

NO17080E17

**Fig. 1: Identifying Master Cylinder Components With Torque Specification (Example)**  
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Torque specifications, grease application areas and non-reusable parts are emphasized in the procedures.

**HINT:**

There are cases where such information can only be explained by using an illustration. In these cases, torque, oil and other information are described in the illustration.

- d. Only items with key points are described in the text. What to do and other details are explained using illustrations next to the text. Both the text and illustrations are accompanied by standard values and notices.

**PROCEDURE REFERENCE**

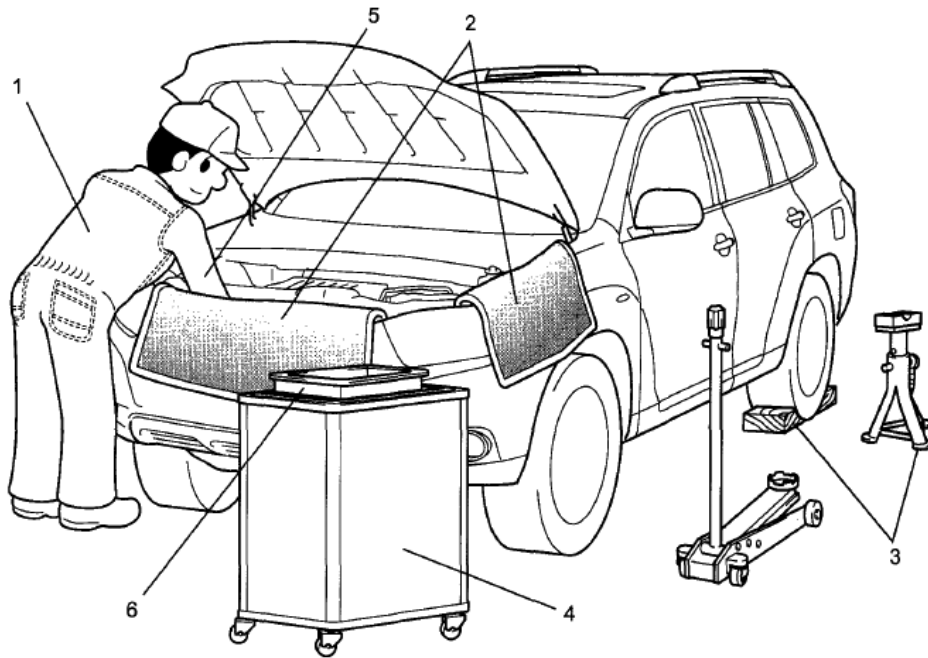
Illustration	What to do and where to do it
Task heading	What work will be performed
Explanation text	How to perform the task Also has information such as specifications and warnings, which are written in boldface text

- e. Illustrations of similar vehicle models are sometimes used. In these cases, minor details may be different from the actual vehicle.
- f. Procedures are presented in a step-by-step format.

**4. SERVICE SPECIFICATIONS**

- a. SPECIFICATIONS are presented in boldface text throughout the information. The specifications are also found in the **SERVICE SPECIFICATIONS** article for reference.

**5. TERM DEFINITIONS**



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1	Attire	<ul style="list-style-type: none"> <li>Always wear a clean uniform.</li> <li>Hat and safety shoes must be worn.</li> </ul>
2	Vehicle protection	Prepare a grille cover, fender cover, seat cover and floor mat before starting the operation.
3	Safety operation	<ul style="list-style-type: none"> <li>When working with 2 or more persons, be sure to check safety for one another.</li> <li>When working with the engine running, make sure to provide ventilation for exhaust fumes in the workshop.</li> <li>If working on high temperature, high pressure, rotating, moving, or vibrating parts, wear appropriate safety equipment and take extra care not to injure yourself or others.</li> <li>When jacking up the vehicle, be sure to support the specified location with a safety stand.</li> <li>When lifting up the vehicle, use appropriate safety equipment.</li> </ul>
4	Preparation of tools and measuring gauge	Before starting an operation, prepare a tool stand, SST, gauge, oil and parts for replacement.
5	Removal and installation, disassembly and assembly operations	<ul style="list-style-type: none"> <li>Diagnose with a thorough understanding of proper procedures and of the reported problem.</li> <li>Before removing any parts, check the general condition of the assembly and for deformation and damage.</li> <li>If the procedure is complicated, take notes. For example, note the total number of electrical connections, bolts, or hoses removed. Add matchmarks to insure reassembly of components in the original positions. Temporarily mark hoses and their fittings if needed.</li> <li>Clean and wash the removed parts if necessary and assemble them after a thorough check.</li> </ul>
6	Removed parts	<ul style="list-style-type: none"> <li>Place the removed parts in a separate box to avoid mixing them up with new parts or contaminating the new parts.</li> <li>For non-reusable parts such as gaskets, O-rings, and self-locking nuts, replace them with new ones as instructed in this manual.</li> <li>Retain the removed parts for customer inspection, if requested.</li> </ul>

**Fig. 5: Identifying Basic Repair Operations Procedure**  
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



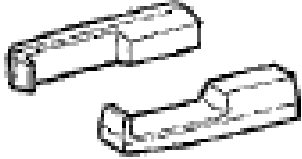
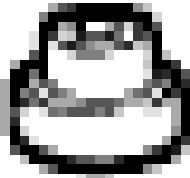

b. JACKING UP AND SUPPORTING VEHICLE

- Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.

c. PRECOATED PARTS



**2009 Toyota Highlander Limited**

2009 GENERAL INFORMATION Preparation - Highlander

		
	(09954-04010)	Arm 25
	(09955-04061)	Claw No. 6
	(09957-04010)	Attachment
	(09958-04011)	Holder

**RECOMMENDED TOOLS**

**DIFFERENTIAL - RECOMMENDED TOOLS SPECIFICATION**

	09010-3C100	Set, Hexagon Wrench
	(09013-6C130)	Socket Hexagon 10mm

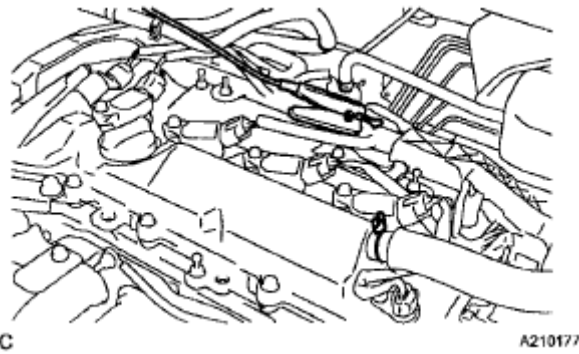
**HINT:**

Refer to the Techstream operator's manual for further details.

If the ignition timing is not as specified, check the valve timing.

8. Enter the following menus: Connect the TC and TE1/OFF.
  9. Turn the ignition switch off.
  10. Disconnect the Techstream from the DLC3.
- c. When not using the Techstream:
1. Remove the No. 1 engine cover sub-assembly.
  2. Pull out the wire harness as shown in the illustration.
  3. Connect the clip of the timing light to the wire harness.

**NOTE:** Use a timing light that detects primary signals.



**Fig. 1: Connecting Clip Of Timing Light To Wire Harness**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

**SST 09843-18040**

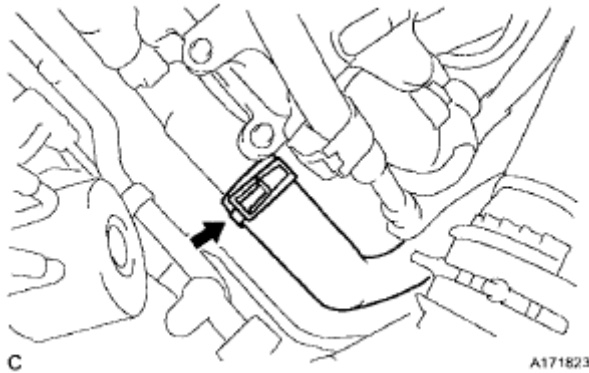
**NOTE:**

- Confirm the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.
- When checking the ignition timing, the transmission should be in neutral.

**Fig. 277: Locating No. 1 Radiator Hose And Clamp**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**38. DISCONNECT NO. 2 RADIATOR HOSE**

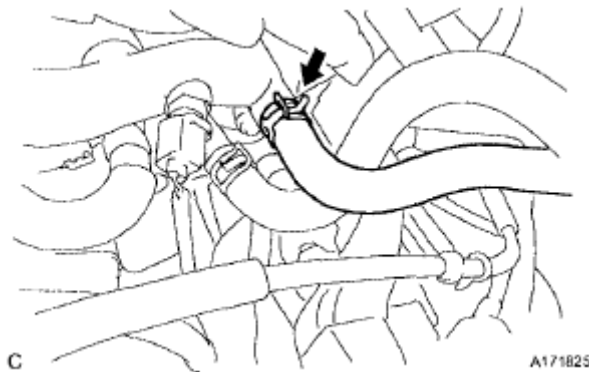
- a. Using pliers, grip the claws of the clip and slide the clip to disconnect the No. 2 radiator hose from the water inlet.



**Fig. 278: Locating No. 2 Radiator Hose And Clip**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**39. DISCONNECT HEATER WATER HOSE OUTLET B**

- a. Using pliers, grip the claws of the clip and slide the clip to disconnect heater water outlet hose B from the water inlet.

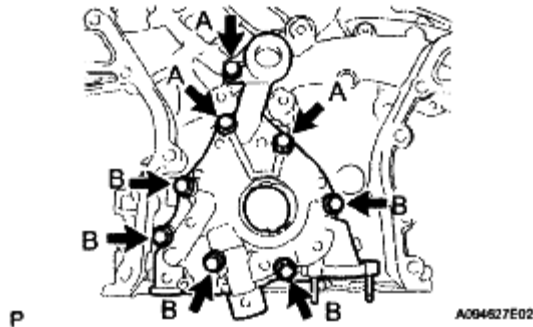


**Fig. 279: Locating Heater Water Outlet Hose And Claws**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**40. DISCONNECT HEATER WATER HOSE INLET B**

- a. Using pliers, grip the claws of the clip and slide the clip to disconnect heater water inlet hose B from the water outlet.

Bolt A	22 mm (0.87 in.)
Bolt B	40 mm (1.58 in.)

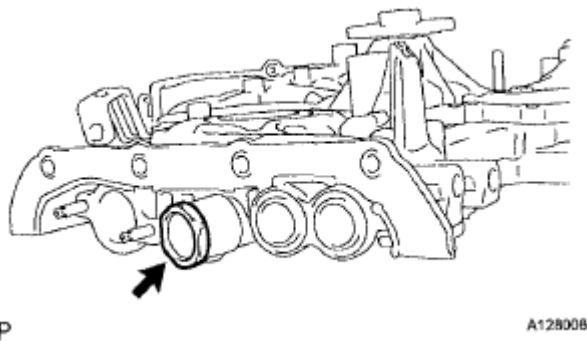


**Fig. 48: Locating Oil Pump Cover Bolts**  
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**2. INSTALL OIL PUMP RELIEF VALVE**

- a. Coat the oil pump relief valve with engine oil.
- b. Insert the relief valve and relief valve spring into the oil pump cover hole.
- c. Using a 27 mm socket wrench, install the plug.

**Torque: 49 N\*m (500 kgf\*cm, 37 ft.\*lbf)**



**Fig. 49: Locating Timing Chain Case Oil Seal**  
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**INSTALLATION**

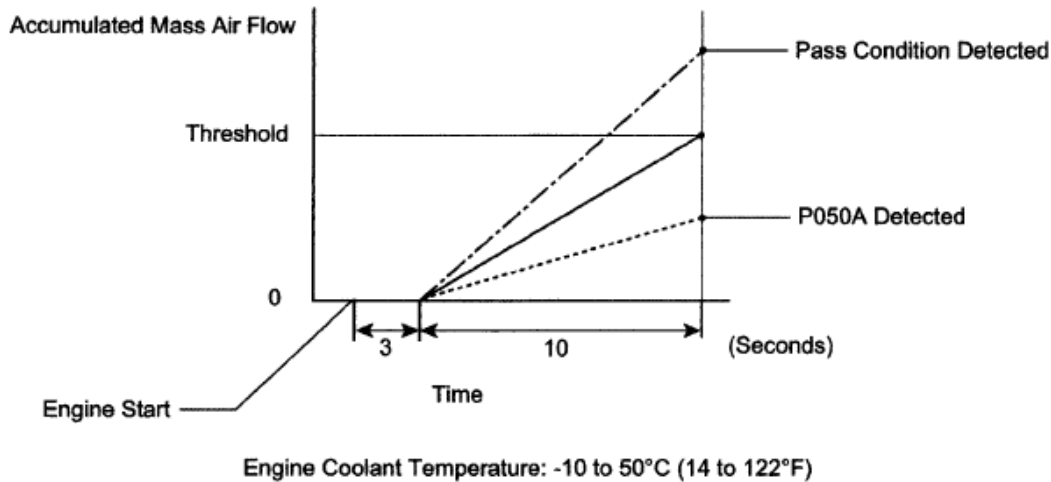
**1. INSTALL TIMING CHAIN CASE OIL SEAL**

- a. Using SST, tap in a new oil seal until its surface is flush with the timing chain case edge.

**SST 09223-22010, 09506-35010**

**NOTE:**                      • **Keep the lip free from foreign matter.**

**P050A Detection Logic:**



A163341E01

**Fig. 186: Engine Coolant Temperature Graph (P050A Detection Logic)**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**MONITOR STRATEGY**

**MONITOR STRATEGY REFERENCE CHART**

Related DTCs	P050A: Idle speed control problem at cold
Required Sensors/Components (Main)	Mass air flow meter
Required Sensors/Components (Related)	Engine Coolant Temperature (ECT) sensor, Throttle position sensor, Vehicle speed sensor
Frequency of Operation	Once per driving cycle
Duration	10 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

**TYPICAL ENABLING CONDITIONS**

**TYPICAL ENABLING CONDITIONS CHART**

	P0010, P0020 (OCV bank 1, 2) P0011, P0021 (VVT system bank 1, 2 - advance) P0012, P0022 (VVT system bank 1,2 - retard) P0013, P0023 (Exhaust OCV bank 1, 2) P0014, P0024 (Exhaust VVT system bank 1,2 - advance) P0015, P0025 (Exhaust VVT system bank 1, 2 - retard)
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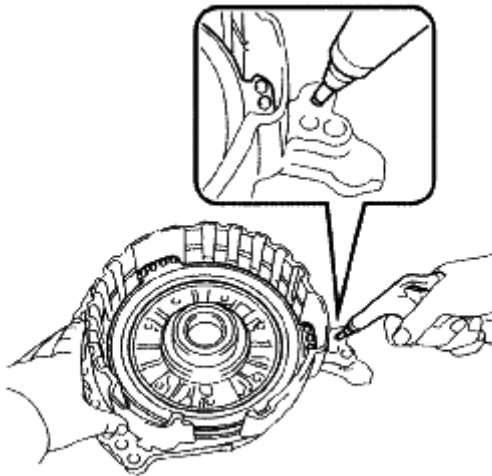
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**Fig. 327: Identifying 2nd Brake Piston Return Spring Sub-Assembly**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**36. REMOVE NO. 1 BRAKE PISTON**

- a. Holding the oil pump assembly by hand, apply compressed air (392 kPa, 4.0 kgf/cm<sup>2</sup>, 57 psi) to the oil pump assembly to remove the No. 1 brake piston.



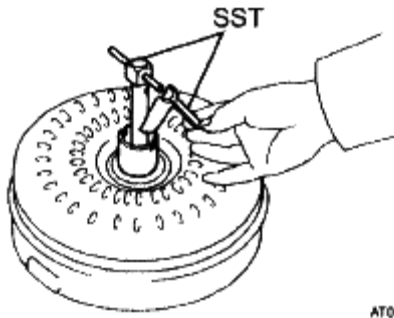
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**Fig. 328: Applying Compressed Air To Oil Pump Assembly**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, remove the 2 O-rings from the No. 1 brake piston.





**Fig. 284: Inspecting One-Way Clutch**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Inspect the one-way clutch.
  1. Set SST into the inner race of the one-way clutch.

**SST 09350-32014 (09351-32010)**

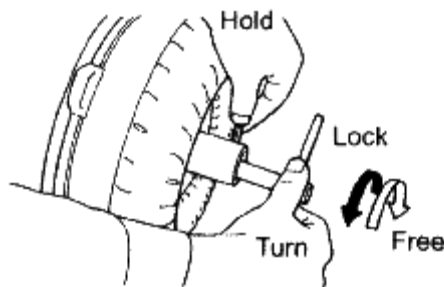
2. Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.

**SST 09350-32014 (09351-32010, 09351-32020)**

3. Stand the torque converter and turn the SST.

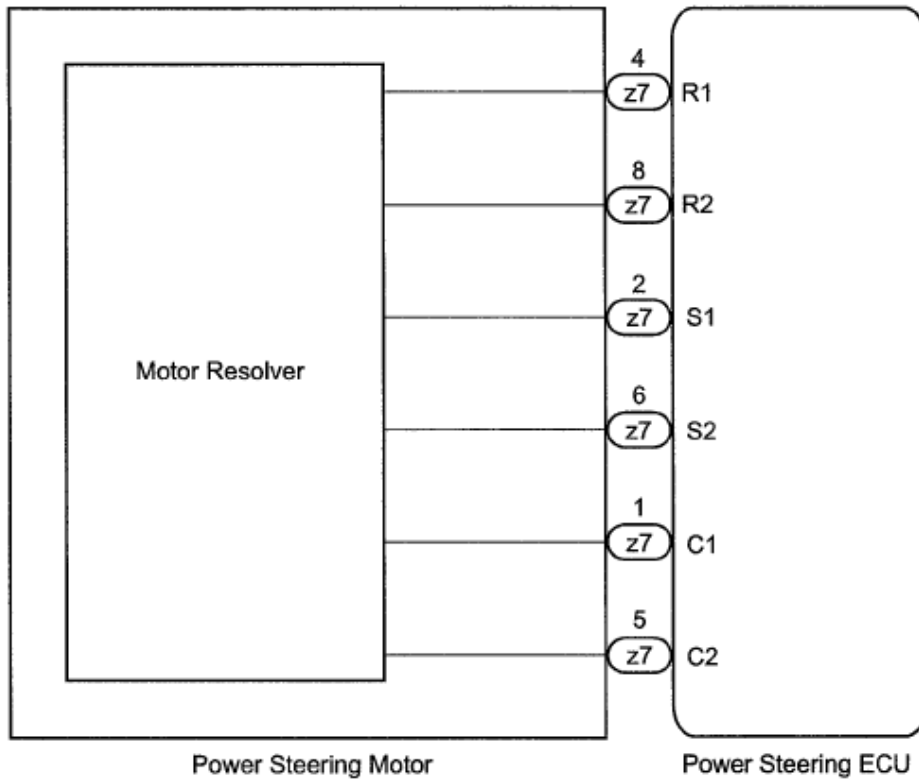
**OK:**

**If the one-way clutch is turned clockwise, it rotates freely, and if turned counterclockwise, it locks.**



**Fig. 285: Checking Clutch Locks**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Determine the condition of the torque converter clutch assembly.
  1. If the inspection result of the torque converter clutch assembly satisfies the following conditions, replace the torque converter clutch assembly.



C170025E01

**Fig. 18: Motor Rotation Angle Sensor Malfunction - Wiring Diagram**  
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**INSPECTION PROCEDURE**

**1. CHECK CONNECTOR CONNECTION CONDITION**

- a. Check the installation condition of the motor rotation angle sensor connector.

**OK: Motor rotation angle sensor connector is securely connected to the power steering ECU.**

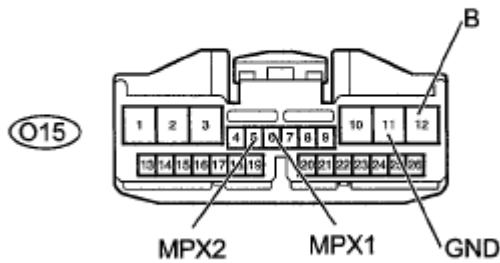
**Result**

**RESULT CHART**

Result	Proceed to
NG	A
OK	B

**B: Go to step 3**

Front view of wire harness connector:  
(to Back Door ECU)



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**Fig. 59: Identifying Back Door ECU Connector Terminals**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**OK: Go to next step**

**15. CHECK FOR SHORT IN CAN MS BUS WIRES**

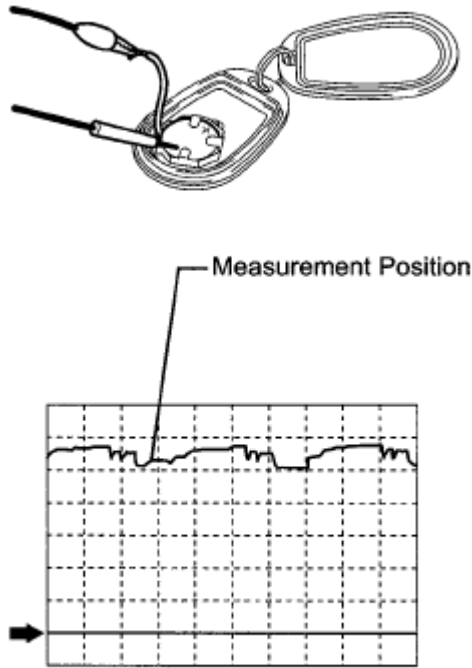
- a. Reconnect the certification ECU junction connector to the CAN junction connector RR.
- b. Disconnect the certification ECU connector from the certification ECU.
- c. Measure the resistance according to the value (s) in the table below.

**Standard resistance**

**DETECTION ITEM CHART**

Tester Connection	Condition	Specified Condition
D40-27 (CANH) - D40-28 (CANL)	Ignition switch off	108 to 132 ohms
D40-27 (CANH) - D40-17 (E)	Ignition switch off	200 ohms or higher
D40-28 (CANL) - D40-17 (E)		
D40-27 (CANH) - D40-1 (+B)	Negative battery terminal disconnected	6 kohms or higher
D40-28 (CANL) - D40-1 (+B)		

**NG: REPAIR OR REPLACE CAN MS BUS MAIN WIRE OR CONNECTOR (CERTIFICATION ECU BRANCH WIRE)**



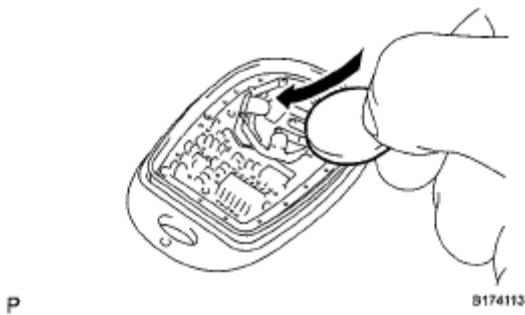
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**Fig. 187: Checking Transmitter Battery Voltage Waveform**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

## INSTALLATION

### 1. INSTALL TRANSMITTER BATTERY

- a. Install a new battery (lithium battery) with the positive (+) side up, as shown in the illustration.

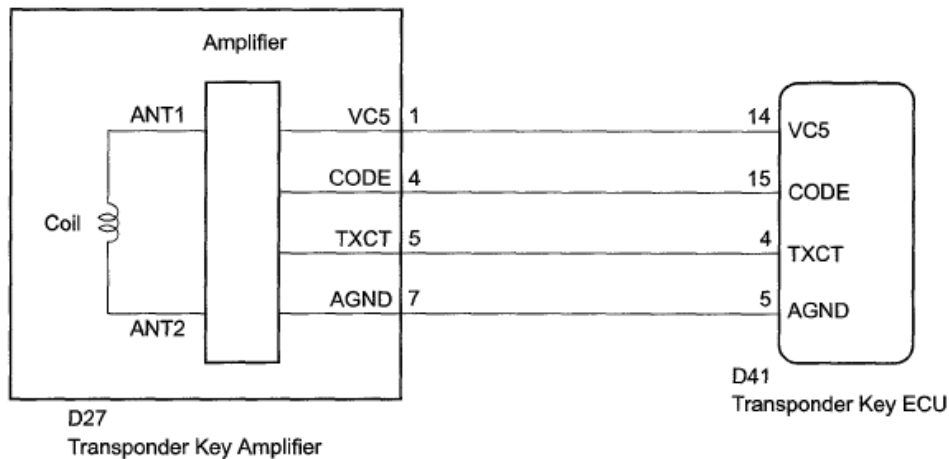


**Fig. 188: Installing Lithium Battery**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Press down gently on the battery to set it in place.

**NOTE:**

- Be careful not to bend the transmitter battery electrode during insertion.



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**Fig. 59: Antenna Coil Open/Short - Wiring Diagram**  
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**INSPECTION PROCEDURE**

**NOTE:** If the transponder key ECU is replaced, register the key and ECU communication ID (See REGISTRATION).

**1. READ VALUE ON TECHSTREAM (TRANSPONDER KEY AMPLIFIER)**

- a. Connect Techstream to the DLC3.
- b. Turn the ignition switch to the ON position.
- c. Turn the tester on.
- d. Select the following menu items: Body Electrical/Immobiliser/ Data List.
- e. Select Antenna Coil Status in the Data List and read the tester display.

**Immobiliser (Transponder Key ECU):**

**DATA LIST**

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Antenna Coil Status	Transponder key amplifier coil condition/NORMAL or FAIL	NORMAL: Antenna coil is normal FAIL: Antenna coil is malfunctioning	-

**OK:**

**NORMAL** (Antenna coil is normal) appears on the screen.

**NG:** Go to step 2

- c. Reconnect the S1 camera connector.
- d. Measure the voltage and frequency of each terminal of the connector.

**TERMINAL DESCRIPTION**

Terminal No. (Symbols)	Wiring Color	Terminal Description	Condition	Specified Condition
S1-1 (CV-) - S1-2 (CV+)	BR - R	Display signal	Ignition switch on (IG) Shift lever R position	Pulse generation (See waveform 1 1)

If the result is not as specified, the camera may have a malfunction.

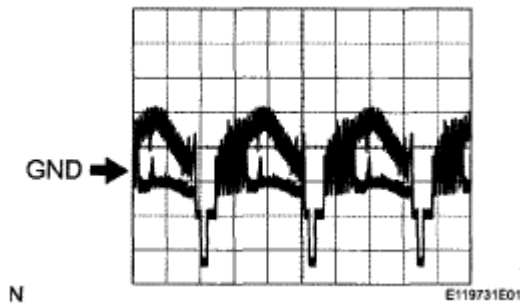
- e. Reference:

Oscilloscope waveform

- 1. Waveform 1

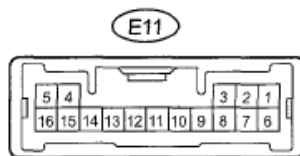
**WAVEFORM REFERENCE**

Item	Content
Measure terminal	S1-1 (CV-) - S1-2 (CV+)
Measure set	0.2 V/DIV., 0.2 μS/DIV.
Condition	Ignition switch: on (IG), Shift lever: R position



**Fig. 19: Identifying Waveform 1**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 2. CLOCK ASSEMBLY (Multi-Information Display)



**Fig. 20: Identifying E11 Clock Assembly Connector Terminal**

