SCITOO CUSTOMER MANUAL

Before starting work,

please be sure to read

this manual before working.

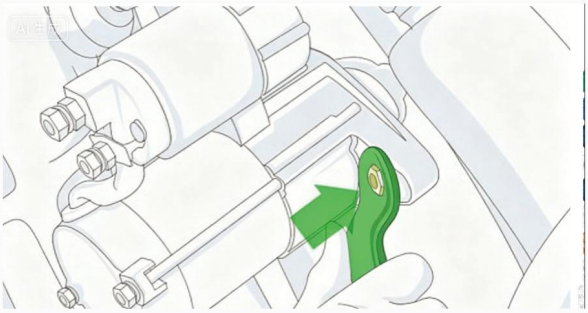


General Automotive Starter Replacement and Installation Operation Manual

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1. General Notes

This manual provides universal procedures for the disassembly, installation, inspection and troubleshooting of automotive starters, applicable to routine starter replacement for passenger vehicles and light commercial vehicles, and not tailored to a single vehicle model.



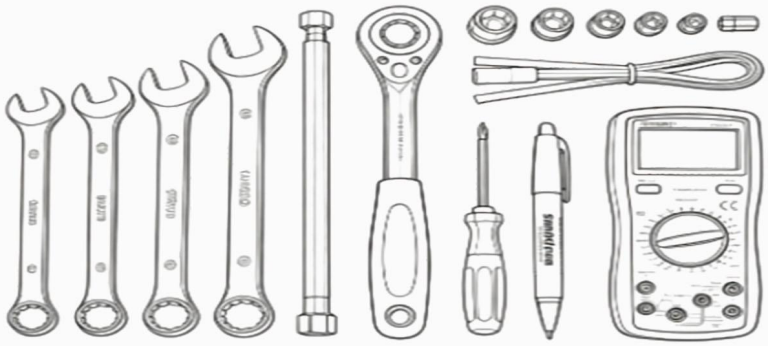
2. Safety Precautions

Power Cut-off Protection: Turn off all electrical equipment and shut down the engine before operation. Never disassemble or assemble starter wiring

Environmental & Personal Protection: Start work only after the engine has fully cooled to avoid scalds from high-temperature components. Keep the working area away from open flames and flammable and explosive materials, and smoking is strictly prohibited.

Operation Specifications: Do not strike the starter housing, gears or wiring connectors with brute force. Use special tools to separate tightly fitted components.

Wiring Harness Protection: Do not pull wiring harnesses forcibly during disassembly and assembly. Plug and unplug connectors gently to prevent bent pins and damaged insulation layers.



3. Pre-installation Preparation and Inspection

3.1 Tools and Consumables Preparation

Basic Tools: 10mm/12mm/13mm/14mm combination wrenches, open-end wrenches, sockets, ratchet wrenches, extension bars, Phillips screwdrivers, multimeter, cable ties, marker pens and cameras.

Auxiliary Consumables: High-temperature resistant grease, lint-free cleaning cloths, special component cleaners and adhesive tapes (for wiring marking).

Optional Tools: Universal joints, deep sockets (for starters in concealed positions) and torque wrenches (essential for key assembly work).

3.2 Vehicle and Old Starter Inspection (Confirm Starter Replacement Necessity)

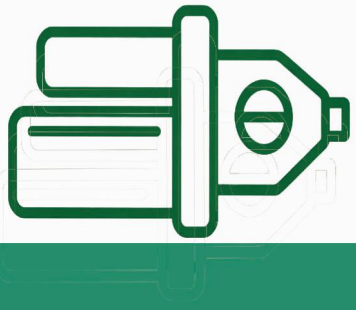
Battery Inspection: Measure the static voltage of the battery with a multimeter. Check that the positive and negative terminals are firmly connected without oxidation or looseness, to rule out starting faults caused by insufficient battery power or poor wiring connection.

Wiring Visual Inspection: Check the main power cables and control wires of the starter. Ensure the insulation layers are intact without aging, damage or burn marks, and the terminals are free from looseness and corrosion.

Preliminary Function Troubleshooting: Turn the ignition switch to the start position and listen for sounds from the engine compartment.

- Only a "click" sound is heard but the starter does not rotate: The electromagnetic switch or main circuit is likely faulty.
- No sound at all: Inspect the start relay and ignition circuit.
- The starter idles while the gear fails to engage: The overrunning clutch is defective.
- The starter runs weakly: Make a comprehensive judgment combined with the battery condition.

Peripheral Component Inspection: Check the integrity of heat shields, air intake pipes, wiring brackets and other surrounding parts of the starter, and record the disassembly sequence.



3.3 Comparison Between Old and New Starters (Key Step)

Appearance Comparison: Verify that the new and old starters have identical models, overall shapes, electromagnetic switch positions, gear specifications and mounting flange holes to avoid incorrect installation due to model mismatch.

Interface Comparison: Check the quantity and position of main power terminals, control connectors and grounding points to ensure normal wiring connection.

Accessory Verification: Confirm that matching gaskets, heat shields and fixing brackets are complete. Retain the original adjusting gaskets and reinstall them in place, as missing gaskets will lead to abnormal gear meshing, abnormal noises and gear knocking.

Peripheral Component Inspection: Check the integrity of heat shields, air intake pipes, wiring brackets and other surrounding parts of the starter, and record the disassembly sequence.

4. Removal Procedures for the Old Starter

Starters are generally installed at the joint of the engine and transmission. Follow the sequence from outside to inside, and from wiring harness to main body for removal.

Reconfirm Power Cut-off: Double-check that the battery negative terminal is disconnected, and move the cables to a safe area.

Remove Shielding Components: Dismantle heat shields, air intake ducts, wiring clamps and auxiliary brackets as required. Place all removed parts in order and mark their positions.

Disconnect and Mark Wiring Harnesses:



Mark each wiring harness with a marker pen or adhesive tape and take photos for record to prevent wrong installation.



Disconnect the thin control wiring/connector of the electromagnetic switch first, then remove the thick main power cable from the battery. Loosen the fixing nuts and take off the cables. Protect the terminals to prevent oil contamination.

Remove Starter Fixing Bolts



The starter is usually secured to the engine/transmission housing by 2 to 3 long bolts.

Support the starter with both hands, loosen the fixing bolts diagonally in several steps. Remove the bolts, shake the starter gently to separate the drive gear from the flywheel ring gear, and take out the starter assembly carefully to avoid gear collision.

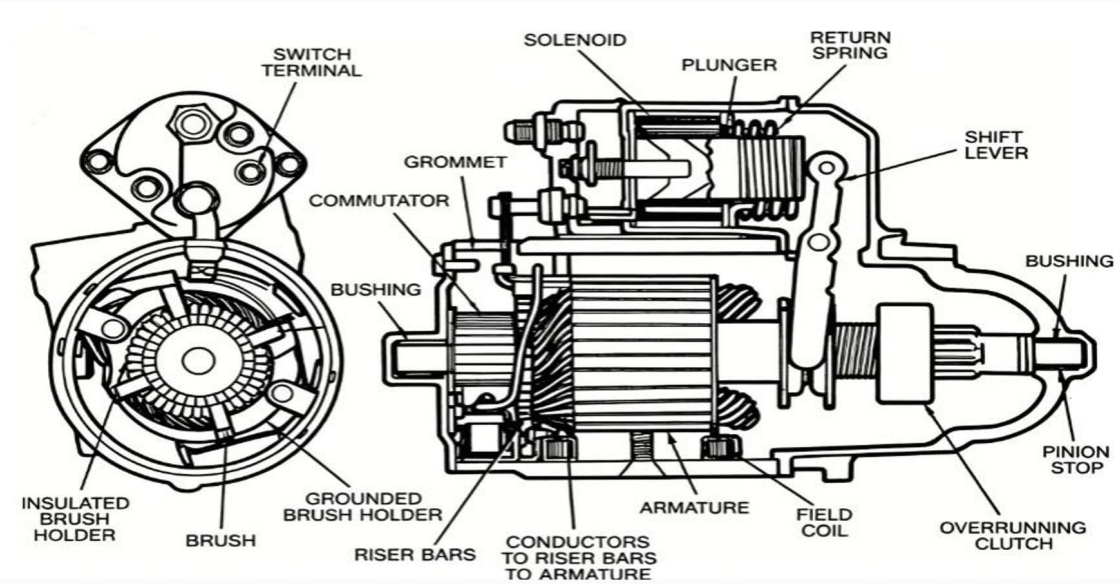
Inspect Flywheel Ring Gear: After removing the starter, visually check the flywheel ring gear for worn, chipped or deformed teeth. Do not install the new starter if the ring gear is damaged, otherwise the new starter will be severely damaged.

5. Pre-assembly Preparation for the New Starter

Lubrication Maintenance: Apply a thin layer of high-temperature resistant grease to the drive gear, armature shaft and movable points of the shift fork to reduce meshing friction and abnormal noises. Do not apply excessive grease to avoid grease splashing onto the coils.

Pre-install Accessories: Mount the retained original adjusting gaskets, heat shields and small brackets onto the corresponding positions of the new starter to keep the assembly reference consistent with the original state.

6. Installation Procedures for the New Starter (Reverse the Disassembly Sequence and Control Torque Strictly)



6.1 Position the Starter Main Body

Place the new starter steadily into the mounting position, align the mounting holes and flywheel ring gear to ensure a normal gap between the drive gear and the ring gear. Insert the fixing bolts and screw them in manually for pre□tightening to prevent thread slipping.

Use a torque wrench to tighten the fixing bolts diagonally in several steps. The standard torque for starter assembly bolts is 37N·m. Do not tighten the bolts fully at one time or fasten them unilaterally, which may cause housing deformation and joint surface leakage.

6.2 Connect Wiring Harnesses (Critical Step to Avoid Loose Connection)

Connect the control connector and ensure the buckle is fully locked without looseness or poor contact.

Install the main power cable (Terminal 30) and tighten the nut to a standard torque of 9.8N·m. Keep the terminal contact surface clean and free of impurities to ensure good electrical conductivity.

Install wiring brackets and clamps. Tighten the bracket bolts to a standard torque of 8.4N·m. Arrange the wiring harnesses properly to prevent them from being squeezed or rubbing against high-temperature or moving parts.

Fit the terminal protective cover. Check that all wiring harnesses are neatly routed without pulling or twisting.

6.3 Reinstall Peripheral Components

Reassemble heat shields, air intake pipes, wheel covers and other auxiliary parts in the reverse order of disassembly, and tighten all bolts to ensure no parts are left out.

6.4 Restore Vehicle Power Supply

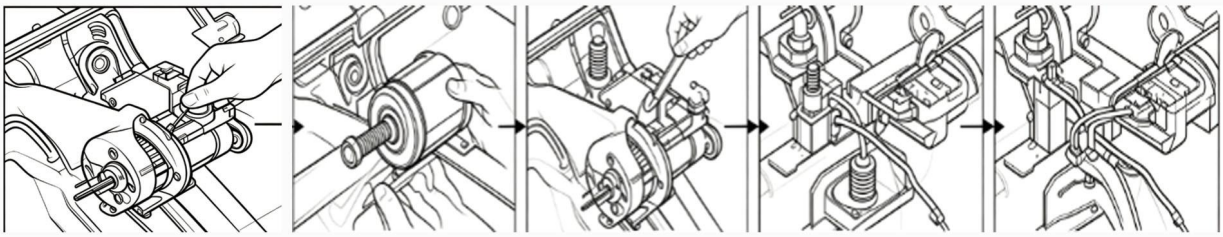
Clean the battery terminals, then connect and fasten the battery negative cable securely. Make sure the cables are not over-tensioned or interfered with other components.

7. Post-installation Inspection and Comprehensive Testing

7.1 Visual Static Inspection

Comprehensive Recheck: Confirm all bolts, wiring harnesses, clamps and protective covers are properly installed. No tools or spare parts are left in the engine compartment.

Gap Inspection: Ensure the starter does not interfere with the vehicle frame, pipelines or wiring harnesses, and no looseness exists when shaking the starter.



7.2 No-load and Actual Vehicle Start Test

Static Power-on Pre-inspection: Without pressing the clutch or brake, switch the ignition to the ON position repeatedly. Check that the control wires do not overheat and no short circuit occurs.

Initial Start Test

Turn the ignition switch to the start position. The starter should respond quickly, and the gear meshes with the flywheel smoothly without gear knocking, harsh abnormal noises or idling.

After the engine starts successfully, the starter drive gear disengages from the ring gear and returns to its original position immediately, with no continuous meshing or dragging.

Repeated Tests: Perform start tests 3 to 5 times consecutively with an interval of more than 10 seconds each time to simulate daily use. Ensure stable and consistent operation every time.

Idling Recheck: Let the engine idle for 3 to 5 minutes. Check for abnormal noises in the engine compartment, overheated wiring harnesses and excessive temperature on the starter housing.

8. Common Fault Troubleshooting (Post-installation & In-use Faults)

Fault 1: Starter does not work at all when the ignition switch is turned to the start position

Troubleshooting Sequence: Check battery voltage and wiring → Inspect start fuse/relay → Test ignition start circuit → Check loose connection of starter main terminals and control connectors → Inspect damaged starter electromagnetic switch.

Solutions: Retighten battery and starter wiring harnesses; replace blown fuses and faulty relays; repair broken circuits; replace the starter assembly if the electromagnetic switch is damaged.

Fault 2: A "click" sound from the electromagnetic switch is heard, but the starter does not rotate or runs weakly

Causes: Insufficient battery power, severe loose/corroded main power cables, stuck starter armature or excessively worn internal brushes.

Solutions: Charge the battery, polish and retighten corroded terminals; inspect and repair starter brushes and armature. Replace the starter if parts are severely worn.

Fault 3: The starter idles and fails to crank the engine

Causes: Slipping starter overrunning clutch, severely worn drive gear, chipped or worn flywheel ring gear.

Solutions: Replace the starter overrunning clutch or the entire starter assembly; repair or replace the engine flywheel ring gear.

Fault 4: Sharp gear-knocking noise occurs during starting

Causes: Missing or misplaced mounting gaskets, loose starter fixing bolts, insufficient gear lubrication or deformed flywheel ring gear.

Solutions: Refit gaskets in original positions and retighten bolts in accordance with standard torque; replenish lubricant; repair or replace the damaged flywheel ring gear.

Fault 5: Starter gear fails to retract and keeps dragging after engine startup

Causes: Malfunctioning ignition switch, stuck electromagnetic switch, deformed shift fork or continuous power supply caused by wiring short circuit.

Solutions: Repair the ignition switch; maintain or replace the starter electromagnetic switch and shift fork; troubleshoot wiring short circuits.

Fault 6: The starter works normally but the engine is hard to start

Rule out starter faults, and further inspect spark plugs, fuel injection system, air intake system and engine mechanical failures.