

GROUP 16b

STARTING SYSTEM

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GENERAL INFORMATION

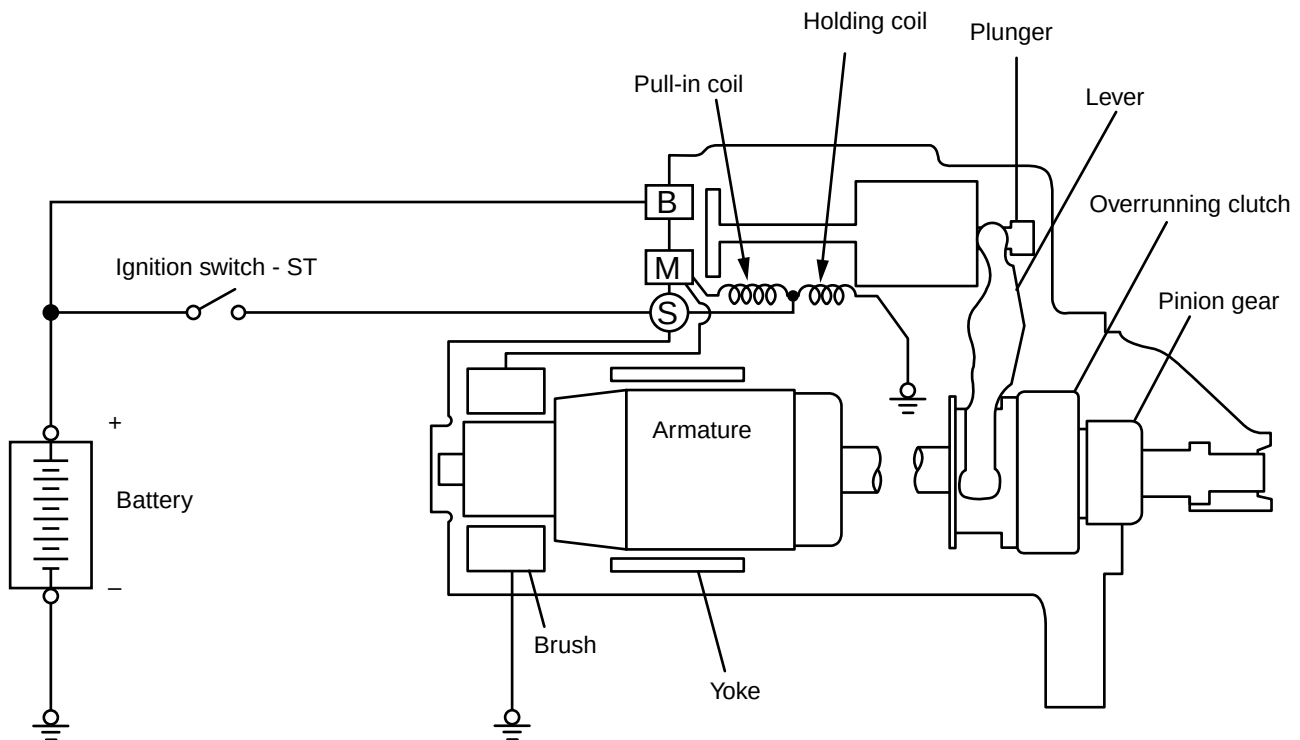
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If the ignition switch is turned to the "START" position, current flows in the coil provided inside magnetic switch, attracting the plunger. When the plunger is attracted, the lever connected to the plunger is actuated to engage the starter clutch.

On the other hand, attracting the plunger will turn on the magnetic switch, allowing the "B" terminal and "M" terminal to conduct. Thus, current flows to engage the starter motor.

When the ignition switch is returned to the "ON" position after starting the engine, the starter clutch is disengaged from the ring gear.

An overrunning clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.



ZK600357AA00

OPERATION

For models equipped with A/T, when the ignition switch is turned to the "ST" position while the selector

lever is at the "P" or "N" position, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

GENERAL SPECIFICATIONS

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ITEMS	SPECIFICATIONS
Type	Reduction drive with planetary gear
Identification number	M0T20571ZC
Part No.	MR994145
Rated output kW/V	1.4/12
Number of pinion teeth	8

SERVICE SPECIFICATIONS

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ITEMS	STANDARD VALUE	LIMIT
Free running characteristics	Terminal voltage V	11
	Current A	90
	Speed r/min	2,000 or more
Pinion gap mm (in)	0.5 - 2.0 (0.02 - 0.07)	-
Commutator run-out mm (in)	0.05 (0.002)	Minimum 0.1 (0.004)
Commutator diameter mm (in)	29.4 (1.16)	Minimum 28.8 (1.13)
Undercut depth mm (in)	0.5 (0.02)	Minimum 0.2 (0.008)

STARTING SYSTEM DIAGNOSIS

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TROUBLESHOOTING HINTS

The starter motor does not operate at all.

WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

- *Check the starter (coil).
- *Check for poor contact at the battery terminals and starter.
- *Check the transmission range switch.

The starter motor doesn't stop

- *Check the starter (magnetic switch).

TROUBLESHOOTING GUIDE

The starting system troubleshooting guide is shown in the following steps.

WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

STEP 1.

Q: Is the battery in good condition? (Refer to GROUP 54A, Chassis Electrical - Battery - On-vehicle Service - Battery Check P.54Aa-2.)

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STARTING SYSTEM DIAGNOSIS

YES: Go to Step 2.

NO: Charge or replace the battery.

STEP 2.

- Disconnect the starter motor S (solenoid) terminal connector.
 - Using a jumper wire, apply battery positive voltage to the starter motor S (solenoid) terminal.
 - Check the engine condition.
- OK: Turns normally

Q:Dose the starter motor operate normally?

YES:

- Check the ignition switch (Refer to GROUP 54A, Chassis Electrical - Ignition Switch - Ignition Switch - Inspection P. 54Ag-15.)
- Check the transmission range switch. (Refer to GROUP 23A, Automatic Transaxle - On-vehicle Service - Essential Service - Transmission Range Switch Check P.23A-157.)
- Check the line between the battery and starter motor S (solenoid) terminal.

NO: Go to Step 3.

STEP 3.

- Check the cable between starter B (battery) terminal and battery positive terminal for connection and continuity.

Q:Is the starter cable in good condition?

YES: Go to Step 4.

NO: Repair or replace the cable.

STEP 4.

- Check the connection and the continuity of the cable between the starter motor body and the negative battery terminal.

Q:Is the ground line in good condition?

YES: Go to Step 5.

NO: Repair or replace the cable.

STEP 5.

Q:Is the starter motor in good condition? (Refer to Starting System - Starter Motor Assembly - Inspection P. 16b-6.)

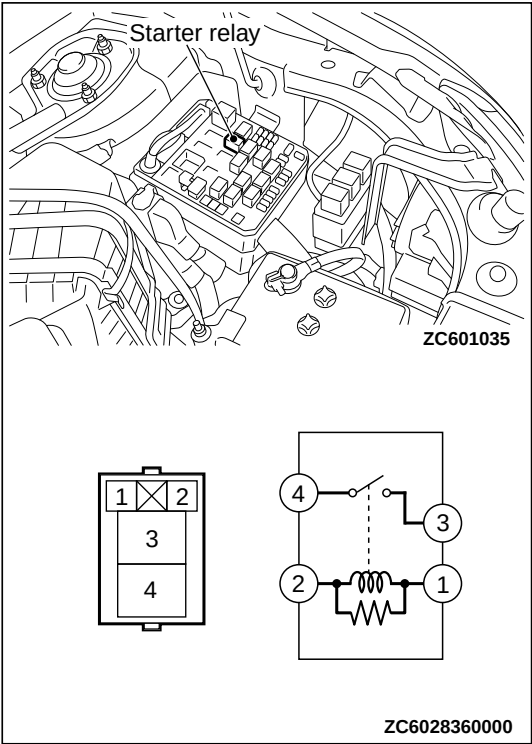
YES: Excessive rotational resistance of the engine.

NO: Replace the starter motor.

ON-VEHICLE SERVICE

STARTER RELAY CHECK

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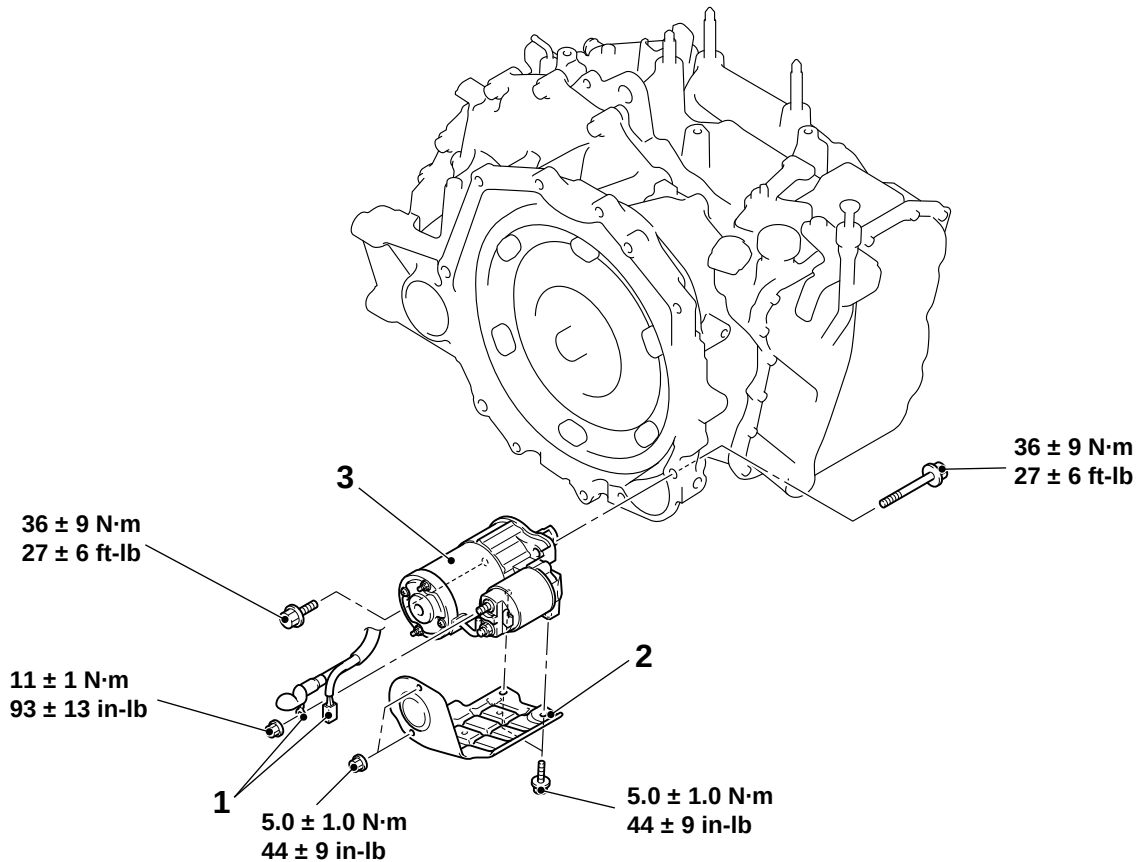
BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	4 - 3	Open circuit
Connect terminal No.2 to battery (+) terminal. Connect terminal No.1 to battery (-) terminal.	4 - 3	Continuity (less than 2 ohms)

STARTER MOTOR ASSEMBLY

REMOVAL AND INSTALLATION

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Pre-removal and Post-installation Operation
Under Cover Removal and Installation (Refer to GROUP 51A, Under Cover P.51A-18).

**Removal steps**

1. Starter connector and terminal
2. Starter cover

Removal steps

3. Starter assembly

REMOVAL SERVICE POINT**<<A>> STARTER ASSEMBLY REMOVAL**

Remove the starter assembly from under the vehicle.

INSPECTION

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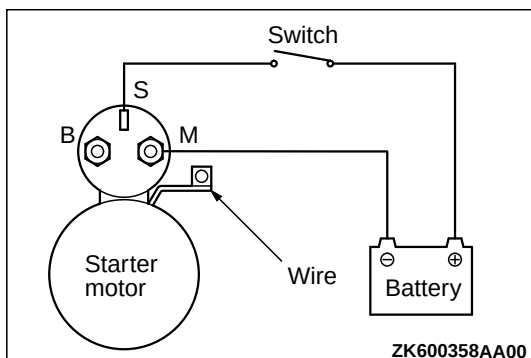
PINION GAP ADJUSTMENT

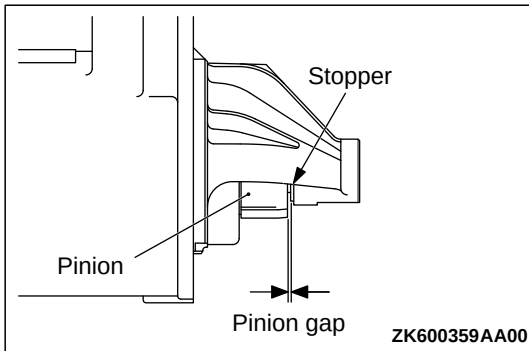
1. Disconnect the lead wire from the M-terminal of the magnetic switch.
2. Connect a 12-volt battery between the S-terminal and M-terminal.

⚠ CAUTION

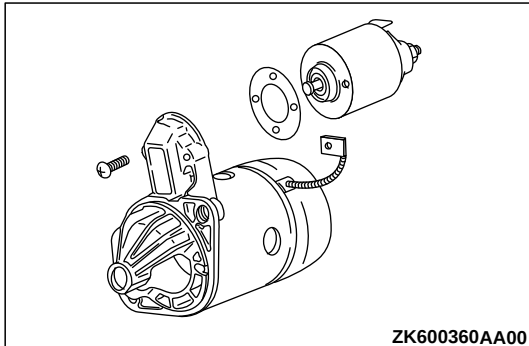
This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. Set the switch to "ON", and the pinion will move out.

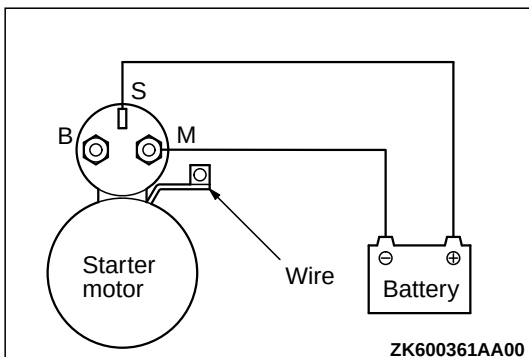




4. Check the pinion-to-stopper clearance (pinion gap) with a feeler gauge.
Standard value: 0.5 - 2.0 mm (0.02 - 0.07 inch)



5. If the pinion gap is out of specification, adjust by adding or removing gasket(s) between the magnetic switch and front bracket.



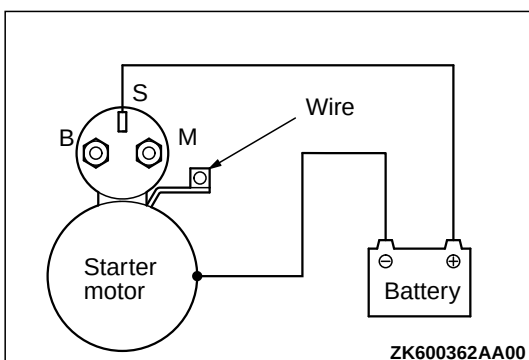
MAGNETIC SWITCH PULL-IN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the S-terminal and M-terminal.
3. If the pinion moves out, the pull-in coil is good. If it doesn't, replace the magnetic switch.



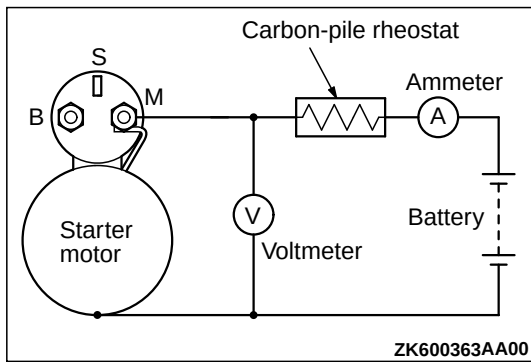
MAGNETIC SWITCH HOLD-IN TEST

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

CAUTION

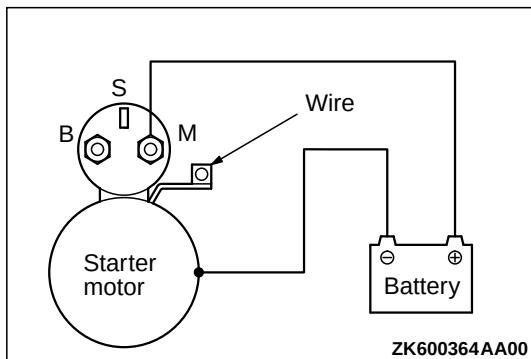
This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the S-terminal and body.
3. Manually pull out the pinion as far as the pinion stopper position.
4. If the pinion remains out, everything is operating properly. If the pinion moves in, the hold-in circuit is open. Replace the magnetic switch.

**FREE RUNNING TEST**

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to the starter motor as follows:
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series between the positive battery terminal and starter motor terminal.
3. Connect a voltmeter (15-volt scale) across the starter motor.
4. Rotate carbon pile to full-resistance position.
5. Connect the battery cable from the negative battery terminal to the starter motor body.
6. Adjust the rheostat until the battery positive voltage shown by the voltmeter is 11 V.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current: maximum 90 Amps

**MAGNETIC SWITCH RETURN TEST**

1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

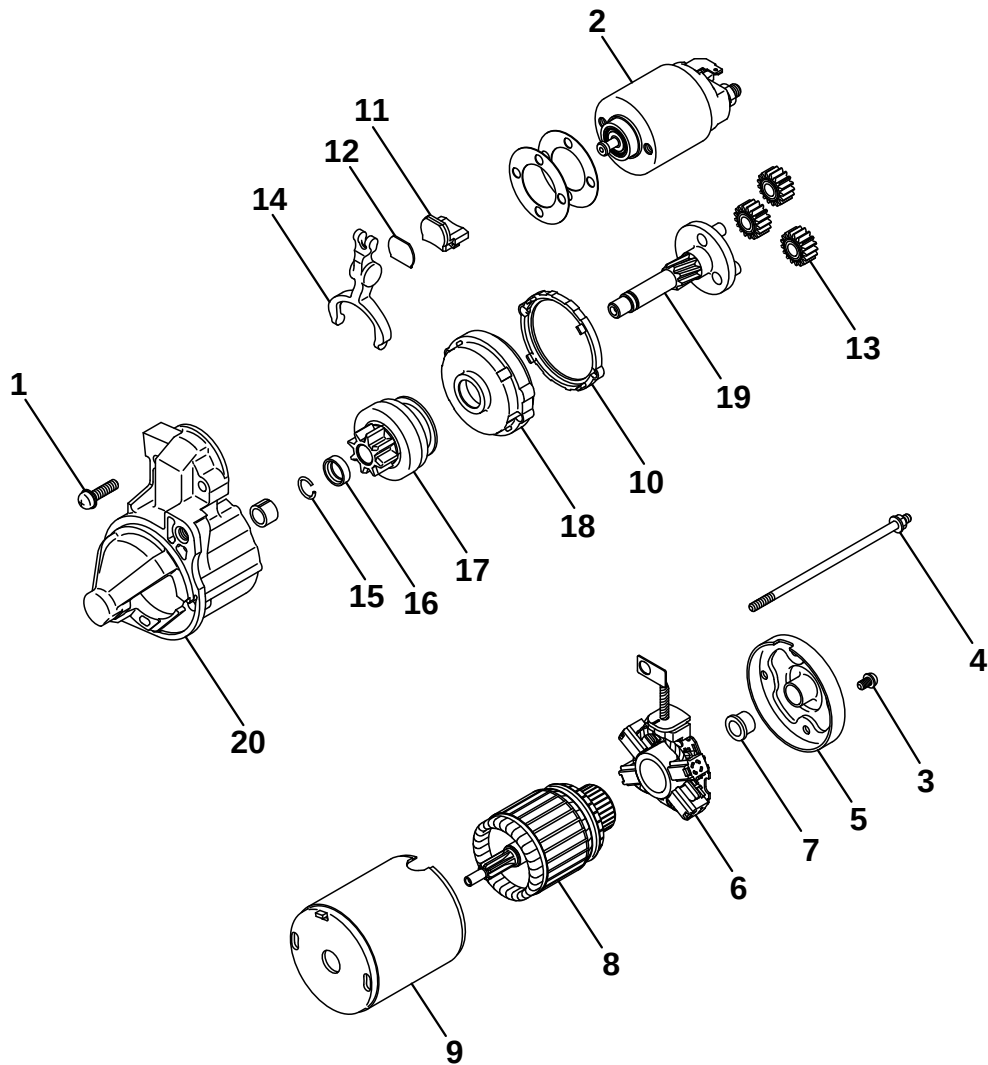
2. Connect a 12-volt battery between the M-terminal and body.

WARNING

Be careful not to get your fingers caught when pulling out the pinion.

3. Pull the pinion out and release. If the pinion quickly returns to its original position, everything is operating properly. If it doesn't, replace the magnetic switch.

DISASSEMBLY AND ASSEMBLY



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DISASSEMBLY STEPS

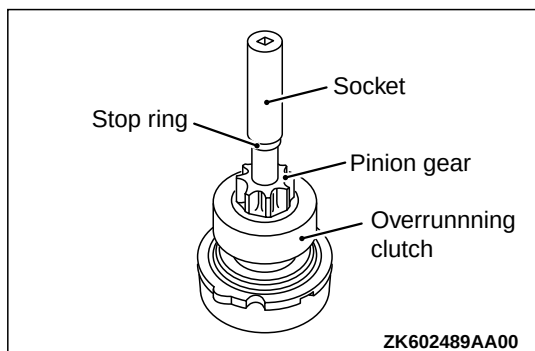
1. SCREW
2. MAGNETIC SWITCH
3. SCREW
4. SCREW
5. REAR BRACKET
6. BRUSH
7. REAR BEARING
8. ARMATURE
9. YOKE ASSEMBLY
10. PACKING A
- .
11. PACKING B
- .
12. PLATE
- .
13. PLANETARY GEAR
- .

DISASSEMBLY STEPS

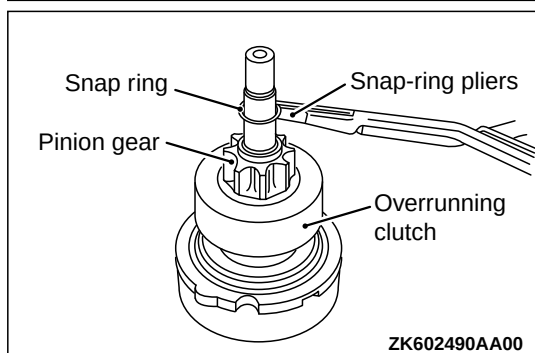
- | | |
|-------------|---------------------------|
| 14. LEVER | . |
| <<A>> >>A<< | 15. SNAP RING |
| <<A>> >>A<< | 16. STOP RING |
| . | 17. OVERRUNNING CLUTCH |
| . | 18. INTERNAL GEAR |
| . | 19. PLANETARY GEAR HOLDER |
| . | 20. FRONT BRACKET |
| . | . |

DISASSEMBLY SERVICE POINTS**<<A>> SNAP RING AND STOP RING REMOVAL**

1. Press a long socket wrench of appropriate size to the stop ring. Then tap the socket wrench to remove the stop ring to the pinion gear side.



2. After removing the snap ring (by using snap-ring pliers), remove the stop ring and the overrunning clutch.

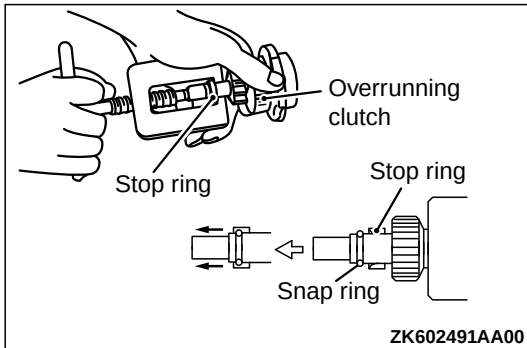
**STARTER MOTOR PART CLEANING**

1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a shop towel only.
2. Do not immerse the drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a shop towel.

ASSEMBLY SERVICE POINT

>>A<< STOP RING AND SNAP RING INSTALLATION

Using a suitable pulling tool, pull the overrunning clutch stop ring over the snap ring.



INSPECTION

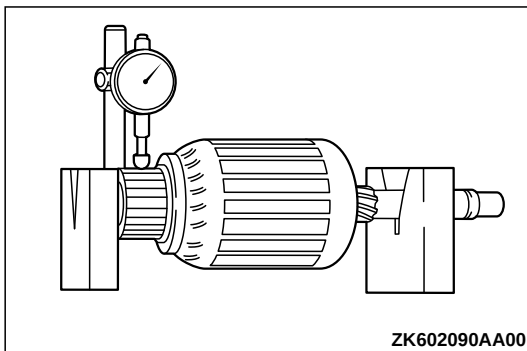
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COMMUTATOR CHECK

1. Place the armature on a pair of V-blocks, and check the deflection by using a dial gauge.

Standard value: 0.05 mm (0.002 inch)

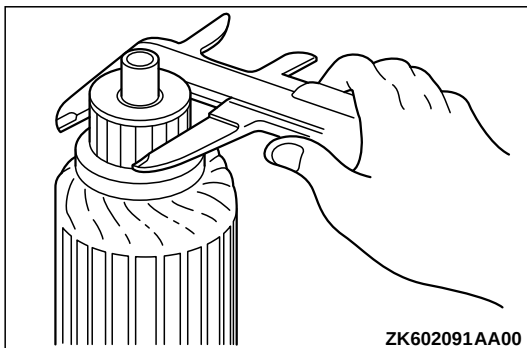
Limit: 0.1 mm (0.004 inch)



2. Check the outer diameter of the commutator.

Standard value: 29.4 mm (1.16 inches)

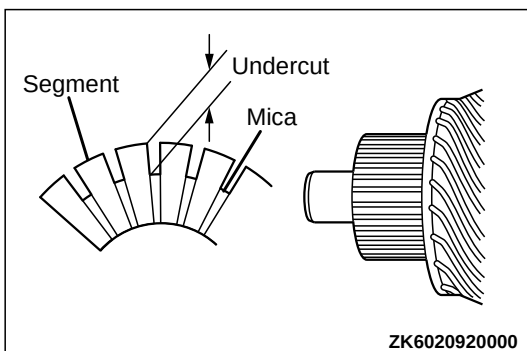
Minimum limit: 28.8 mm (1.13 inches)

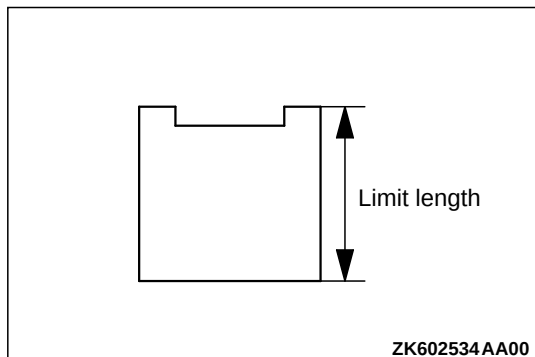


3. Check the depth of the undercut between segments.

Standard value: 0.5 mm (0.02 inch)

Minimum limit: 0.2 mm (0.008 inch)



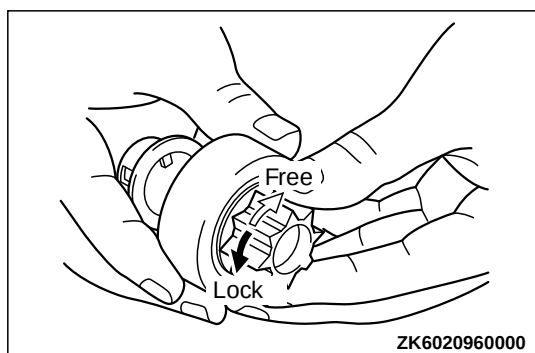
**BRUSH CHECK**

1. Check the brush for roughness of the surface that contacts the commutator and check the brush length. Replace the brush holder if this measurement exceeds the limit.

Minimum limit:

7.0 mm (0.28 inch)

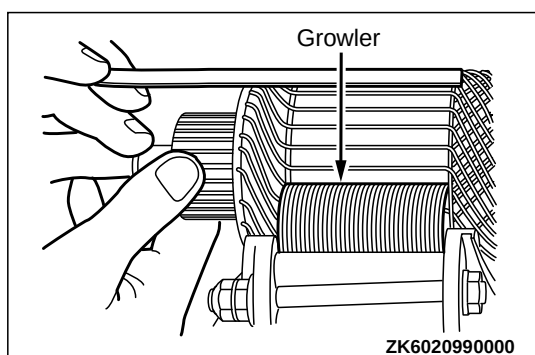
2. If the contacting surface has been corrected or the brush has been replaced, correct the contacting surface by winding sandpaper around the commutator.

**OVERRUNNING CLUTCH CHECK**

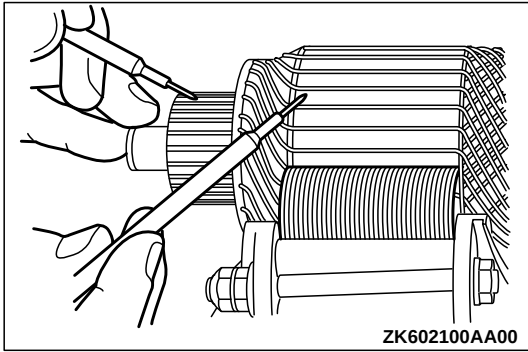
1. While holding the clutch housing, rotate the pinion. The drive pinion should rotate smoothly in one direction, but should not rotate in the opposite direction. If the clutch does not function properly, replace the overrunning clutch assembly.
2. Inspect the pinion for wear or burrs. If the pinion is worn or burred, replace the overrunning clutch assembly. If the pinion is damaged, also inspect the ring gear for wear or burrs.

FRONT AND REAR BRACKET BUSHING CHECK

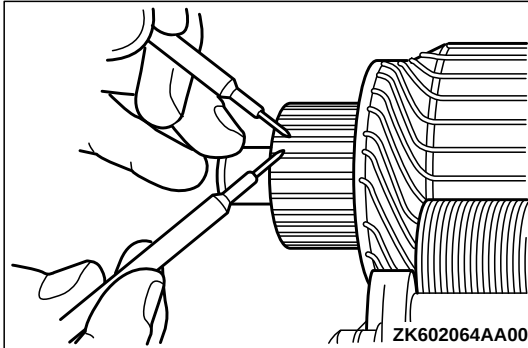
Inspect the bushing for wear or burrs. If the bushing is worn or burred, replace the front bracket assembly or rear bracket assembly.

**ARMATURE CHECK**

1. Check that the armature coil is not grounded.
2. Place the armature in a growler.
3. Hold a thin steel blade parallel and just above while rotating the armature slowly in the growler. A shorted armature will cause a blade to vibrate and be attracted to the core. Replace the shorted armature.



4. Check the insulation between the armature coil cores and the commutator segments. They are normal if there is no continuity.



5. Check for continuity between the segments. The condition is normal if there is continuity.

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STARTING SYSTEM

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