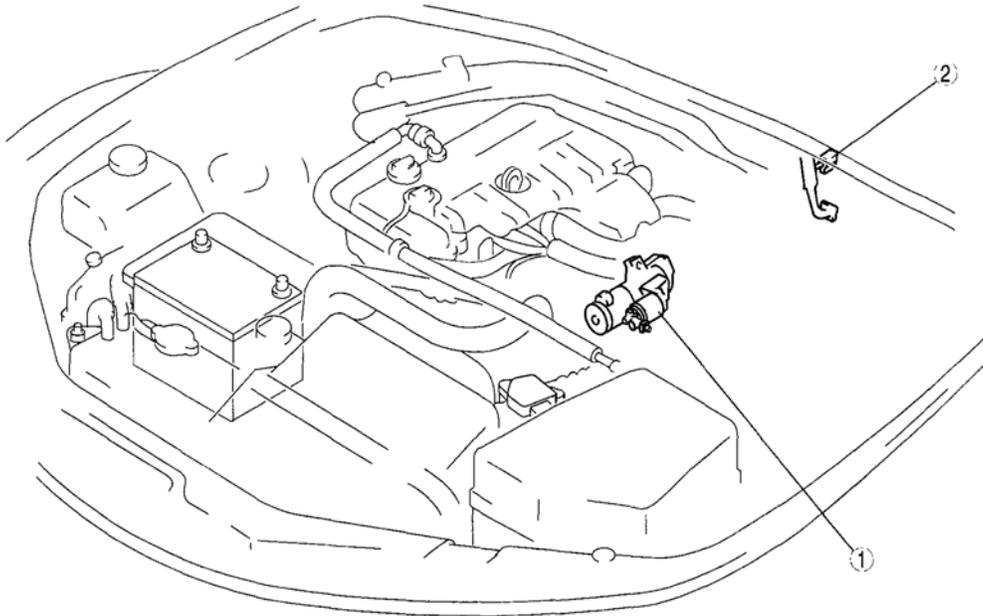


2008 ENGINE

Starting System - MX-5 Miata

STARTING SYSTEM LOCATION INDEX [LF]



E6U119ZW5001

1	Starter
2	Starter interlock switch (MT)

Fig. 1: Identifying Location Of Starting System Components
Courtesy of MAZDA MOTORS CORP.

STARTER REMOVAL/INSTALLATION [LF]

WARNING:

- Remove and install all parts when the engine is cold, otherwise they can cause severe burns or serious injury.
- When the battery cables are connected, touching the vehicle body with starter terminal B will generate sparks. This can cause personal injury, fire, and damage to the electrical components. Always disconnect the negative battery cable before performing the following operation.

1. Remove the battery cover.
2. Disconnect the negative battery cable. (See **BATTERY REMOVAL/INSTALLATION [LF]** .)
3. Remove the side cover. (LH)

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4. Remove the under cover. (MT) (See **TRANSVERSE MEMBER REMOVAL/INSTALLATION** .)
5. Remove the clutch release cylinder with the pipes still connected. Position the clutch release cylinder so that it is out of the way. (MT) (See **TRANSMISSION REMOVAL/INSTALLATION [M15M-D]** .) (See **TRANSMISSION REMOVAL/INSTALLATION [P66M-D]** .)
6. Remove in the order indicated in **Fig. 2** .
7. Install in the reverse order of removal.

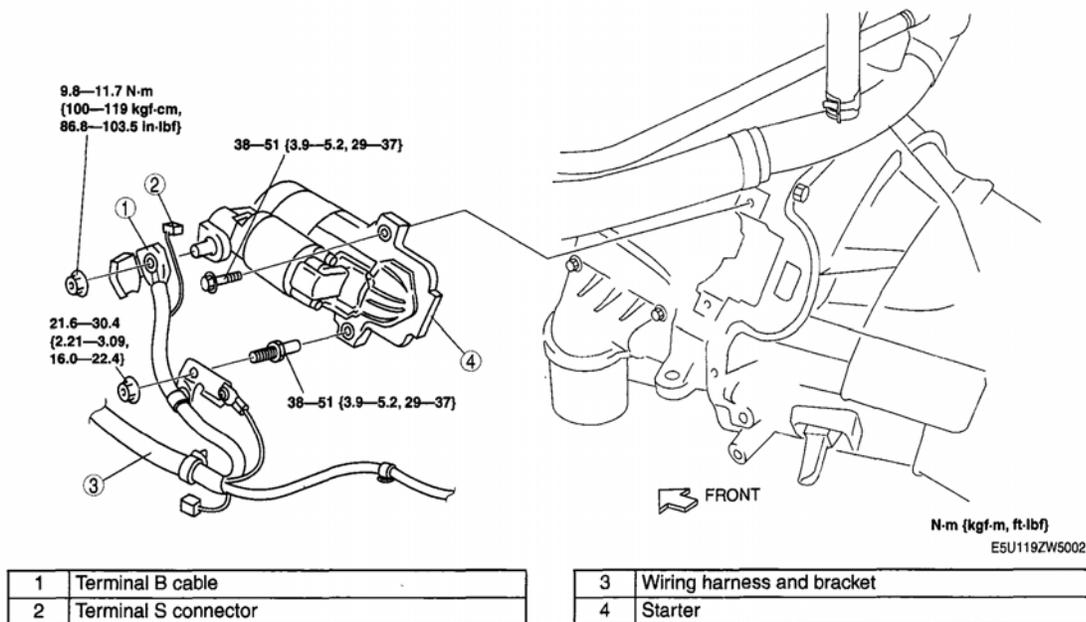


Fig. 2: View Of Starter Removal Order & Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

STARTER INSTALLATION NOTE

NOTE:

- If there is peeling on or damage to the insulator, attach a new insulator using the following procedure:

1. Peel off the insulator from the starter completely using a scraper.

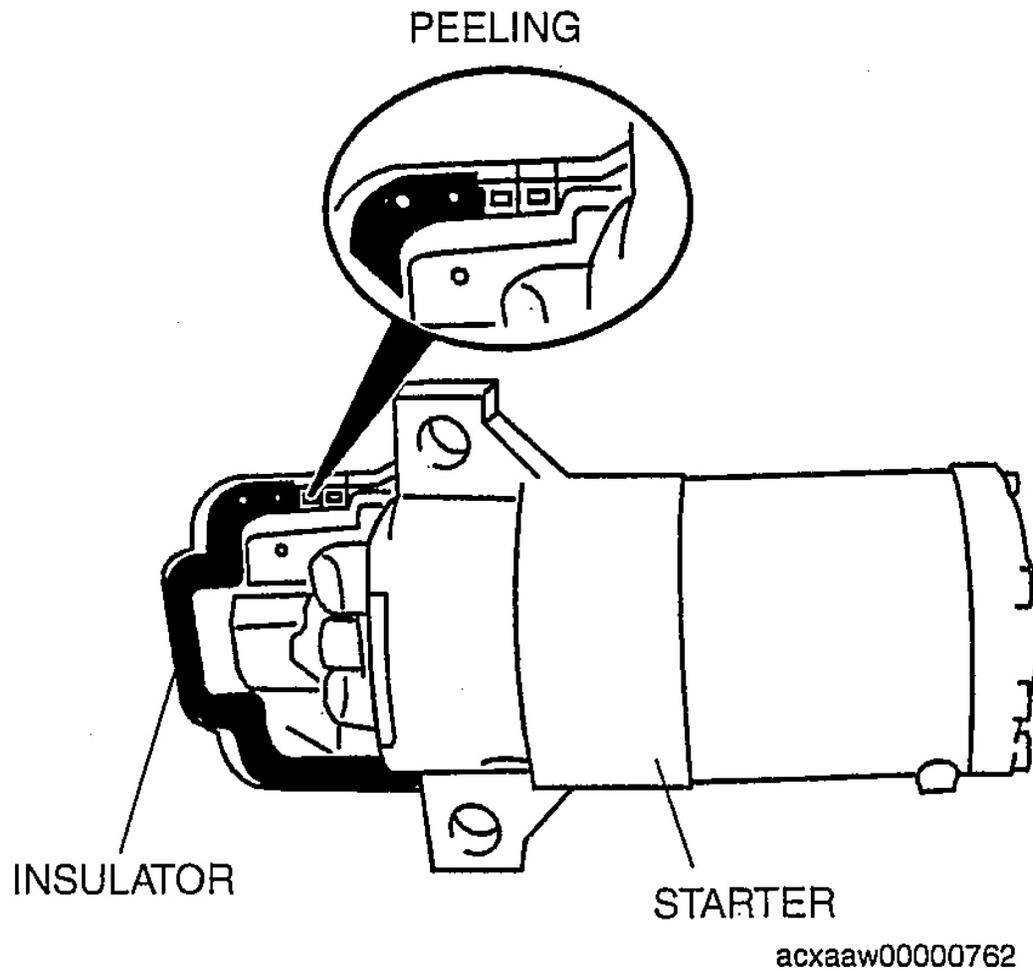


Fig. 3: Identifying Starter Insulator

2. Degrease the insulator attachment area.

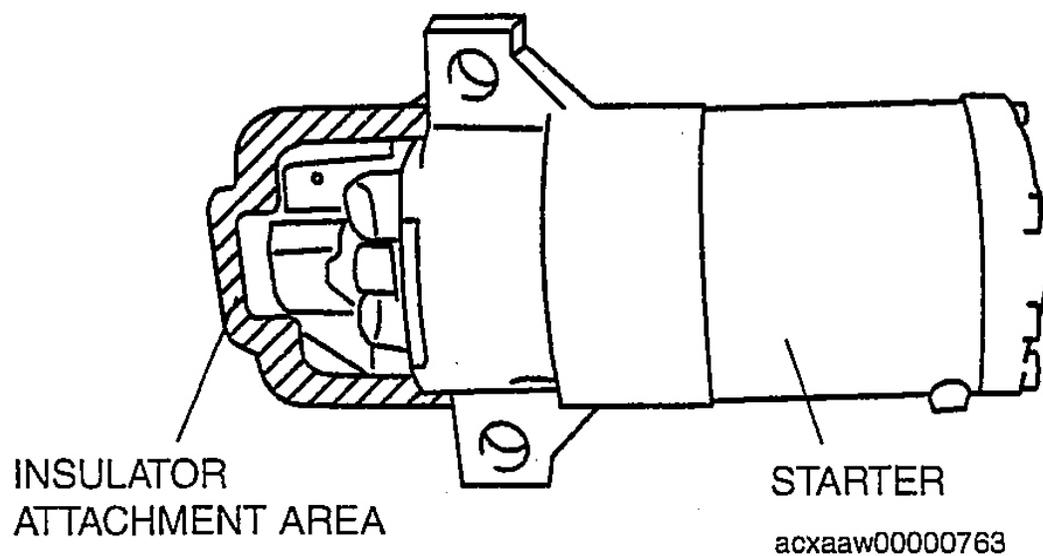


Fig. 4: Identifying Insulator Attachment Area

3. Attach a new insulator to the starter.

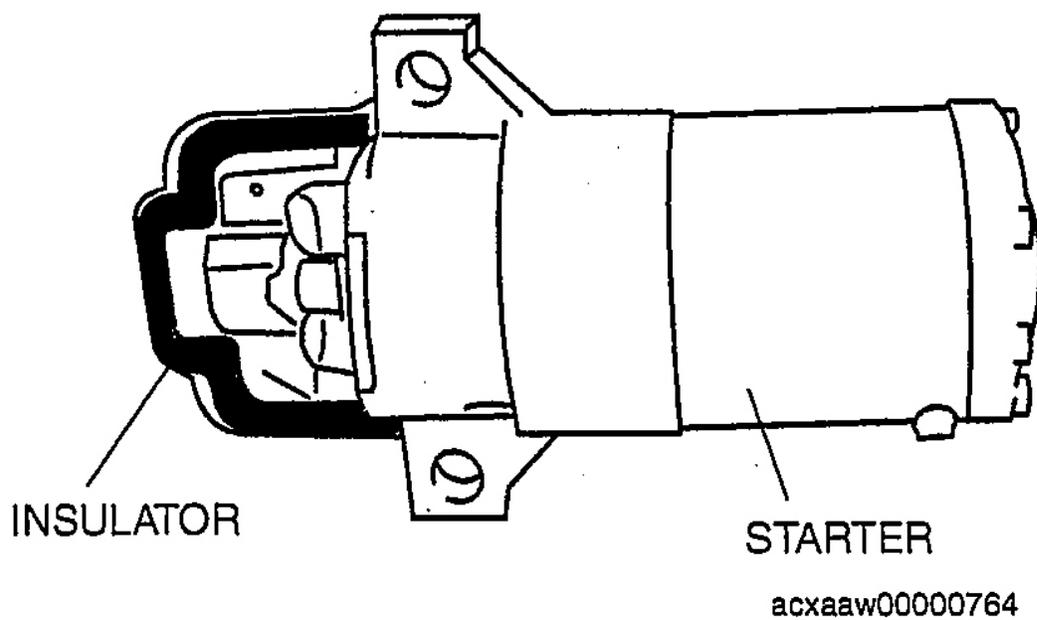


Fig. 5: Identifying New Starter Insulator

STARTER INSPECTION [LF]

ON-VEHICLE INSPECTION

1. Verify that the battery is fully charged.
2. The starter is normal if it rotates smoothly and without any noise when the engine is cranked.
 - If the starter does not operate, inspect the following:
 - Remove the starter, and inspect the starter unit.
 - Inspect the related wiring harnesses, the ignition switch, and the transmission range switch (AT).

NO-LOAD TEST

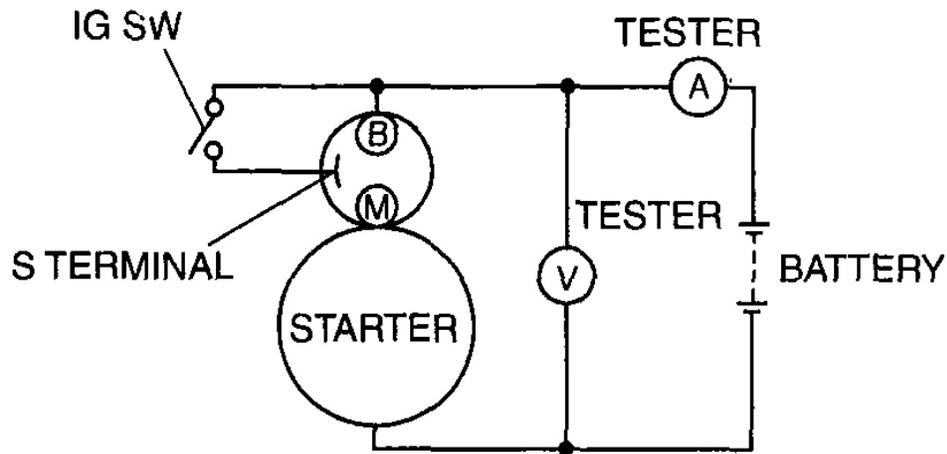
1. Verify that the battery is fully charged.
2. Connect the starter, battery and a tester as shown in **Fig. 6** .
3. Operate the starter and verify that it rotates smoothly.
 - If the starter does not rotate smoothly, inspect the starter unit.
4. Measure the voltage and current while the starter is operating.
 - If not within the specification, replace the starter.

Starter no load test voltage

11 V

Starter no load test current

90 A or less



DPE119AW1003

Fig. 6: No - Load Test - Circuit Diagram
 Courtesy of MAZDA MOTORS CORP.

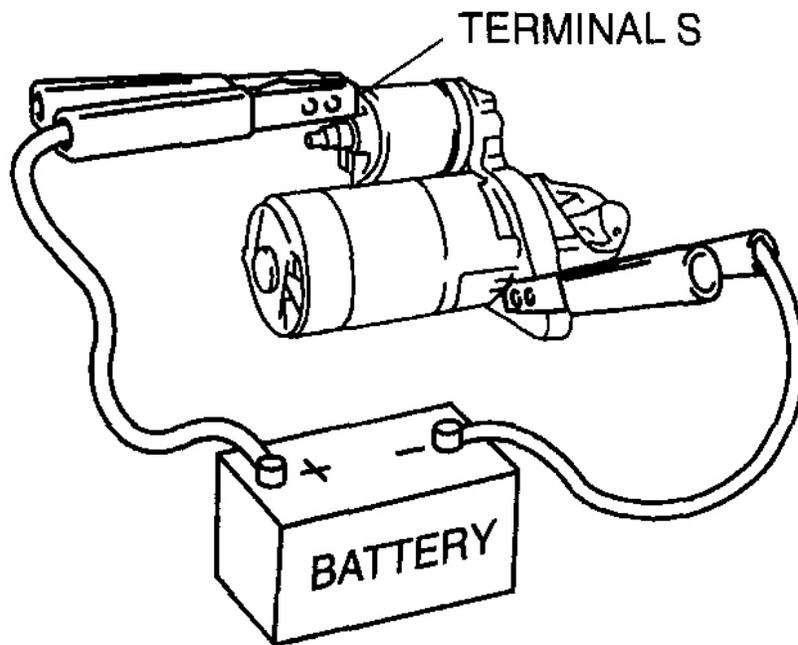
MAGNETIC SWITCH OPERATION INSPECTION

Pull-out Test

NOTE:

- Depending on the battery charge condition, the starter motor pinion may rotate while in an extended state. This is due to current flowing to the starter motor through the pull-in coil to turn the starter motor, and does not indicate an abnormality.

1. Verify that the starter motor pinion is extended while battery positive voltage is connected to terminal S and the starter body is grounded.
 - If the starter motor pinion is not extended, repair or replace the starter.

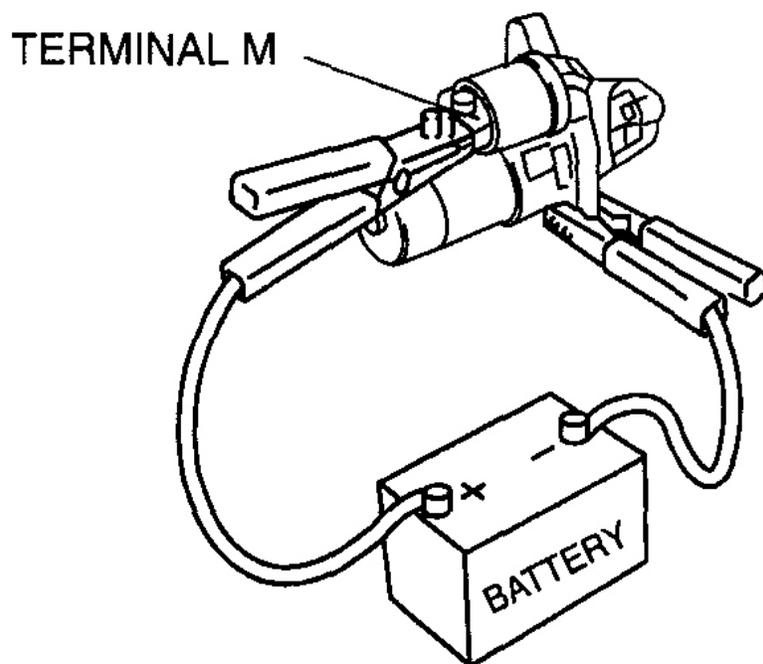


CHU0119W023

Fig. 7: Energizing Starter S Terminal
Courtesy of MAZDA MOTORS CORP.

Return test

1. Disconnect the motor wire from terminal M.
2. Connect battery positive voltage to terminal M and ground the starter body.



CHU0119W022

Fig. 8: Connecting Battery Positive Voltage To Terminal M & Ground Starter Body
Courtesy of MAZDA MOTORS CORP.

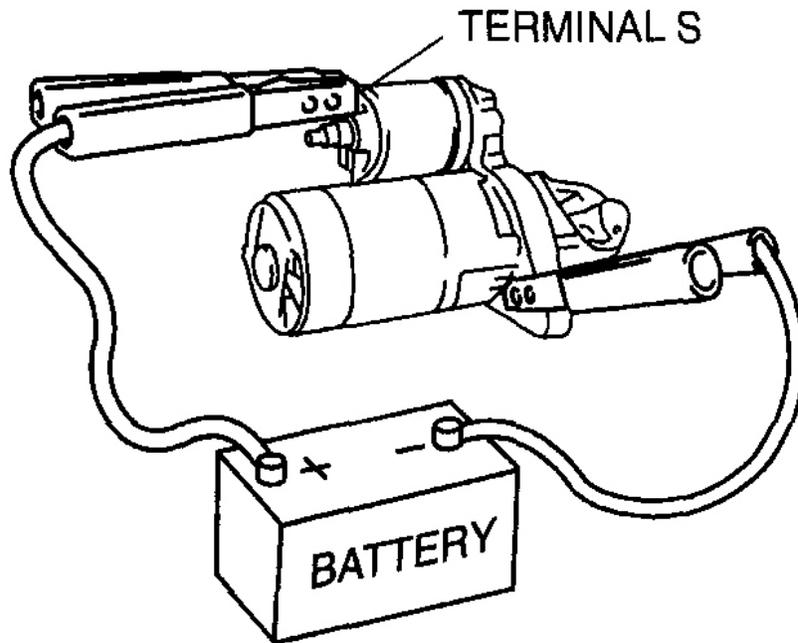
3. Pull out the drive pinion with a screwdriver. Verify that it returns to its original position when released.
 - If it does not return, repair or replace the starter.

PINION GAP INSPECTION

1. Pull out the drive pinion with the battery positive voltage connected to terminal S and the starter body grounded.

CAUTION:

- Applying power for more than 10 s can damage the starter. Do not apply power for more than 10s.



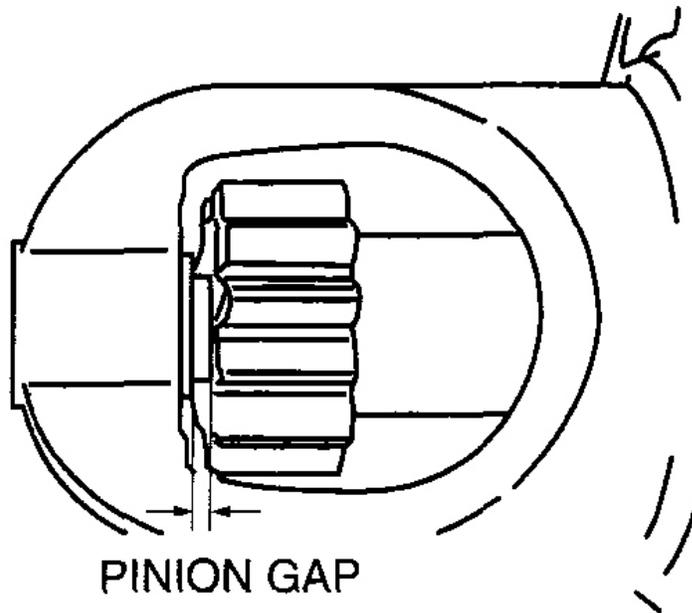
CHU0119W023

Fig. 9: Energizing Starter S Terminal
Courtesy of MAZDA MOTORS CORP.

2. Measure the pinion gap while the drive pinion is extended.
 - If not as specified, adjust with an adjustment washer (between drive housing front cover and magnetic switch).

Starter pinion gap

0.5-2.0 mm {0.02-0.07 in}



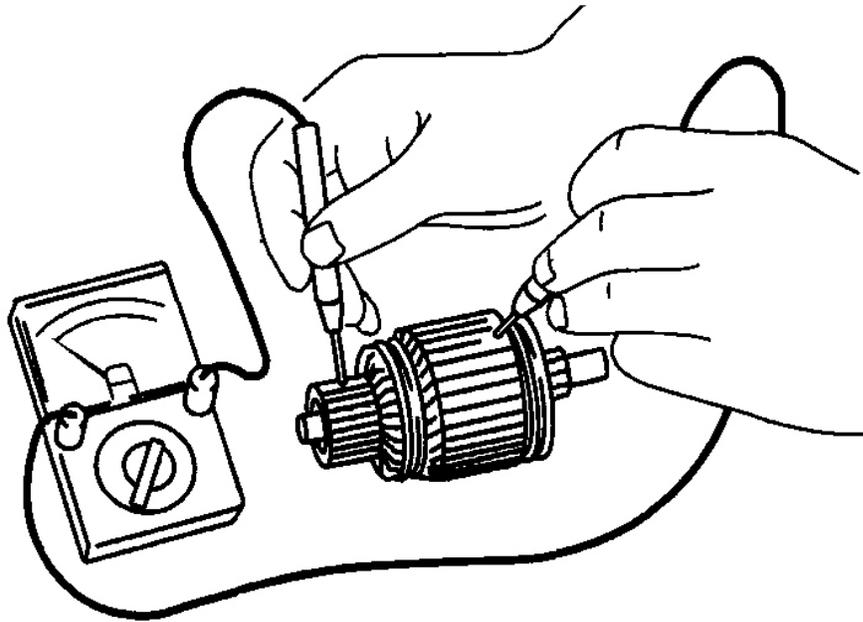
CHU0119W015

Fig. 10: Measuring Pinion Gap While Drive Pinion Is Extended
Courtesy of MAZDA MOTORS CORP.

STARTER INNER PARTS INSPECTION

Armature

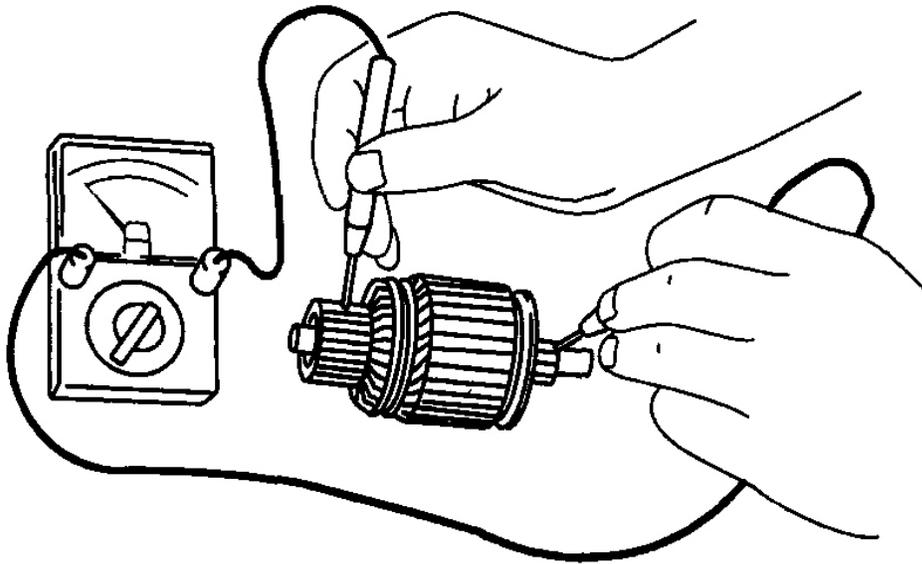
1. Verify that there is no continuity between the commutator and the core at each segment using a tester.
 - If there is continuity, replace the armature.



CHU0119W016

Fig. 11: Inspecting Continuity Between Commutator & Core
Courtesy of MAZDA MOTORS CORP.

2. Verify that there is no continuity between the commutator and the shaft using a tester.
 - If there is continuity, replace the armature.



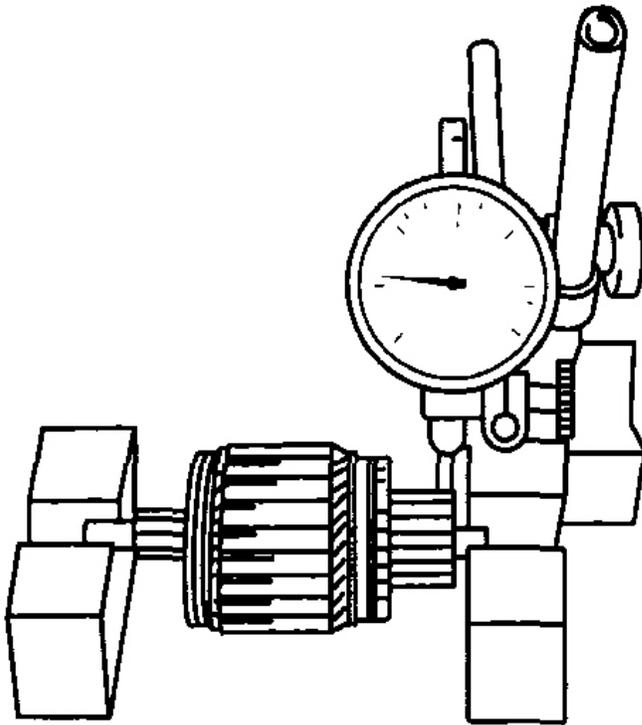
CHU0119W017

Fig. 12: Inspecting Continuity Between Commutator & Shaft
Courtesy of MAZDA MOTORS CORP.

3. Place the armature on V-blocks, and measure the runout using a dial indicator.

Starter armature runout

0.1 mm {0.004 in} max.



CHU0119W018

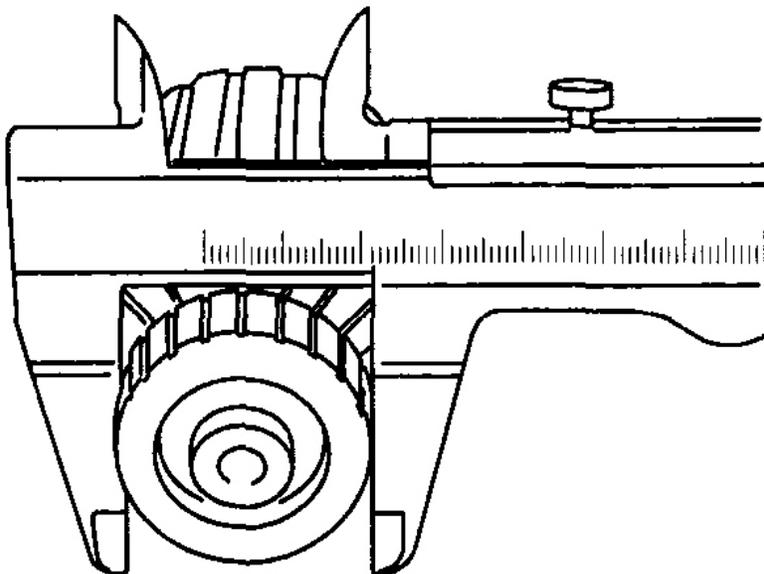
Fig. 13: Measuring Armature Runout Using Dial Indicator
Courtesy of MAZDA MOTORS CORP.

4. Measure the commutator diameter.
 - If not within the minimum specification, replace the armature.

Starter commutator diameter

Standard: 29.4 mm {1.16 in}

Minimum: 28.8 mm {1.13 in}



CHU0119W019

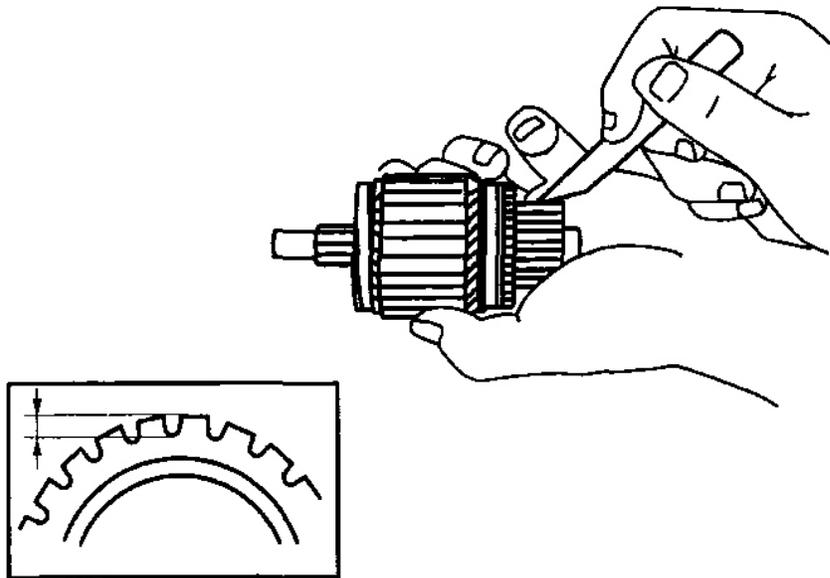
Fig. 14: Measuring Commutator Diameter
Courtesy of MAZDA MOTORS CORP.

5. Measure the segment groove depth of the commutator.
 - If not within the minimum specification, undercut the grooves to the standard depth.

Segment groove depth of starter commutator

Standard: 0.5 mm {0.02 in}

Minimum: 0.2 mm {0.008 in}

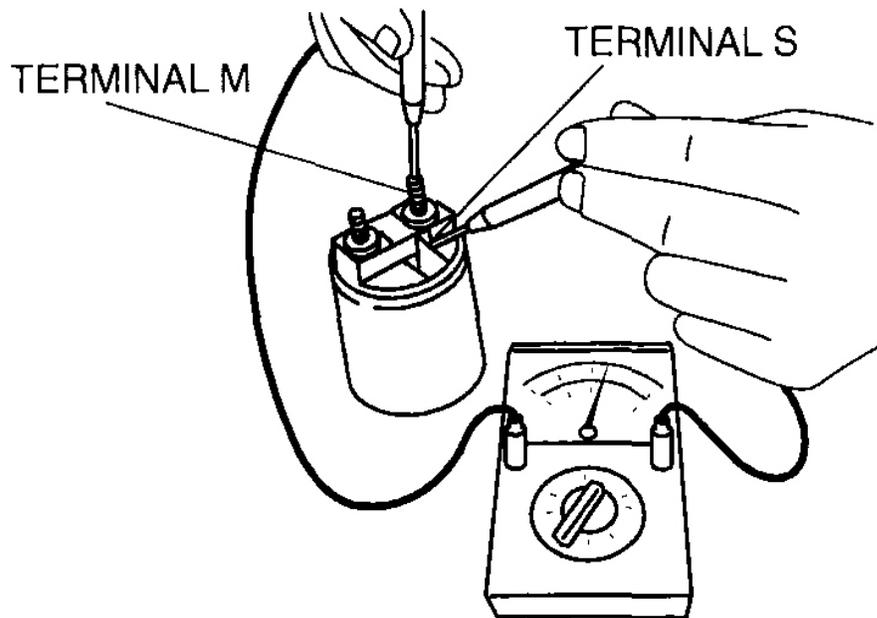


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Fig. 15: Measuring Segment Groove Depth Of Commutator
Courtesy of MAZDA MOTORS CORP.

Magnetic Switch

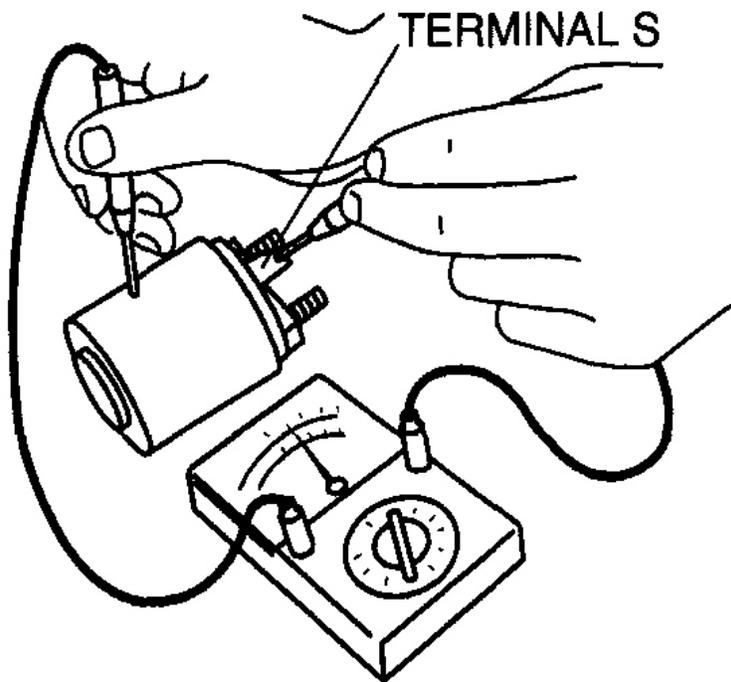
1. Inspect for continuity between terminals S and M using a tester.
 - If there is no continuity, replace the magnetic switch.



CHU0119W007

Fig. 16: Verifying If There Is Continuity Between Terminals S & M
Courtesy of MAZDA MOTORS CORP.

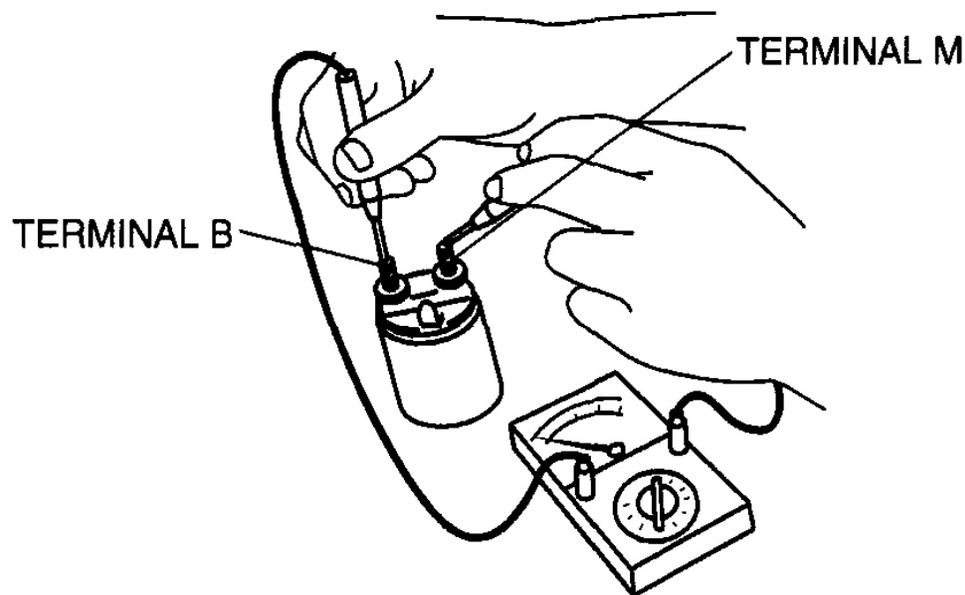
2. Inspect for continuity between terminal S and the body using a tester.
 - If there is no continuity, replace the magnetic switch.



CHU0119W008

Fig. 17: Verifying If There Is Continuity Between Terminal S & Body
Courtesy of MAZDA MOTORS CORP.

3. Verify that there is no continuity between terminals M and B using a tester.
 - If there is continuity, replace the magnetic switch.

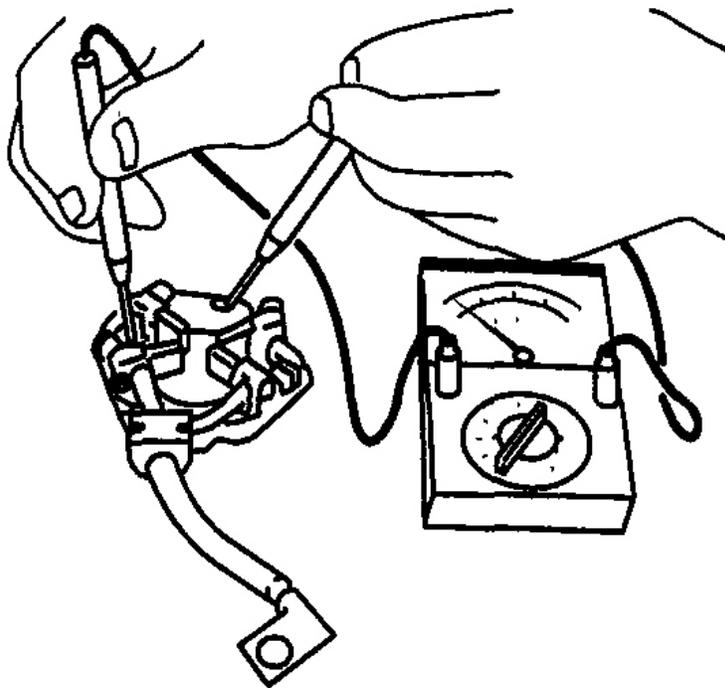


CHU0119W009

Fig. 18: Verifying If There Is No Continuity Between Terminals M & B
Courtesy of MAZDA MOTORS CORP.

Brush And Brush Holder

1. Verify that there is no continuity between each insulated brush and plate using a tester.
 - If there is continuity, replace the brush holder.



CHU0119W012

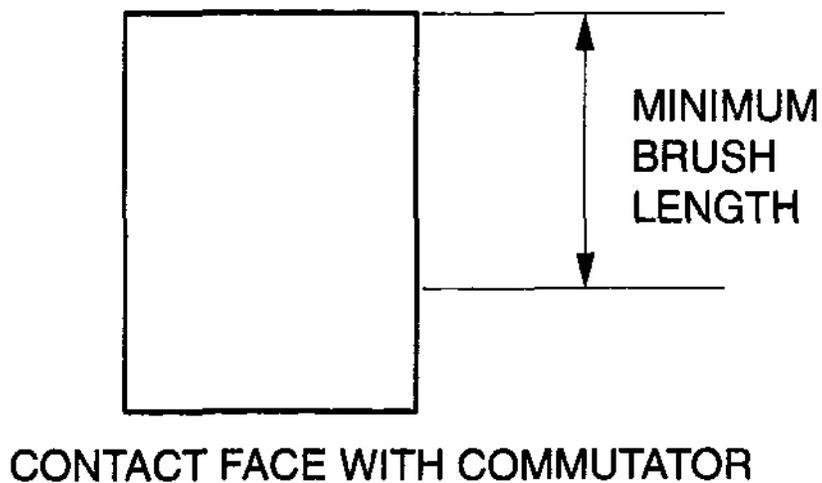
Fig. 19: Verifying If There Is No Continuity Between Insulated Brush & Plate
Courtesy of MAZDA MOTORS CORP.

2. Measure the brush length.
 - If any brush is worn almost to or beyond the minimum specification, replace all of the brushes.

Starter brush length

Standard: 12.3 mm {0.48 in}

Minimum: 5.5 mm {0.22 in}



CHU0119W013

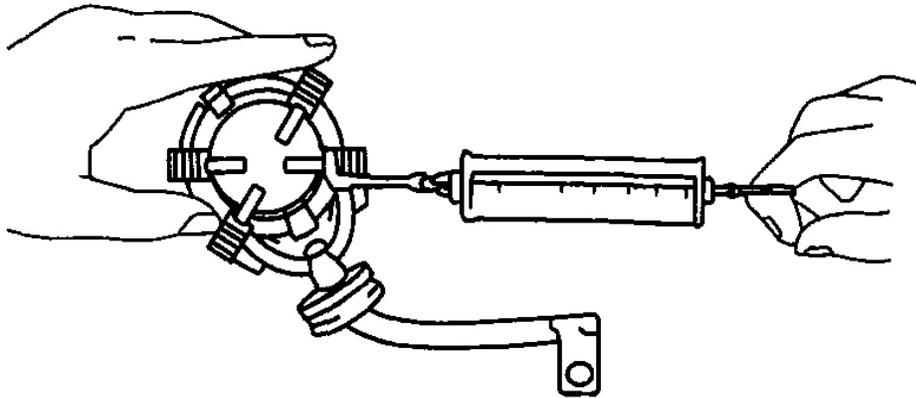
Fig. 20: Measuring Brush Length
Courtesy of MAZDA MOTORS CORP.

3. Measure the brush spring force using a spring balance.
 - If not within the minimum specification, replace the brush and brush holder component.

Starter brush spring force

Standard: 15.0-20.4 N {1.53-2.08 kgf, 3.38-4.58 lbf}

Minimum: 2.75 N {0.28 kgf, 0.62 lbf}



CHU0119W014

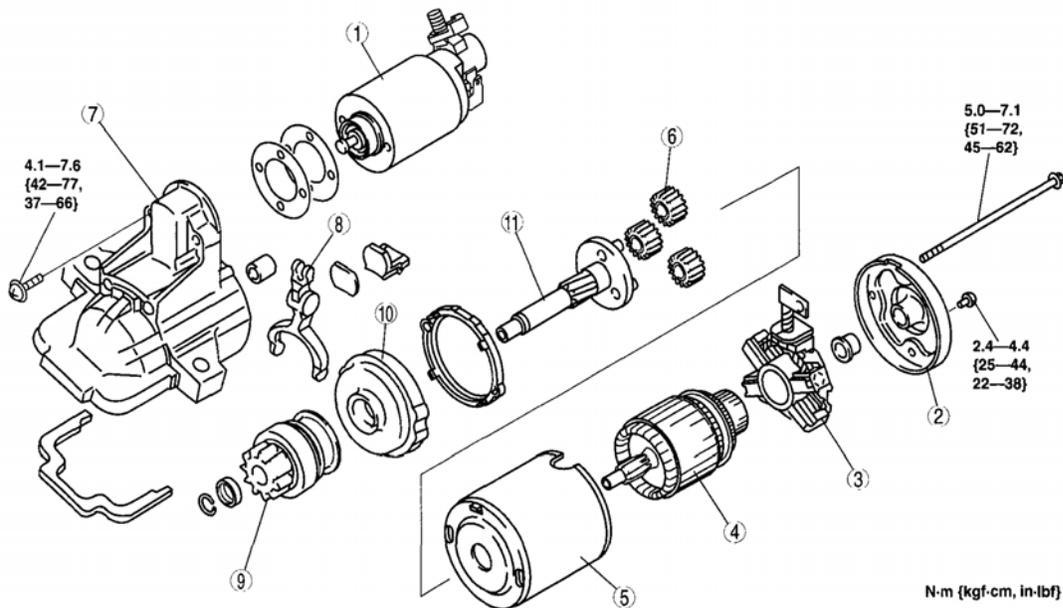
Fig. 21: Measuring Brush Spring Force Using Spring Balance
Courtesy of MAZDA MOTORS CORP.

STARTER DISASSEMBLY/ASSEMBLY [LF]

1. Disassemble in the order indicated in **Fig. 22** .
2. Assemble in the reverse order of disassembly.

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N-m (kgf-cm, in-lbf)

E5U119ZW5003

1	Magnetic switch
2	Rear housing
3	Brush and brush holder
4	Armature
5	Yoke
6	Planetary gear

7	Front cover
8	Lever
9	Drive pinion
10	Internal gear
11	Gear shaft

Fig. 22: Identifying Disassemble Order Of Starter & Components (With Torque Specifications)
 Courtesy of MAZDA MOTORS CORP.

STARTER INTERLOCK SWITCH INSPECTION [MT]

CAUTION:

- Do not reuse the starter interlock switch if it is removed from the vehicle even once. Replace with a new starter interlock switch when installing.

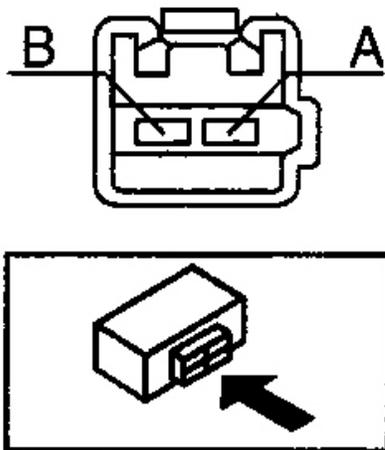
1. Remove the battery cover.
2. Disconnect the negative battery cable. (See **BATTERY REMOVAL/INSTALLATION [LF]** .)
3. Disconnect the starter interlock switch connector.
4. Verify that the continuity is as indicated in **Fig. 23** using a tester.
 - If the continuity is not as indicated in **Fig. 23** , replace the starter interlock switch.

○—○ : Continuity

Condition	Terminal	
	A	B
Clutch pedal is depressed	○—○	○—○
Clutch pedal is not depressed		

EPU119ZW3002

Fig. 23: Starter Interlock Switch Continuity Check Table
 Courtesy of MAZDA MOTORS CORP.



B3J0119W006

Fig. 24: Identifying Starter Interlock Switch Connector Terminals
 Courtesy of MAZDA MOTORS CORP.