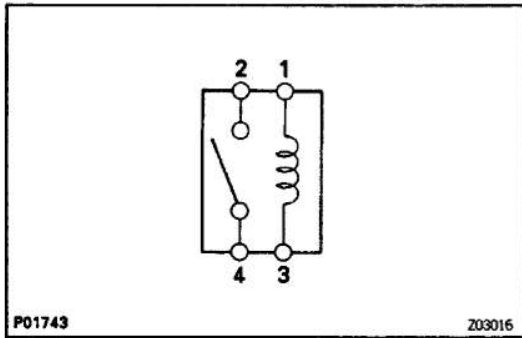
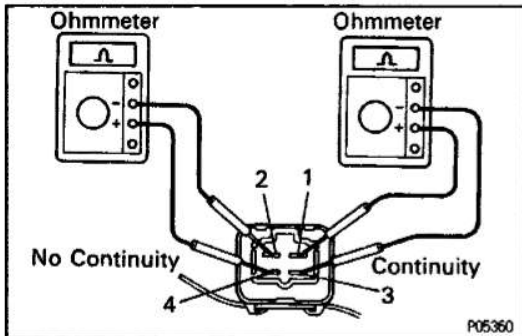


ST-26

STARTING SYSTEM – PARK NEUTRAL SWITCH (PNS)

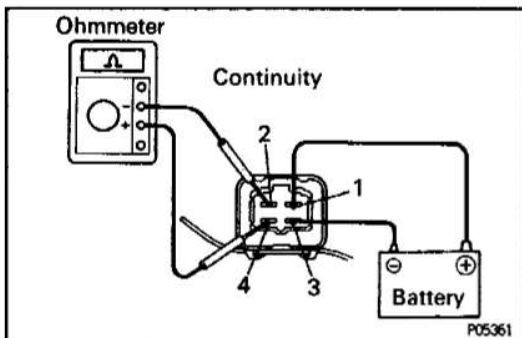


4. INSPECT STARTER RELAY



A. Inspect relay continuity

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.
 - (b) Check that there is no continuity between terminals 2 and 4.
- If continuity is not as specified, replace the relay.



6. Inspect relay operation

- (a) Apply battery voltage across terminals 1 and 3.
 - (b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.
- If operation is not as specified, replace the relay.

5. REINSTALL STARTER RELAY

6. REINSTALL LUGGAGE COMPARTMENT FLOOR MAT

7. RECONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

CLUTCH START SWITCH

(See MX section)

87013-01

PARK/NEUTRAL SWITCH (PNS)

(See AX section)

87014-01

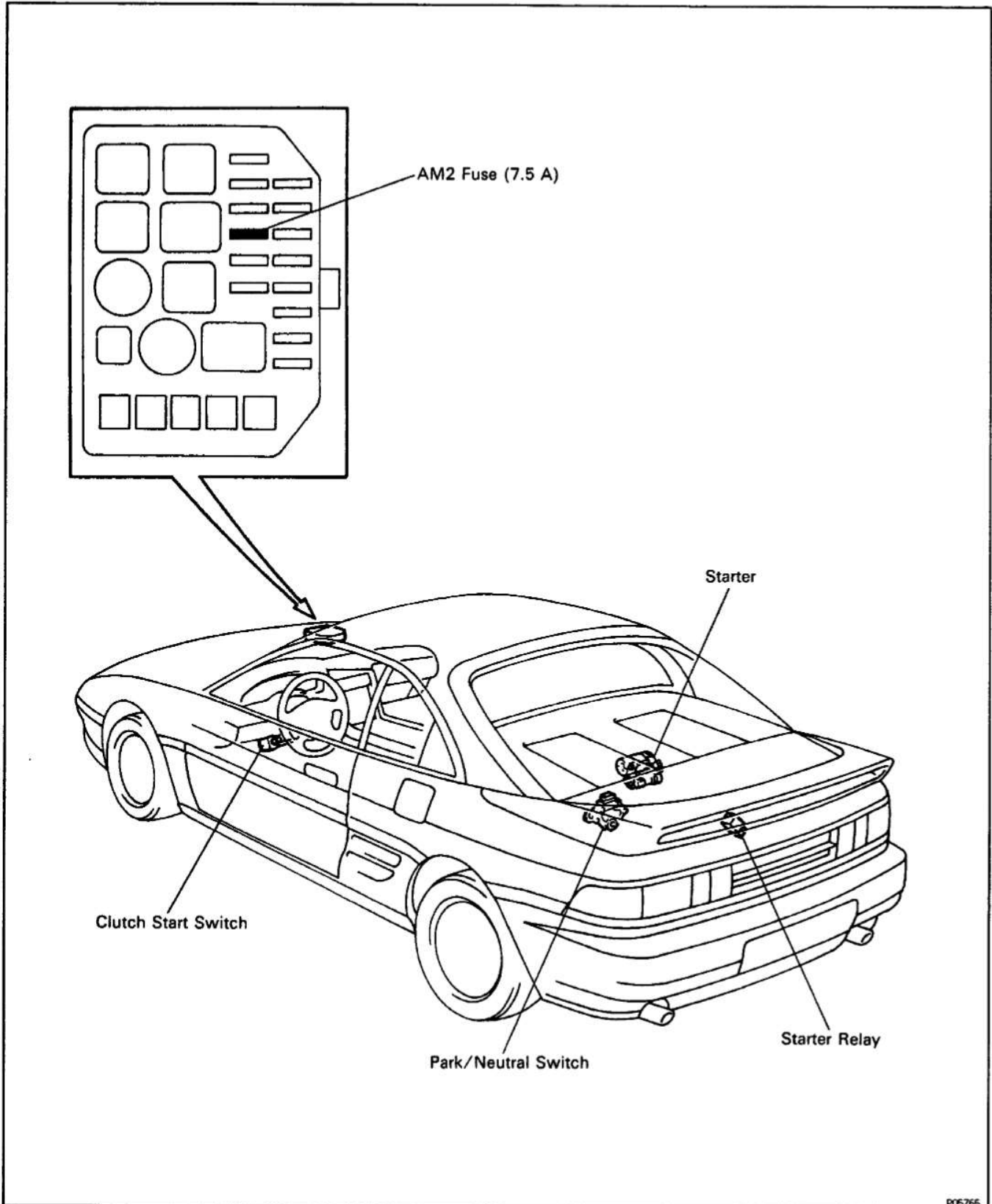
STARTING SYSTEM

ST-2

STARTING SYSTEM - DESCRIPTION

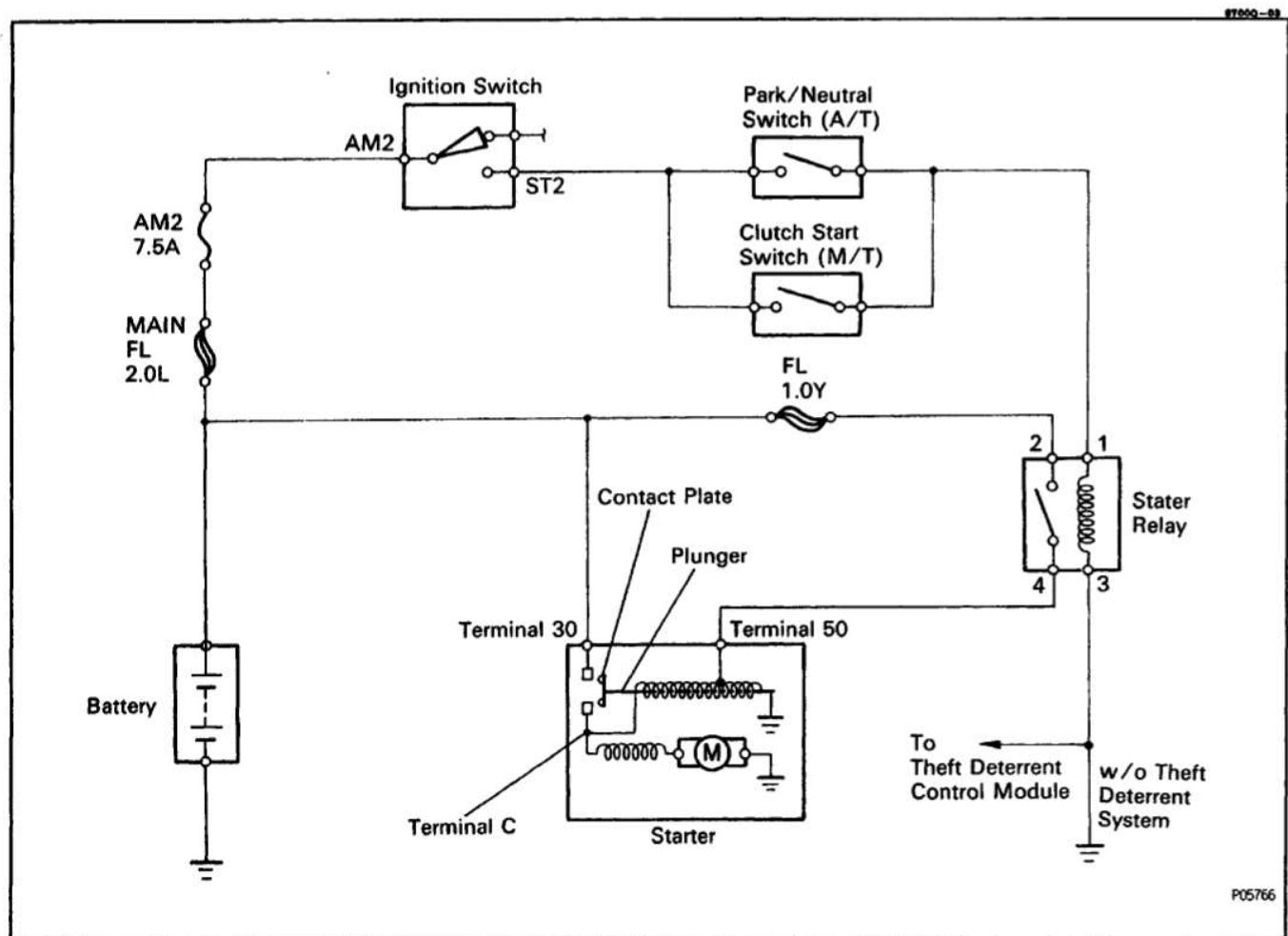
DESCRIPTION

The starter is a reduction type with a small, high-speed motor used to drive the pinion gear.



P05765

SYSTEM CIRCUIT



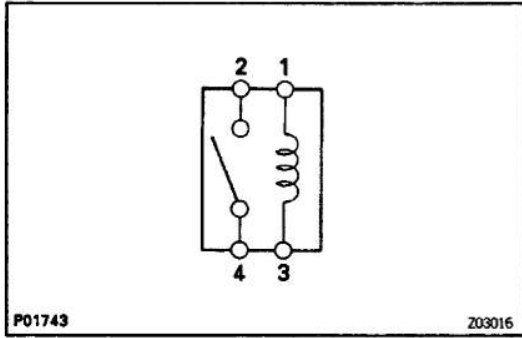
OPERATION

When the ignition switch is turned to START position, current flows from terminal 50 to the coil of the solenoid and the plunger is pulled by the magnetic force of the coil. When the plunger is pulled to the left as shown above, the contact plate of the plunger allows current from the battery to flow directly from terminal 30 to the motor, and the starter rotates.

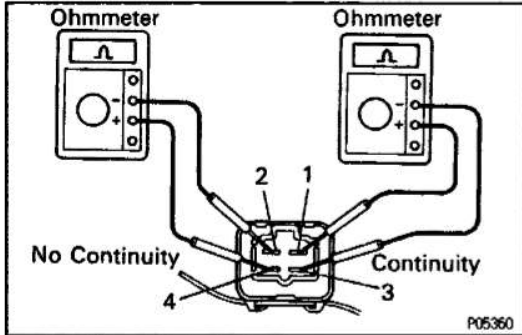
When the engine is running and the ignition switch is returned to ON, the magnetic force of the coil disappears and the contact plate of the plunger is returned to its original position by the return spring. Battery voltage no longer flows from terminal 30, so the motor stops.

ST-26

STARTING SYSTEM – PARK NEUTRAL SWITCH (PNS)

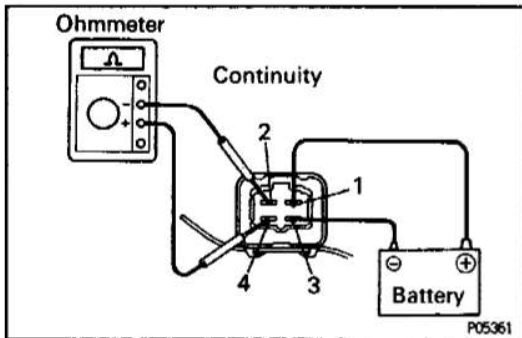


4. INSPECT STARTER RELAY



A. Inspect relay continuity

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.
 - (b) Check that there is no continuity between terminals 2 and 4.
- If continuity is not as specified, replace the relay.



6. Inspect relay operation

- (a) Apply battery voltage across terminals 1 and 3.
 - (b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.
- If operation is not as specified, replace the relay.

5. REINSTALL STARTER RELAY

6. REINSTALL LUGGAGE COMPARTMENT FLOOR MAT

7. RECONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

CLUTCH START SWITCH

(See MX section)

87013-01

PARK NEUTRAL SWITCH (PNS)

(See AX section)

87014-01

ST-4

STARTING SYSTEM – PREPARATION

PREPARATION**SST (SPECIAL SERVICE TOOLS)**

ST008-03

	09286-46011 Injection Pump Spline Shaft Puller	Armature bearing
	09285-76010 Injection Pump Camshaft Bearing Cone Replacer	Armature front bearing for conventional type
	09820-00030 Alternator Rear Bearing Replacer	Armature front bearing for compact type

RECOMMENDED TOOLS

ST007-01

	09082-00015 TOYOTA Electrical Tester	
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EQUIPMENT

ST006-01

Dial indicator	Commutator
Magnetic finger	
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V-block	
Vernier calipers	Commutator, Brush

SERVICE SPECIFICATIONS

ST018-00

SERVICE DATA

Starter	Rated voltage and output power	12 V 1.4 kW, 12 V 1.6 kW
	No-load characteristics (Current)	90 A or less at 11.5 V
	No-load characteristics (rpm)	3,000 rpm or more (Compact type) 3,500 rpm or more (Conventional type)
	Brush length (STD)	15.0 mm (0.591 in.)
	Brush length (Minimum)	10.0 mm (0.394 in.)
	Spring installed load	18 – 24 N (1.79 – 2.41 kgf, 3.9 – 5.3 lbf)
	Commutator	
	Diameter (STD)	30 mm (1.18 in.)
	Diameter (Minimum)	29 mm (1.14 in.)
	Undercut depth (STD)	0.6 mm (0.024 in.)
	Undercut depth (Minimum)	0.2 mm (0.008 in.)
	Circle runout (Maximum)	0.05 mm (0.0020 in.)

ST018-01

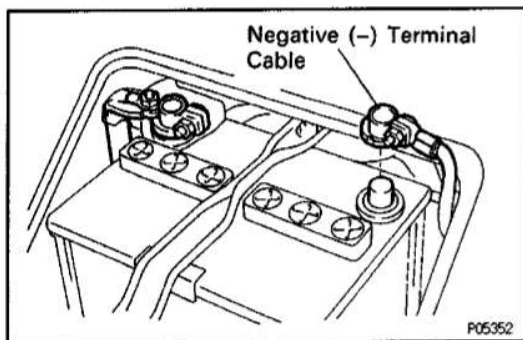
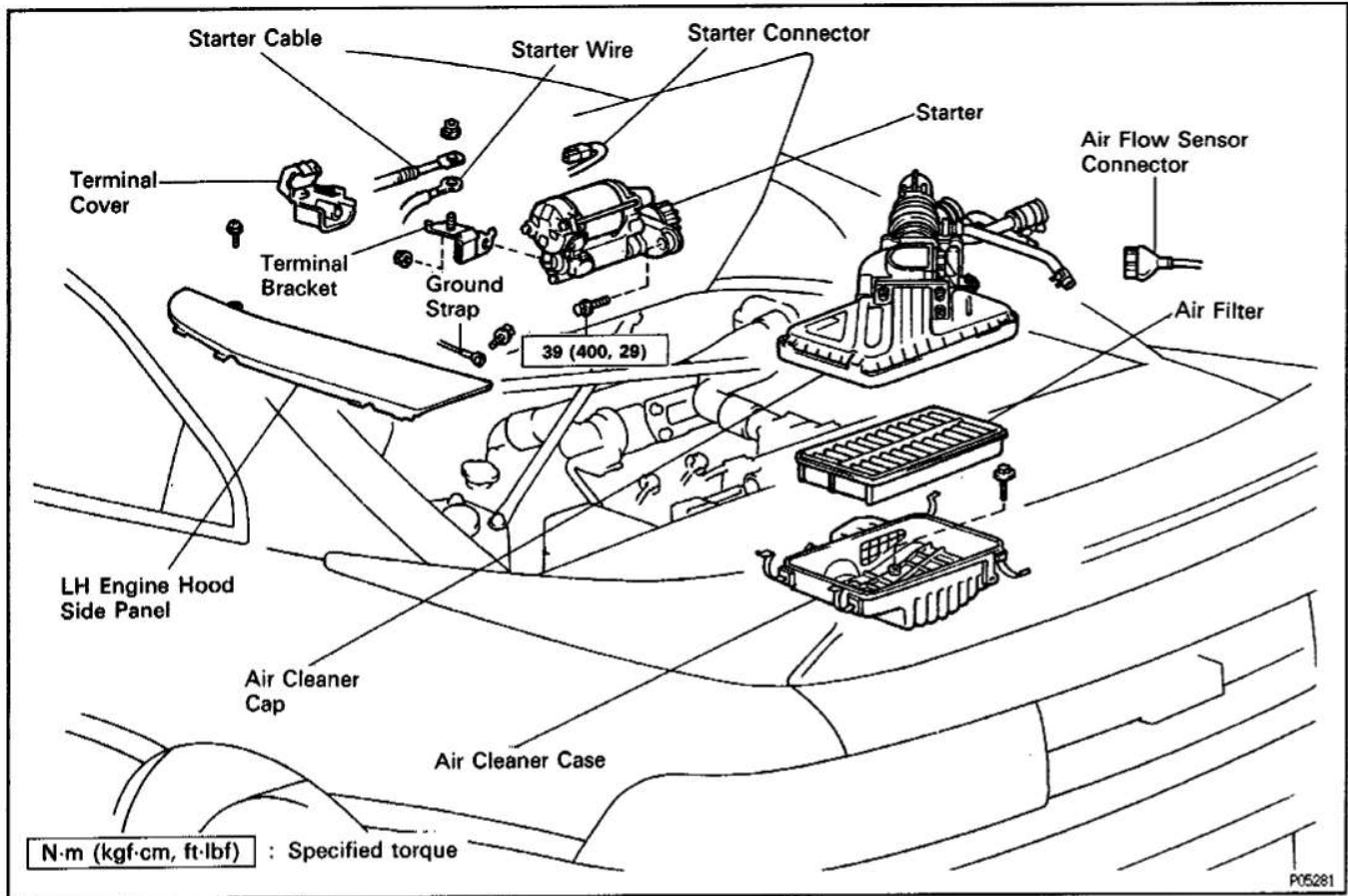
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Starter mounting bolt	39	400	29

STARTER

ST00W-04

COMPONENTS FOR REMOVAL AND INSTALLATION (3S-GTE)



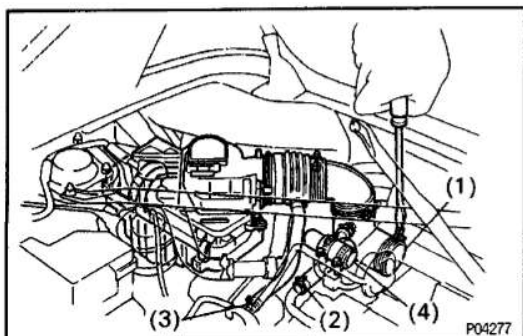
STARTER REMOVAL (3S-GTE)

(See Components for Removal and Installation)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Turn the ignition switch to "LOCK". Disconnect the negative terminal from the battery. Wait at least 20 seconds before proceeding with work.

2. REMOVE LH ENGINE HOOD SIDE PANEL



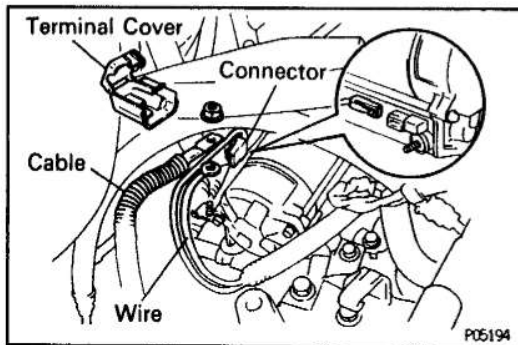
3. REMOVE AIR CLEANER HOUSING

- (a) Disconnect the air flow sensor connector.
- (b) Disconnect the following hoses:
 - (1) Air cleaner hose from turbocharger
 - (2) PCV hose from cylinder head cover
 - (3) Air hose from No.2 air hose
 - (4) Air hose from air by-pass valve

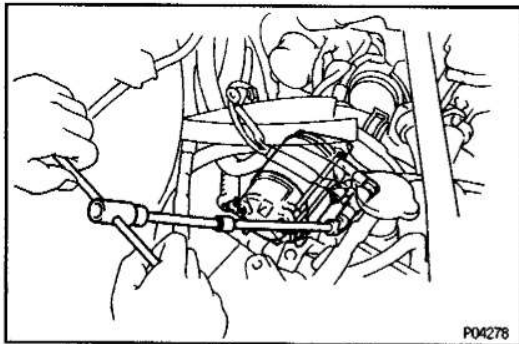
ST-6

STARTING SYSTEM – STARTER

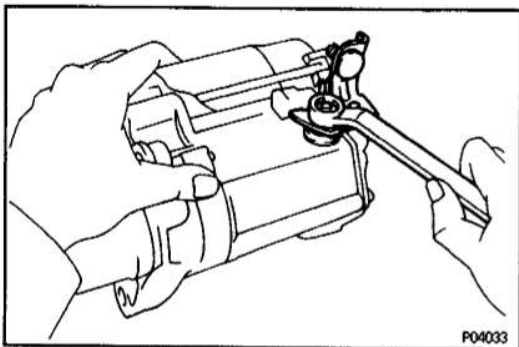
- (c) Disconnect the four clamps, and remove the air cleaner cap and air flow sensor assembly.
- (d) Remove the air filter.
- (e) Remove the three bolts and air cleaner case.

**4. REMOVE STARTER**

- (a) Remove the terminal cover.
- (b) Disconnect the starter connector.
- (c) Remove the nut, and disconnect the starter and cable and wire.

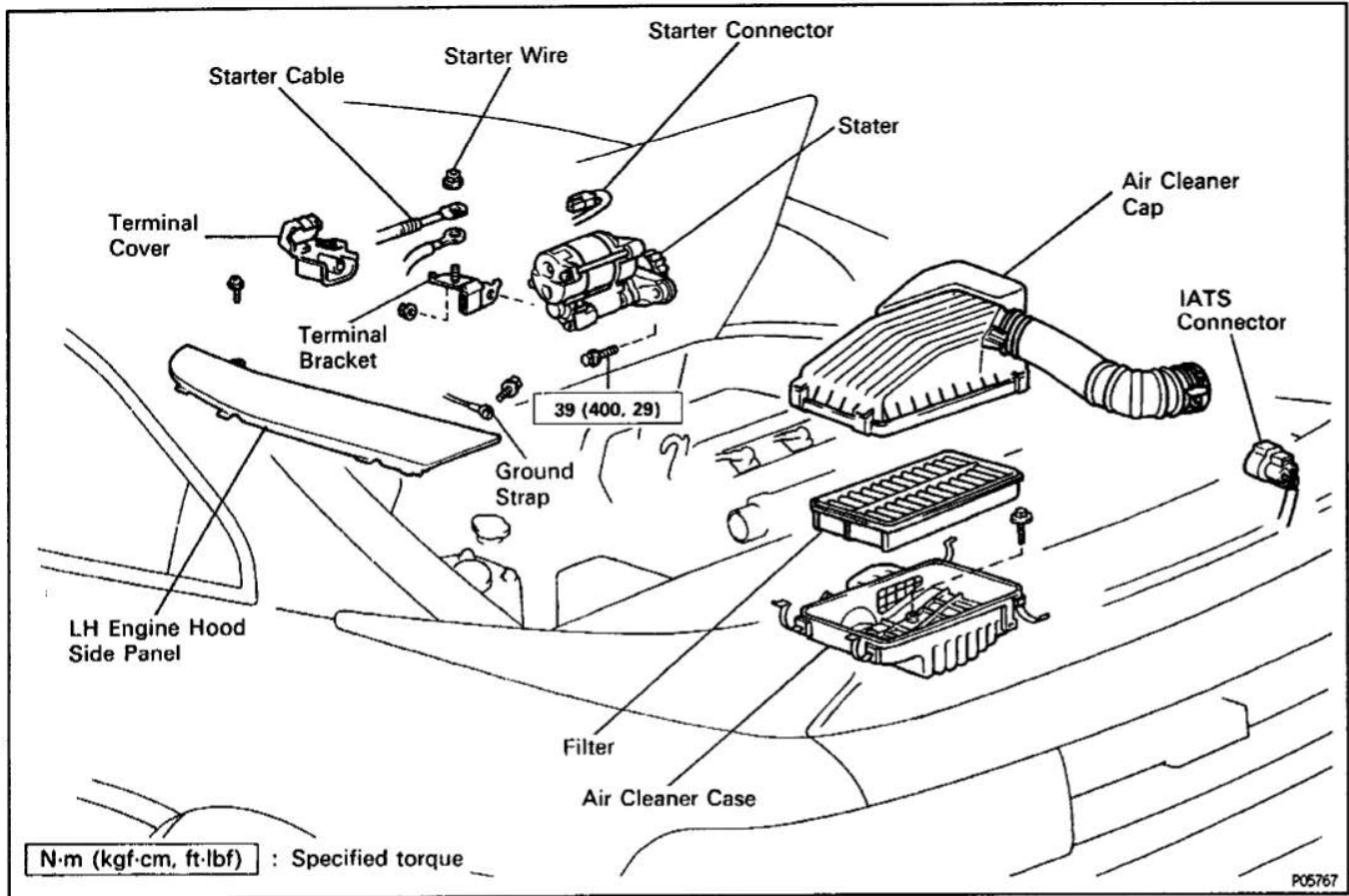


- (d) Remove the two bolts and starter.

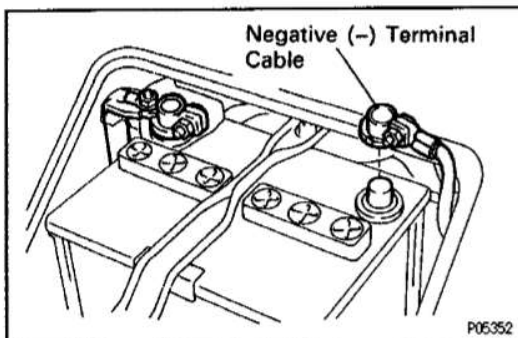


- (e) Remove the nut and terminal bracket from the starter.

COMPONENTS FOR REMOVAL AND INSTALLATION (5S-FE)



ST02T-01



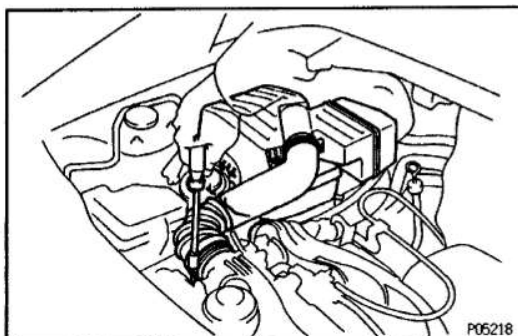
STARTER REMOVAL (5S-FE)

(See Components for Removal and Installation)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

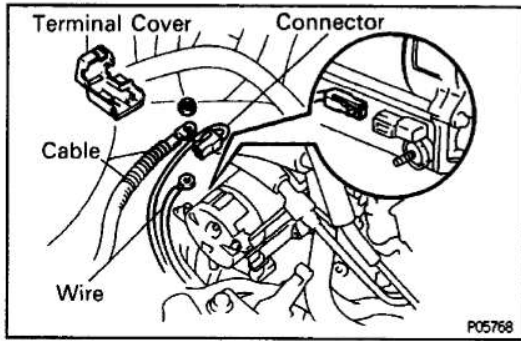
CAUTION: Turn the ignition switch to "LOCK". Disconnect the negative terminal from the battery. Wait at least 20 seconds before proceeding with work.

2. REMOVE LH ENGINE HOOD SIDE PANEL

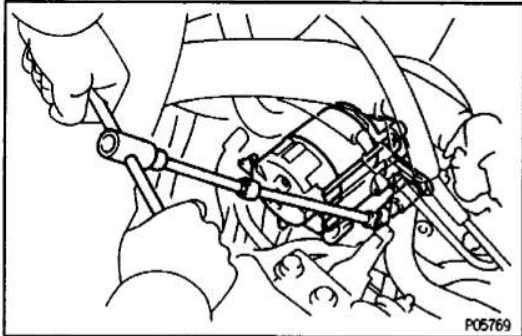


3. REMOVE AIR CLEANER HOUSING

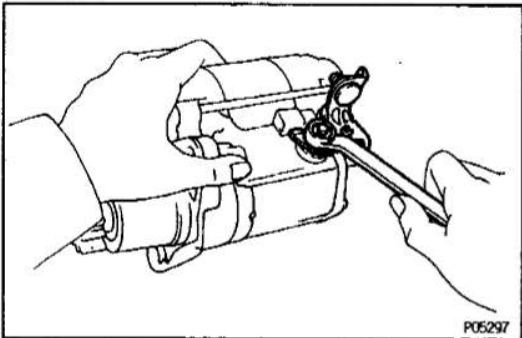
- (a) Disconnect the IATS connector.
- (b) Disconnect the air cleaner hose from the throttle body.
- (c) Disconnect the four clamps, and remove the air cleaner cap.
- (d) Remove the air filter.
- (e) Remove the three bolts and air cleaner case.

ST-8**STARTING SYSTEM – STARTER****4. REMOVE STARTER**

- (a) Remove the terminal cover.
- (b) Disconnect the starter connector.
- (c) Remove the nut, and disconnect the starter cable and wire.



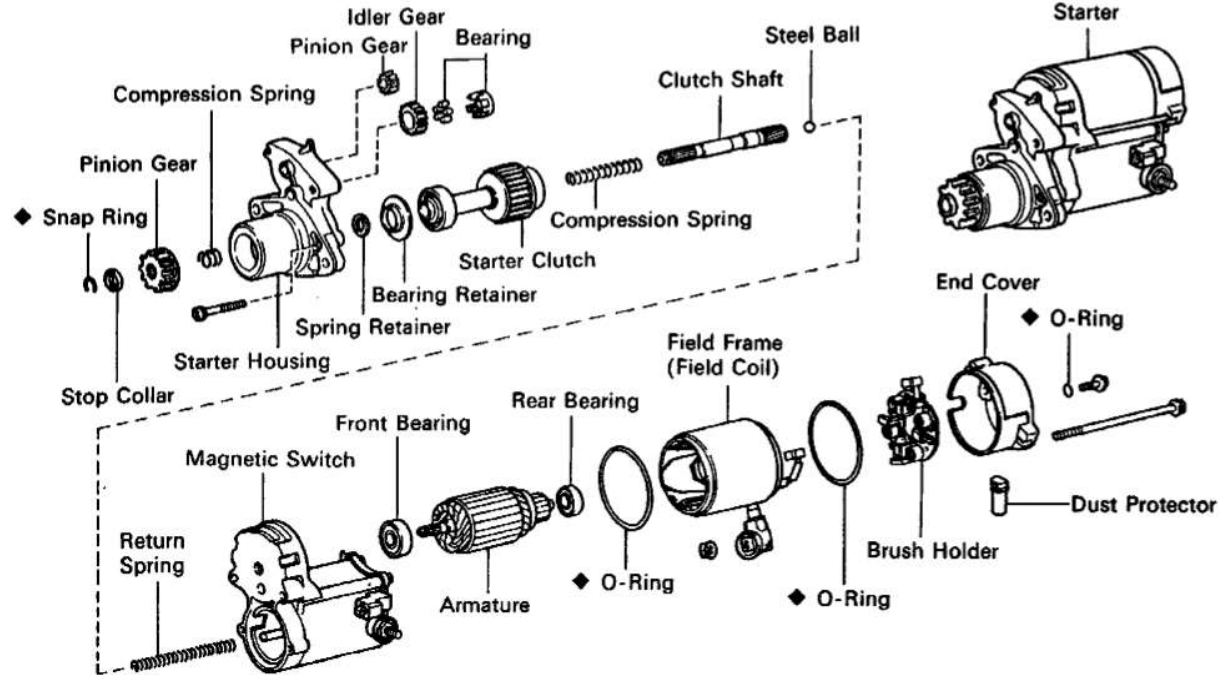
- (d) Remove the two bolts and starter.



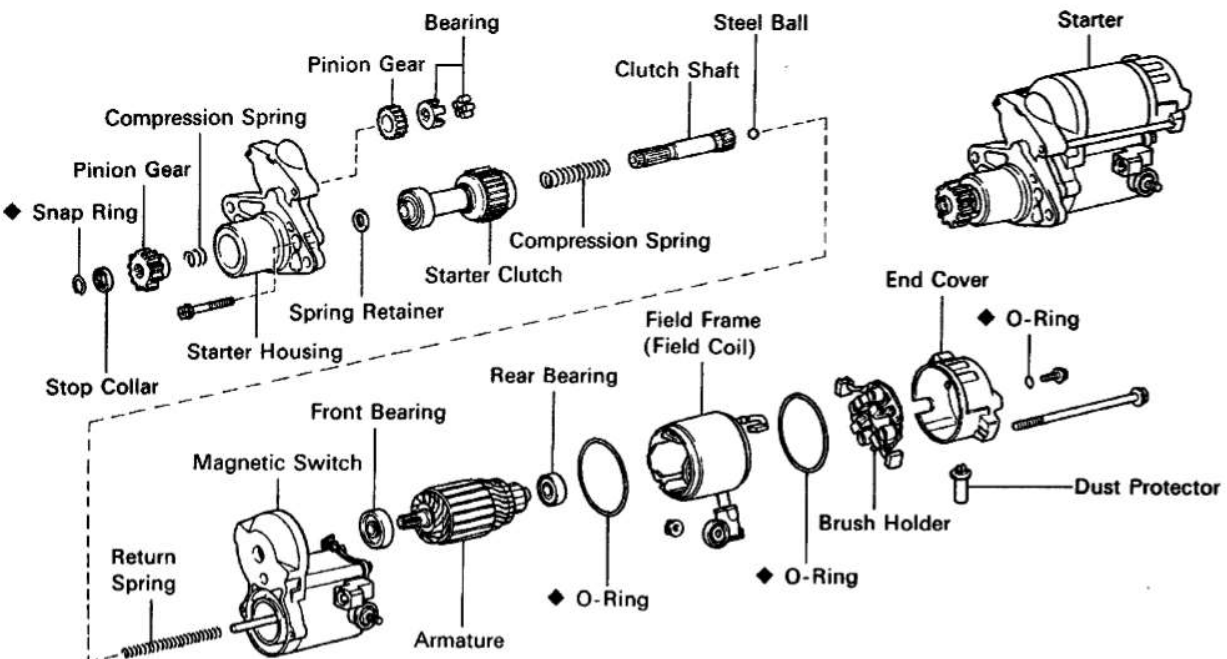
- (e) Remove the nut and terminal bracket from the starter.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

Conventional Type (1.4 kW and 1.6 kW)



Compact Type (1.4 kW)



◆ Non-reusable part

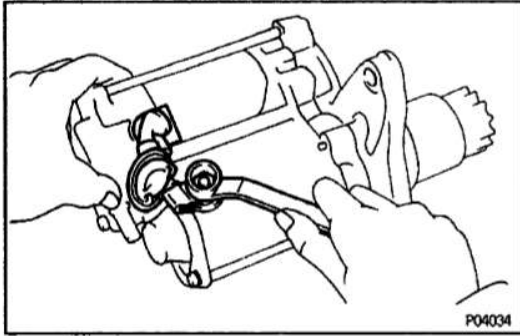
P04072
P05210

202716

ST-10

STARTING SYSTEM – STARTER

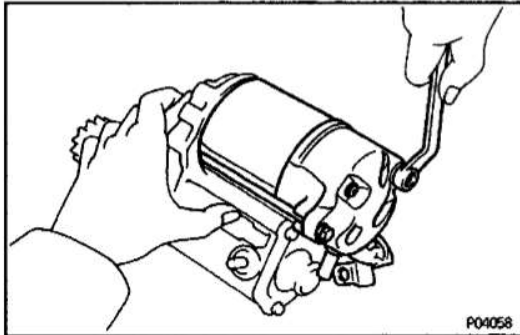
RT03U-01

**STARTER DISASSEMBLY**

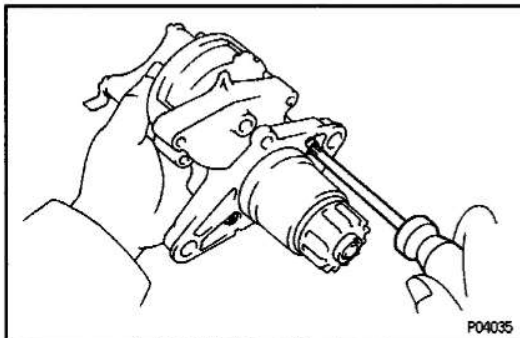
(See Components for Disassembly and Assembly)

1. REMOVE FIELD FRAME AND ARMATURE

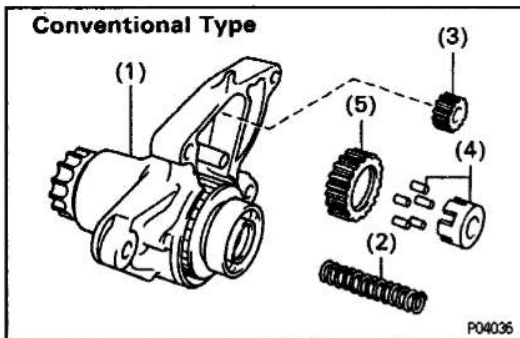
- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.



- (b) Remove the two through bolts.
 (c) Pull out the field frame together with the armature from the magnetic switch.
 (d) Remove the O-ring.

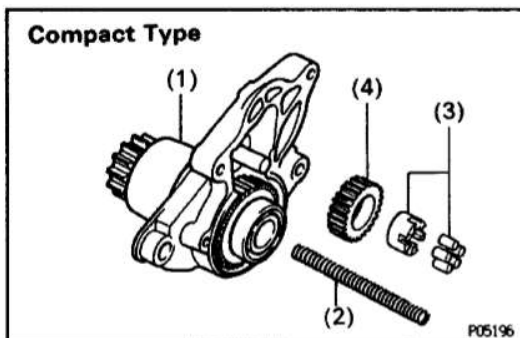
**2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR**

- (a) Remove the two screws.



- (b) Remove the following parts from the magnetic switch:
 (Conventional Type)

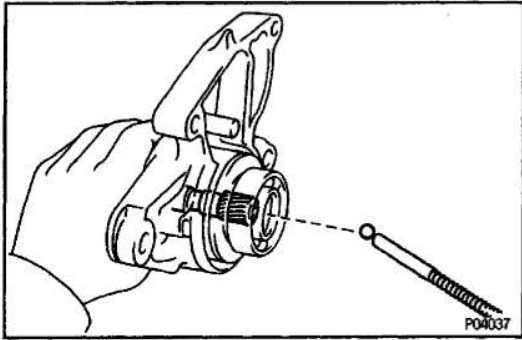
- (1) Starter housing and clutch assembly
 (2) Return spring
 (3) Pinion gear
 (4) Bearing
 (5) Idler gear



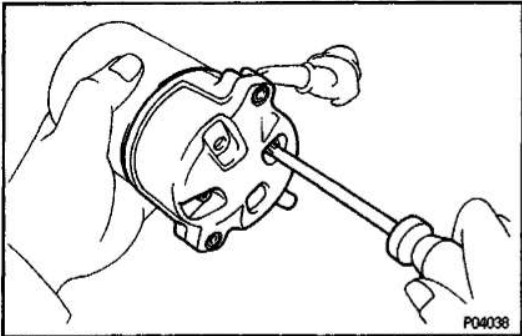
(Compact Type)

- (1) Starter housing and clutch assembly
 (2) Return spring
 (3) Bearing
 (4) Idler gear

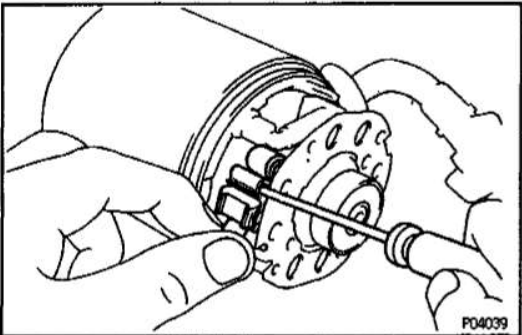
STARTING SYSTEM – STARTER

**3. REMOVE STEEL BALL**

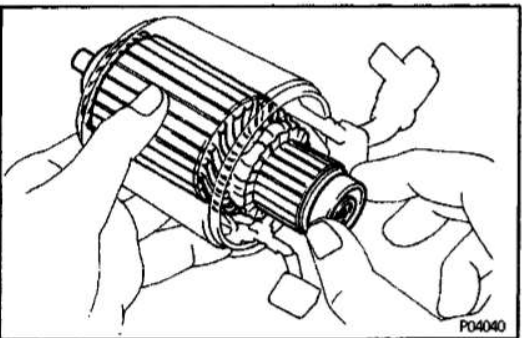
Using a magnetic finger, remove the steel ball from the clutch shaft hole.

**4. REMOVE BRUSH HOLDER**

- (a) Remove the two screws, two O-rings and end cover from the field frame.
- (b) Remove the O-ring from the field frame.

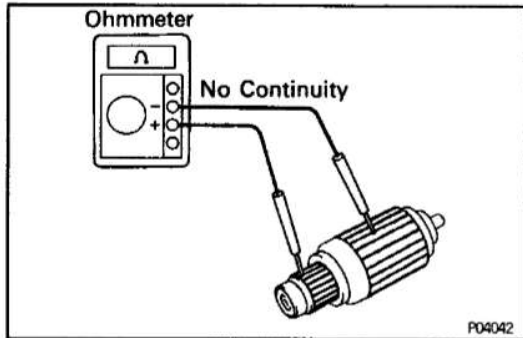
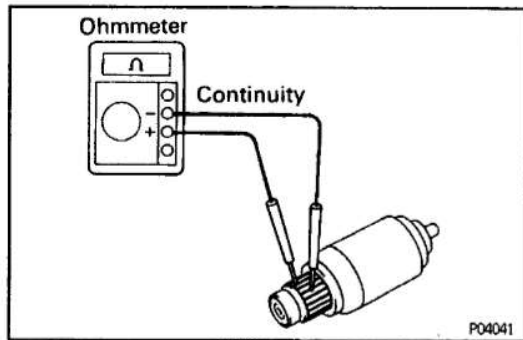


- (c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes, and remove the brush holder.

**5. REMOVE ARMATURE FROM FIELD FRAME**

ST-12

STARTING SYSTEM – STARTER



STARTER INSPECTION AND REPAIR

Armature Coil

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator. If there is no continuity between any segment, replace the armature.

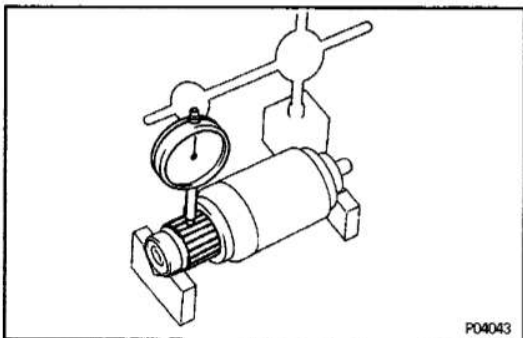
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core. If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sand-paper (No.400) or on a lathe.



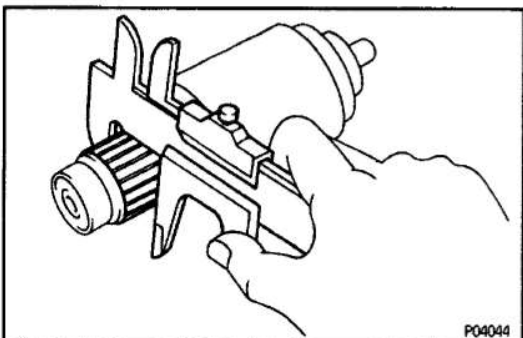
2. INSPECT COMMUTATOR CIRCLE RUNOUT

- Place the commutator on V-blocks.
- Using a dial gauge, measure the circle runout.

Maximum circle runout:

0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.



3. INSPECT COMMUTATOR DIAMETER

Using a vernier caliper, measure the commutator diameter.

Standard diameter:

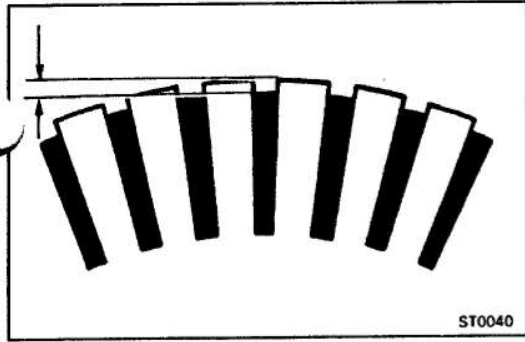
30mm(1.18in.)

Minimum diameter:

29 mm (1.14 in.)

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

STARTING SYSTEM – STARTER

**4. INSPECT UNDERCUT DEPTH**

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

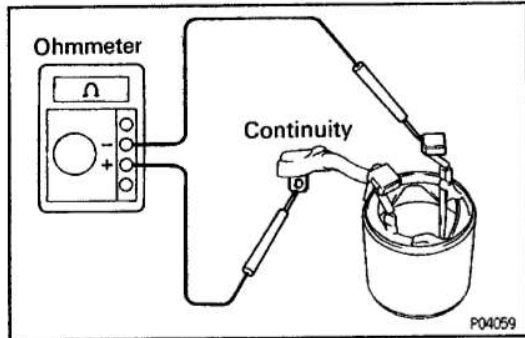
Standard undercut depth:

0.6 mm (0.024 in.)

Minimum undercut depth:

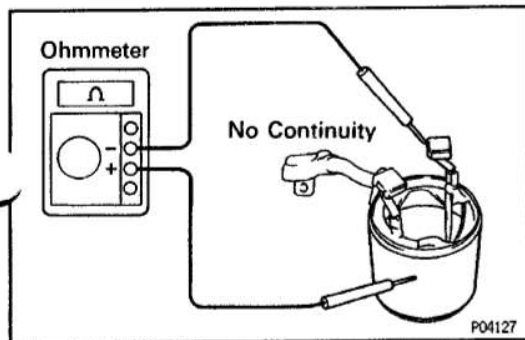
0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

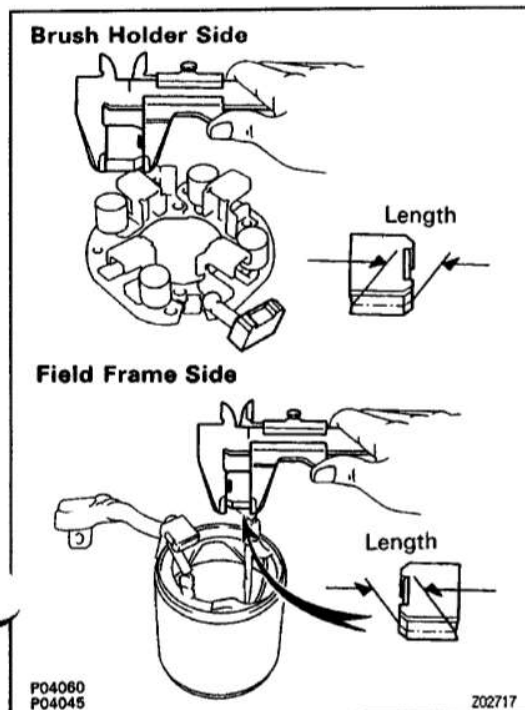
**Field Coil (Field frame)****1. INSPECT FIELD COIL FOR OPEN CIRCUIT**

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

If there is no continuity, replace the field frame.

**2. INSPECT FIELD COIL FOR GROUND**

Using an ohmmeter, check that there is no continuity between the coil end and field frame. If there is continuity, repair or replace the field frame.

**Brushes****INSPECT BRUSH LENGTH**

Using a vernier caliper, measure the brush length.

Standard length:

15.0 mm (0.591 in.)

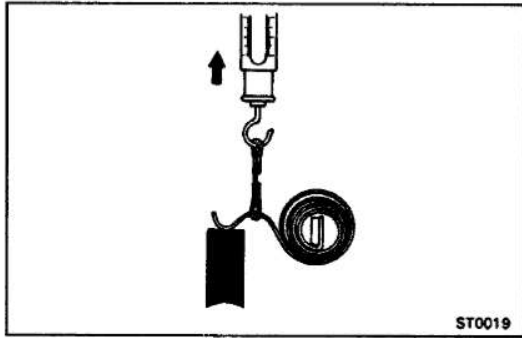
Minimum length:

10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.

ST-14

STARTING SYSTEM – STARTER

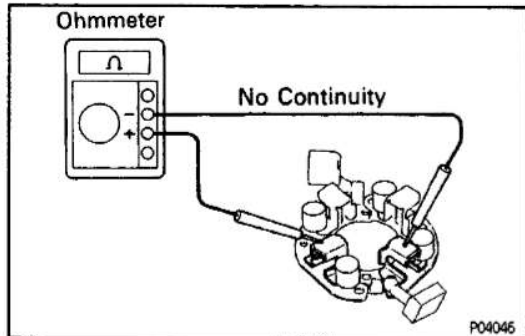
**Brush Springs****INSPECT BRUSH SPRING LOAD**

Take the pull scale reading the instant the brush spring separates from the brush.

Spring installed load:

18–24N(1.79–2.41kgf,3.9–5.31lbf)

If the installed load is not as specified, replace the brush springs.

**Brush Holder****INSPECT BRUSH HOLDER INSULATION**

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

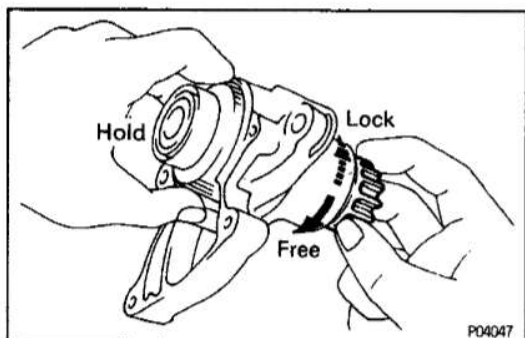
If there is continuity, repair or replace the brush holder.

Clutch and Gears**1. INSPECT GEAR TEETH**

Check the gear teeth on the pinion gear, idle gear and clutch assembly for wear or damage.

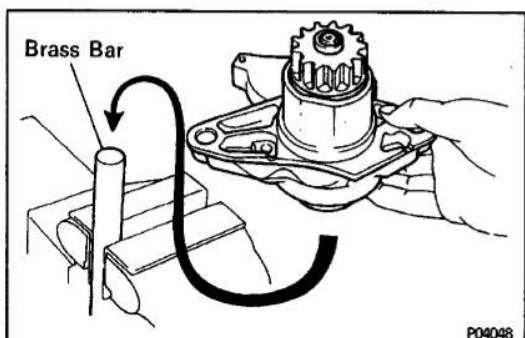
If damaged, replace the gear or clutch assembly.

If damaged, also check the drive plate ring gear for wear or damage.

**2. INSPECT CLUTCH PINION GEAR**

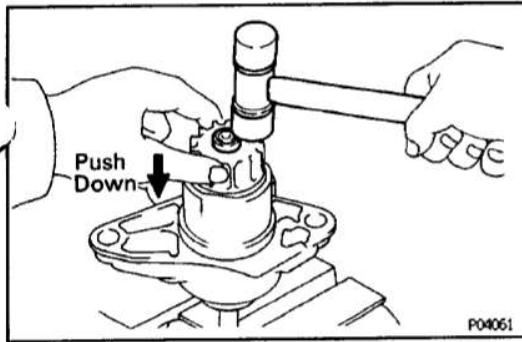
Hold the starter clutch and rotate the pinion gear counterclockwise, and check that it turns freely. Try to rotate the pinion gear clockwise and check that it locks.

If necessary, replace the clutch assembly.

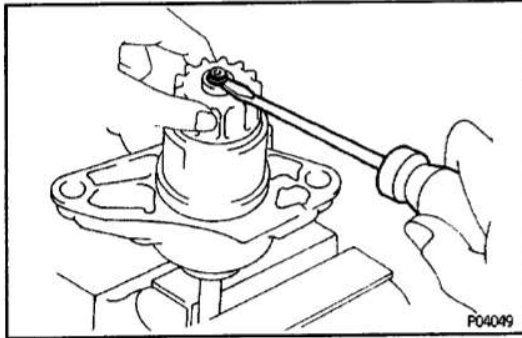
**3. IF NECESSARY, REPLACE CLUTCH ASSEMBLY****A. Disassembly of starter housing and clutch assembly**

- (a) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.

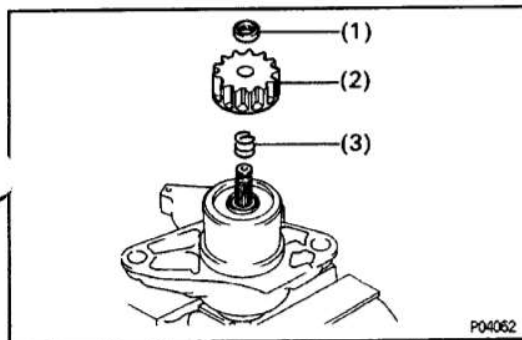
STARTING SYSTEM – STARTER



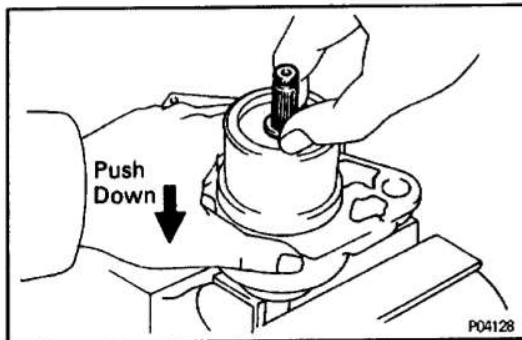
- (b) Push down the pinion gear.
- (c) Using a plastic-faced hammer, tap down the stop collar.



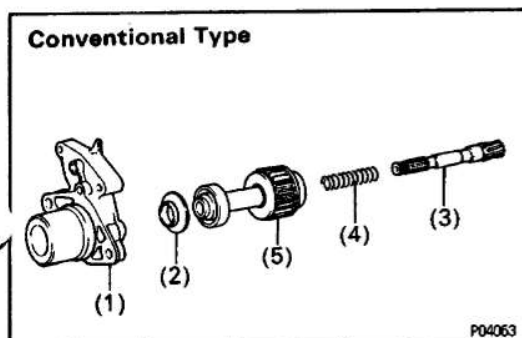
- (d) Using a screwdriver, pry out the snap ring.



- (e) Remove the following parts:
- (1) Stop collar
- (2) Pinion gear
- (3) Compression spring



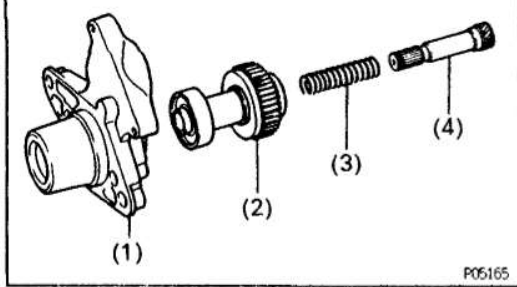
- (f) Push down the starter housing, and remove the spring retainer.



- (g) Disassemble the following parts:
(Conventional Type)
- (1) Starter housing
- (2) Bearing retainer
- (3) Starter clutch
- (4) Compression spring
- (5) Clutch shaft

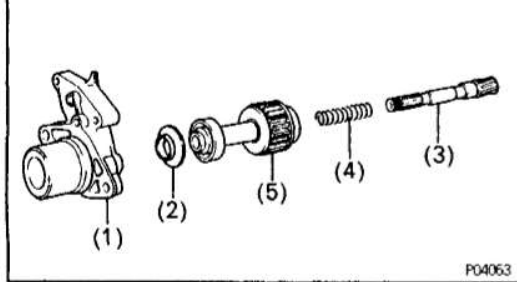
ST-16

STARTING SYSTEM - STARTER

Compact Type

(Compact Type)

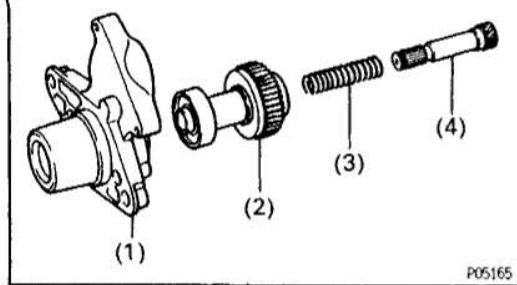
- (1) Starter housing
- (2) Starter clutch
- (3) Compression spring
- (4) Clutch shaft

Conventional Type**B. Assemble starter housing and clutch assembly**

(a) Assemble the following parts:

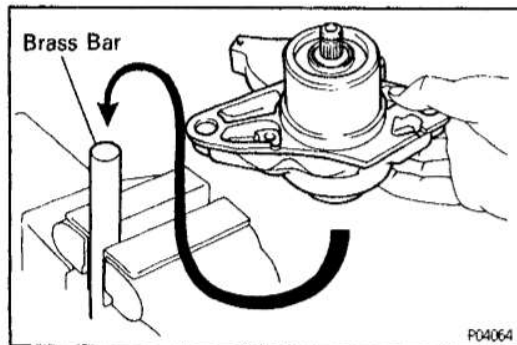
(Conventional Type)

- (1) Starter housing
- (2) Bearing retainer
- (3) Starter clutch
- (4) Compression spring
- (5) Clutch shaft

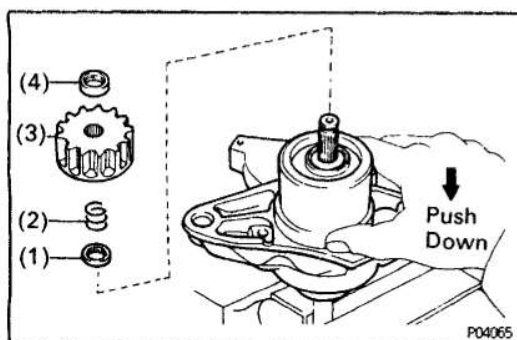
Compact Type

(Compact Type)

- (1) Starter housing
- (2) Starter clutch
- (3) Compression spring
- (4) Clutch shaft



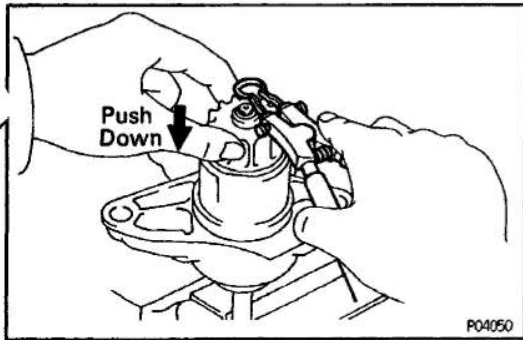
(b) Mount a brass bar in a vise, install the starter housing and clutch assembly to the brass bar.



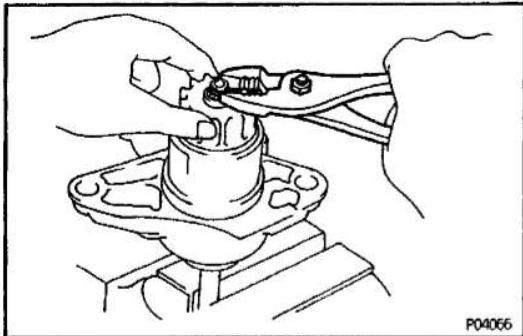
(c) Push down the starter housing, and install the following parts:

- (1) Spring retainer
- (2) Compression spring
- (3) Pinion gear
- (4) Stop collar

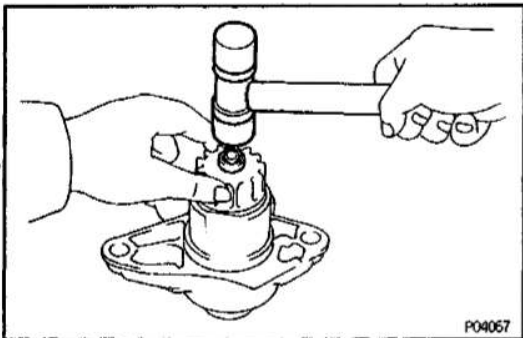
STARTING SYSTEM – STARTER



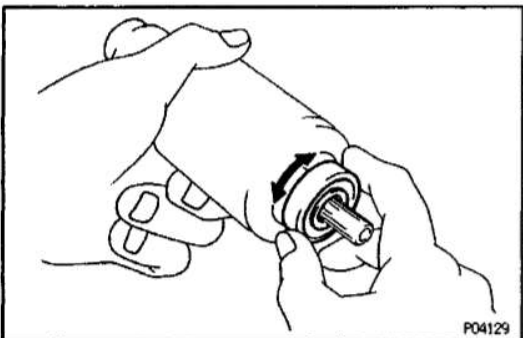
- (d) Push down the pinion gear.
- (e) Using snap ring pliers, install a new snap ring.



- (f) Using pliers, compress the snap ring.
- (g) Check that the snap ring fits correctly.



- (h) Remove the starter housing and clutch assembly from the brass bar.
- (i) Using a plastic-faced hammer, tap the clutch shaft and install the stop collar onto the snap ring.

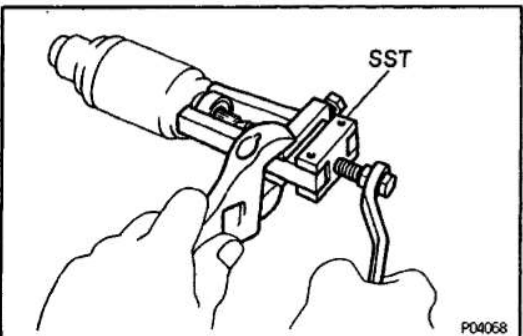


Bearings

1. INSPECT FRONT BEARING

Turn each bearing by hand while applying inward force.

If resistance is felt or the bearing sticks, replace the bearing.

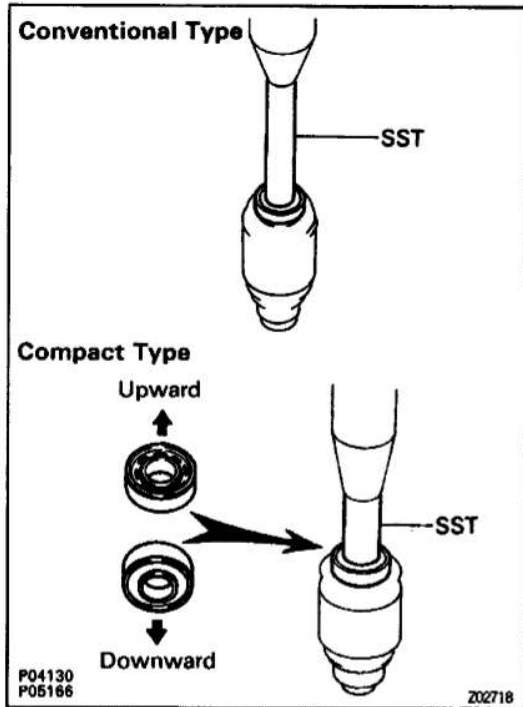


2. IF NECESSARY, REPLACE FRONT BEARING

- (a) Using SST, remove the bearing.
SST 09286-46011

ST-18

STARTING SYSTEM – STARTER

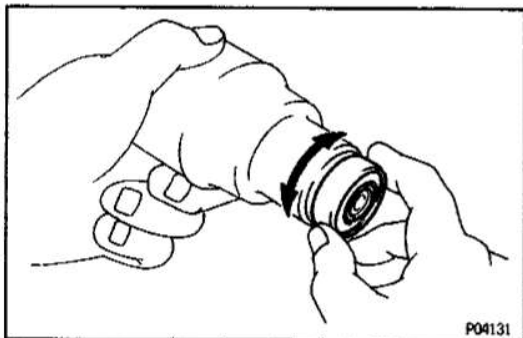


(b) Using SST and a press, press in a new bearing.
SST

09825 – 76010 for Conventional type

09820–00030 for Compact type

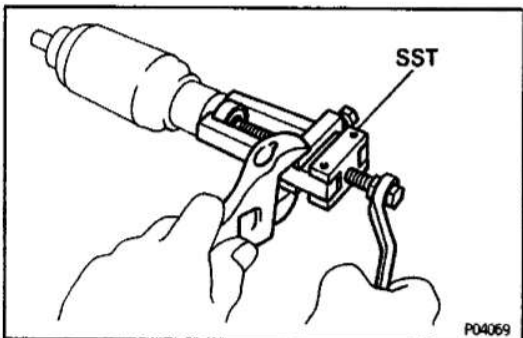
NOTICE (Compact type): Be careful of the bearing installation direction.



3. INSPECT REAR BEARING

Turn each bearing by hand while applying inward force.

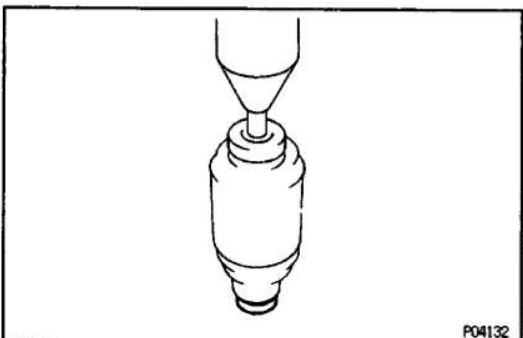
If resistance is felt or the bearing sticks, replace the bearing.



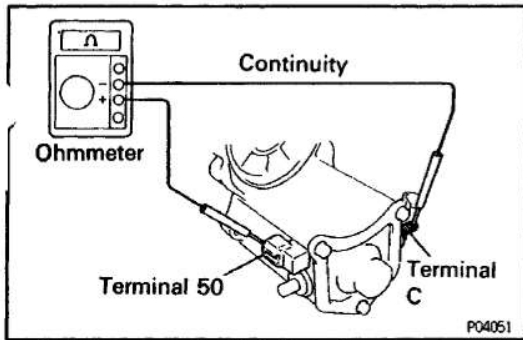
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing.

SST 09286–46011



(b) Using a press, press in a new bearing.

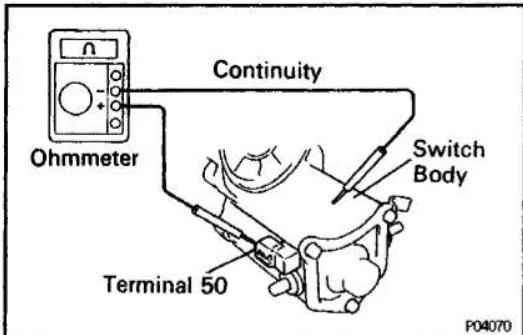


Magnetic Switch

1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.

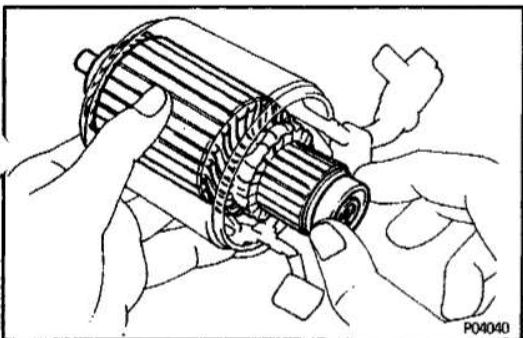
If there is no continuity, replace the magnetic switch,



2. PERFORM HOLD-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.:



STARTER ASSEMBLY

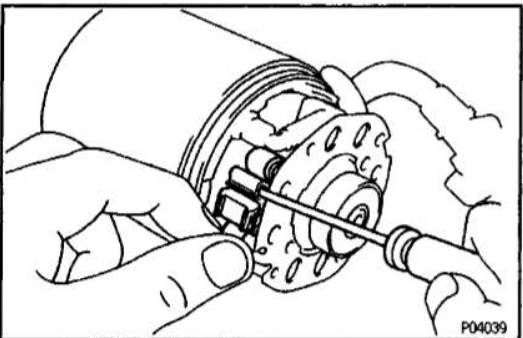
ST02W-01

(See Components for Disassembly and Assembly)

HINT: Use high-temperature grease to lubricate the bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

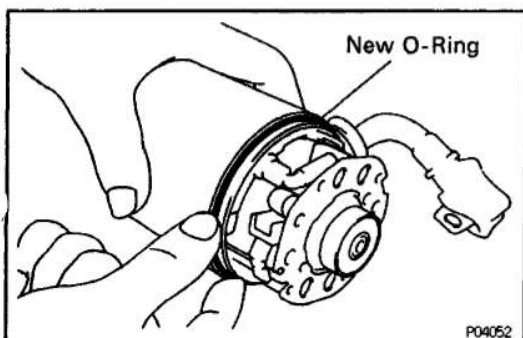
Apply grease to the armature bearings, and insert the armature into the field frame.



2. INSTALL BRUSH HOLDER

- Place the brush holder on the armature.
- Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the four brushes.

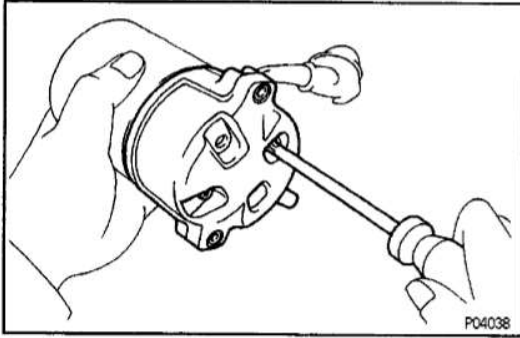
NOTICE: Check that the positive (+) lead wires are not-grounded.



- Install a new O-ring to the groove of the field frame.

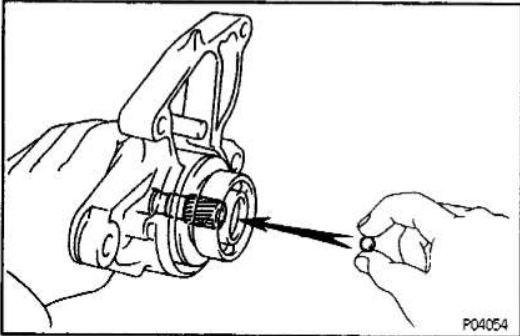
ST-20

STARTING SYSTEM – STARTER



(d) Install a new O-ring to the screw.

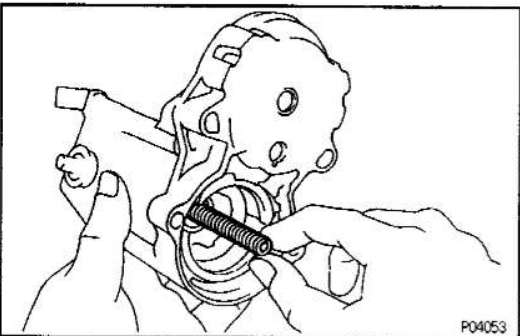
(e) Install the end cover to the field frame with the two screws.



3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.

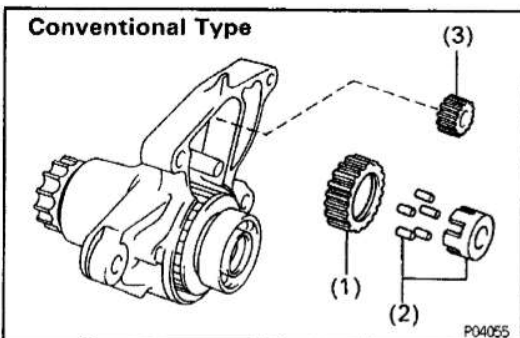
(b) Insert the steel ball into the clutch shaft hole.



4. INSTALL STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Apply grease to the return spring.

(b) Insert the return spring into the magnetic switch hole



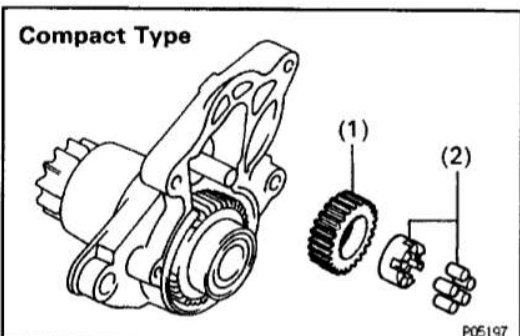
(c) Place the following parts in position on the starter housing:

(Conventional Type)

(1) Idler gear

(2) Bearing

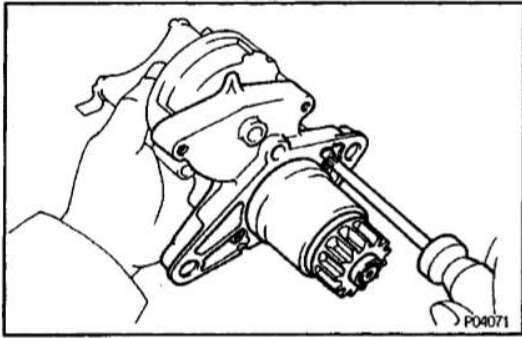
(3) Pinion Gear



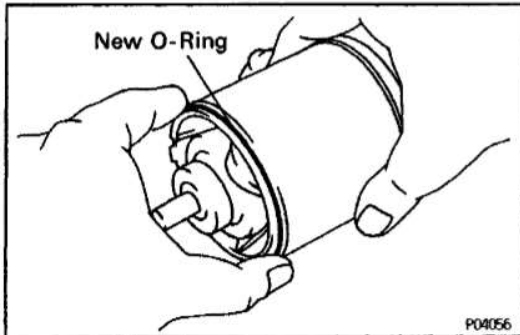
(Compact Type)

(1) Idler gear

(2) Bearing

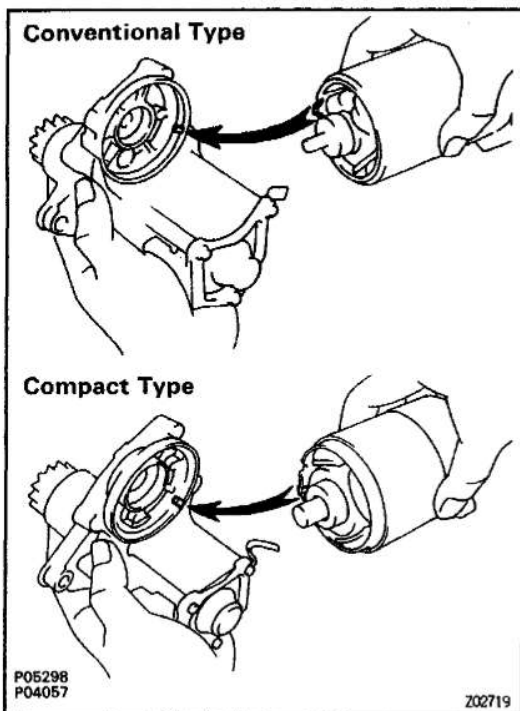


- (d) Install the starter housing to the magnetic switch the two screws.

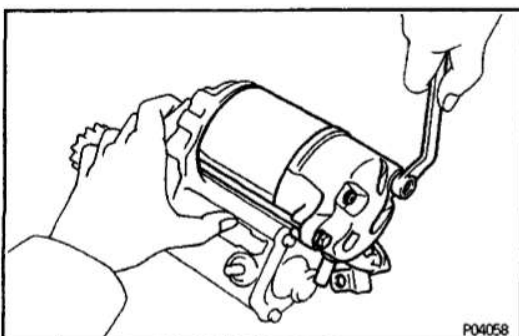


5. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY

- (a) Install a new O-ring to the groove of the frame



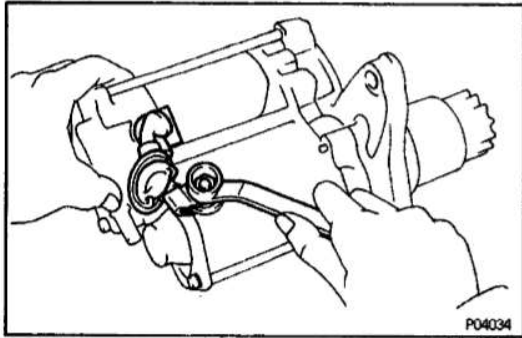
- (b) Align the protrusion of the field frame with the cutout of the magnetic switch.



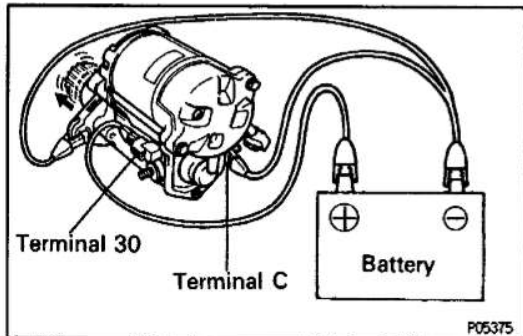
- (c) Install the field frame and armature assembly, two through bolts.

ST-22

STARTING SYSTEM - STARTER



- (d) Connect the lead wire to terminal C, and install the nut.



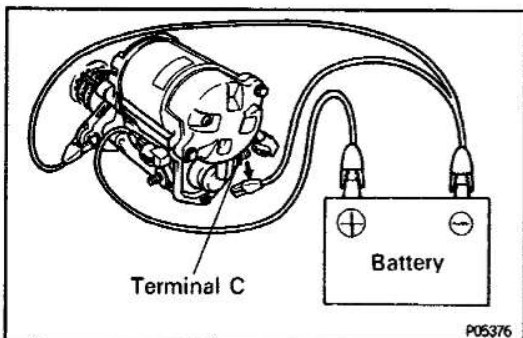
STARTER PERFORMANCE TEST

87010-04

NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL-IN TEST

- Disconnect the field coil lead wire from terminal C.
- Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward. If the clutch pinion gear does not move, replace the magnetic switch assembly.

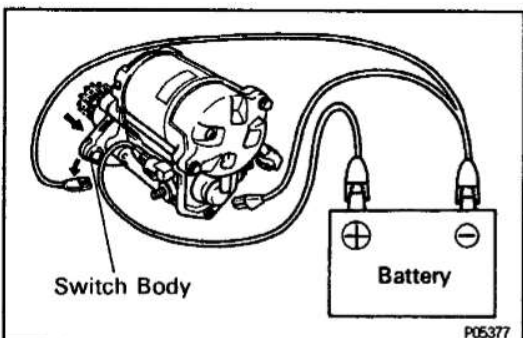


2. PERFORM HOLD-IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (-) lead from terminal

- C. Check that the pinion gear remains out.

If the clutch pinion gear returns inward, replace the magnetic switch assembly.

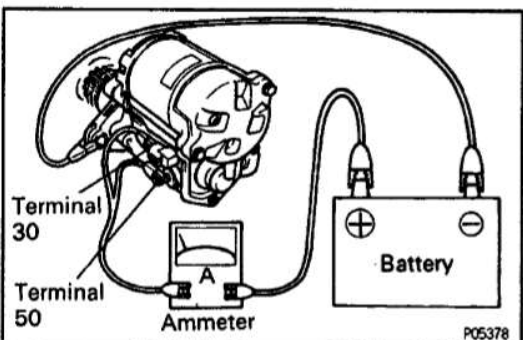


3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (-) lead from the switch body.

Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return, replace the magnetic switch assembly.

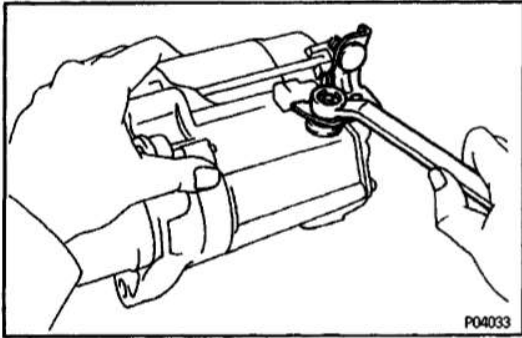


4. PERFORM NO-LOAD PERFORMANCE TEST

- Connect the battery and ammeter to the starter as shown.
- Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter shows the specified current.

Specified current:

90 A or less at 11.5 V

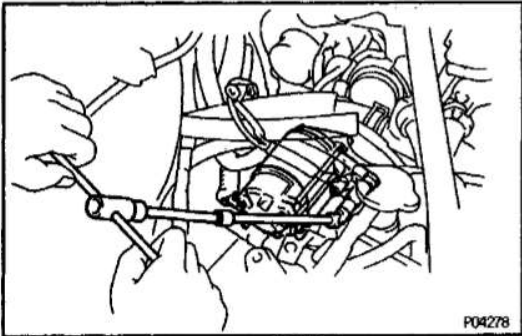


STARTER INSTALLATION (3S-GTE)

(See Components for Removal and Installation)

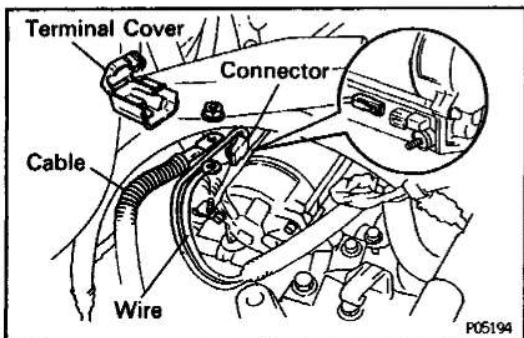
1. INSTALL STARTER

- (a) Install the terminal bracket to the starter with the nut.



- (b) Install the starter with the two bolts.

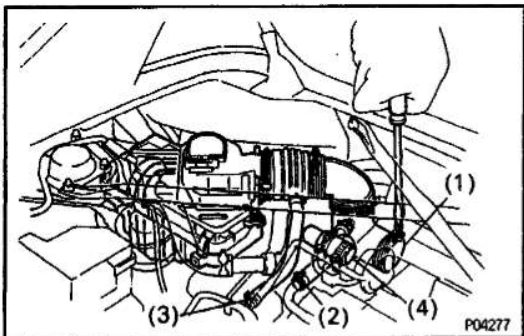
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



- (c) Connect the starter wire and cable with the nut.

- (d) Connect the starter connector.

- (e) Install the terminal cover.



2. INSTALL AIR CLEANER HOUSING

- (a) Install the air cleaner case with the three bolts.

- (b) Install the air filter.

- (c) Install the air cleaner cap and air flow sensor assembly with the four clips.

- (d) Connect the following hoses:

- (1) Air cleaner hose to turbocharger

- (2) PCV hose to cylinder head cover

- (3) Air hose to No.2 air tube

- (4) Air hose to air by-pass valve

- (e) Connect the air flow sensor connector.

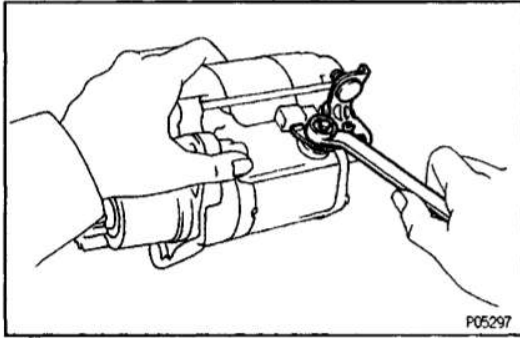
3. INSTALL LH ENGINE HOOD SIDE PANEL

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK THAT ENGINE STARTS

ST-24

STARTING SYSTEM - STARTER

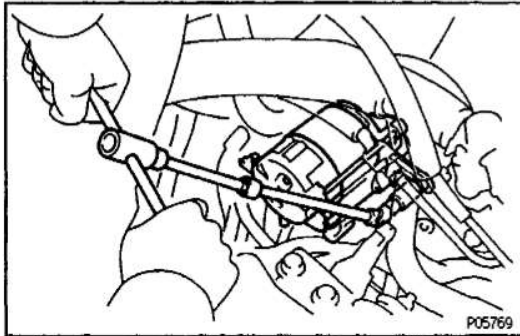


STARTER INSTALLATION (5S-FE)

(See Components for Removal and Installation)

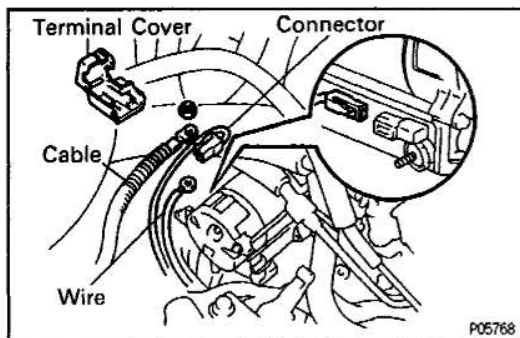
1. INSTALL STARTER

(a) Install the terminal bracket to the starter with the nut.



(b) Install the starter with the two bolts.

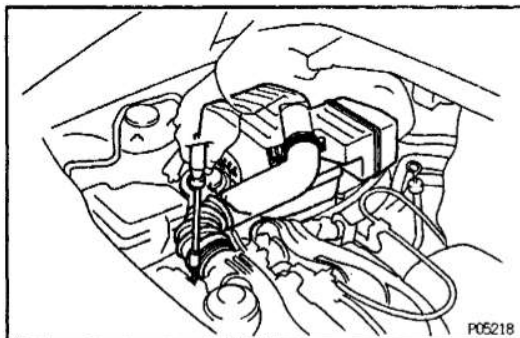
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



(c) Connect the starter wire and cable with the nut.

(d) Connect the starter connector.

(e) Install the terminal cover.



2. INSTALL AIR CLEANER HOUSING

(a) Install the air cleaner case with the three bolts.

(b) Install the air filter.

(c) Install the air cleaner cap with the four clamps.

(d) Connect the air cleaner hose to the throttle body.

(e) Connect the IATS connector.

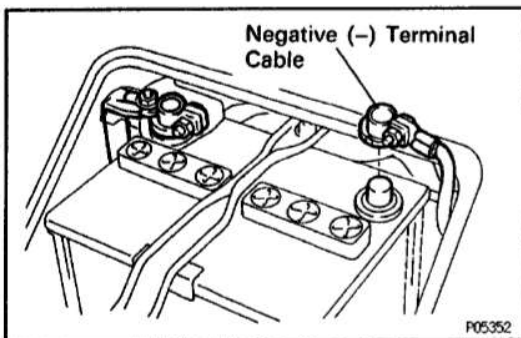
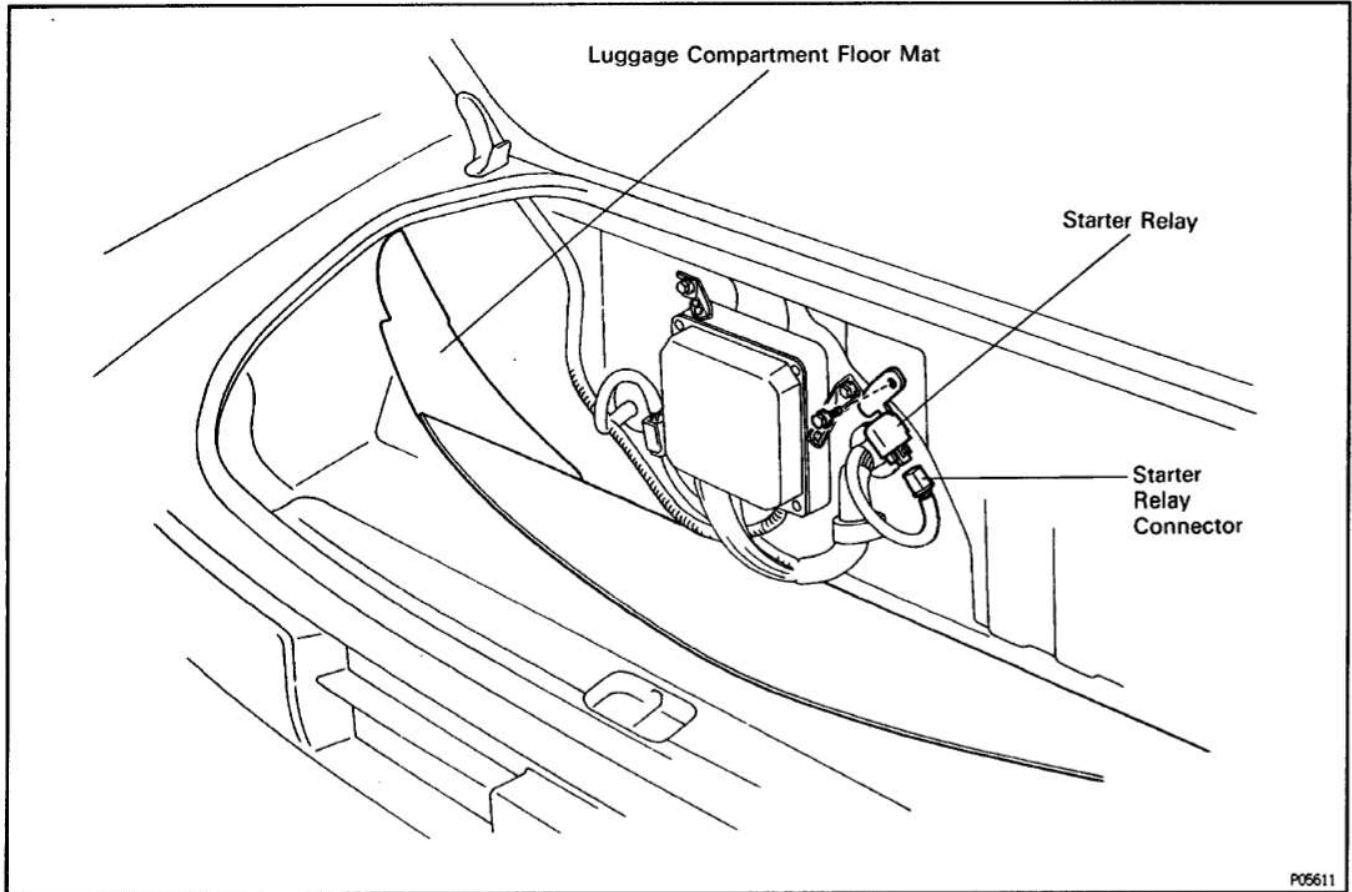
3. INSTALL LH ENGINE HOOD SIDE PANEL

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK THAT ENGINE STARTS

STARTER RELAY COMPONENTS FOR REMOVAL AND INSTALLATION

ST032-01



ST030-01

STARTER RELAY INSPECTION

(See Components for Removal and Installation)

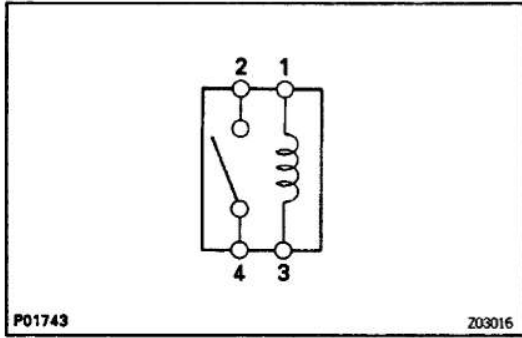
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Turn the ignition switch to "LOCK". Disconnect the negative terminal from the battery. Wait at least 20 seconds before proceeding with work.

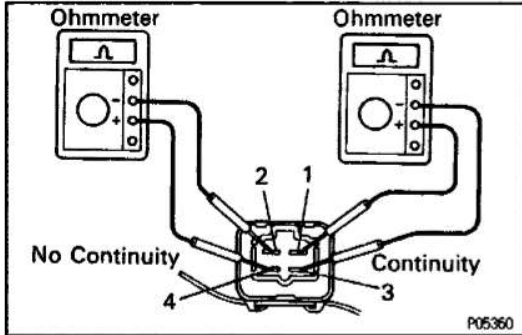
2. DISCONNECT FRONT SIDE OF LUGGAGE COMPARTMENT FLOOR MAT FROM PARTITION PANEL
3. REMOVE STARTER RELAY

ST-26

STARTING SYSTEM – PARK/NEUTRAL SWITCH (PNS)

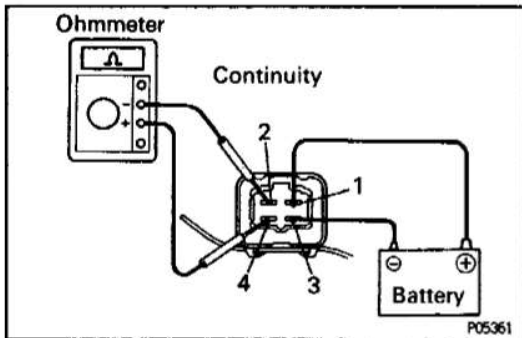


4. INSPECT STARTER RELAY



A. Inspect relay continuity

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.
 - (b) Check that there is no continuity between terminals 2 and 4.
- If continuity is not as specified, replace the relay.



6. Inspect relay operation

- (a) Apply battery voltage across terminals 1 and 3.
 - (b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.
- If operation is not as specified, replace the relay.

5. REINSTALL STARTER RELAY

6. REINSTALL LUGGAGE COMPARTMENT FLOOR MAT

7. RECONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

CLUTCH START SWITCH

(See MX section)

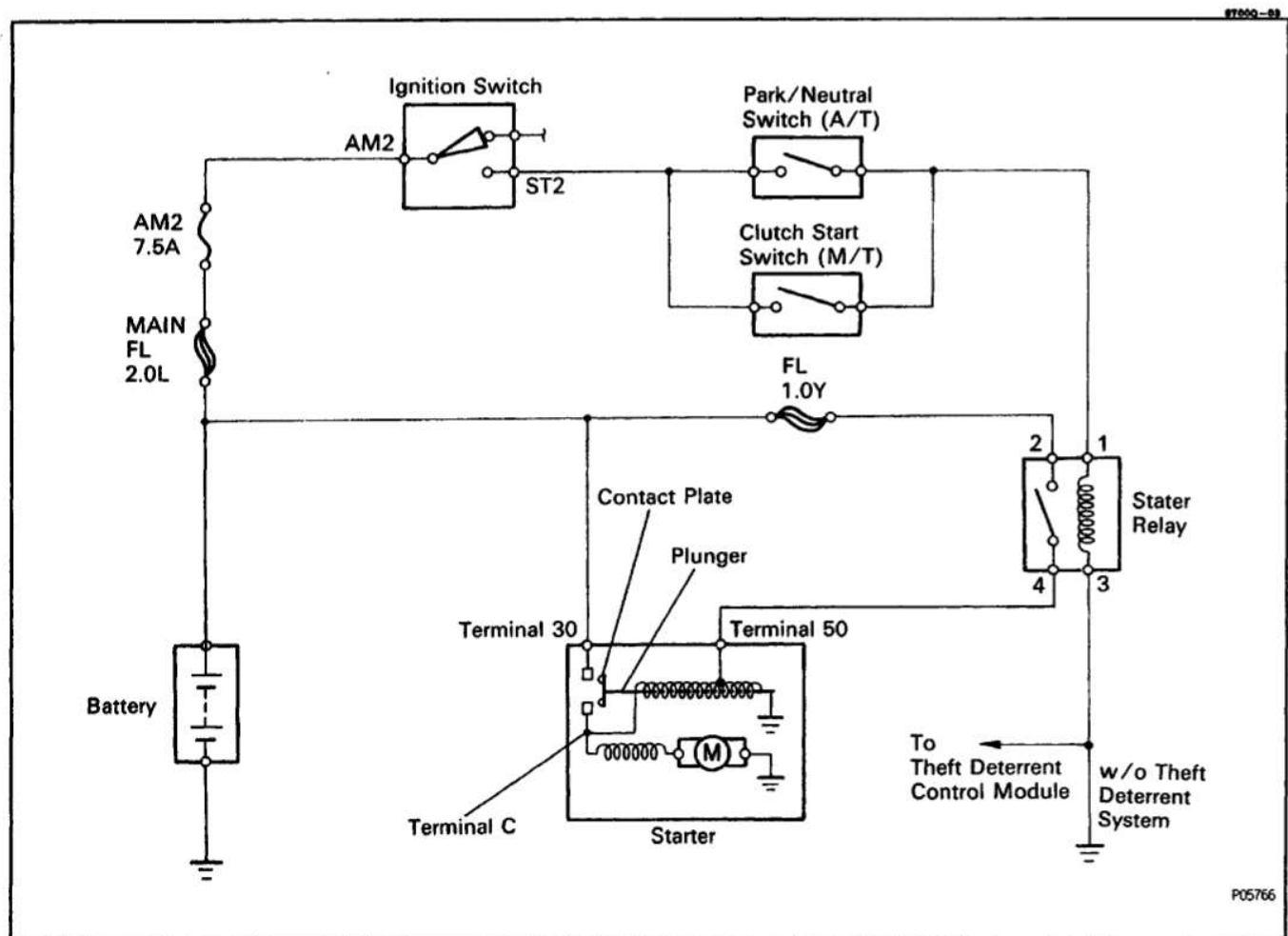
87013-01

PARK/NEUTRAL SWITCH (PNS)

(See AX section)

87014-01

SYSTEM CIRCUIT



OPERATION

When the ignition switch is turned to START position, current flows from terminal 50 to the coil of the solenoid and the plunger is pulled by the magnetic force of the coil. When the plunger is pulled to the left as shown above, the contact plate of the plunger allows current from the battery to flow directly from terminal 30 to the motor, and the starter rotates.

When the engine is running and the ignition switch is returned to ON, the magnetic force of the coil disappears and the contact plate of the plunger is returned to its original position by the return spring. Battery voltage no longer flows from terminal 30, so the motor stops.