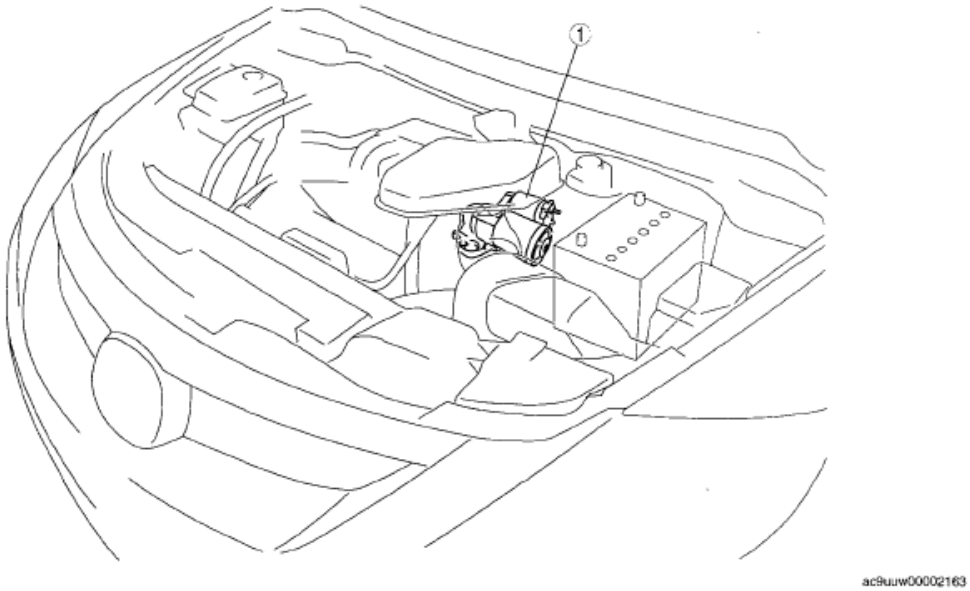
2008 ENGINE

Starting System (MZI-3.7) - Mazda CX-9

STARTING SYSTEM LOCATION INDEX [MZI-3.7]



1	Starter (See 01-19-2 STARTER REMOVAL/INSTALLATION [MZI-3.7].) (See 01-19-2 STARTER INSPECTION [MZI-3.7].) (See 01-19-7 STARTER DISASSEMBLY/ ASSEMBLY [MZI-3.7].)

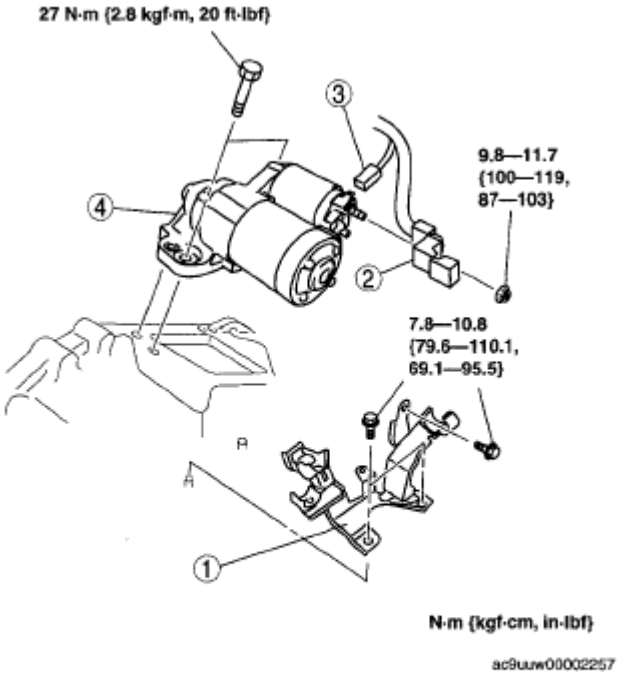
Fig. 1: Identifying Starter
Courtesy of MAZDA MOTORS CORP.

STARTER REMOVAL/INSTALLATION [MZI-3.7]

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 and battery tray. (See **BATTERY REMOVAL/INSTALLATION [MZI-3.7]** .)
2. Position the selector cable out of the way.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.



1	Wiring harness bracket
2	Terminal B cable
3	Terminal S connector
4	Starter

Fig. 2: Identifying Wiring Harness Bracket, Starter, Connector & Torque Specifications
Courtesy of MAZDA MOTORS CORP.

STARTER INSPECTION [MZI-3.7]

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 transaxle range switch.

NO-LOAD TEST

1. Verify that the battery is fully charged.
2. Connect the starter, battery, and a tester as shown in the figure.
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

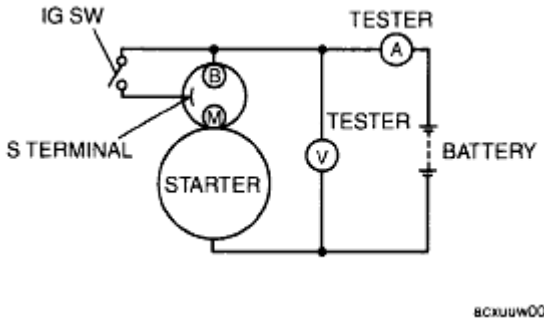


Fig. 3: Connecting Starter, Battery, And A Tester
Courtesy of MAZDA MOTORS CORP.

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.

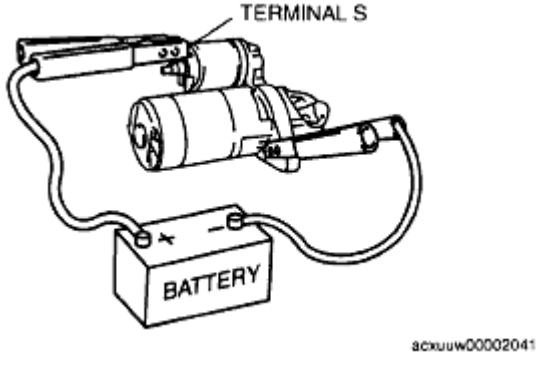


Fig. 4: Checking Battery Positive Voltage Terminal S And Starter Body
Courtesy of MAZDA MOTORS CORP.

Return test

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

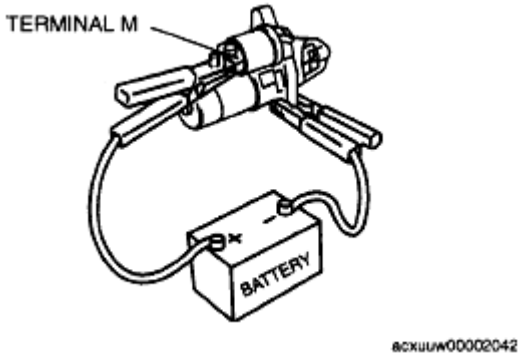


Fig. 5: Connecting Battery Positive Voltage To Terminal M And Ground Starter Body
Courtesy of MAZDA MOTORS CORP.

PINION GAP INSPECTION

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

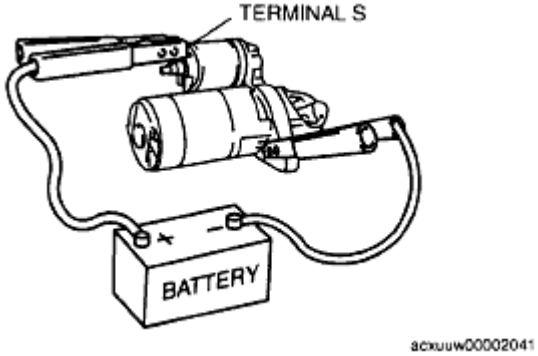


Fig. 6: Pulling Drive Pinion With Battery Positive Voltage Connected To Terminal S And Starter Body Grounded
Courtesy of MAZDA MOTORS CORP.

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

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 mm {0 in}

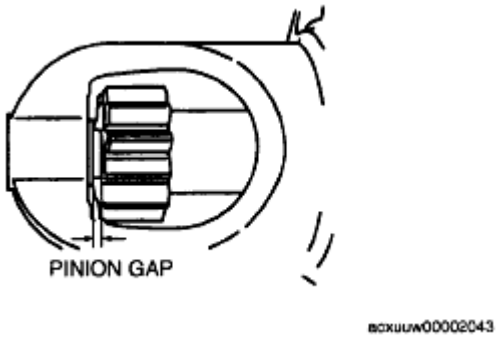


Fig. 7: Measuring Pinion Gap
Courtesy of MAZDA MOTORS CORP.

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.

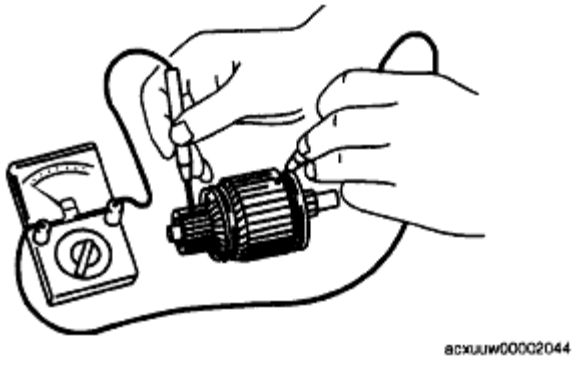


Fig. 8: Checking Continuity Between Commutator And Core
Courtesy of MAZDA MOTORS CORP.

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

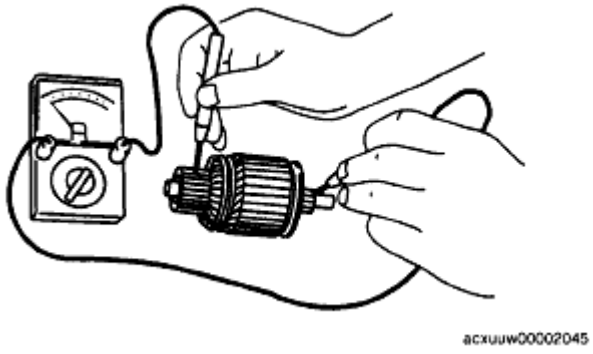


Fig. 9: Checking Continuity Between Commutator And Shaft
Courtesy of MAZDA MOTORS CORP.

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.

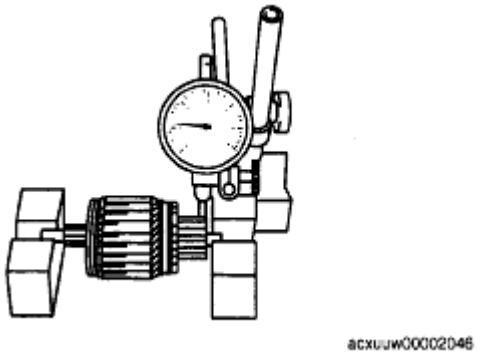


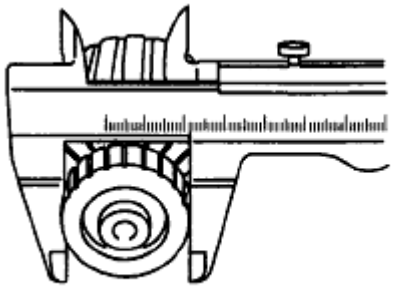
Fig. 10: Measuring Runout With Dial Indicator
Courtesy of MAZDA MOTORS CORP.

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}



acxuuw00002047

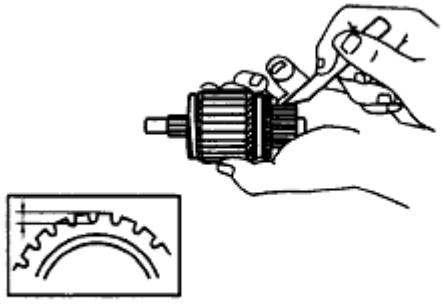
Fig. 11: Measuring Commutator Diameter
Courtesy of MAZDA MOTORS CORP.

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}



acxuuw00002048

Fig. 12: 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.

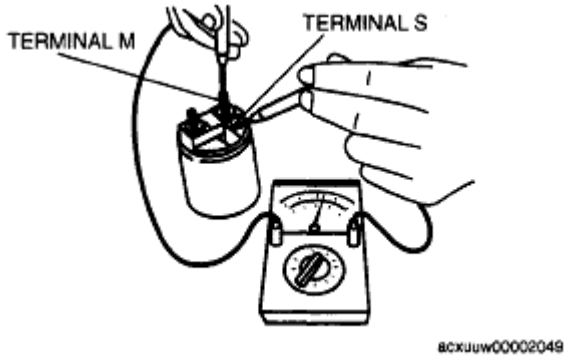


Fig. 13: Checking Continuity Between Terminals S And M
Courtesy of MAZDA MOTORS CORP.

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

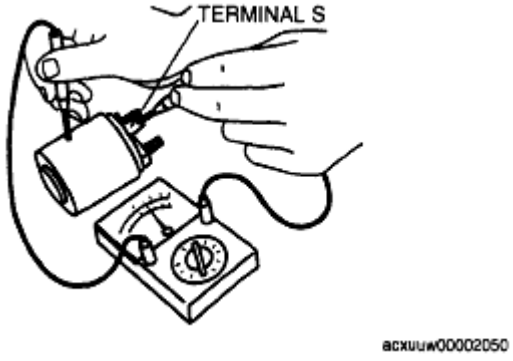


Fig. 14: Checking Continuity Between Terminal S And Body With Tester
Courtesy of MAZDA MOTORS CORP.

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

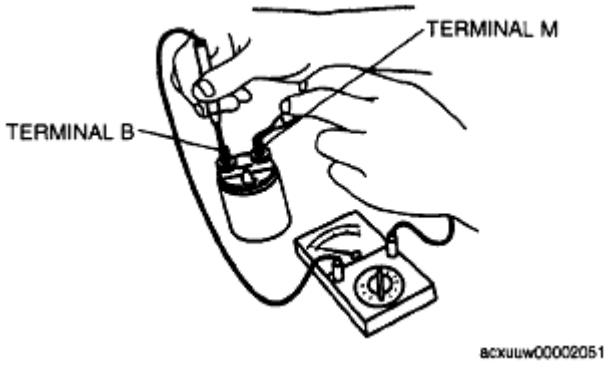
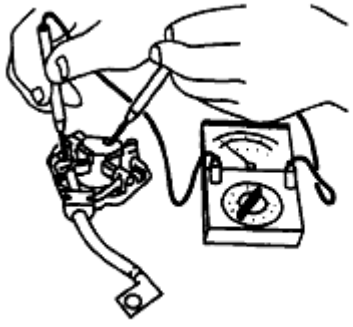


Fig. 15: Checking Continuity Between Terminals M And B With Tester
Courtesy of MAZDA MOTORS CORP.

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.



acxuuw00002052

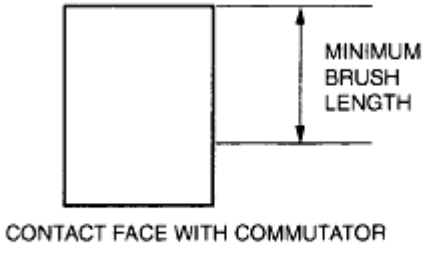
Fig. 16: Checking Continuity Between Brush And Plate With Tester
Courtesy of MAZDA MOTORS CORP.

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}



acxuuw00002053

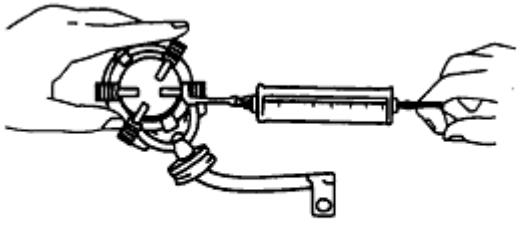
Fig. 17: Identifying Brush Length
Courtesy of MAZDA MOTORS CORP.

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}

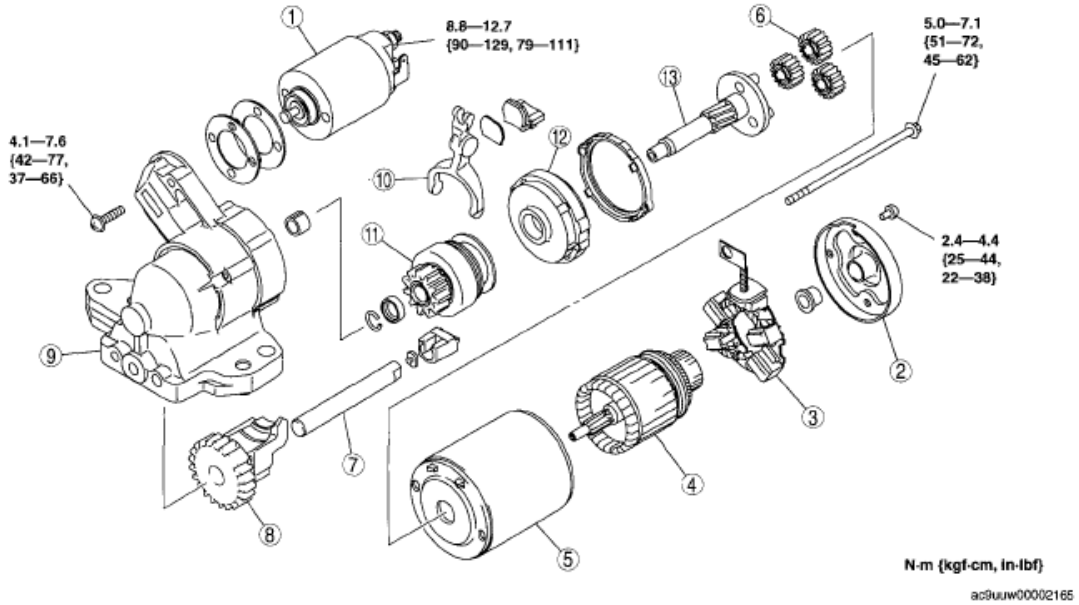


acxuuw00002054

Fig. 18: Measuring Brush Spring Force With Spring Balance
Courtesy of MAZDA MOTORS CORP.

STARTER DISASSEMBLY/ASSEMBLY [MZI-3.7]

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



ac9uuw00002165

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

8	Pinion
9	Front cover
10	Lever
11	Drive pinion
12	Internal gear
13	Gear shaft

Fig. 19: Identifying Starter Components & Torque Specifications
Courtesy of MAZDA MOTORS CORP.