Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM1000000029GTB
Model Year Start: 2023	**Model:** Prius	**Prod Date Range:** [12/2022 -]
Title: NETWORKING: CAN COMMUNICATION SYSTEM (for HEV Model): HOW TO PROCEED WITH TROUBLESHOOTING; 2023 - 2024 MY Prius [12/2022 -]		

HOW TO PROCEED WITH TROUBLESHOOTING

CAUTION / NOTICE / HINT

PRECAUTIONS WHEN TROUBLESHOOTING

NOTICE:

- Because the order of diagnosis is important to allow correct diagnosis, make sure to begin troubleshooting using How to Proceed with Troubleshooting when CAN communication system related DTCs are output.
- If the CAN communication system is malfunctioning, check the contact pressure of the terminals in connectors, as insufficient terminal contact pressure may be the cause.

  Click here INFO
- Before measuring the resistance of the CAN bus, turn the ignition switch off and leave the vehicle for 1 minute or more without operating the key or any switches, or opening or closing the doors. After that, disconnect the cable from the negative (-) auxiliary battery terminal and leave the vehicle for 10 minutes or more before measuring the resistance.
- After the ignition switch is turned off, there may be a waiting time before disconnecting the negative (-) auxiliary battery terminal.

  Click here INFO
- When disconnecting and reconnecting the auxiliary battery.

HINT:

When disconnecting and reconnecting the auxiliary battery, there is an automatic learning function that completes learning when the respective system is used.

Click here INFO

(a) CAN communication DTCs are output for CAN main bus and CAN branch malfunctions as well as for internal malfunctions or power source malfunctions of ECUs or sensors for systems using CAN communication. Therefore, when DTCs for internal malfunctions or power source malfunctions of corresponding systems are output at the same time as CAN communication DTCs, troubleshoot according to the internal malfunction and power source malfunction DTCs.

(b) The DLC3 inspection can only be used to detect malfunctions in the diagnosis bus (the bus which connects the DLC3 to the central gateway ECU (network gateway ECU)).

(c) An open in a branch for ECUs or sensors that are connected to the CAN main bus can be checked by performing a CAN bus check using the GTS. (This inspection is possible when all the main bus lines are normal.)

(d) In the event of communication error history in the central bus, identify the ECUs or sensors which were not communicating by analyzing the combination of stored DTCs or by performing Communication Bus Check (Detail).

(e) If a sub bus has a communication error, the gateway function equipped ECU (sub bus monitor ECU) detects it and stores DTCs related to the error.

HINT:

On the GTS, gateway function equipped ECUs display DTCs for ECUs connected to the sub bus.

(f) When an open circuit is detected, before disconnecting related connectors for inspection, push in on the connector body to check that the connector is not loose or disconnected.

(g) When a connector is disconnected, check that the terminals and connector body are not cracked, deformed or corroded.

PROCEDURE

1.	**VEHICLE BROUGHT TO WORKSHOP**

HINT:

- If the ignition switch can be turned to ON (the power source mode can be changed to on) when the vehicle is brought in for repair, check for DTCs and check the illumination condition of the indicators in the combination meter assembly and the basic operation of the vehicle (such as steering operation) promptly.
- Do not turn the ignition switch off until the inspection of the vehicle is finished, as some fail-safe functions are canceled when the ignition switch is turned off.
- If the ignition switch cannot be turned to ON (the power source mode cannot be changed to on) even though the auxiliary battery voltage is normal, repair this malfunction before performing troubleshooting.

  Click here INFO
- When the ignition switch cannot be turned to ON, data can be read from ECUs that can communicate with the ignition switch off by connecting the GTS to the vehicle and turning a courtesy light switch on and off at intervals of 1.5 seconds or less until communication starts.

NEXT

2.	**CUSTOMER PROBLEM ANALYSIS**

HINT:

- When troubleshooting, confirm that the problem symptoms have been accurately identified. Preconceptions should be discarded in order to make an accurate judgment. To clearly understand what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time the malfunction occurred.
- Ask the customer if the vehicle is/was equipped with additional devices such as a theft deterrent device or monitor. (If equipped, explain to the customer that the additional devices will be removed before performing troubleshooting as the malfunction cannot be checked properly.)
- Examples of points to be confirmed are shown below.

(a) It is useful to confirm the symptoms and the conditions in which the vehicle was operating at the time when a malfunction occurred. This helps to narrow down the malfunctioning part.

HINT:

- What was affected (system, part or meter warning indicators)
- What happened (details of the malfunction)
- When (occurrence date and time, frequency and if it recurs or not)
- Under what kind of situation did the problem occur (driving and operating condition at the occurrence and weather)
- Road type or condition (city, suburb, paved road, unpaved road, highway, etc.)
- Conditions when vehicle returned to normal (ignition switch was turned off, etc.)

Points to be confirmed

Symptom	• Air conditioning

	- Whether the air conditioning system operated - Whether the blower fan operated - The air conditioning functions cannot be operated at all • Electric power steering - Normal - A little heavier than usual - There was no assist • Drive monitor display - Whether the update of multi-information display items stopped - Whether the numeric part of the drivable distance was displayed - Not displayed at all • Eco navigation (eco drive) display - Whether the average fuel consumption graph is updated every minute - Whether the updated section average fuel consumption graph is displayed - Whether the distance-to-empty is displayed on the section average fuel consumption graph display - Not displayed at all • Interior lights - Whether the interior light illumination changes when the door is opened or closed - Whether the interior lights turned off when the ignition switch is turned to ON - Not illuminated at all • Wireless door lock function and smart entry function - Whether the lock/unlock function operated - Whether the entry warning function operated - Whether the illumination was turned on when the key was brought into a smart detection area • 4WD/AWD operation - Normal - Slip detected when starting off • Memory call - Normal - Memory write error - Memory read error - Whether the auto return or auto away control is performed • Operation of other systems of concern
Meter warning lights	• Illumination of warning lights and the order in which they illuminated - Master - Check engine (MIL) - Brake - ABS - Slip - EPS - SRS - Others • Meter display - Speedometer - Tachometer - Engine coolant temperature gauge • Content displayed on the multi-information display

	- Whether the odometer to TRIP meter has stopped - Whether the value of the average fuel economy is displayed on the multi-information display - Whether a warning message is displayed on the multi-information display

NEXT

3.	**PRE-CHECK**

(a) Measure the auxiliary battery voltage with the ignition switch off.

Standard Voltage:

11 to 14 V

If the voltage is below 11 V, recharge or replace the auxiliary battery before proceeding to the next step.

HINT:

If the ignition switch cannot be turned to ON, measure the voltage of the auxiliary battery. If it is below 11 V, perform inspection after replacing or recharging the auxiliary battery.

NG ▶ **CHARGE OR REPLACE AUXILIARY BATTERY**

OK

4.	**CHECK GTS OPERATION**

HINT:

Read the GTS operator's manual before use.

Click here INFO

(a) Connect the GTS to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the GTS on.

(d) Check that the GTS and ECUs can communicate with the ignition switch ON.

HINT:

- ECUs and sensors are not displayed on the "Communication Bus Check" screen when the GTS cannot communicate with the vehicle.
- If communication between the GTS and ECUs is not possible, either the GTS or vehicle has a malfunction.
- If communication between the GTS and ECUs is still not possible even when the GTS is connected to another vehicle, the GTS has a malfunction. Perform the self tests described in the GTS operator's manual. (The GTS may be malfunctioning or its battery may be discharged.)

NG ▶ **GO TO Check CAN Communication Connection**

OK

5.	**BUS INSPECTION (CHECK CONNECTED ECUS AND SENSORS USING GTS)**

(a) Based on the vehicle equipment and specifications, confirm the systems that use CAN communication.

Click here INFO

(b) Select "CAN Bus Check" from the screen on the GTS.

CAN Bus Check

(c) Observe the screen for approximately 2 minutes to check the ECUs and sensors displayed on the screen.

(d) Check for ECUs or sensors displayed as not communicating on the "Communication Bus Check" screen (indicated by a red background color or a background color that changes from red to yellow).

NOTICE:

- A sub bus monitoring ECU outputs DTCs for its respective ECUs and sensors. Identify the malfunctioning ECU or sensor using the output DTCs.
- ECUs or sensors that are not installed to the vehicle will not be displayed. Do not mistake these for ECUs or sensors that are not communicating.
- When using the combo box, it may be possible to select a sub bus from the drop down list that does not have any connected ECUs or sensors. This is not a malfunction and occurs when there is no optional device connected to a sub bus which is monitored by a sub bus monitoring ECU (gateway function equipped ECU).

HINT:

- For details on how to read the "Communication Bus Check" screen, refer to Description of "Communication Bus Check" screen.

  Click here INFO
- If there is an ECU or sensor whose connection status changes intermittently while checking the "Communication Bus Check" screen, there may be an open circuit in one of the wires of a branch line of an ECU or sensor in the bus. If an open occurs in one of the wires of a CAN branch line, it may interfere with the communication of other ECUs or sensors resulting in an incorrect state being displayed.
- The central gateway ECU (network gateway ECU) displays the connection status of ECUs and sensors connected to the central bus on the GTS.
- Sub bus monitoring ECUs display the connection status of ECUs and sensors connected to their respective sub bus on the GTS.
- If a CAN commutation DTC is output for an ECU connected to the sub bus, refer to the corresponding diagnostic procedure.

  Click here INFO

RESULT	PROCEED TO
No ECUs or sensors are displayed as not communicating	A
ECUs or sensors are displayed as not communicating	B

B ▶ **GO TO STEP 8**

A

6.	**CHECK DTC (HEALTH CHECK)**

(a) Using the GTS, perform Health Check to read current and history DTCs and record them.

NOTICE:

- CAN communication DTCs are output when there is an open or short in any of the communication lines. Any problems with the power source of a corresponding ECU or sensor, or problems in the ECU or sensor itself also cause these DTCs to be output.
- If a CAN communication line connector is disconnected with the ignition switch ON or ACC, the ECUs of the corresponding system and related systems store a DTC.

HINT:

If an open occurs in just one of the wires of a CAN branch line, DTCs which are not related to malfunctioning parts may be output (DTCs may be displayed randomly), or a message indicating a communication error may be displayed.

RESULT	PROCEED TO
DTCs are not output.	A
Output DTCs are listed in the Diagnostic Trouble Code Chart for CAN Communication System.	B
Output DTCs are not listed in the Diagnostic Trouble Code Chart for CAN Communication System.	C

B ▶ **GO TO DTC CHART**

C ▶ **GO TO PERFORM DIAGNOSIS FOR RESPECTIVE SYSTEM**

A

7.	**BUS INSPECTION (DETAIL) (CHECK CONNECTED ECUS AND SENSORS USING GTS)**

(a) Using the GTS, perform "Initialization".

Body Electrical > Central Gateway > Utility

TESTER DISPLAY
Initialization

(b) Using the GTS, display the "Communication Bus Check (Detail)" screen.

HINT:

For details on how to inspect buses using the "Communication Bus Check (Detail)" screen, refer to Description of "Communication Bus Check" Screen.

Click here INFO

(c) Check if ECUs or sensors with a Lost Communication Time (s) of 2 seconds or more are displayed.

RESULT	PROCEED TO
No ECUs or sensors with a Lost Communication Time (s) of 2 seconds or more are displayed	A
ECUs or sensors with a Lost Communication Time (s) of 2 seconds or more are displayed	B

A ▶ **INSPECT FOR INTERMITTENT PROBLEMS**

B ▶ **GO TO DIAGNOSIS PROCEDURE FOR RESPECTIVE BUS**

TARGET BUS	LINK	TARGET BUS	LINK
BUS 1	INFO	BUS 2	INFO
BUS 3	INFO	BUS 4	INFO
BUS 5	INFO	BUS 6	INFO
BUS 7	INFO	-	-

8.	**CAN BUS INSPECTION (DETERMINE CAUSE OF PROBLEM SYMPTOM)**

(a) Disconnect the cable from the negative (-) auxiliary battery terminal.

(b) Measure the resistance of the CAN bus for which a malfunction is confirmed from the connector on the central gateway ECU (network gateway ECU) side.

HINT:

- For details on the terminal arrangement of the central gateway ECU (network gateway ECU), refer to Terminals of ECU.

  Click here INFO
- If the CAN bus main line is normal and there is an ECU or sensor whose connection status changes intermittently while checking the "Communication Bus Check" screen, there may be an open circuit in one of the wires of a branch line of an ECU or sensor in the bus. If an open occurs in one of the wires of a CAN branch line, it may interfere with the communication of other ECUs or sensors resulting in an incorrect state being displayed.

  Performing the bus inspection again may help in determining the suspected area.

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
CANH - CANL of a suspected bus	Cable disconnected from negative (-) auxiliary battery terminal	54 to 69 Ω
CANH - body ground of a suspected bus	Cable disconnected from negative (-) auxiliary battery terminal	200 Ω or higher
CANL - body ground of a suspected bus	Cable disconnected from negative (-) auxiliary battery terminal	200 Ω or higher
CANH - +B of a suspected bus	Cable disconnected from negative (-) auxiliary battery terminal	6 kΩ or higher
CANL - +B of a suspected bus	Cable disconnected from negative (-) auxiliary battery terminal	6 kΩ or higher

OK ▶ **GO TO DIAGNOSIS PROCEDURE FOR RESPECTIVE COMMUNICATION STOP**

ECU OR SENSOR DISPLAYED ON GTS AS NOT COMMUNICATING	LINK	ECU OR SENSOR DISPLAYED ON GTS AS NOT COMMUNICATING	LINK
Hybrid Vehicle Control	INFO	Skid Control (ABS/VSC/TRAC)	INFO
Brake Booster	INFO	Clearance Warning (Intuitive Parking Assist)	INFO
Air Conditioning Amplifier	INFO	Power Steering (EPS)	INFO
Spiral cable (Steering Angle Sensor)	INFO	ECM (Engine)	INFO
Transmission Control	INFO	HV Battery	INFO
Sub Battery System	INFO	Main Body	INFO
Combination Meter	INFO	Certification (Smart) and/or Power Management	INFO
Airbag	INFO	Display and Navigation (AVN)	INFO
Blind Spot Monitor "B"	INFO	Digital Rear-View Mirror	INFO
Remote Engine Starter	INFO	Panoramic View Monitor / Circumference Monitoring Camera Control Module	INFO
DCM	INFO	Back Door	INFO

ECU OR SENSOR DISPLAYED ON GTS AS NOT COMMUNICATING	LINK	ECU OR SENSOR DISPLAYED ON GTS AS NOT COMMUNICATING	LINK
Acoustic Vehicle Alerting System	INFO	D-Seat	INFO
Front Radar	INFO	Front Side Radar "A"	INFO
Motor Generator	INFO	Front Camera Module	INFO
Tire Pressure	INFO	Parking Assist Monitor System / Rear Camera	INFO

NG ▶ **GO TO DIAGNOSIS PROCEDURE FOR RESPECTIVE BUS**

TARGET BUS	LINK	TARGET BUS	LINK
BUS 1	INFO	BUS 2	INFO
BUS 3	INFO	BUS 4	INFO
BUS 5	INFO	BUS 6	INFO
BUS 7	INFO	-	-