C1509, C150A, C150F, C1510)	Not detected
BSCM2 fail (C121F)	Not detected
Brake booster motor fail (C12BF, C13BB)	Not detected
Solenoid relay output voltage	Below 4.8 V

C12FB (Case 2)

All of the following conditions are met	A, B, C, D, E, F, G, H, I and J
A. Either of the following conditions is met	-
ECU status	Premain
ECU status	Final check
B. Command to main relay	Off
C. Premain	Finished
D. Final check	Finished
E. BM voltage	7.1 V or higher
F. Brake system voltage fail (C12FA)	Not detected
G. Brake pressure control solenoid fail (C14F3, C14F4, C14FC, C14FD, C1509, C150A, C150F, C1510)	Not detected
H. BSCM2 fail (C121F)	Not detected
I. Brake booster motor fail (C12BF, C13BB)	Not detected
J. Solenoid relay output voltage	Below 3.3 V

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 5 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.

WIRING DIAGRAM

Refer to DTC C117514.

Click here INFO

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
- 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.	**READ VALUE USING GTS (BS VOLTAGE)**

Pre-procedure1

(a) Perform the Active Test and operate the main relay.

Procedure1

(b) Monitor the value of BS Voltage when the Active Test is being performed.

Chassis > Brake Booster > Active Test

TESTER DISPLAY	MEASUREMENT ITEM	CONTROL RANGE	RESTRICT CONDITION	DIAGNOSTIC NOTE
ECB Main Relay	Main relay	OFF / ON	Vehicle condition: Vehicle stopped **HINT:** To protect this Actuator and Solenoid, this test will only last 5 seconds.	ECB: Electronically Controlled Brake System

Chassis > Brake Booster > Data List

TESTER DISPLAY	MEASUREMENT ITEM	RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
BS Voltage	BS voltage value	Min.: 0.0 V Max.: 25.5 V	-	Changes in proportion to auxiliary battery voltage

Chassis > Brake Booster > Active Test

ACTIVE TEST DISPLAY
ECB Main Relay

DATA LIST DISPLAY
BS Voltage

HINT:

During the Active Test, the voltage indicated by BS Voltage changes in proportion to the voltage of the auxiliary battery.

RESULT	PROCEED TO
During the Active Test, the voltage indicated by BS Voltage increases to the approximate voltage of the auxiliary battery.	A
During the Active Test, the voltage indicated by BS Voltage remains low around 0 V.	B

Post-procedure1

(c) None

B ▶ **GO TO STEP 4**

A ▼

2.	**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

3.	**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

RESULT	PROCEED TO
C12F812 and C12F814 are not output	A
C12F812 or C12F814 is output	B

Post-procedure1

(c) None

A **USE SIMULATION METHOD TO CHECK**

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

Click here INFO

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

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 connector.

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.

Procedure3

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

Standard Voltage:

EWD INFO

Click Location & Routing(A3)
Click Connector(A3)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
A3-11 (BS) - Body ground	Always	11 to 14 V	V

Post-procedure1

(f) None

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

Click here INFO

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