

2008 Scion xD
2008 ENGINE 2ZR-FE Starting - xD

2008 ENGINE

2ZR-FE Starting - xD

STARTING SYSTEM

PARTS LOCATION

cardiagn.com

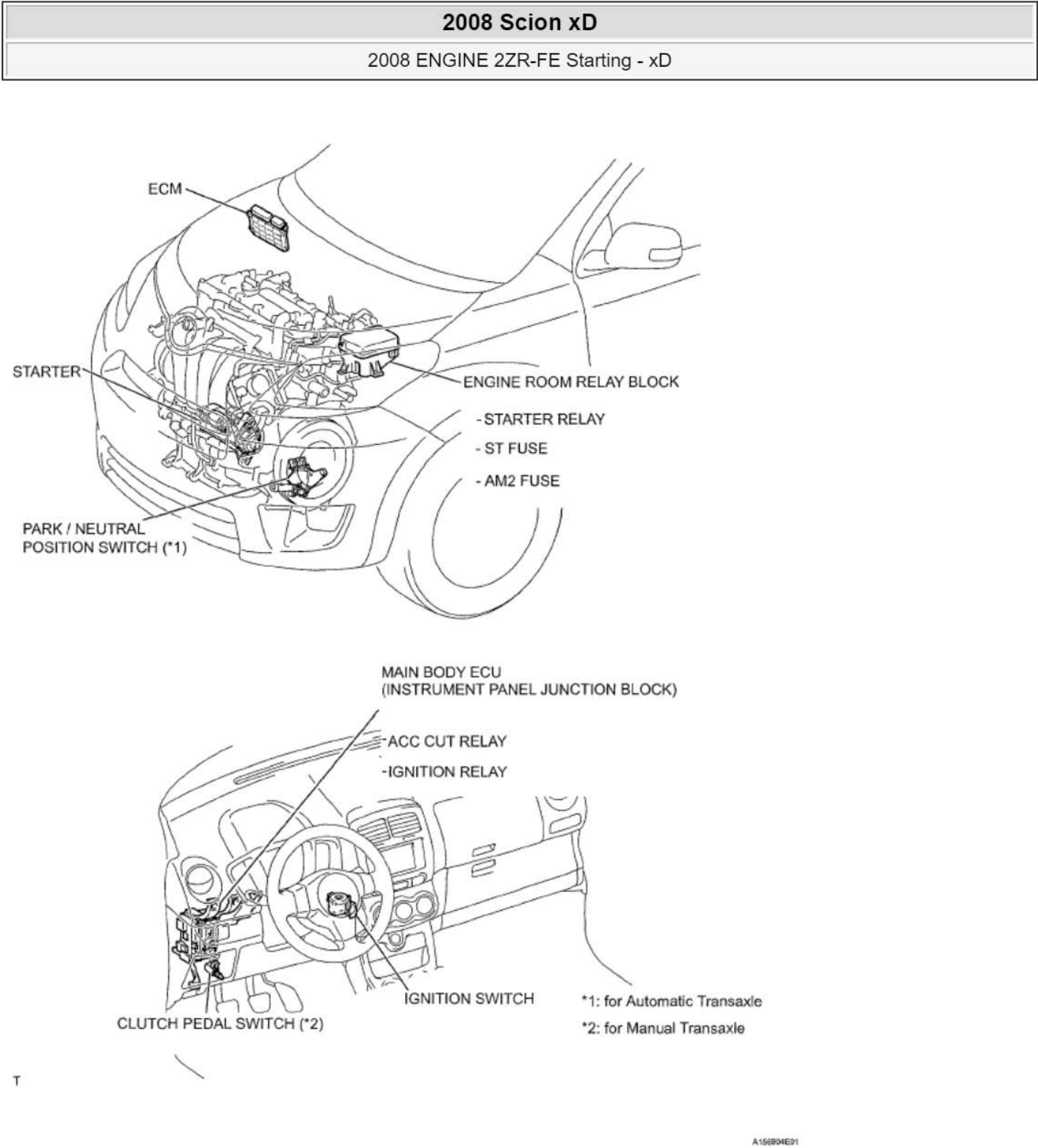
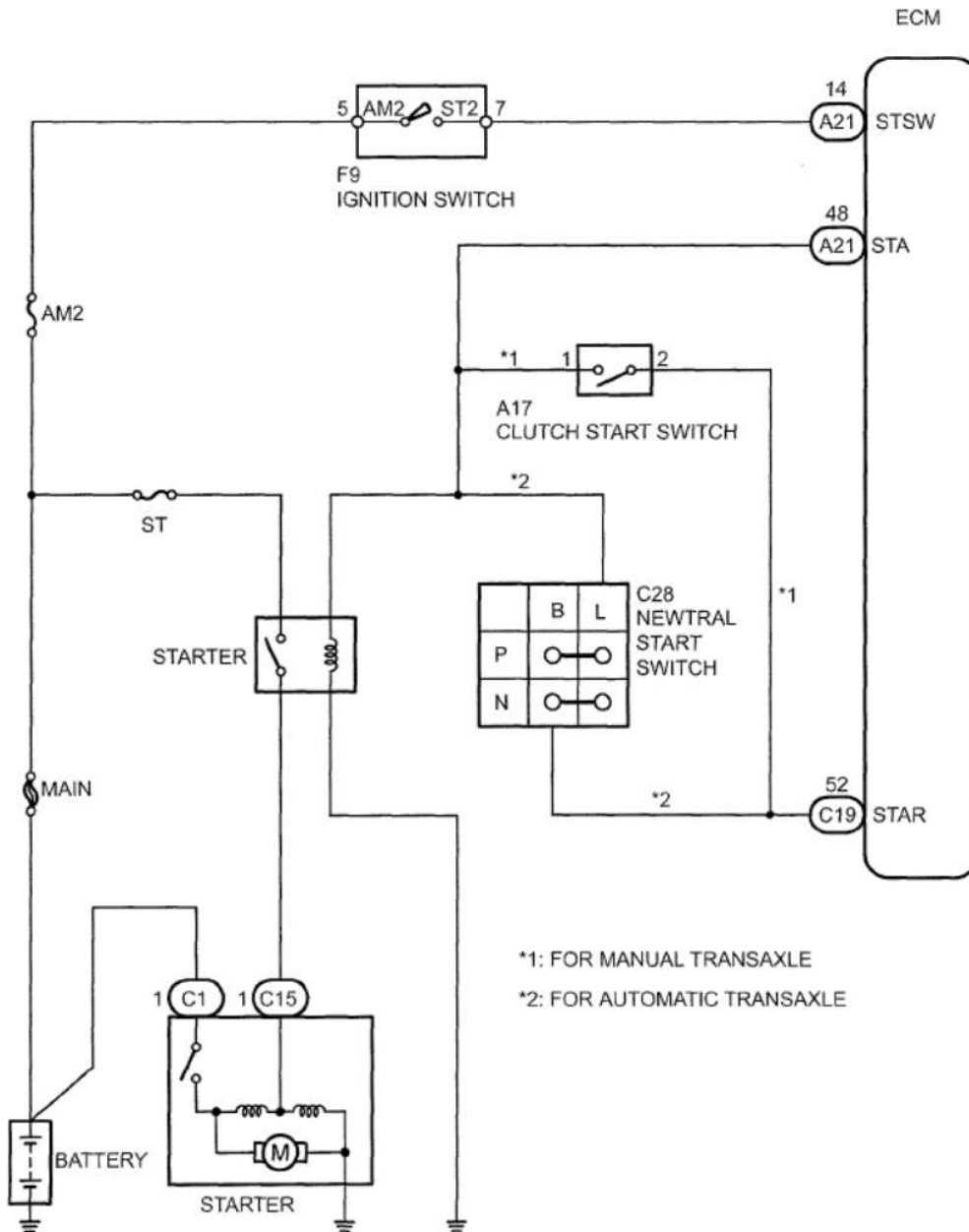


Fig. 1: Identifying Starting System Parts Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SYSTEM DIAGRAM

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Fig. 2: Starting System Diagram

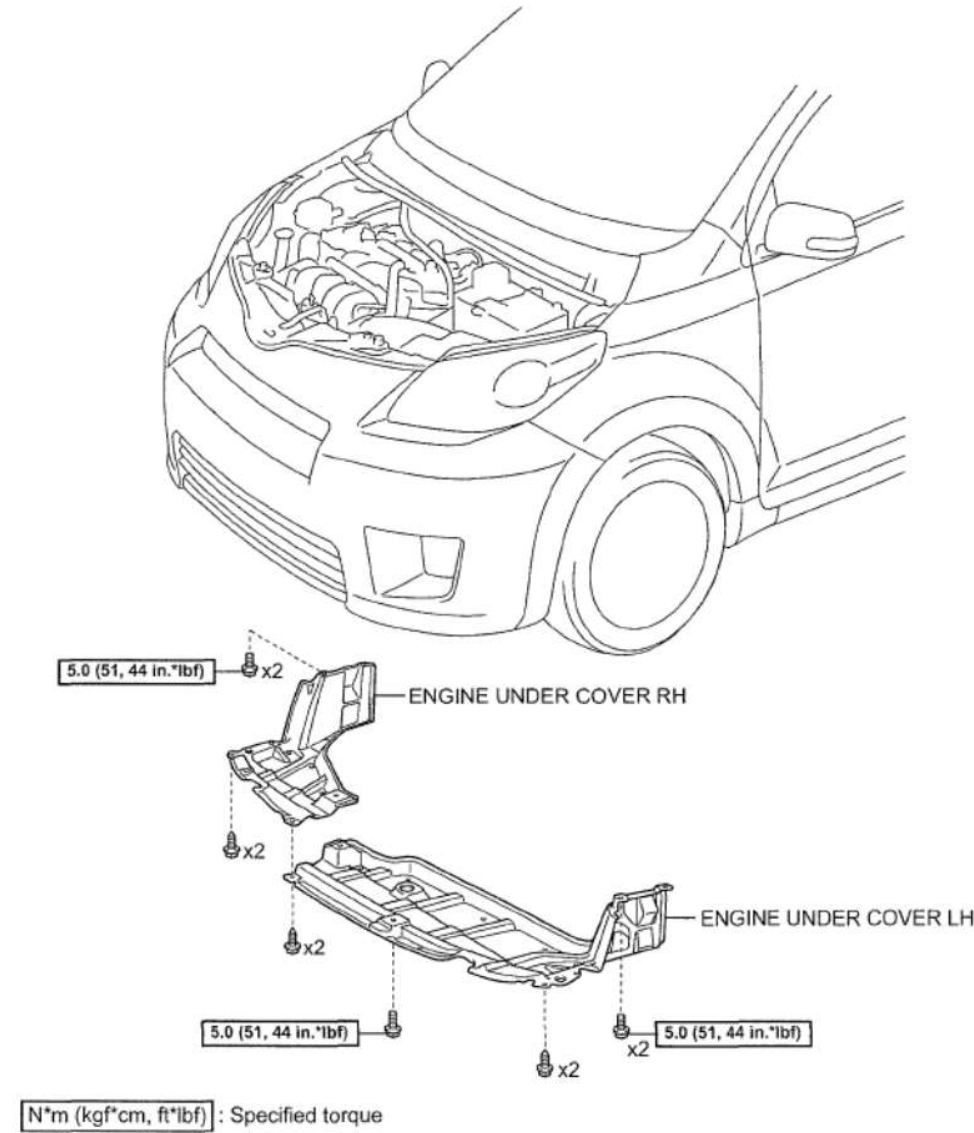
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

STARTER

COMPONENTS

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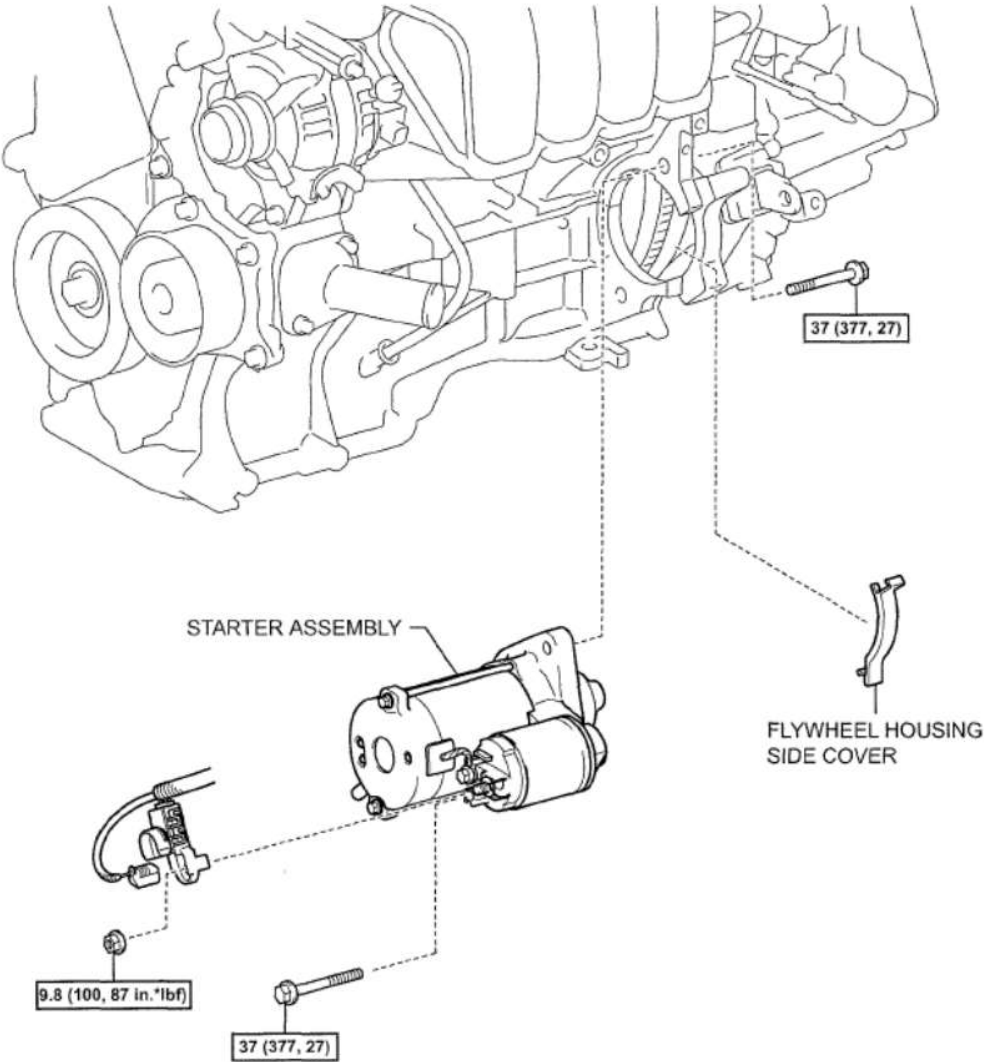


Y A173244E01

Fig. 3: Identifying Starter Components With Torque Specifications (1 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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N*m (kgf*cm, ft*lbf) : Specified torque

T

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Fig. 4: Identifying Starter Components With Torque Specifications (2 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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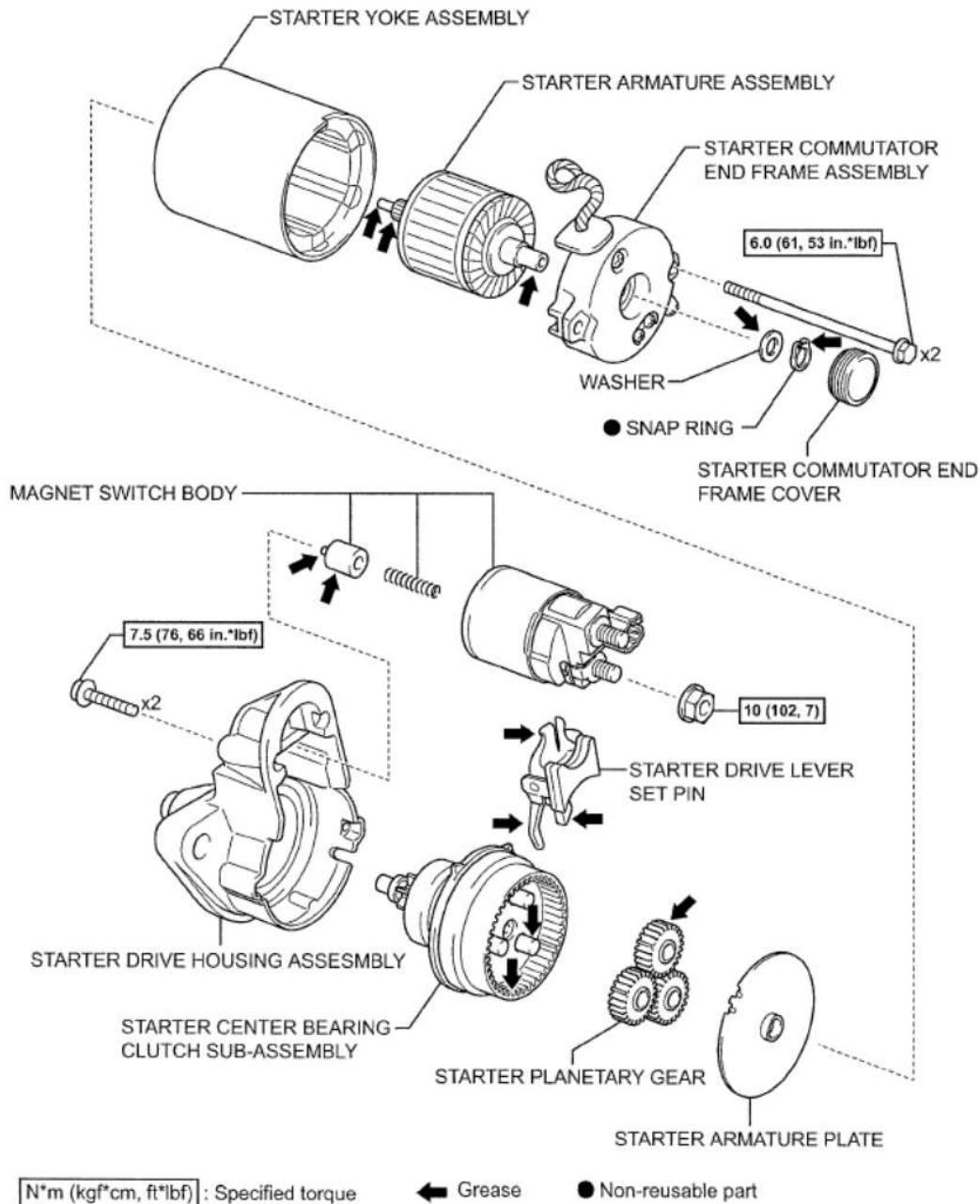


Fig. 5: Identifying Starter Components With Torque Specifications (3 Of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE UNDER COVER LH
3. REMOVE ENGINE UNDER COVER RH

2008 Scion xD**2008 ENGINE 2ZR-FE Starting - xD****4. REMOVE FLYWHEEL HOUSING SIDE COVER**

- a. Disengage the claw by pulling it outward and remove the flywheel housing side cover.

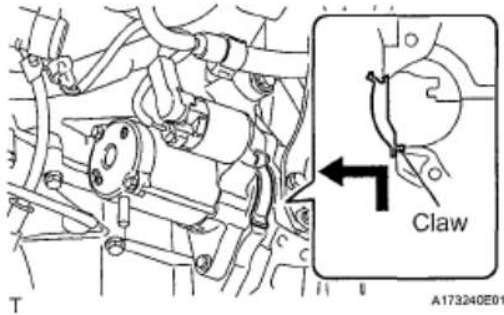


Fig. 6: Identifying Flywheel Housing Side Cover And Claw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE STARTER ASSEMBLY

- a. Remove the terminal cap.
- b. Remove the nut and disconnect terminal 30.
- c. Disconnect the connector.

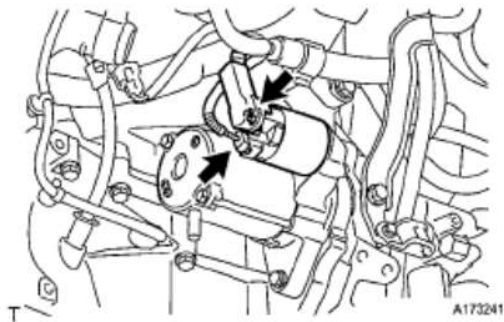
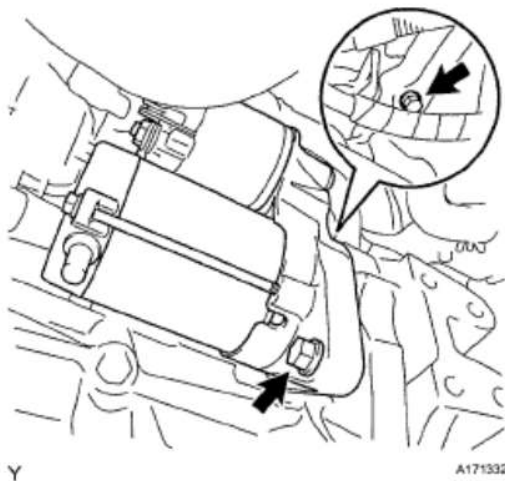


Fig. 7: Identifying Starter Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the 2 bolts and remove the starter assembly.

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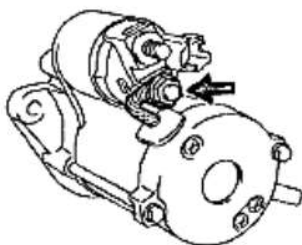
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**Fig. 8: Locating Starter Assembly Bolts**

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

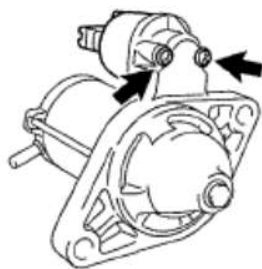
DISASSEMBLY**1. REMOVE MAGNET SWITCH BODY**

- a. Remove the nut, and disconnect the lead wire from the terminal C.

**Fig. 9: Locating Lead Wire Of Terminal C**

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

- b. Remove the 2 screws and magnet switch body from the starter drive housing assembly.

**Fig. 10: Locating Magnet Switch Body Screw**

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

- c. Remove the return spring and the plunger from the magnet switch body.

2. REMOVE STARTER YOKE ASSEMBLY

- a. Remove the 2 through bolts, and pull out the starter yoke assembly and starter commutator end frame assembly together.

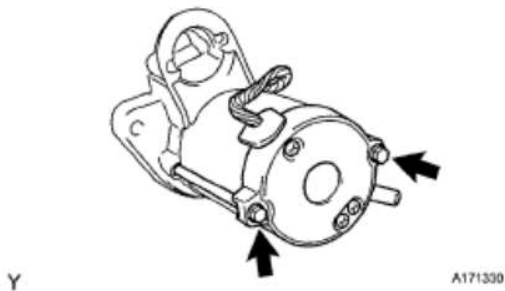


Fig. 11: Locating Starter Yoke Assembly Bolts

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

- b. Remove the starter yoke assembly from the starter commutator end frame assembly.

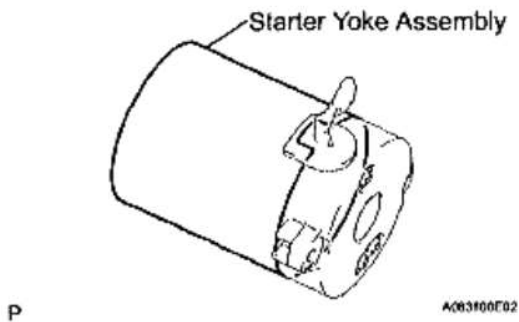


Fig. 12: Identifying Starter Yoke Assembly

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

3. REMOVE STARTER COMMUTATOR END FRAME COVER

- a. Using a screwdriver, remove the starter commutator end frame cover from the starter commutator end frame.

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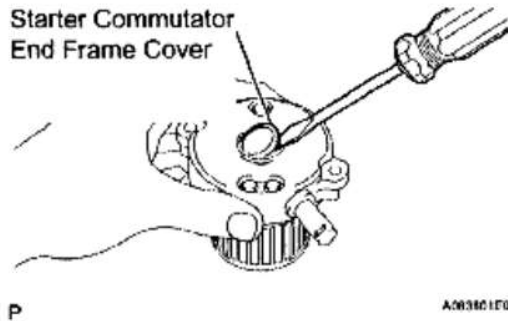


Fig. 13: Removing Starter Commutator End Frame Cover And Starter Commutator End Frame

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

4. REMOVE STARTER ARMATURE ASSEMBLY

- Hold the starter commutator end frame in a vise between aluminum plates.

NOTE: Do not over tighten the vise.

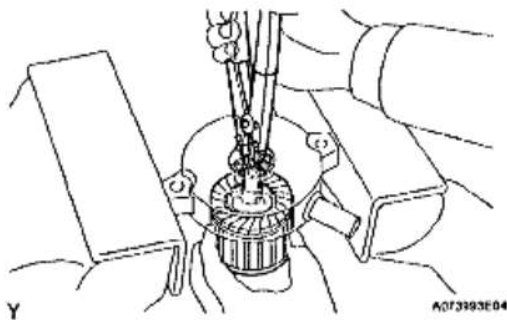


Fig. 14: Holding Starter Commutator End Frame
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Using snap ring pliers, remove the snap ring and the plate washer.
- Remove the starter armature assembly from the commutator end frame assembly.

NOTE: Do not drop the starter armature assembly.

5. REMOVE STARTER ARMATURE PLATE

- Remove the starter armature plate from the starter yoke assembly.

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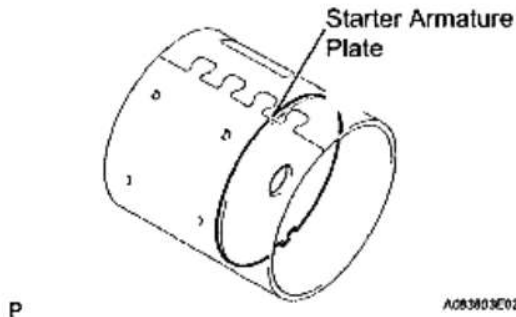


Fig. 15: Identifying Starter Armature Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE STARTER PLANETARY GEAR

- Remove the 3 planetary gears from the starter drive housing.

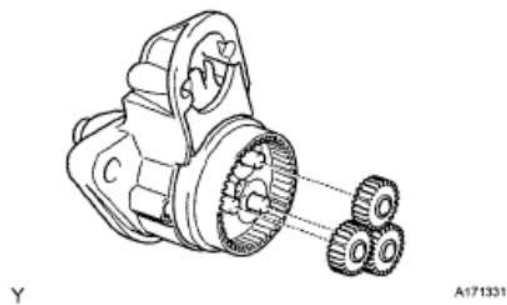


Fig. 16: Identifying Starter Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE STARTER CENTER BEARING CLUTCH SUB-ASSEMBLY

- Remove the starter center bearing clutch sub-assembly with drive lever set pin from the starter drive housing assembly.

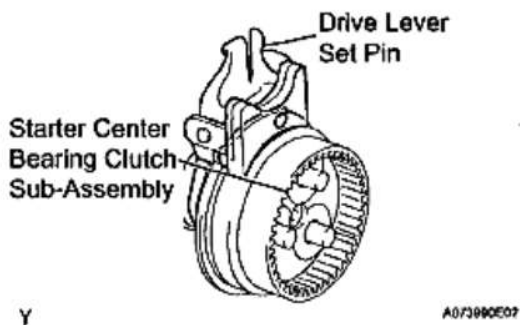


Fig. 17: Identifying Starter Center Bearing Clutch Sub-Assembly And Drive Lever Set Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Remove the drive lever set pin from the starter center bearing clutch sub-assembly.

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INSPECTION

1. INSPECT STARTER ASSEMBLY

NOTE: The following tests must be performed for no longer than 5 seconds to prevent the coil from burning out.

- a. Perform the pull-in test.
 1. Remove the nut and disconnect the lead wire from terminal C.
 2. Connect the battery to the starter magnetic switch as shown in the illustration. Check that the clutch pinion gear moves outward. If the result is not as specified, replace the magnet starter switch assembly.

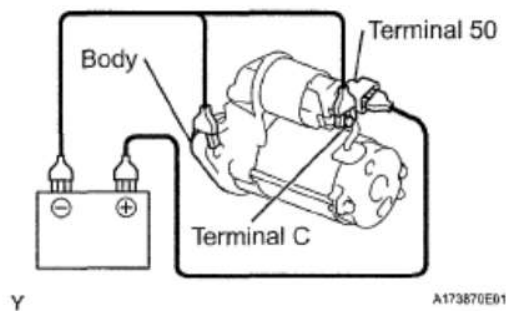


Fig. 18: Connecting Battery To Starter Magnetic Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Perform the holding test.
 1. Disconnect the negative (-) lead from terminal C. Check that the pinion gear remains out. If the result is not as specified, replace the magnet starter switch assembly.

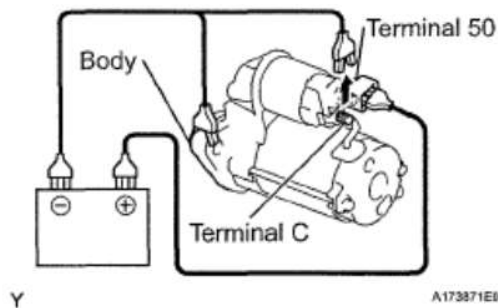


Fig. 19: Checking Pinion Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Check the operation.
 1. Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns in ward.

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If the result is not as specified, replace the magnet starter switch assembly.

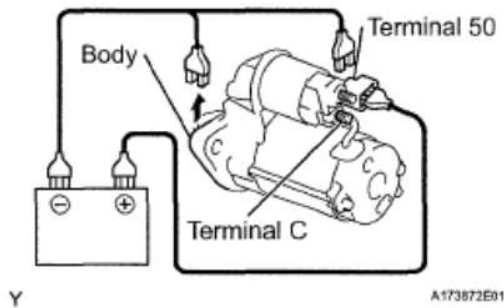


Fig. 20: Checking Clutch Pinion Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Perform the no-load performance test.
1. Connect the lead wire to terminal C with the nut. Make sure that the lead is not grounded.

Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

2. Clamp the starter in a vise.
3. Connect the battery and an ammeter to the starter as shown in the illustration.
4. Check that the starter rotates smoothly and steadily while the pinion gear is moving out. Check that the ammeter reads the specified current.

Standard current

STANDARD CURRENT SPECIFICATION

Tester connection	Condition	Specified condition
Positive battery terminal - Terminal 30 -Terminal 50	11.5 V	Below 90 A

If the result is not as specified, replace the starter assembly.

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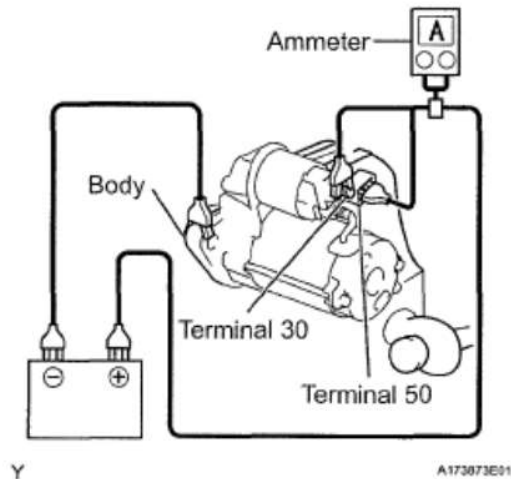


Fig. 21: Connecting Battery And Ammeter To Starter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT STARTER ARMATURE ASSEMBLY

- a. Inspect the commutator for open circuits.
 - 1. Measure the resistance according to the value (s) in the table below.

Standard resistance

RESISTANCE REFERENCE

Tester connection	Specified condition
Segment - Segment	Below 1 ohms

If the result is not as specified, replace the starter armature assembly.

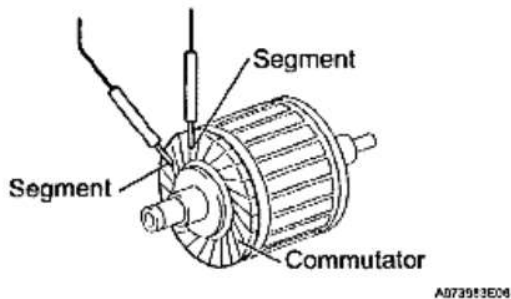


Fig. 22: Inspecting Commutator For Open Circuits
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Inspect the commutator for ground.
 - 1. Measure the resistance according to the value (s) in the table below.

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Standard resistance

RESISTANCE REFERENCE

Tester connection	Specified condition
Commutator - Armature core	10 kohms or higher

If the result is not as specified, replace the starter armature assembly.

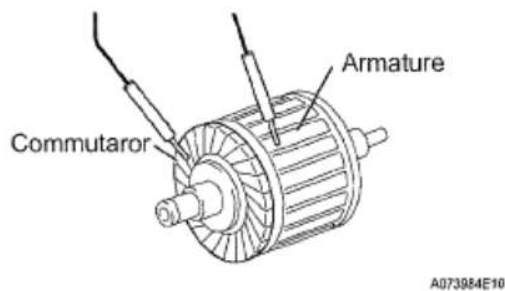


Fig. 23: Measuring Resistance According To Value
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Inspect the commutator surface for dirt and burns. If the surface is dirty or burnt, restore it with sandpaper (No. 400) or a lathe.
- d. Using vernier calipers, measure the commutator length.

Standard length:

3.1 mm (0.122 in.)

Maximum length:

3.8 mm (0.150 in.)

If the length is greater than the maximum, replace the armature assembly.

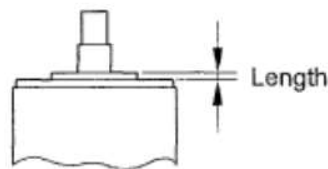


Fig. 24: Identifying Commutator Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT STARTER COMMUTATOR END FRAME ASSEMBLY

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- a. Using vernier calipers, measure the brush length.

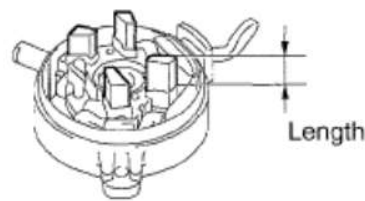
Standard length:

9.0 mm (0.354 in.)

Minimum length:

4.0 mm (0.158 in.)

If the length is less than the minimum, replace the starter commutator end frame assembly.



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Fig. 25: Identifying Brush Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

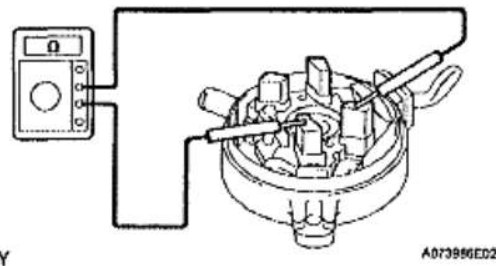
- b. Inspect the brush holder.
1. Measure the resistance according to the value (s) in the table below.

Standard resistance

RESISTANCE REFERENCE

Tester connection	Specified condition
Positive (+) brush - Negative (-) brush	10 kohms or higher

If the result is not as specified, replace the starter commutator end frame assembly.



Y

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Fig. 26: Measuring Resistance Value
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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4. INSPECT STARTER CENTER BEARING CLUTCH SUB-ASSEMBLY

- a. Inspect the gear teeth on the planetary gear, internal gear and starter clutch for wear and damage.

If damaged, replace the starter planetary gear or starter center bearing clutch sub-assembly. Also check the starter planetary gear for wear or damage.

- b. Inspect the starter clutch.

1. Rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion gear counterclockwise and check that it locks.

If necessary, replace the starter center bearing clutch sub-assembly.

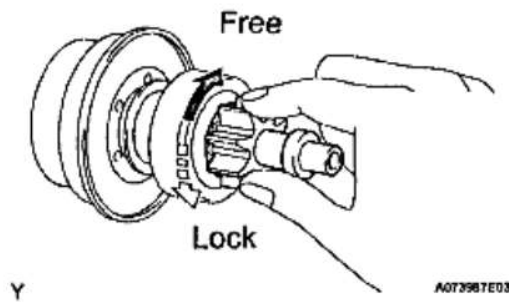


Fig. 27: Inspecting Starter Clutch

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

5. INSPECT MAGNET SWITCH BODY

- a. Inspect the plunger.

1. Push in the plunger and check that it returns quickly to its original position. If necessary, replace the magnet switch body.

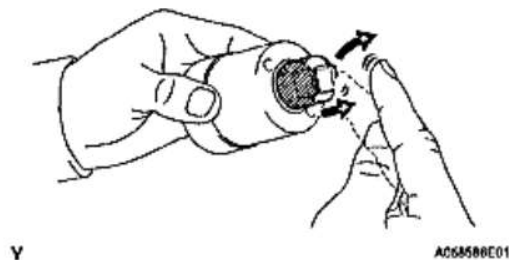


Fig. 28: Inspecting Plunger

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

- b. Inspect the pull-in coil for open circuits.

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

Standard resistance

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RESISTANCE REFERENCE

Tester connection	Specified condition
Terminal C - Terminal 50	Below 1 ohms

If the result is not as specified, replace the magnet switch body.

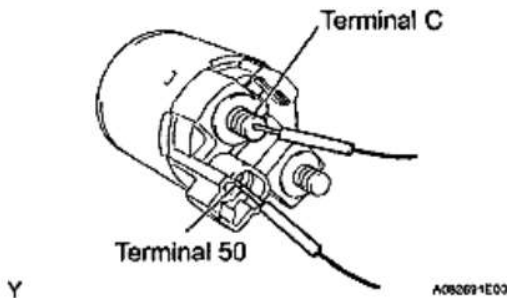


Fig. 29: Measuring Resistance Value
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Check whether the holding coil has an open circuit.
 - 1. Measure the resistance according to the value (s) in the table below.

Standard resistance

RESISTANCE REFERENCE

Tester connection	Specified condition
Terminal 50 - Magnet switch body	Below 2 ohms

If the result is not as specified, replace the magnet switch body.

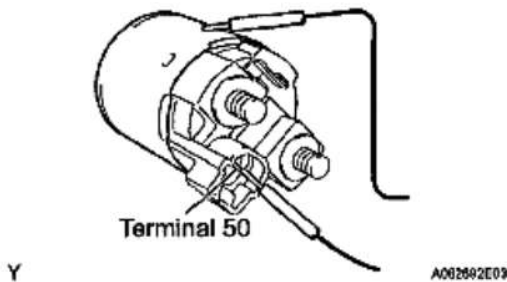


Fig. 30: Checking Whether Holding Coil
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

- 1. INSTALL STARTER CENTER BEARING CLUTCH SUB-ASSEMBLY
 - a. Apply grease to the drive lever set pin, as shown in the illustration.

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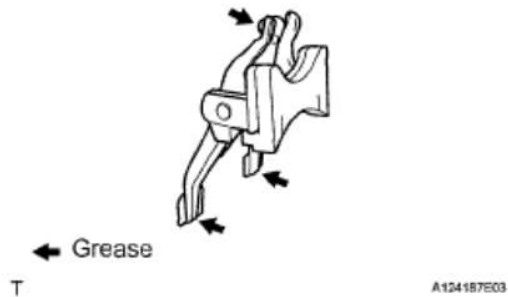


Fig. 31: Locating Drive Lever Set Pin

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

- b. Install the drive lever set pin into the starter center bearing clutch sub-assembly.

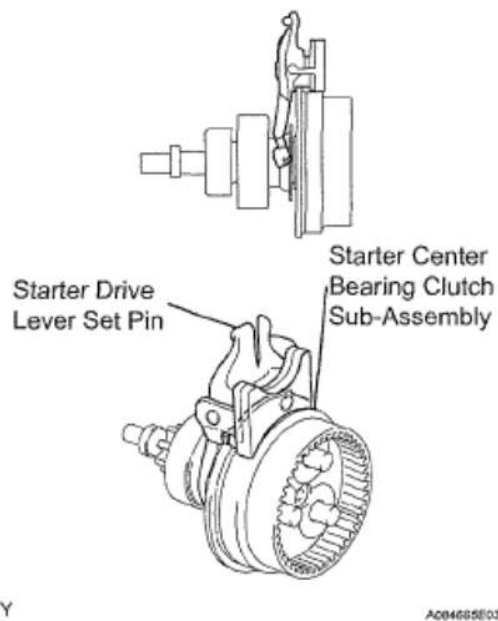


Fig. 32: Identifying Drive Lever Set Pin Into Starter Center Bearing Clutch Sub-Assembly

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

- c. Install the starter center bearing clutch sub-assembly together with the starter drive lever set pin into the starter drive housing assembly.

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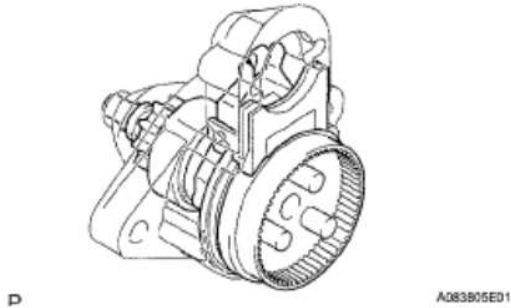


Fig. 33: Identifying Starter Center Bearing Clutch Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL STARTER PLANETARY GEAR

- Apply grease to the planetary gears and pin parts of the planetary shaft as shown in the illustration.
- Install the 3 planetary gears.

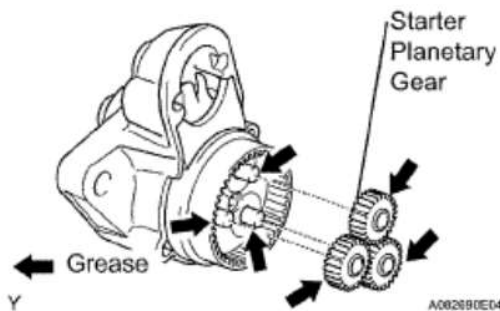


Fig. 34: Locating Starter Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL STARTER ARMATURE ASSEMBLY

- Apply grease to the washer plate and the armature shaft.
- Install the armature shaft onto the starter commutator end frame assembly.
- Using snap ring pliers, install the plate washer and a new snap ring.

NOTE:

- Be sure to install the snap ring in the armature shaft groove securely.
- Be sure to properly install the snap ring because it easily expands.

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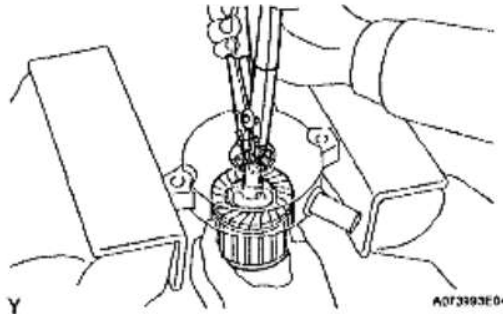


Fig. 35: Installing Starter Armature Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using vernier calipers, measure the snap ring.

Maximum length:

5.0 mm (0.197 in.)

If the length is greater than the maximum, replace the snap ring.

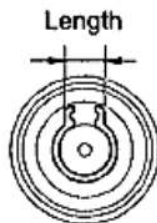
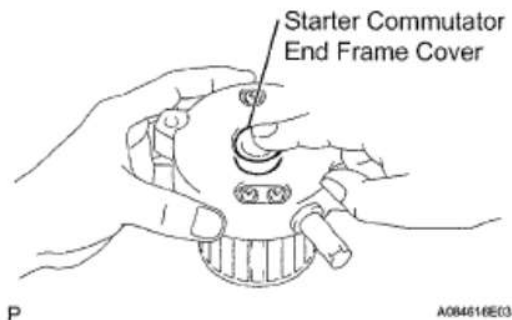


Fig. 36: Identifying Snap Ring Length
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL STARTER COMMUTATOR END FRAME COVER

- a. Install the starter commutator end frame cover onto the starter commutator end frame assembly.



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Fig. 37: Installing Starter Commutator End Frame Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL STARTER ARMATURE PLATE

- Insert the starter armature plate into the starter yoke assembly.
- Align the cutout of the plate with the inside protrusion of the starter yoke assembly, and install the plate.

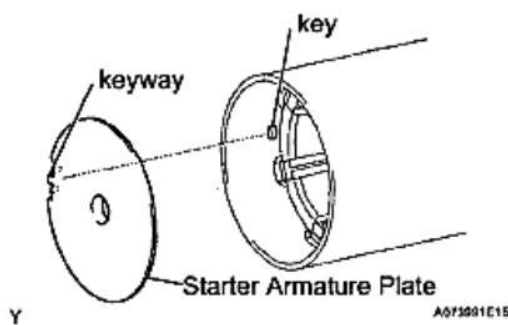


Fig. 38: Identifying Starter Armature Plate, Keyway And Key
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL STARTER COMMUTATOR END FRAME ASSEMBLY

- Align the starter commutator end frame rubber with the cutout of the starter yoke assembly.
- Install the starter yoke assembly onto the starter commutator end frame assembly.

NOTE: The magnet of the starter yoke may attract the starter armature when the starter commutator end frame is installed, causing magnet breakage.

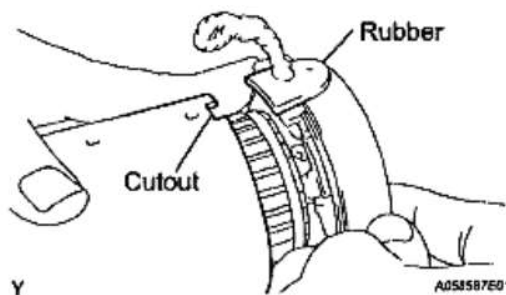


Fig. 39: Installing Starter Commutator End Frame Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL STARTER YOKE ASSEMBLY

- Align the key located on the starter yoke assembly with the keyway of the starter drive housing assembly.

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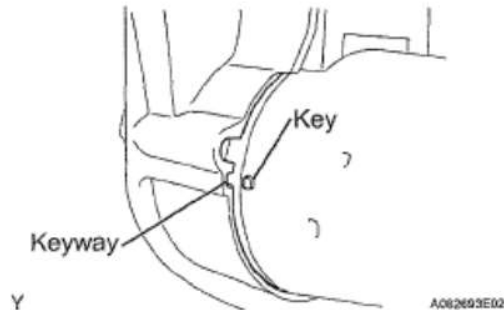


Fig. 40: Identifying Keyway And Key
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the starter yoke assembly with the 2 through bolts.

Torque: 6.0 N*m (61 kgf*cm, 53 in.*lbf)

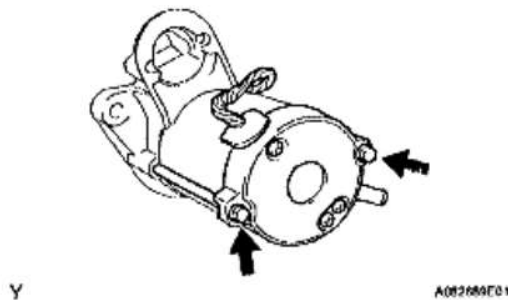


Fig. 41: Identifying Starter Yoke Assembly With Through Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL MAGNET SWITCH BODY

- a. Apply grease to the plunger and the hook, as shown in the illustration.

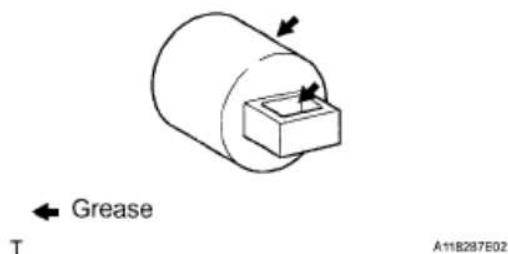


Fig. 42: Locating Magnet Switch Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Hang the plunger hook of the magnet switch body on the starter drive lever set pin.
- c. Install the plunger and the return spring as shown in the illustration.

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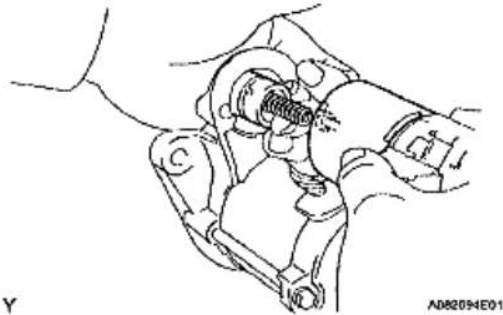


Fig. 43: Installing Plunger And Return Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the magnet switch body with the 2 screws.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

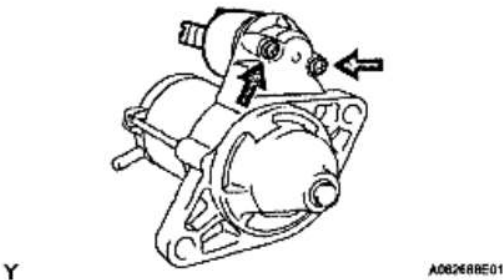


Fig. 44: Locating Magnet Switch Body With Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Connect the lead wire to the terminal C with the nut.

Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

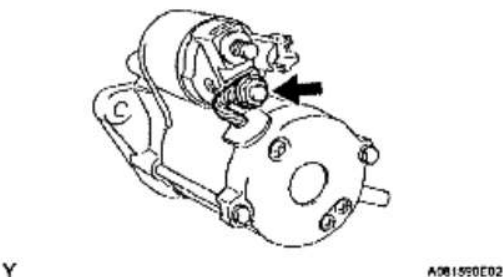


Fig. 45: Locating Lead Wire To Terminal C With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

2008 Scion xD**2008 ENGINE 2ZR-FE Starting - xD****1. INSTALL STARTER ASSEMBLY**

- a. Install the starter assembly with the 2 bolts.

Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)

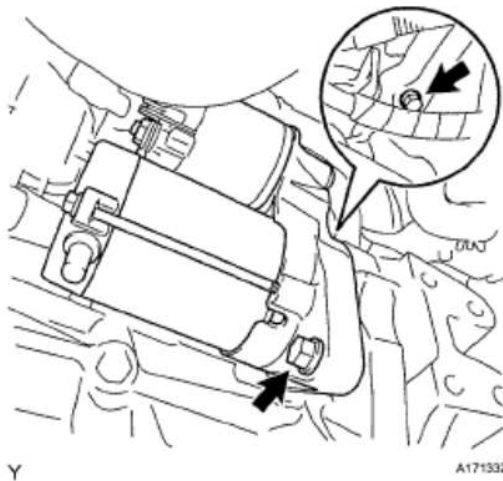


Fig. 46: Locating Starter Assembly With Bolts

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

- b. Connect the connector.
- c. Connect terminal 30 with the nut.

Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)

- d. Close the terminal cap.

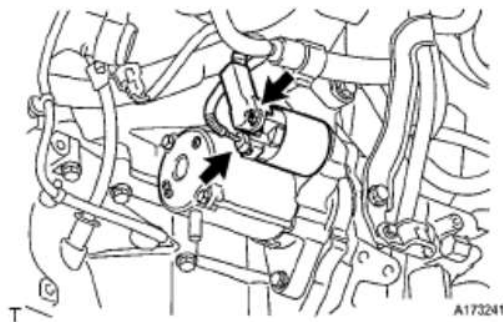


Fig. 47: Identifying Starter Assembly

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

2. INSTALL FLYWHEEL HOUSING SIDE COVER

- a. Insert the protruding portion into the end of the cylinder block and while pushing it along the cylinder block, fit the claw into the cylinder block.

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NOTE:

- Make sure that the claw makes a click sound, indicating that it fits tightly.
- Replace the claw with a new one if it does not fit tightly or is deformed.

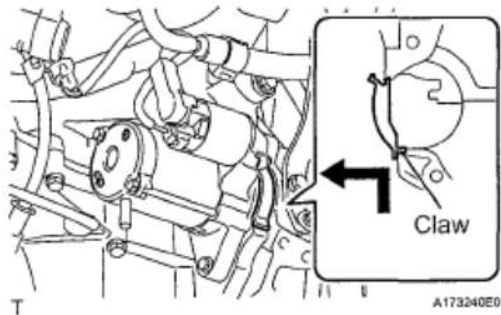


Fig. 48: Identifying Flywheel Housing Side Cover And Claw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL ENGINE UNDER COVER RH
4. INSTALL ENGINE UNDER COVER LH
5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)

STARTER RELAY

ON-VEHICLE INSPECTION

1. INSPECT STARTER RELAY ASSEMBLY
 - a. Check the resistance.
 1. Measure the resistance according to the value (s) in the table below.

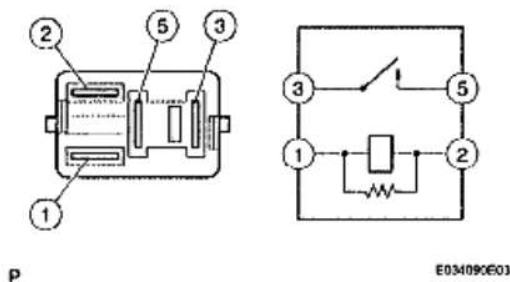


Fig. 49: Identifying Starter Relay Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance

2008 Scion xD	
2008 ENGINE 2ZR-FE Starting - xD	

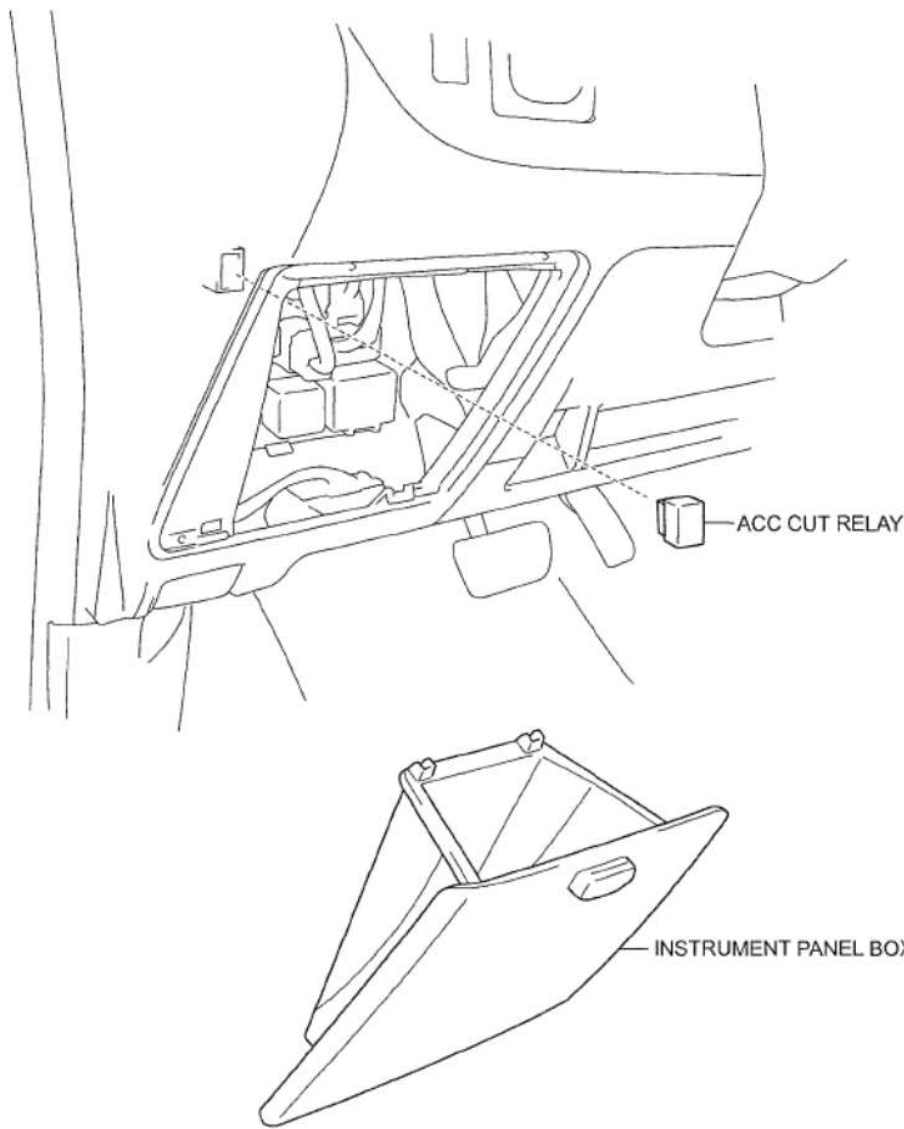
RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
3-5	When battery voltage applied to terminals 1 and 2	Below 1 ohms
	When battery voltage absent	10 kohms or higher

If the result is not as specified, replace the starter relay.

ACC CUT RELAY

COMPONENTS



2008 Scion xD

2008 ENGINE 2ZR-FE Starting - xD

Fig. 50: Identifying ACC Cut Relay Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

- 1. REMOVE INSTRUMENT PANEL BOX (See **REMOVAL**)
- 2. REMOVE ACC CUT RELAY
 - a. Remove the ACC cut relay.

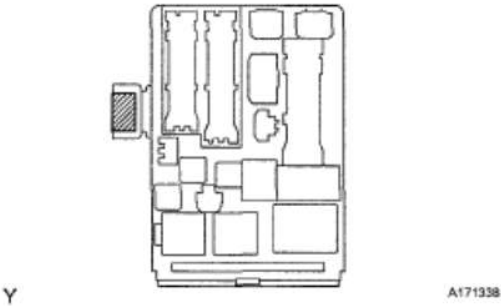


Fig. 51: Identifying ACC Cut Relay
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

- 1. INSPECT ACC CUT RELAY
 - a. Check the resistance.
 - 1. Measure the resistance according to the value (s) in the table below.

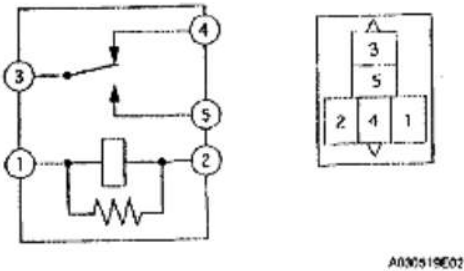


Fig. 52: Identifying ACC Cut Relay Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance

RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
3-4	When battery voltage absent	Below 1 ohms
	When battery voltage applied to terminals 1 and 2	10 kohms or higher

2008 Scion xD		
2008 ENGINE 2ZR-FE Starting - xD		

3-5	When battery voltage applied to terminals 1 and 2	Below 1 ohms
	When battery voltage absent	10 kohms or higher

If the result is not as specified, replace the relay.

INSTALLATION

- 1. **INSTALL ACC CUT RELAY**
 - a. Install the ACC cut relay.

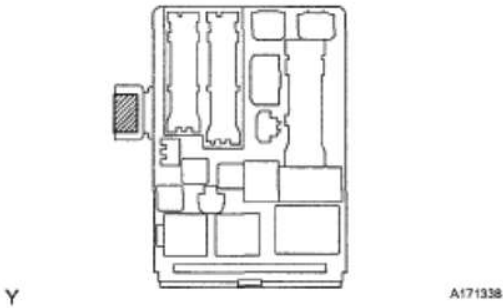


Fig. 53: Identifying ACC Cut Relay
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

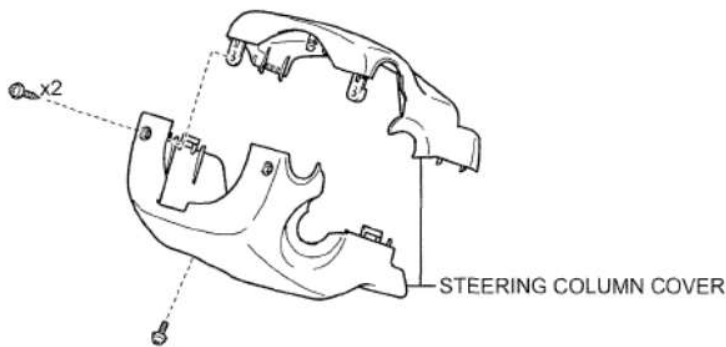
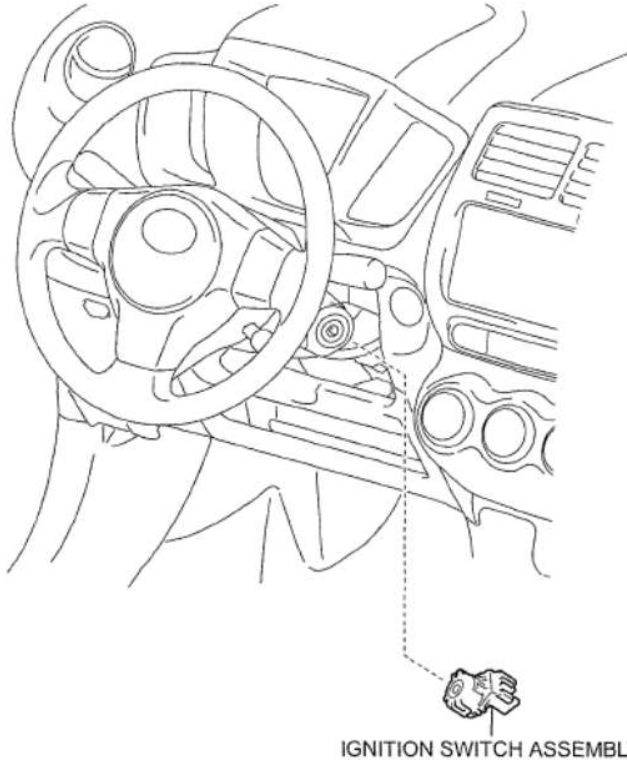
- 2. **INSTALL INSTRUMENT PANEL BOX** (See INSTALLATION)

IGNITION SWITCH

COMPONENTS

2008 Scion xD

2008 ENGINE 2ZR-FE Starting - xD



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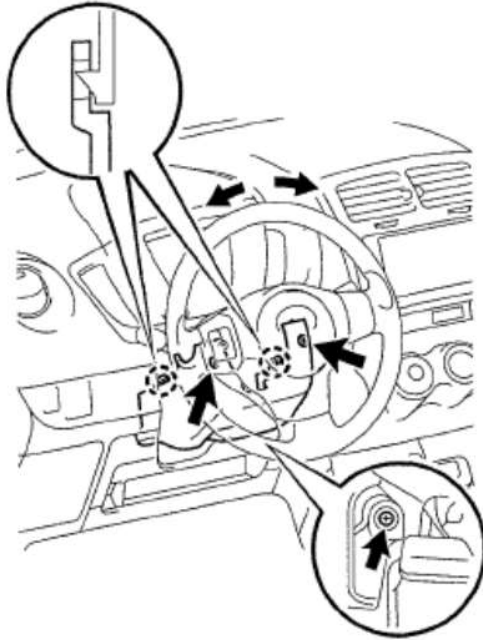
Fig. 54: Identifying Ignition Switch Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL**1. REMOVE STEERING COLUMN COVER**

- a. Turn the steering wheel to the right and remove the screw indicated in the illustration.
- b. Turn the steering wheel to the left and remove the screw indicated in the illustration.
- c. Remove the screw indicated in the illustration and remove the steering column cover.

2008 Scion xD

2008 ENGINE 2ZR-FE Starting - xD



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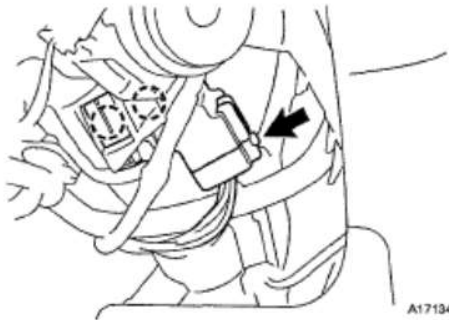
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Fig. 55: Locating Steering Wheel Screw

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

2. REMOVE IGNITION SWITCH ASSEMBLY

- Disconnect the connector.
- Disengage the 2 claws and remove the ignition switch assembly.



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Fig. 56: Locating Ignition Switch Assembly And Claws

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

INSPECTION

1. INSPECT IGNITION SWITCH ASSEMBLY

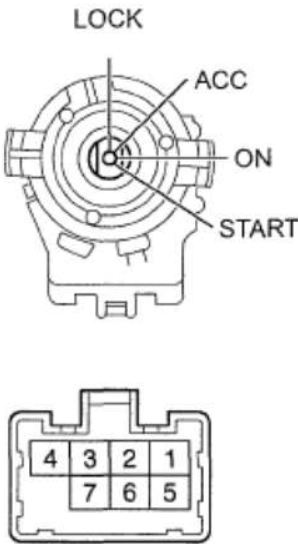
- Check the resistance.
 - Measure the resistance according to the value (s) in the table below.

2008 Scion xD
2008 ENGINE 2ZR-FE Starting - xD

Standard resistance

RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
Between all terminals	LOCK	10 kohms or higher
2-4	ACC	Below 1 ohms
1-2-4	ON	Below 1 ohms
5-6		
1-3-4	START	Below 1 ohms
5-6-7		



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A159373E01

Fig. 57: Identifying Ignition Switch Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

- 1. **INSTALL IGNITION SWITCH ASSEMBLY**
 - a. Engage the 2 claws and install the ignition switch assembly.
 - b. Connect the connector.

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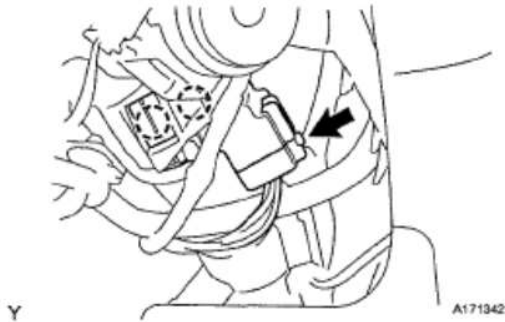


Fig. 58: Identifying Ignition Switch Assembly Claws
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL STEERING COLUMN COVER

- Install the screw in the position indicated in the illustration.
- Turn the steering wheel to the left and install the screw in the position indicated in the illustration.
- Turn the steering wheel to the right, and install the screw in the position indicated in the illustration.

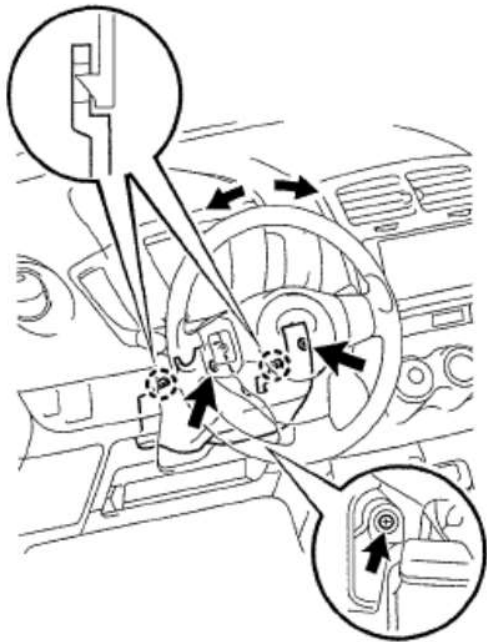


Fig. 59: Locating Steering Column Cover Screw
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.