STARTER INSPECTION [SKYACTIV-G 2.0]

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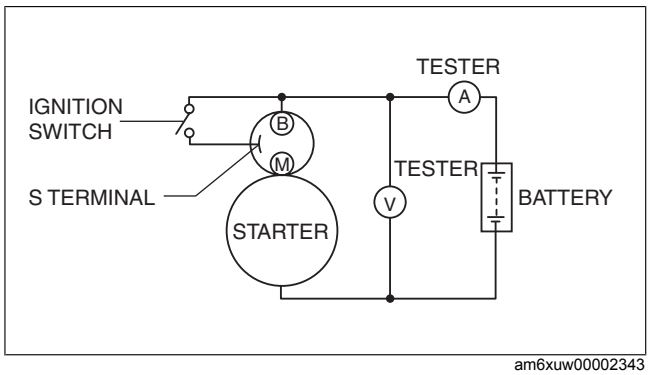
On-vehicle Inspection

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 (ATX) or starter interlock switch (MTX).

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 specification, replace the starter.



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Starter no-load test voltage
11 V

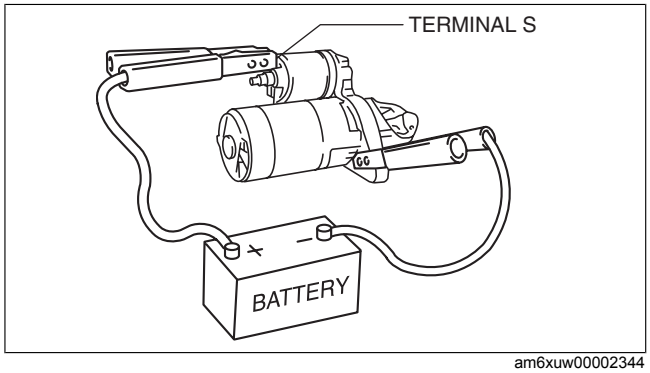
Starter no-load test current
Vehicle with i-stop: 90 A or less
Vehicle without i-stop: 95 A or less

Magnetic Switch Operation Inspection (Vehicle Without i-stop)

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.



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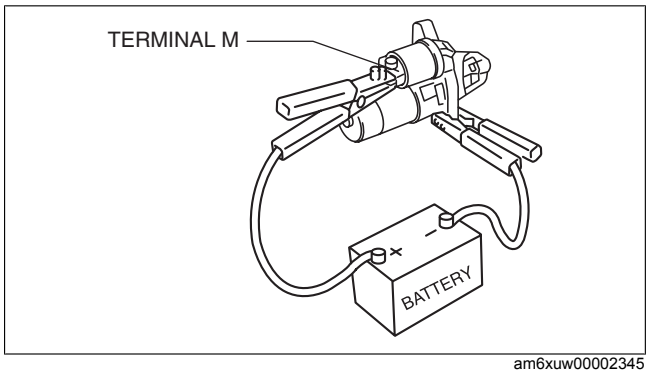
Return test

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.



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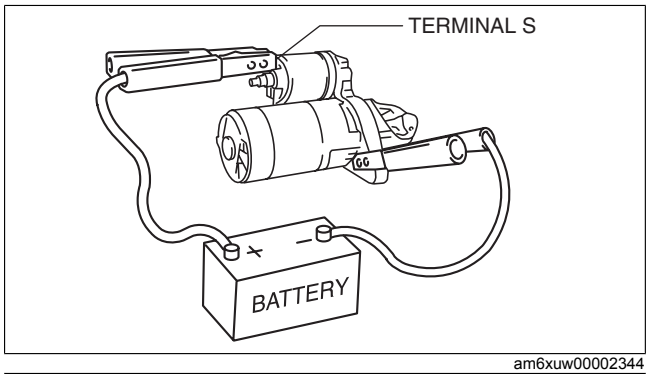
Pinion Gap Inspection (Vehicle Without i-stop)

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 10 s.**



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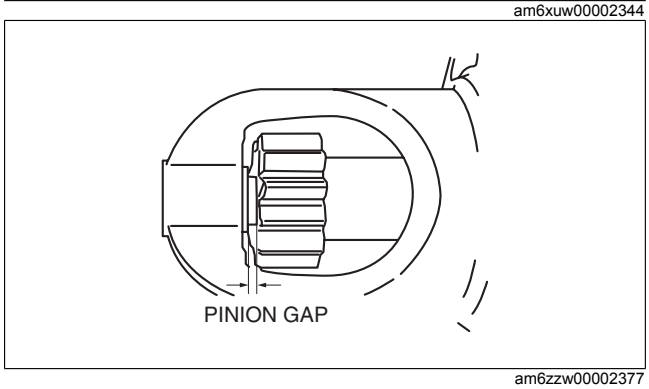
2. Measure the pinion gap while the drive pinion is extended.
   - If not as specified, adjust with an adjustment washer (between drive housing front cover and magnetic switch).

   Starter pinion gap
   0.5—2.0 mm {0.02—0.07 in}



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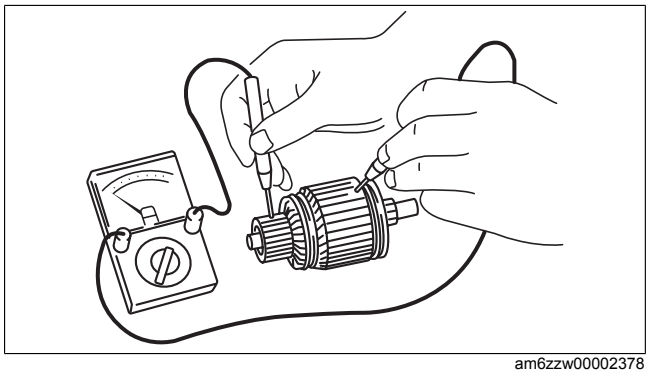
Starter Inner Parts Inspection (Vehicle Without i-stop)
Armature

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.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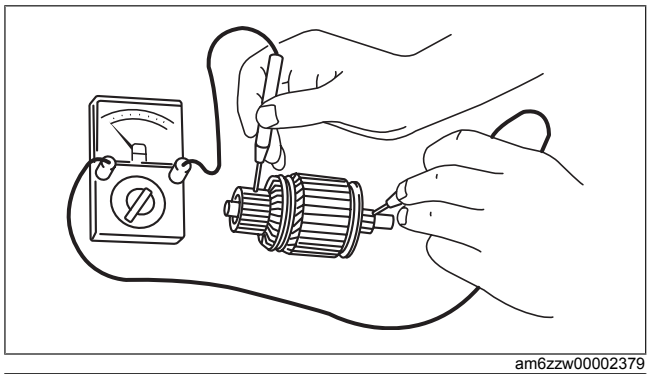
2. Verify that there is no continuity between the commutator and the shaft using a tester.
   - If there is continuity, replace the armature.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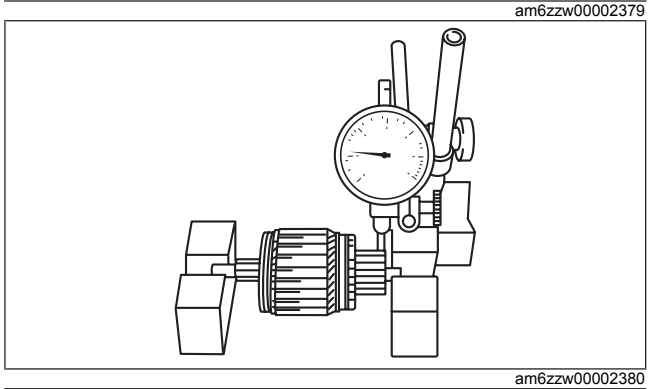
3. Place the armature on V-blocks, and measure the runout using a dial indicator.
   - If not within specification, replace the armature.

   Starter armature runout
   0.1 mm {0.004 in} max.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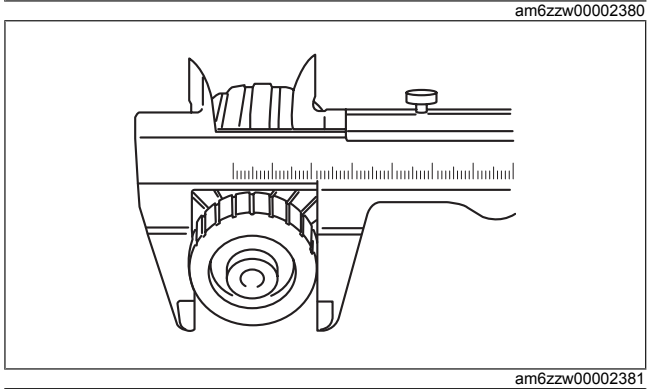
4. Measure the commutator diameter.
   - If not within the minimum specification, replace the armature.

   Starter commutator diameter
   Standard: 29.4 mm {1.16 in}
   Minimum: 28.8 mm {1.13 in}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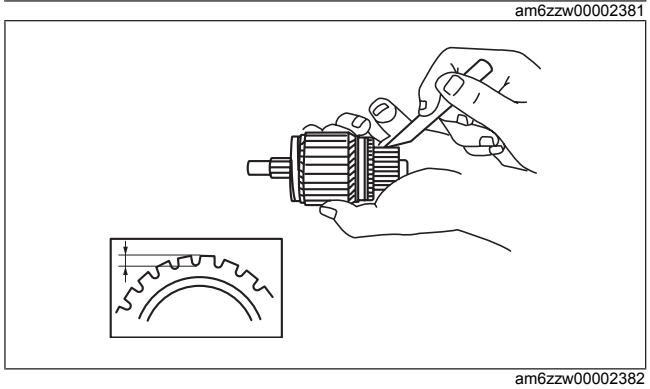
5. Measure the segment groove depth of the commutator.
   - If not within the minimum specification, undercut the grooves to the standard depth.

   Segment groove depth of starter commutator
   Standard: 0.5 mm {0.02 in}
   Minimum: 0.2 mm {0.008 in}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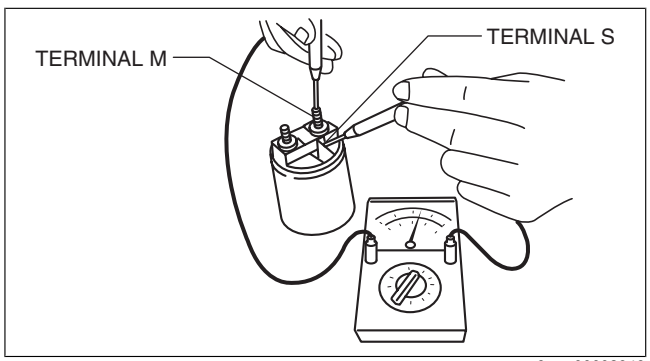
Magnetic switch

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



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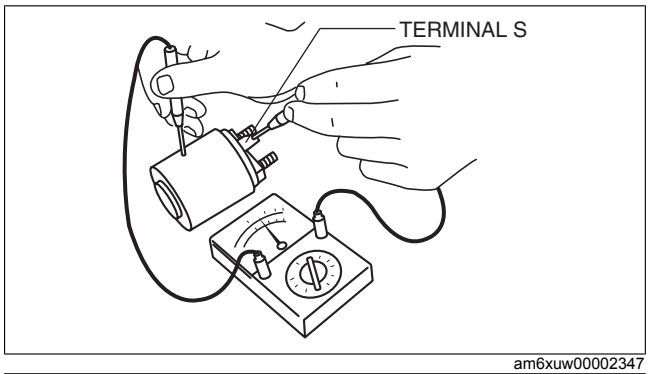
2. Inspect for continuity between terminal S and the body using a tester.
   - If there is no continuity, replace the magnetic switch.



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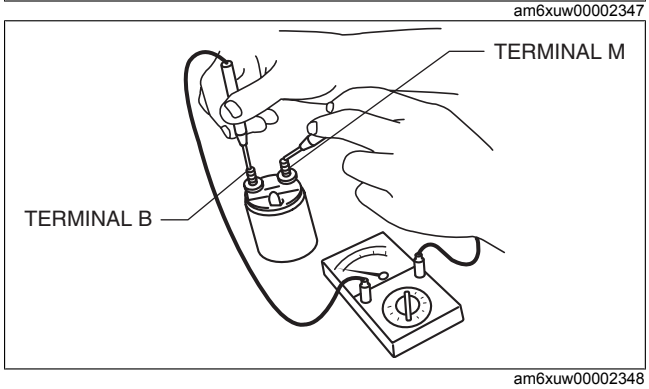
3. Verify that there is no continuity between terminals M and B using a tester.
   - If there is continuity, replace the magnetic switch.



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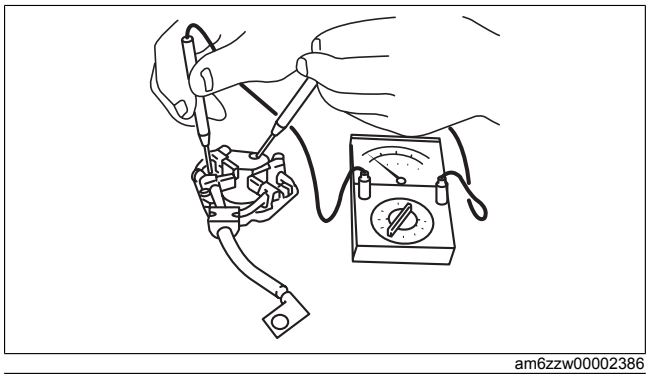
Brush and brush holder

1. Verify that there is no continuity between each insulated brush and plate using a tester.
   - If there is continuity, replace the brush holder.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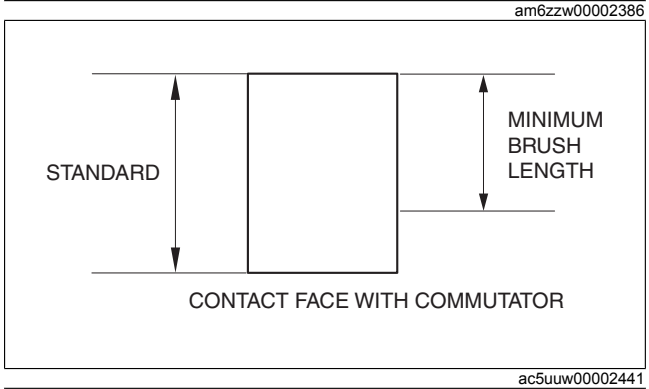
2. Measure the brush length.
   - If any brush is worn almost to or beyond the minimum specification, replace all of the brushes.

   Starter brush length
   Standard: 12.3 mm {0.484 in}
   Minimum: 5.5 mm {0.22 in}



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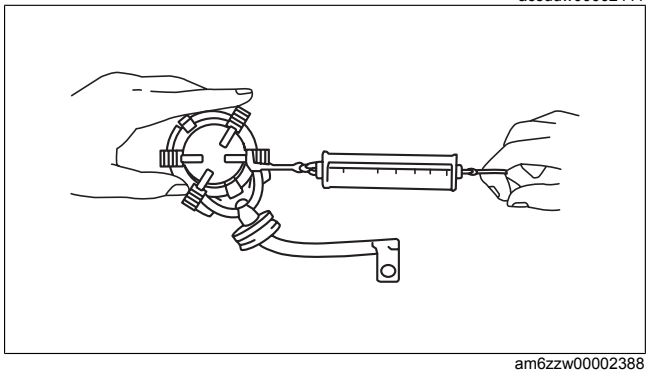
3. Measure the brush spring force using a spring balance.
   - If not within the minimum specification, replace the brush and brush holder component.

   Starter brush spring force
   Standard: 15.1—20.4 N {1.54—2.08 kgf, 3.40—4.58 lbf}
   Minimum: 2.75 N {0.280 kgf, 0.618 lbf}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