DAIHATSU

TERIOS

J100

TO INDEX

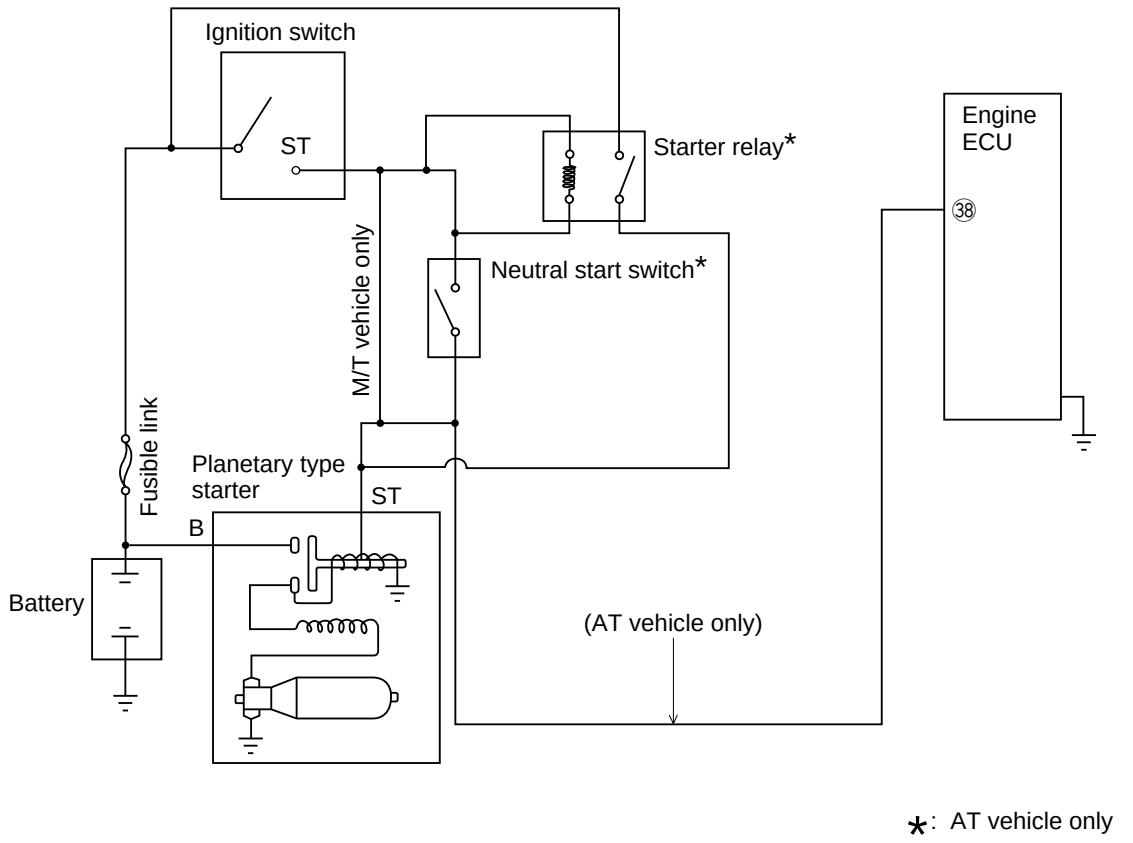
STARTING SYSTEM

ST

JST00001-00000

NO. 9710-JE

STARTING SYSTEM CIRCUIT

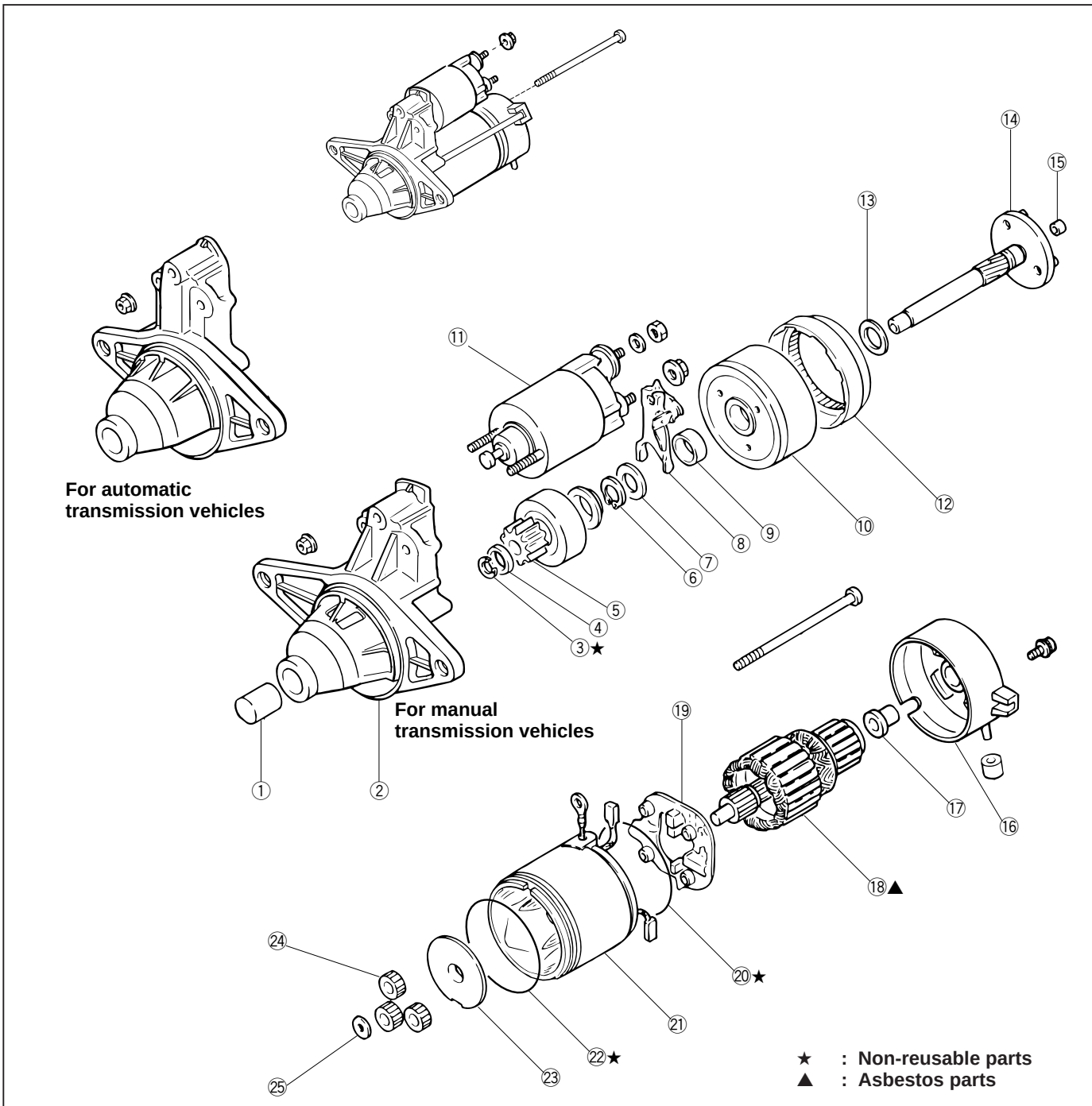


JST00002-00001

STARTER MOTOR

COMPONENTS

0.8 kW, Planetary Type Starter Motor



① Bearing
② Drive housing
③ Snap ring
④ Stop collar
⑤ Clutch
⑥ Snap ring
⑦ Washer
⑧ Drive lever
⑨ Bearing
⑩ Center bearing
⑪ Magnet switch
⑫ Internal gear
⑬ Washer
⑭ Planet carrier shaft
⑮ Bearing
⑯ End frame
⑰ Bearing
⑱ Armature
⑲ Brush holder
⑳ O-ring
㉑ Yoke
㉒ O-ring
㉓ Plate
㉔ Planet gear
㉕ Washer

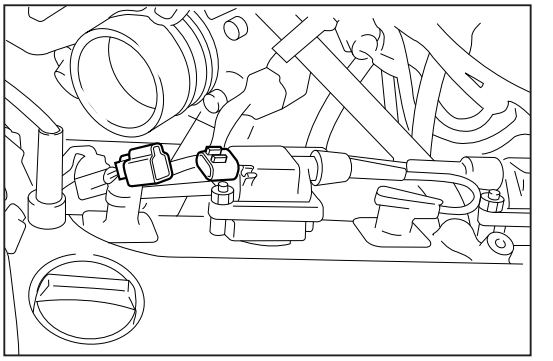
SERVICING INSTRUCTIONS OF STARTER

1. When connecting the starter terminal or battery terminal, perform positive tightening so as to avoid poor connection.
   If poor connection should exist, it presents the hazard of serious danger that a large amount of current flowing during starter operation can overheat the poor connection.
2. When removing the starter, first disconnect the negative ⊖ terminal of the battery. Then, disconnect the positive terminals (+B, ST) at the starter side. Since the battery voltage is always applied to the starter +B terminal, failure to observe this removing sequence may lead to battery short, which is extremely dangerous.
3. When installing the starter, install the starter in the clutch housing positively and be sure to tighten the attaching bolts to the specified torque. Improper installation can cause premature wear of the teeth of the pinion gear or ring gear and also can cause breakage of the clutch housing.

JST00004-00000

IN-VEHICLE INSPECTION

1. Place the shift lever to the neutral position. Apply the parking brake lever.
2. Disconnect the ignition coil coupler so that the engine will not start.



JST00005-00003

3. Set the ignition switch to the ST position. Check to see if the engine cranks.
4. If the engine will not crank, perform the following checks.
   - Inspect the battery for damage. Charge the battery.
   - Perform harness continuity test.
5. If the starter motor still will not rotate even after the checks above have been performed, remove the starter motor and perform the unit check.

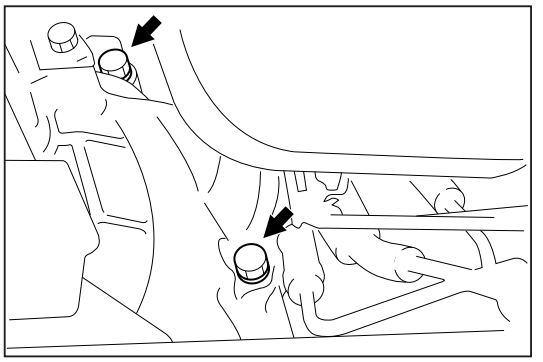
JST00006-00000

REMOVAL

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.

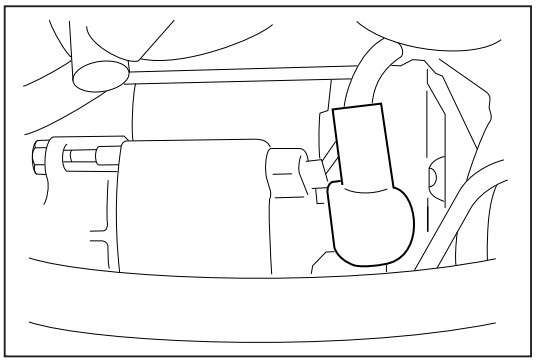
JST00007-00000

2. Remove the battery and battery carrier.
3. Jack up the vehicle and support it with safety stands. (Refer to the GI Section of the service manual.)
4. Removal of starter motor attaching bolt
   (1) Remove the upper side and lower side attaching bolt from the under side of the vehicle.



JST00008-00004

5. Disconnection of two wires from starter
   (1) Disconnect the starter terminal ST of the alternator wire from the starter.
   (2) Disconnect the starter terminal B of the alternator wire from the starter.
6. Remove the starter motor.



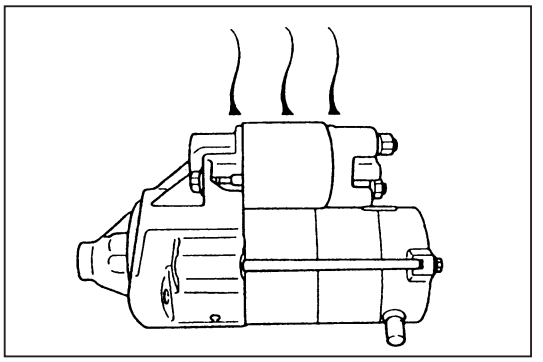
JST00009-00005

PLANETARY TYPE STARTER MOTOR

UNIT CHECK OF PLANETARY TYPE STARTER MOTOR

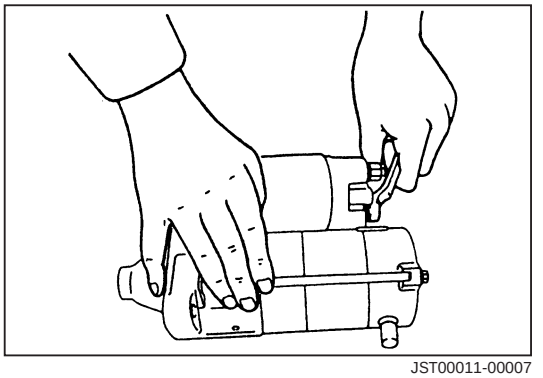
CAUTION:

- Each of the following tests must be performed within three to five seconds. If you fail to observe this caution and the starter should be energized for more than this duration, the coil may be burnt out.



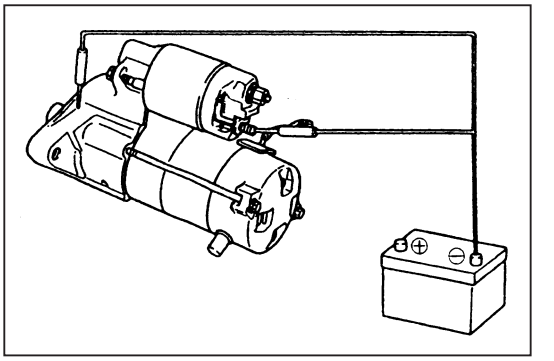
JST00010-00006

1. Pull-in test
   (1) Disconnect the lead wire form the magnetic switch terminal.



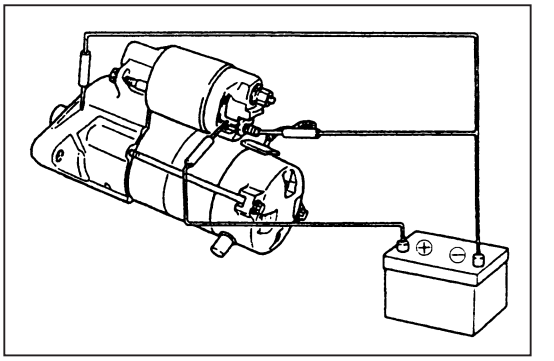
JST00011-00007

(2) Connect the negative (–) terminal of the battery to the starter body and magnetic switch terminal.



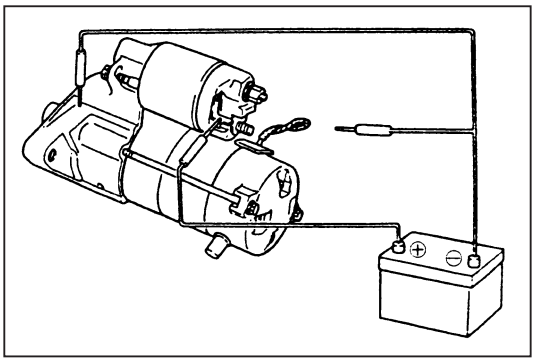
JST00012-00008

(3) Connect the positive (+) terminal to the terminal ST.
Ensure that the pinion is pushed outward.
If the drive pinion fails to move out, replace the magnetic switch.



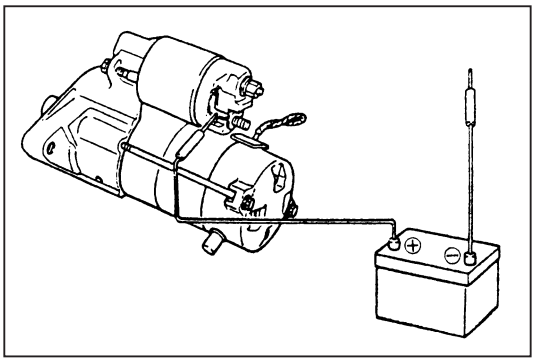
JST00013-00009

2. Hold-in test
After the check has been performed following the same procedure as with the pull-in test, disconnect the negative terminal of the magnetic switch terminal.
Ensure that the drive pinion is held in a pushed-out state.
If the drive pinion fails to be held, replace the magnetic switch.



JST00014-00010

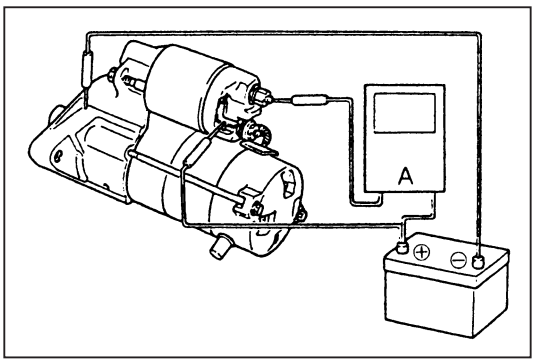
3. Inspection of plunger return
After the check has been performed following the same procedure as with the hold-in test, disconnect the ground terminal of the starter body. Ensure that the drive pinion is drawn into the drive housing.
If the drive pinion fails to be drawn, replace the magnetic switch.



JST00015-00011

4. No-load performance test
Connect the battery and an ammeter to the starter as shown in the right figure. Ensure that the starter rotates smoothly with the pinion moving out.
Measure the current the starter is drawing.
Specified Current: Less than 90A at 11.5V

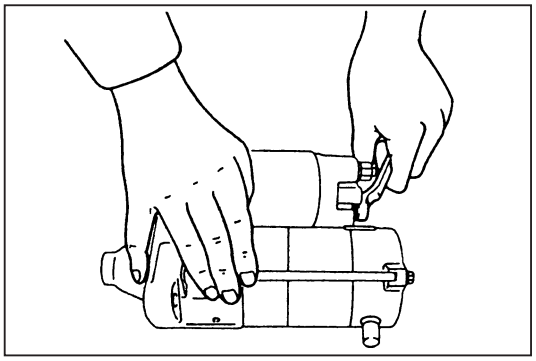
NOTE:
- Prior to the test, be sure to connect the lead wire to the magnetic switch.



JST00016-00012

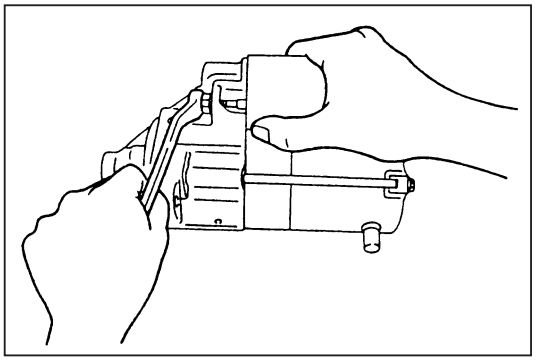
DISASSEMBLY OF PLANETARY TYPE STARTER MOTOR

1. Disconnect the lead wire from the magnetic switch.



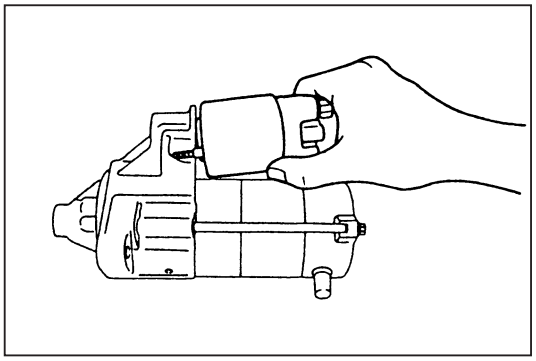
JST00017-00013

2. Remove the attaching nut of the magnetic switch from the drive housing.



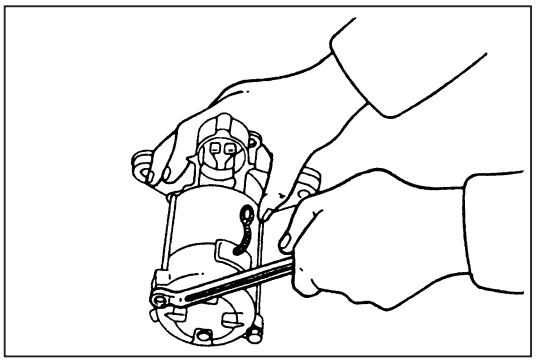
JST00018-00014

3. Remove the magnetic switch from the drive housing.



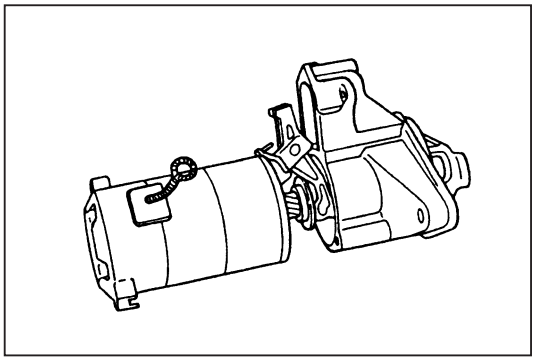
JST00019-00015

4. Remove the two through bolts from the commutator end frame.



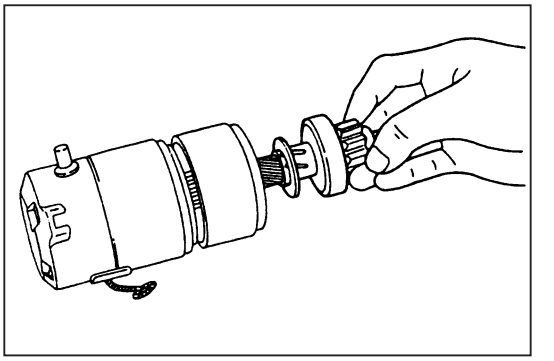
JST00020-00016

5. Remove the yoke with armature and the drive lever from the drive housing.



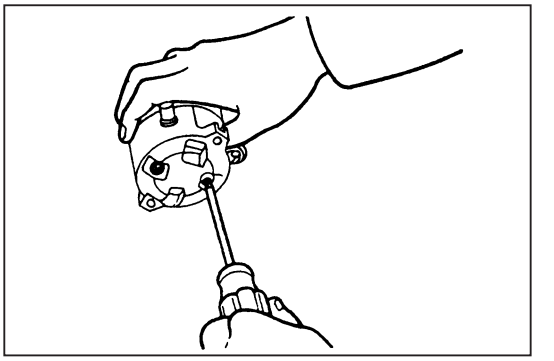
JST00021-00017

6. Separate the yoke with armature from the clutch with center bearing.
7. Remove the O-ring.



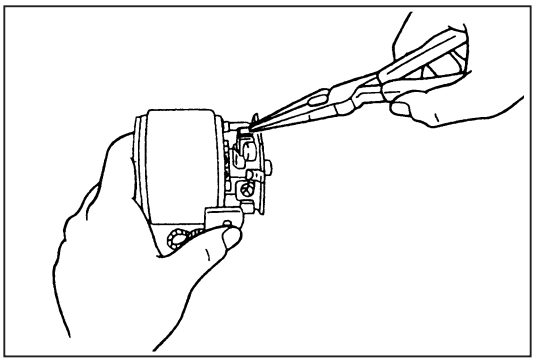
JST00022-00018

8. Remove the end frame cover by removing the two screws.



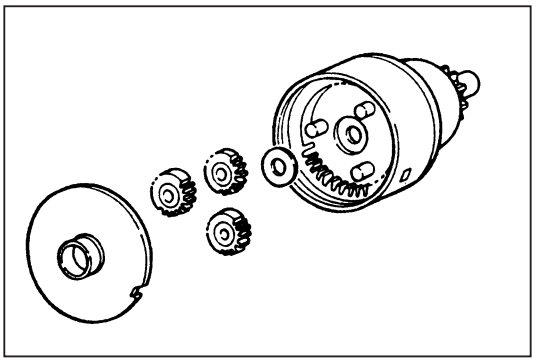
JST00023-00019

9. Remove the brushes from the brush holder by lifting the brush springs by means of nose pliers or the like.
   NOTE:
   - Care must be exercised not to damage the brushes during the removal.
10. Then, remove the armature from the yoke.



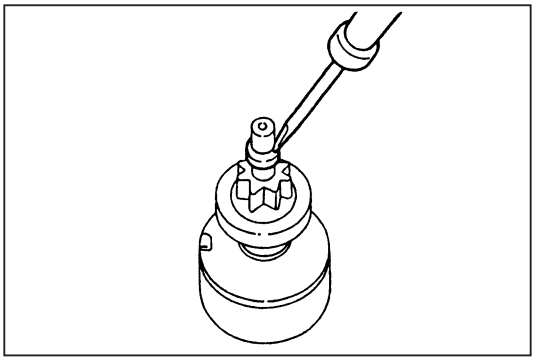
JST00024-00020

11. Removal of planetary gear
    (1) Remove the plate for starter armature.
    (2) Remove the three planetary gears.
    (3) Remove the plate washer.



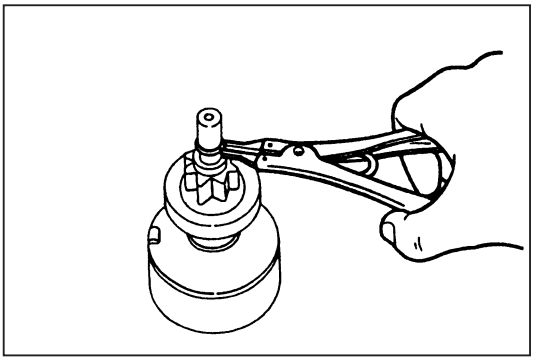
JST00025-00021

12. Remove the stop collar from the snap ring by tapping the collar with a screwdriver or the like placed on it.



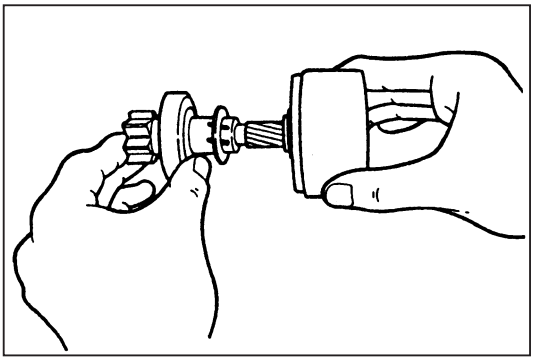
JST00026-00022

13. Detach the snap ring by prying it off with snap ring pliers. Then, remove the collar.



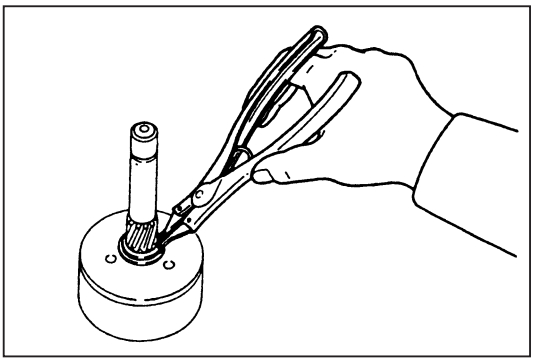
JST00027-00023

14. Remove the clutch.



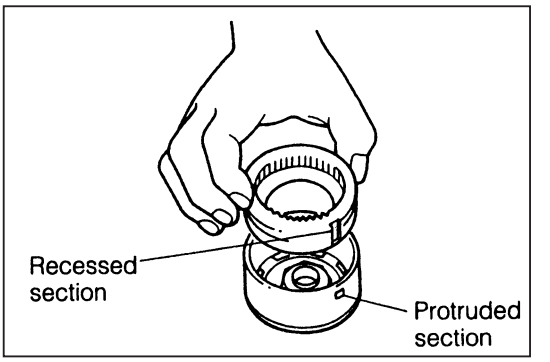
JST00028-00024

15. Detach the snap ring. Separate the center bearing from the planetary carrier shaft.



JST00029-00025

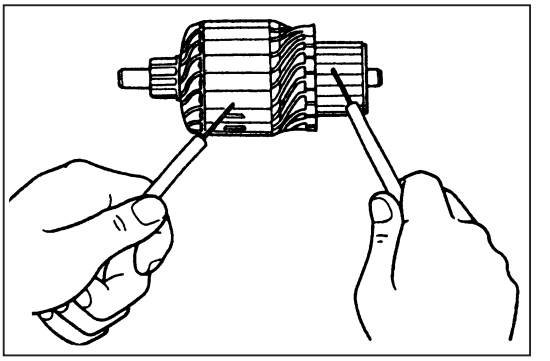
16. Remove the internal gear by aligning the recessed section provided at the outer periphery of the internal gear with the protruded section provided at the inner periphery of the center bearing.



JST00030-00026

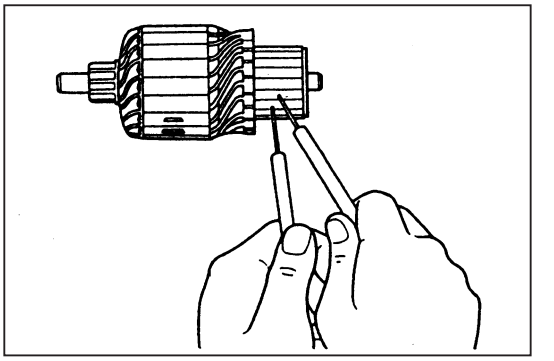
INSPECTION OF PLANETARY TYPE STARTER MOTOR
Check of armature

1. Check of armature insulation
   Ensure that no continuity exists between the commutator and the armature coil, using an ohmmeter.
   If continuity exists, replace the armature.



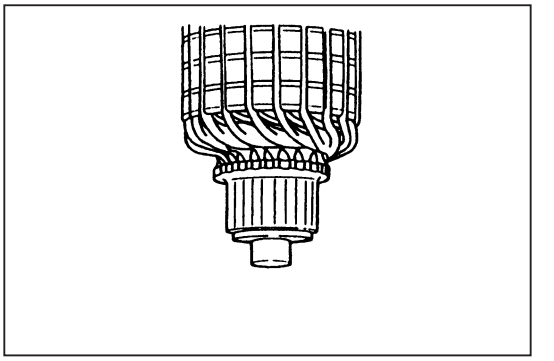
JST00031-00027

2. Check of commutator continuity
   Check continuity between each adjacent segment of the commutator, using an ohmmeter.
   If no continuity exists between any adjacent segments, replace the armature.


JST00032-00028

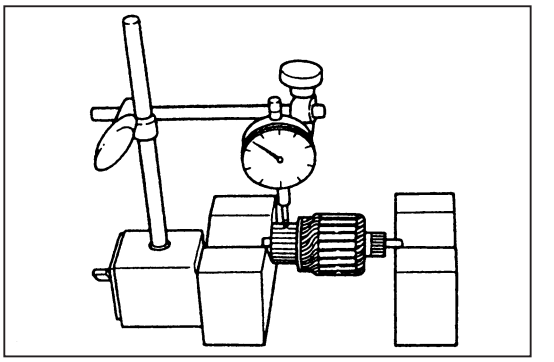
Check of commutator

1. Check each contact surface of the commutator segments with the brushes for burning.
   If the surfaces are dirty or burnt, correct the commutator surfaces, using abrasive paper (No. 400) or a lathe.


JST00033-00029

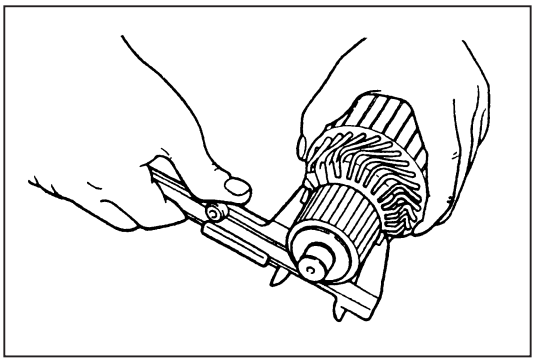
2. Check of commutator for circle runout
   Support the armature at its both ends on a Vee block.
   Check the commutator for circle runout, using a dial gauge.
   Circle Runout Limit: 0.05 mm

   If the circle runout exceeds the allowable limit, turn down the commutator on a lathe.
   At this point, care must be exercised to ensure that the commutator diameter is not less than the minimum requirement diameter of 27 mm.


JST00034-00030

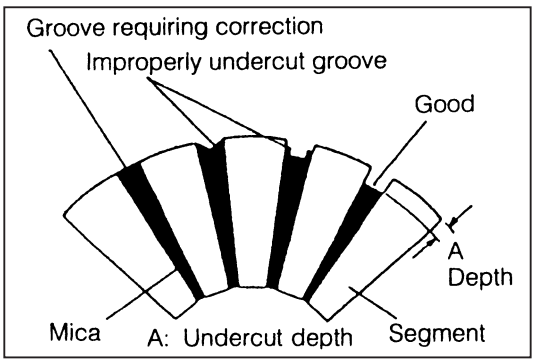
3. Measurement of commutator diameter
   Measure the commutator diameter by means of a micrometer or vernier calipers.
   Standard Diameter: 28 mm
   Minimum Diameter: 27 mm

   If the commutator diameter is less than the minimum diameter, replace the armature.


JST00035-00031

4. Check of commutator undercut
   Measure the insulator groove depth between commutator segments.
   Minimum Depth: 0.2 mm

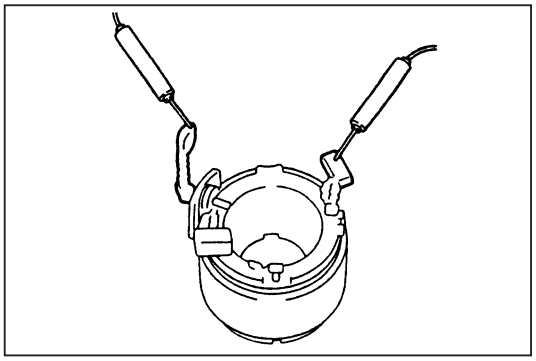
   If the insulator groove depth becomes less than the limit value, replace the commutator.



JST00036-00032

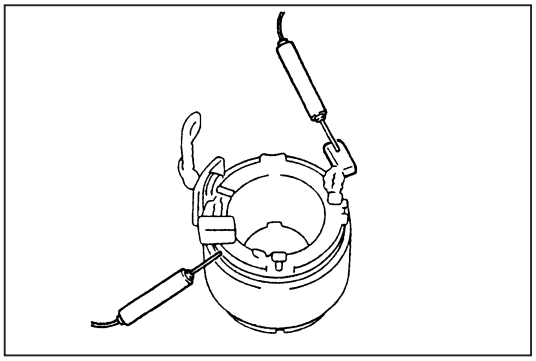
Check of field coil

1. Field coil continuity test
   Perform field coil continuity test at a point between the lead wire and the brush, using an ohmmeter.
   If no continuity exists, replace the yoke.



JST00037-00033

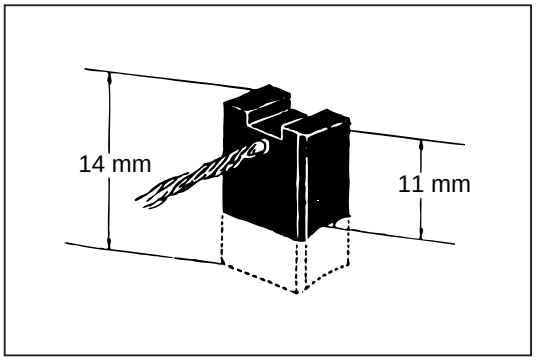
2. Field coil short test
   Perform field coil short test at a point between the brush and the yoke proper, using an ohmmeter.
   If no continuity exists, replace the yoke.



JST00038-00034

Check of brushes

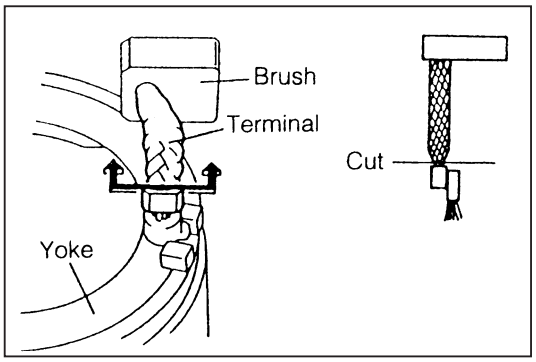
1. Measurement of brush length
   Measure the brush length, using vernier calipers.
   Standard Length: 14 mm
   Minimum Length: 11 mm



JST00039-00035

2. Replacement of brush.
   If the length is less than the minimum requirement, replace the brush holder or the yoke, as required.

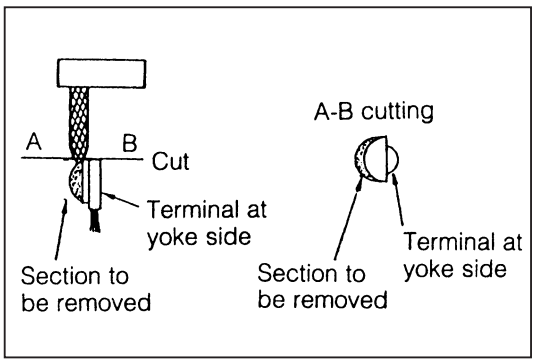
3. Procedure for brush replacement
   (1) Cut the brush lead wire at the terminal side.
   NOTE:
   - Replacement can be made only for the two brushes at the yoke side (positive (+) side). The brush at the negative (–) side should be replaced together with the brush holder.



JST00040-00036

   (2) Remove welding traces with a file or the like to correct the brush terminal to the specified dimensions.
   Specified Dimensions:
   Thickness: 1.5 mm - 1.7 mm
   Width: 5 mm

   NOTE:
   - Be sure to remove the ▭ section of the brush terminal as indicated in the right figure. Since the section to be removed is narrow, be very careful not to damage the field coil.

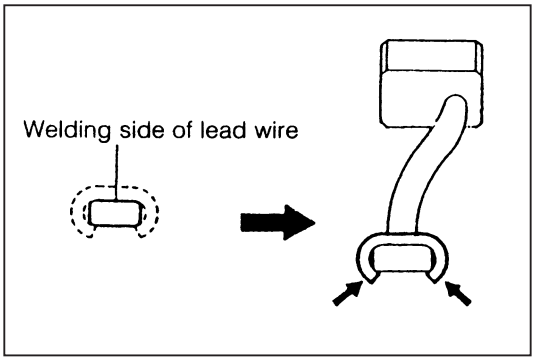


JST00041-00037

(3) Stack the plate section of a replacement brush onto the welding side of the lead wire. Make pressure connection over the overlaid section by pinching it with pliers.

NOTE:

- Be sure to take out the brush lead wire in the correct direction.

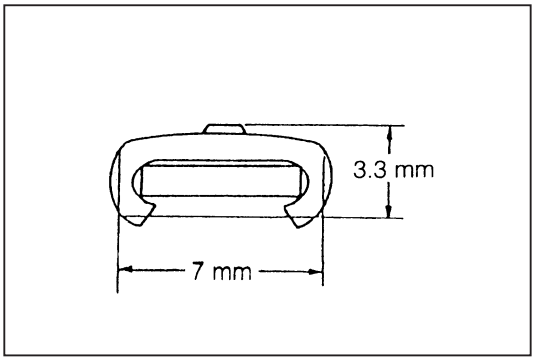


JST00042-00038

(4) Solder the pressure connection section. Correct the section, using a file or the like, so that the section conforms to the dimensions, as indicated in the right figure.

NOTE:

1. When performing the soldering, heat the section to be soldered thoroughly. Be very careful not to allow any solder to flow into the positive side lead wire.
2. Be sure to allow solder in a sufficient amount to flow into the inside of the plate.
3. Ensure that no solder oozes to the field side.

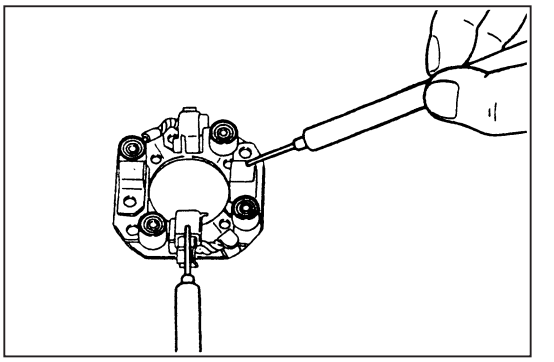


JST00043-00039

Check of brush holder

1. Check of brush holder for insulation
   Measure the insulation between the positive and negative terminals of the brush holder, using an ohmmeter.
   Insulation Resistance: 0.1 MΩ or more

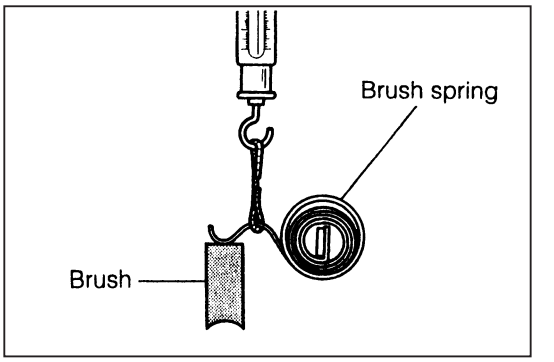
2. Replacement of brush holder.
   If the insulation resistance is less than the specification, replace the brush holder.



JST00044-00040

Check of brush spring

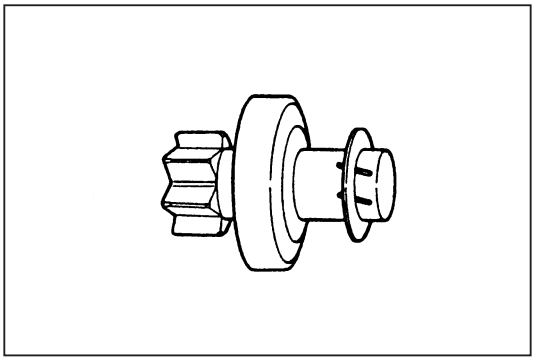
Measure the brush spring tension, using a spring scale.
Standard Tension: 15.7 N (1.6 kgf)



JST00045-00041

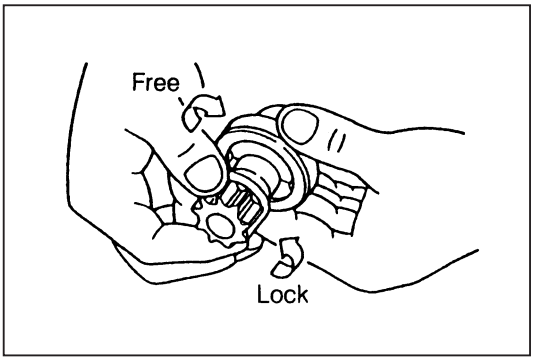
Check of clutch

1. Inspection of pinion gear and spline teeth
   Check the teeth of the pinion gear and spline for wear or damage.
   If the teeth exhibit any damage, replace the clutch. Also, inspect the flywheel ring gear for wear or damage.



JST00046-00042

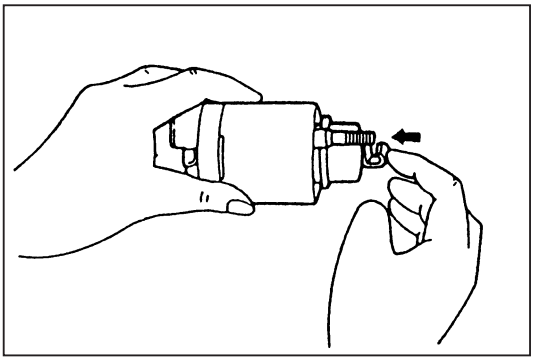
2. Check of starter clutch
   While holding the clutch, turn the pinion clockwise. Ensure that the pinion turns smoothly.
   Turn the pinion counterclockwise. Ensure that the pinion is locked.
   If the check results are unsatisfactory, replace the starter clutch.



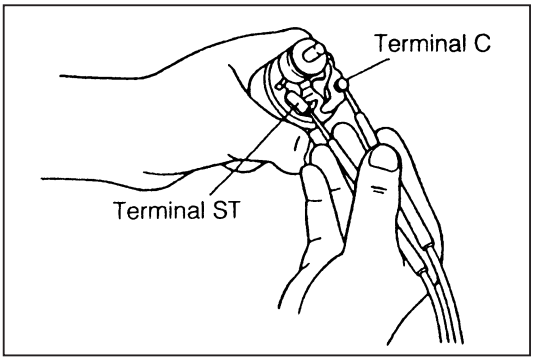
JST00047-00043

Check of magnetic switch

1. Plunger check
   Push in the plunger with your fingers and release your fingers. Ensure that the plunger returns quickly to the original position. If the plunger exhibits poor returning or fails to return, replace the magnetic switch.

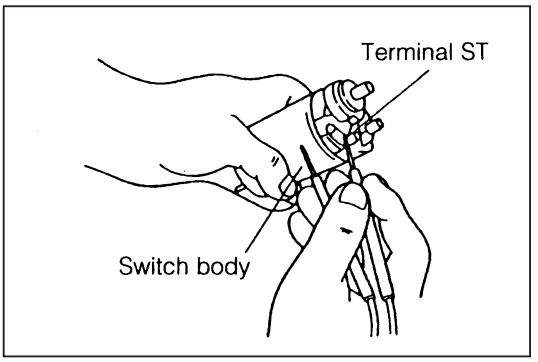

JST00048-00044

2. Pull-in coil open circuit test
   Using an ohmmeter, ensure that continuity exists between the terminal ST and terminal C.
   If no continuity exists, replace the magnetic switch.



JST00049-00045

3. Hold-in coil open circuit test
   Ensure that continuity exists between the terminal ST and the switch body.
   If no continuity exists, replace the magnetic switch.

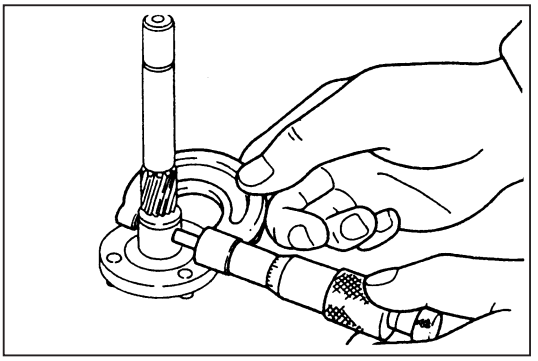


JST00050-00046

Check of bearing

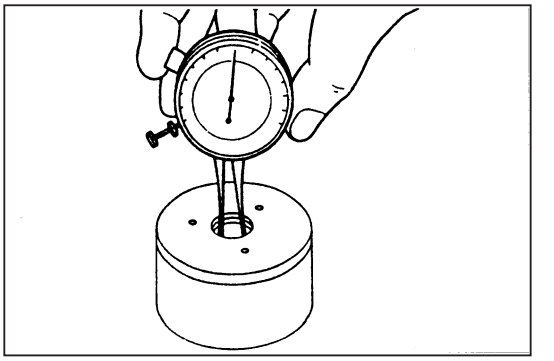
Center bearing

1. Measure the outer diameter of the center bearing sliding section of the planetary carrier shaft.
   Specified Value: 15 mm

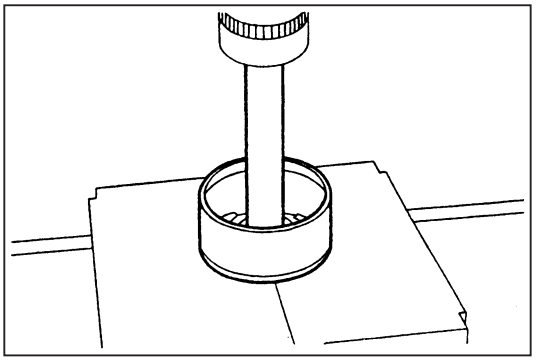

JST00051-00047

2. Measure the inner diameter of the center bearing so as to determine the clearance.
   Specified Value: 0.04 mm
   Allowable Limit: 0.15 mm

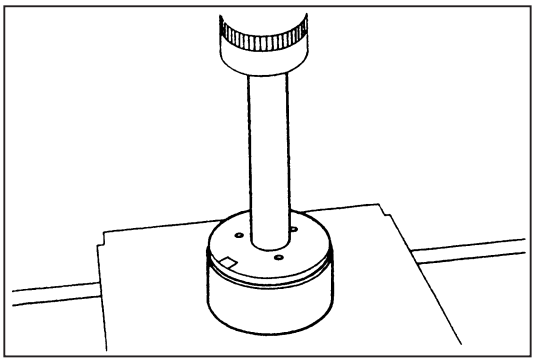
   If the clearance exceeds the allowable limit, replace the oilless bearing or the planetary carrier shaft.


JST00052-00048

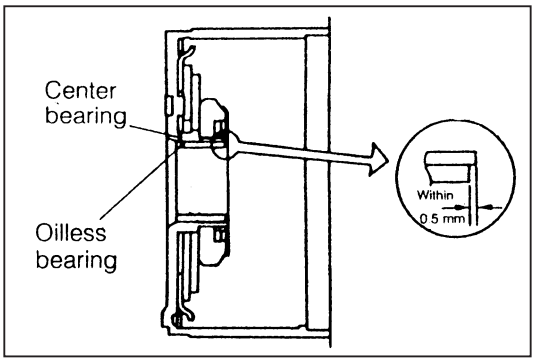
3. Bearing replacement
   (1) Remove the bearing, using a suitable tool in combination with a press or the like.
   NOTE:
   - When pulling out the bearing, be sure to remove it from the inside.


JST00053-00049

   (2) Install the bearing, using a suitable tool in combination with a press or the like.
   NOTE:
   - When installing the bearing, be sure to install it from the outside.


JST00054-00050

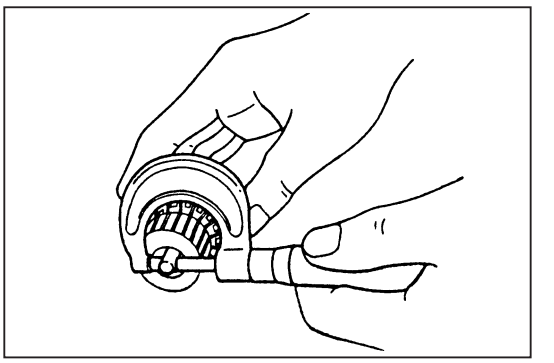
   NOTE:
   - The bearing should be driven into position in such a way that the bearing is recessed within 0.5 mm from the edge of the center bearing.



JST00055-00051

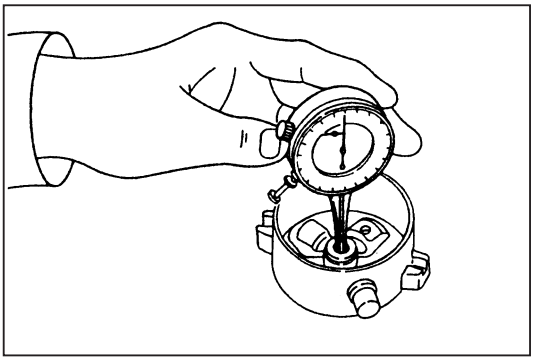
End frame bearing

1. Measure the outer diameter of the end frame sliding section of the armature shaft.
   Specified Value: 7 mm

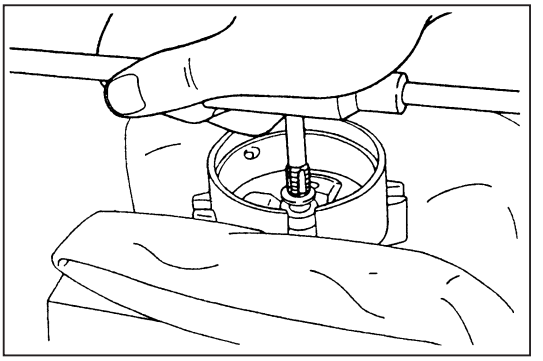

JST00056-00052

2. Measure the inner diameter of the end frame bearing so as to determine the clearance.
   Specified Value: 0.035 mm
   Allowable Limit: 0.1 mm

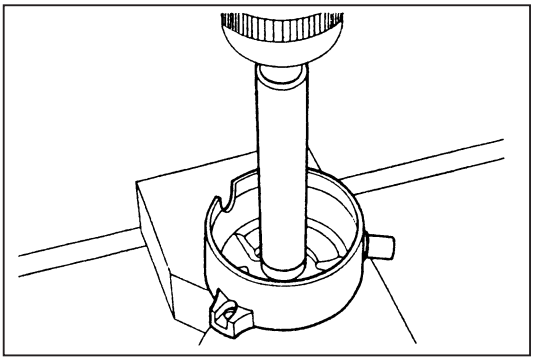
   If the clearance exceeds the allowable limit, replace the oilless bearing or the armature.


JST00057-00053

3. Bearing replacement
   (1) Remove the bearing, using a tap having an outer diameter of 8 mm.
   NOTE:
   - Be certain to clamp the end frame in a vise with a cloth interposed so that no scratch may be made on the end frame.

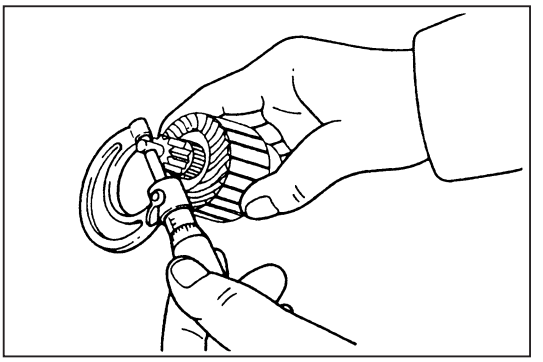

JST00058-00054

   (2) Install a new bearing, using a suitable tool in combination with a press or the like.


JST00059-00055

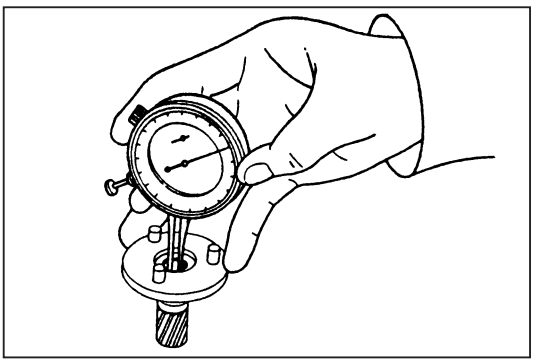
Planetary carrier shaft bearing

1. Measure the outer diameter of the front sliding section of the armature shaft.
   Specified Value: 7 mm

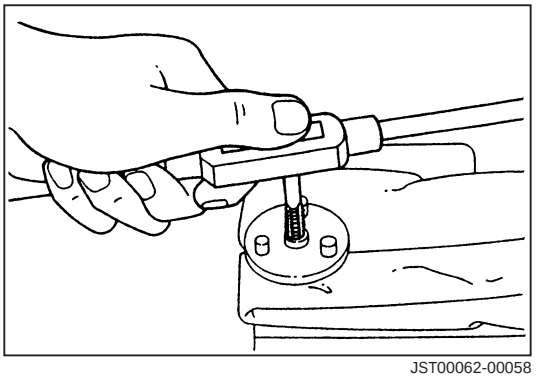

JST00060-00056

2. Measure the inner diameter of the planetary carrier shaft bearing so as to determine the clearance.
   Specified Value: 0.06 mm
   Allowable Limit: 0.10 mm

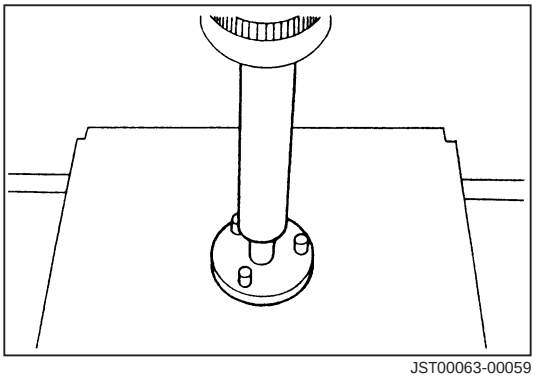
   If the clearance exceeds the allowable limit, replace the oilless bearing or the armature.


JST00061-00057

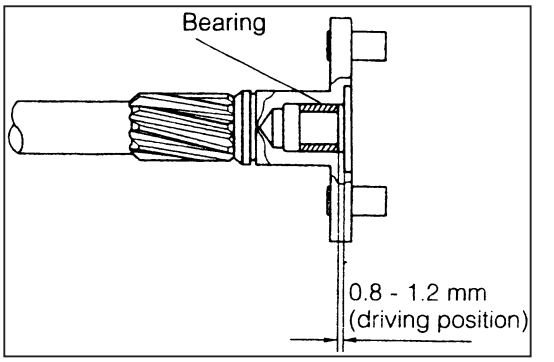
3. Bearing replacement
   (1) Remove the bearing, using a tap having an outer diameter of 8 mm.
   NOTE:
   - Be certain to clamp the planetary carrier shaft in a vice with a cloth interposed so that no scratch be made on the planetary carrier shaft.


JST00062-00058

   (2) Install a new bearing, using a suitable tool in combination with a press or the like.


JST00063-00059

   NOTE:
   - The bearing should be driven into the position, as indicated in the right figure.

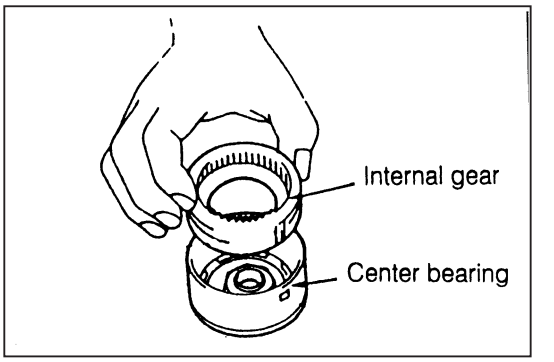


JST00064-00060

ASSEMBLY OF PLANETARY TYPE STARTER MOTOR

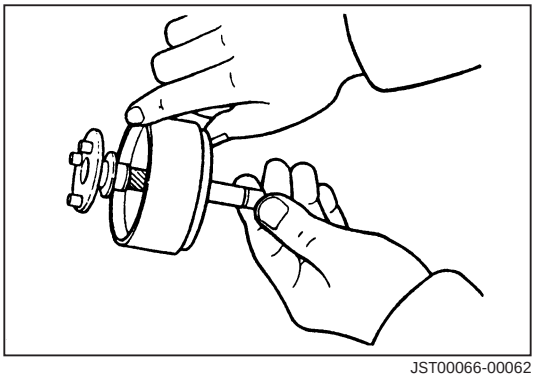
   NOTE:
   - Use high-temperature grease to lubricate the bearings and sliding parts when assembling the starter motor.

1. Install the internal gear by aligning the recessed section provided at the outer periphery of the internal gear with the protruded section provided at the inner periphery of the center bearing.

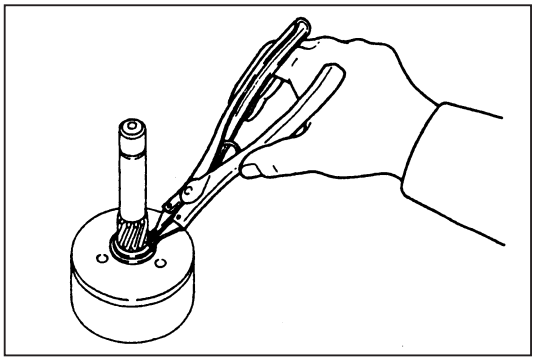


JST00065-00061

2. Put the plate washer onto the planetary carrier shaft. Then, install the center bearing to the planetary carrier shaft.

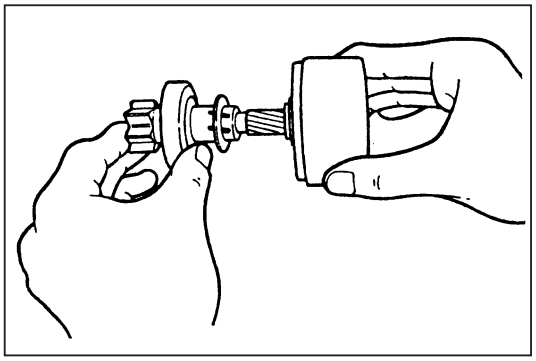

JST00066-00062

3. Install the plate washer in place.
   Install the snap ring.



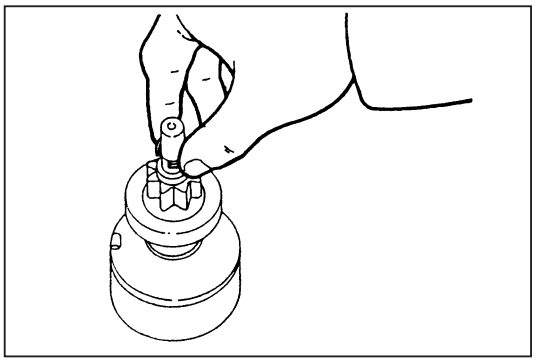
JST00067-00063

4. Install the clutch.



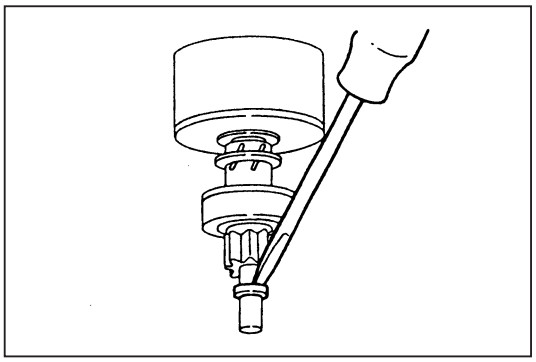
JST00068-00064

5. Install the stop collar and a new snap ring. Compress the snap ring, using a vise or the like.



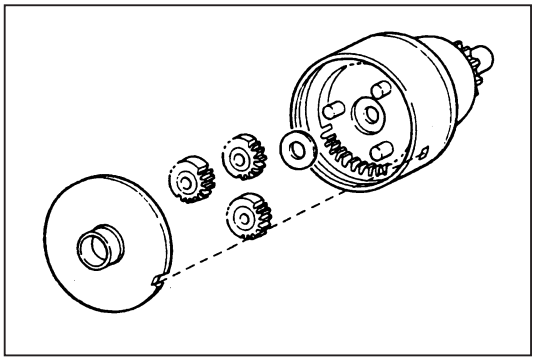
JST00069-00065

6. Tap the collar so that it may come onto the snap ring, using a screwdriver.



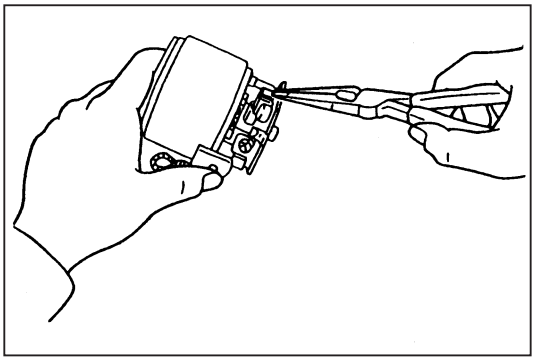
JST00070-00066

7. Installation of planetary gear
   (1) Install the plate washer.
   (2) Install the three planetary gears.
   (3) Install the plate for starter armature.
   NOTE:
   - Be certain to install the plate, aligning with the mate mark on the center bearing.



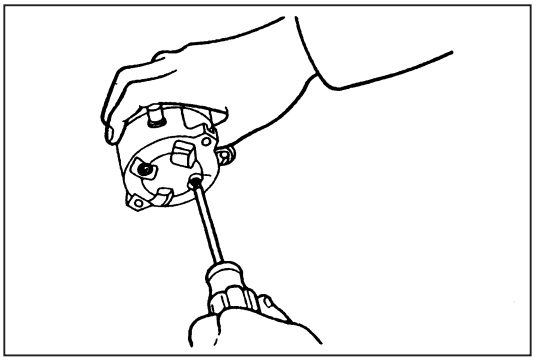
JST00071-00067

8. Install the yoke to the armature. Install the brushes to the brush holder while lifting the brushes by means of nose pliers or the like.



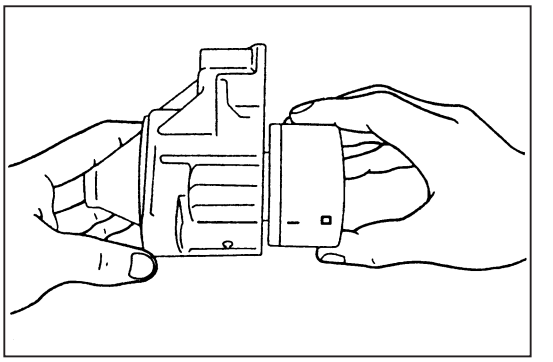
JST00072-00068

9. Install the commutator end frame, together with a new O-ring, to the yoke by means of the two screws.



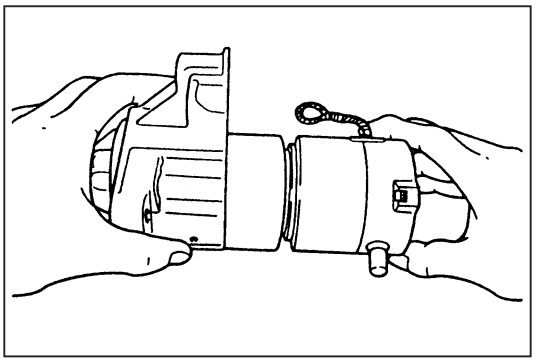
JST00073-00069

10. Install the drive lever and the clutch with center bearing to the drive housing.
    NOTE:
    - Apply high-temperature grease to the sliding section of the drive lever.
    - Make sure to align the mate mark of the drive housing with that of the yoke during the assembly.



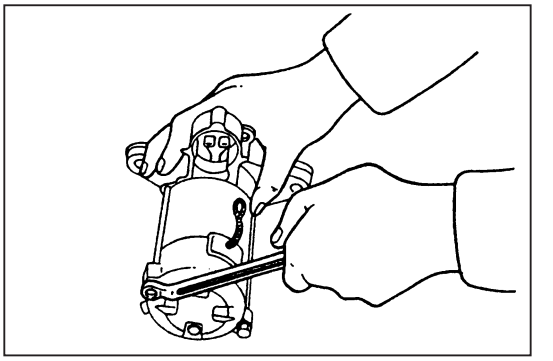
JST00074-00070

11. Install the armature with yoke and a new O-ring to the drive housing.
    NOTE:
    - Make sure to align the mate mark of the center bearing with that of the yoke during the assembly.



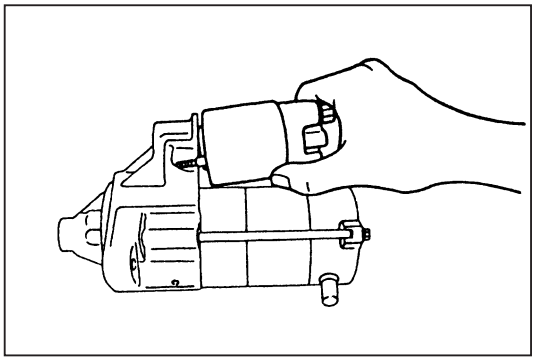
JST00075-00071

12. Install the two through-bolts.



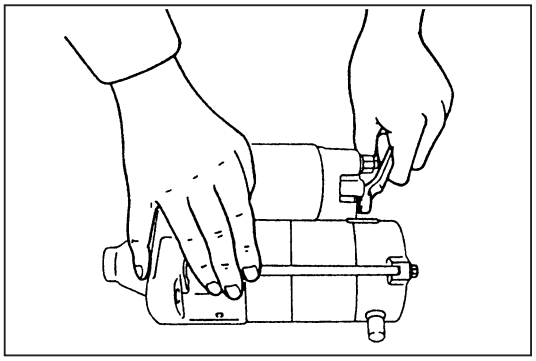
JST00076-00072

13. While hooking the magnetic switch over the drive lever, install the magnetic switch onto the drive housing. Secure the magnetic switch with the two nuts.
    NOTE:
    - Be sure to install the rubber boot in the spring section securely.



JST00077-00073

14. Connect the lead wire to the magnetic switch.



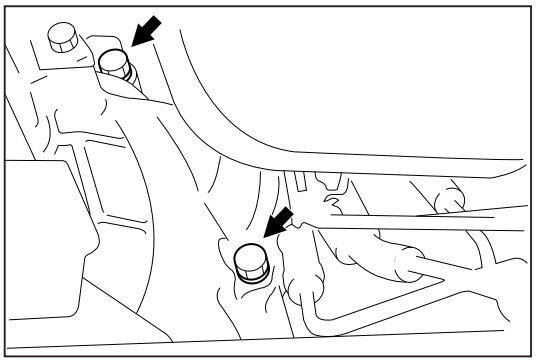
JST00078-00074

INSTALLATION OF STARTER MOTOR

1. Install the starter motor to the bell housing.

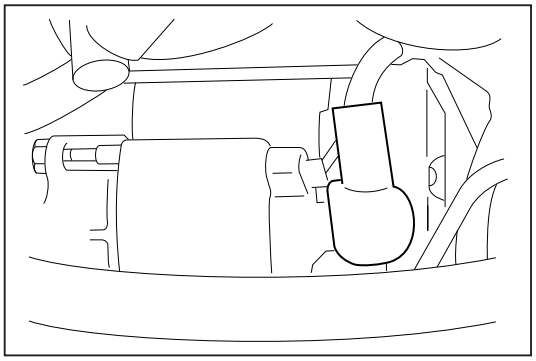
JST00079-00000

2. Tighten the lower side and upper side attaching bolt from the under side of the vehicle.
    Tightening Torque: 31.2 - 46.8 N·m (3.2 - 4.8 kgf-m)



JST00080-00075

3. Connect the starter terminal B of the alternator wire to the starter.
4. Connect the starter terminal ST of the alternator wire to the starter.



JST00081-00076

5. Jack up the vehicle. Remove the safety stands from the vehicle. Then, remove the jack.
6. Install the battery and battery carrier.
7. Connect the ground cable terminal to the negative (–) terminal of the battery.

JST00082-00000

8. Ensure that the starter motor rotates smoothly.
   NOTE:
   - The battery should be in the full charged condition.

JST00083-00000

SERVICE SPECIFICATIONS

Reduction type starter motor	Rating voltage and output power	12V 0.8 kW
	No-load characteristic at 11.5V Amperage	Less than 90A
	Brush length Standard	14.0 mm
	Minimum	11.1 mm
	Commutator Outer diameter Standard	28 mm
	Minimum	27 mm
	Undercut depth Standard	0.45 - 0.75 mm
	Minimum	0.2 mm
	Maximum circle runout	0.05 mm
	Spring installed load	15.7 N (1.6 kgf)

JST00084-00000

TROUBLE SHOOTING

Problem	Possible cause	Remedies	Page
Engine will not crank	Battery not fully charged	Check specific gravity of battery electrolyte. Charge or replace battery.	CH–6
	Battery cables loose, corroded or worn	Repair or replace cables.	CH–6
	Neutral start switch faulty	Adjust or replace Neutral start switch.	
	Fusible link blown	Replace fusible link.	
	Starter faulty	Repair starter.	ST–4
	Ignition switch faulty	Replace ignition switch.	
Engine cranks slowly	Battery not fully charged	Check specific gravity of battery electrolyte. Charge or replace battery.	CH–6
	Battery cables loose, corroded or worn	Repair or replace cables.	
	Starter faulty	Repair starter.	ST–4
Starter keeps running	Starter faulty	Repair starter.	ST–4
	Ignition switch faulty	Replace ignition switch.	
	Short in wiring	Repair wiring.	
Starter spins – engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter.	ST–4
	Flywheel teeth broken	Replace flywheel.	

JST00085-00000

TO INDEX

TO NEXT SECTION