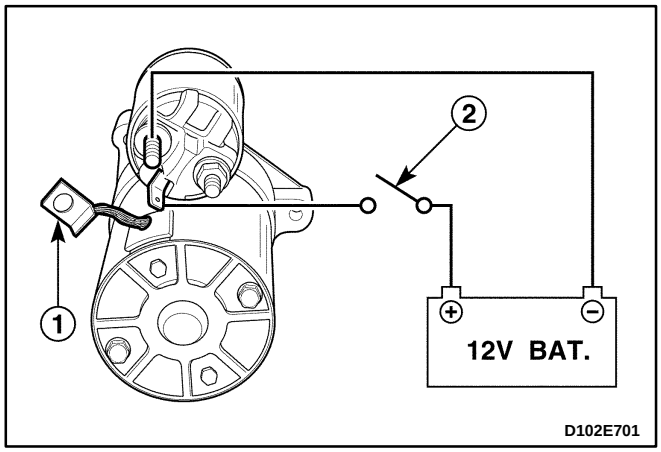
REPAIR INSTRUCTIONS

UNIT REPAIR

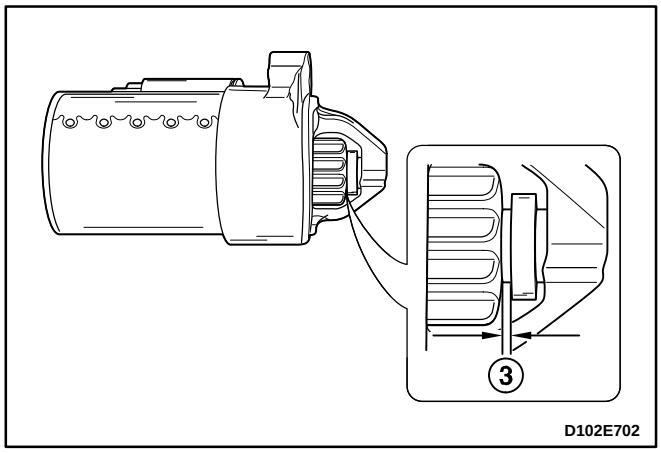


STARTER MOTOR

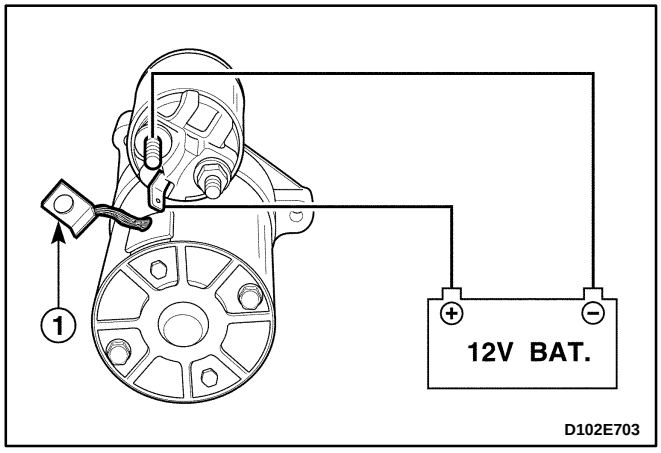
Inspection / Measurement (Before the Overhaul)

1. Remove the starter. Refer to “Starter” in this section.
2. Pinion clearance inspection.
   - Disconnect the starter motor terminal M (1).
   - Connect the 12-volt battery lead to the starter motor terminals M and S.

Notice: Complete the testing in a minimum amount of time to prevent overheating and damaging the solenoid. (in 10 seconds)

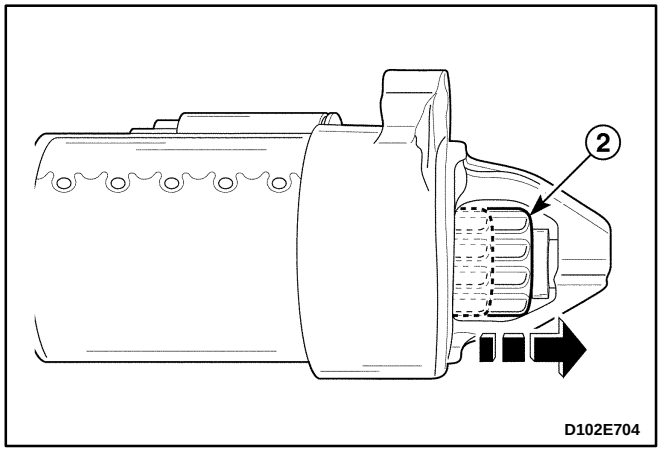


- Switch on to move the pinion gear (2).
- Now check the clearance between the pinion and the stopper with the filler gauge (3).
- If the clearance does not fall within the limits, check for improper installation and replace all worn parts.

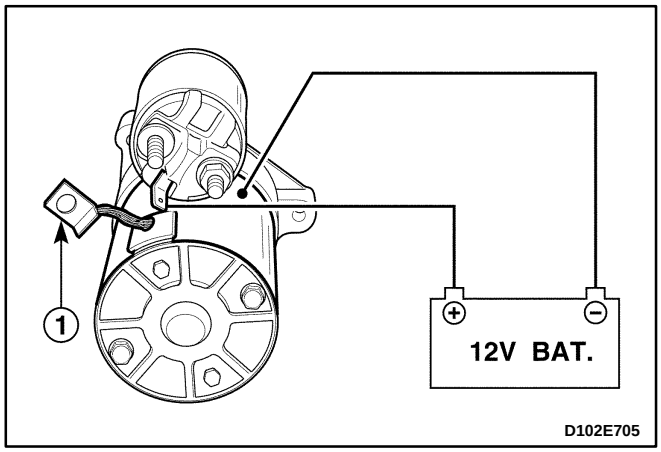


3. Magnetic switch pull-in test.
   - Disconnect the starter motor terminal M (1).
   - Connect the 12-volt battery lead to the starter motor terminals M and S.

Notice: Complete the testing in a minimum amount of time to prevent overheating and damaging the solenoid. (in 10 seconds)

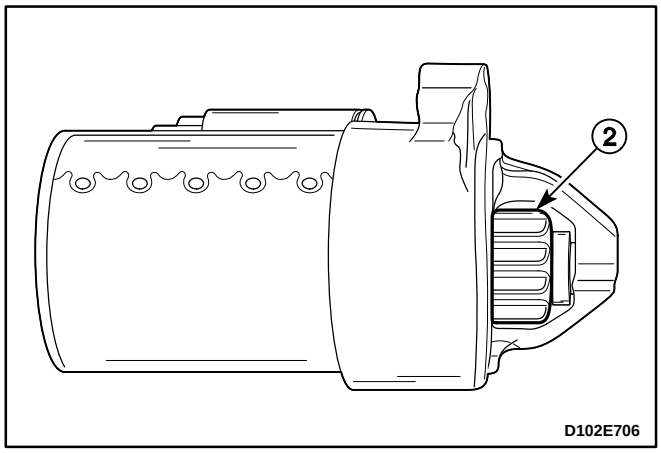


- Inspect the pinion gear's moving to the outside (2).
- If the pinion gear does not move outside, replace the magnetic switch.

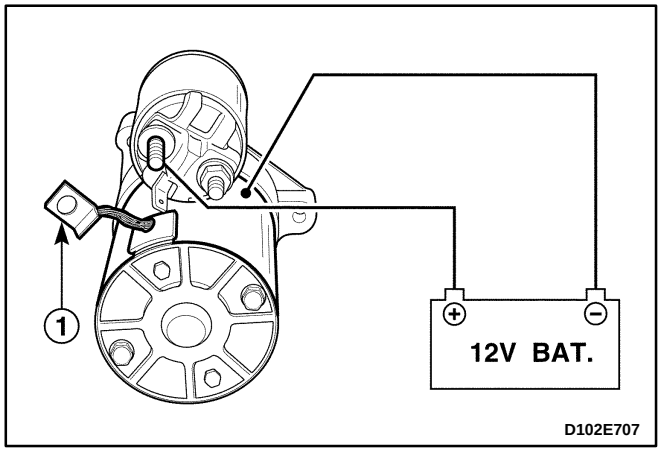


4. Solenoid hold-in test.
   - Disconnect the starter motor terminal M (1).
   - Connect the 12-volt battery lead to the starter motor terminal S and body.

Notice: Complete the testing in a minimum amount of time to prevent overheating and damaging the solenoid.

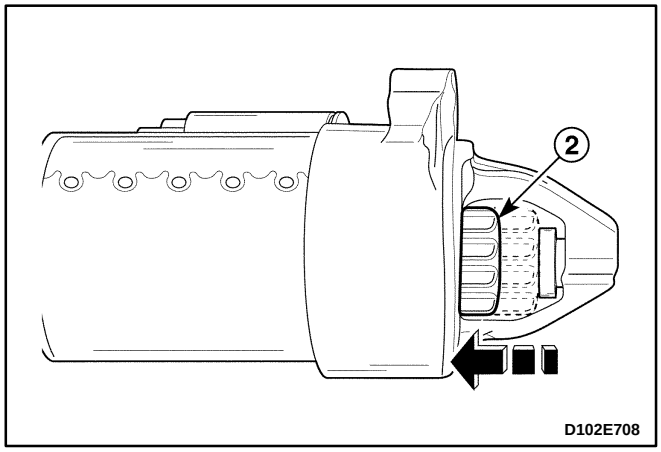


- Check the pinion gear's moving to the outside (2).
- If the pinion gear move to the inside, the circuit is open. Replace the magnetic switch.

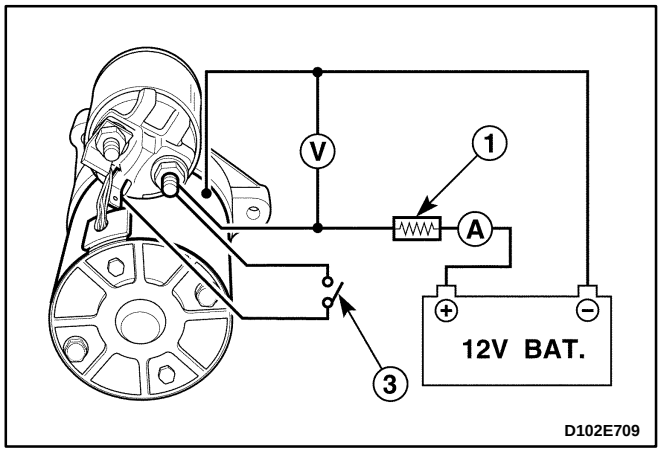


5. Solenoid return test.
   - Disconnect the starter motor terminal M (1).
   - Connect the 12-volt battery lead to the starter motor terminal S and body.

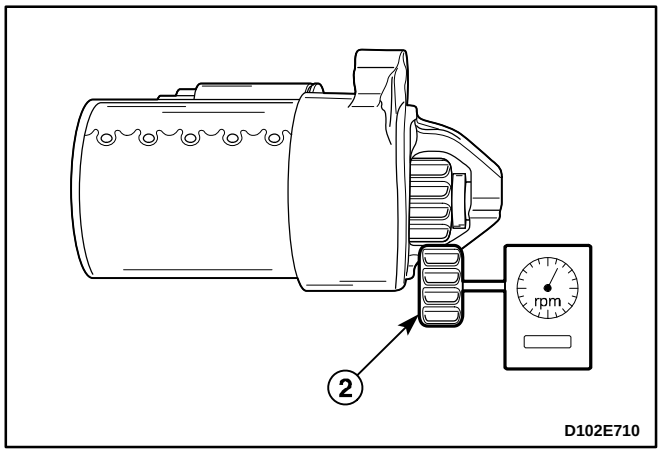
Notice: Complete the testing in a minimum amount of time to prevent overheating and damaging the solenoid.



- Check the returning speed of pinion gear (2).
  If the returning speed is fast, the operation is normal.
- Replace the solenoid if the operation is abnormal.

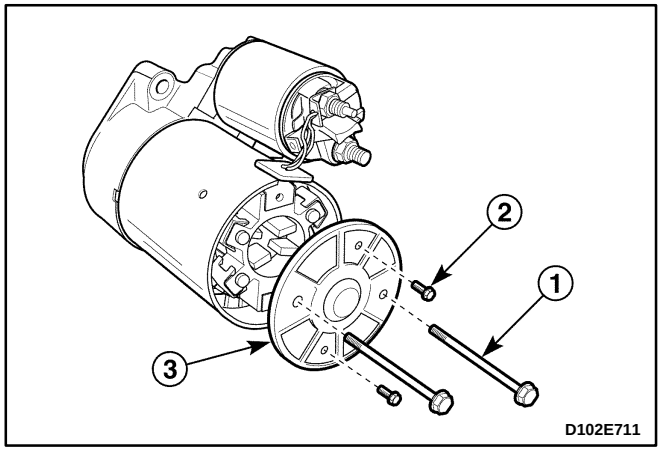


5. No-road test.
   - Connect the 12-volt battery lead to the starter circuit.
   - Connect the current and the voltage (1).
   - Install the starter motor rpm gage (2).
   - Start the starter motor with the switch on (3).
   - Measure the speed of pinion gear and the current.
   - If the measurement satisfy the limit, the starter motor is normal.



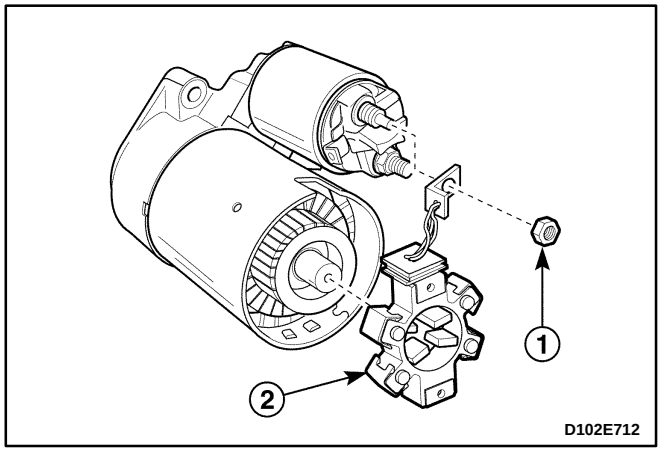
Desciption	Limit
The speed of pinion gear	Minimum: 2,000 rpm
Condition: Voltage/Current	Maximum: 9V / 150A

- Replace the starter motor if necessary.

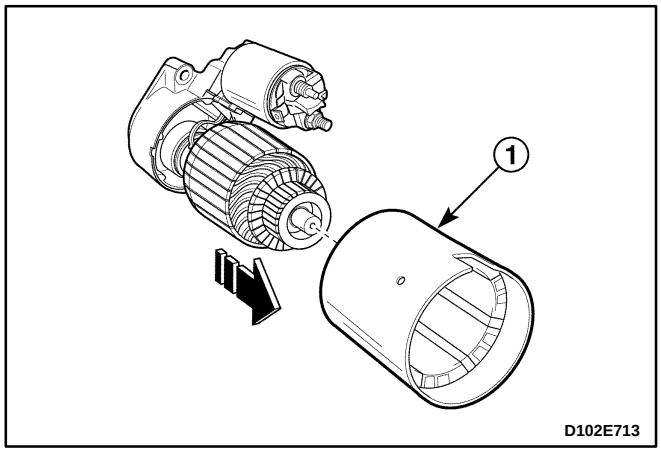


Disassembly Procedure

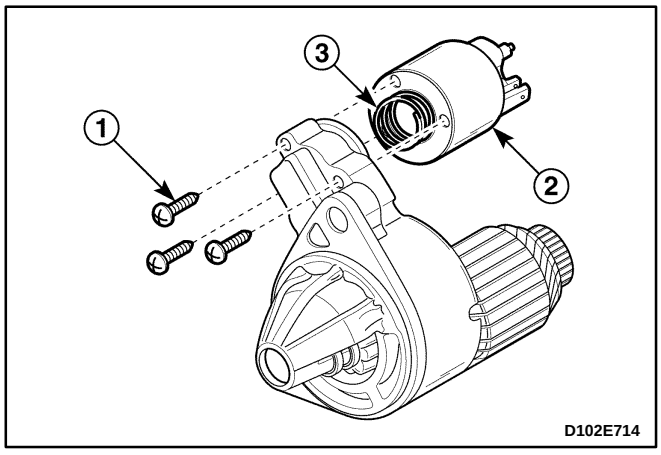
1. Remove the starter contact end frame.
   - Remove the through-bolts (1).
   - Remove the contact end frame bolts (2).
   - Remove the frame with the spacer (3).



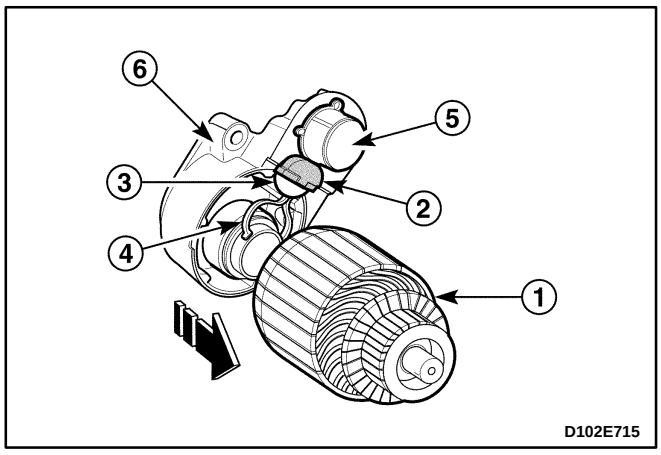
2. Remove the brush holder assembly.
   - Remove the starter motor terminal M nut (1).
   - Remove the brush holder assembly (2).



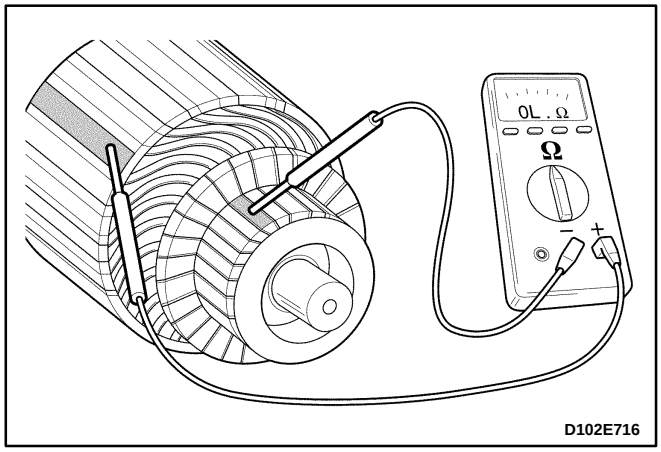
3. Remove the field frame assembly from the armature set (1).



4. Remove the solenoid assembly.
   - Remove the solenoid screws (1).
   - Remove the magnetic switch (2).
   - Remove the spring (3).



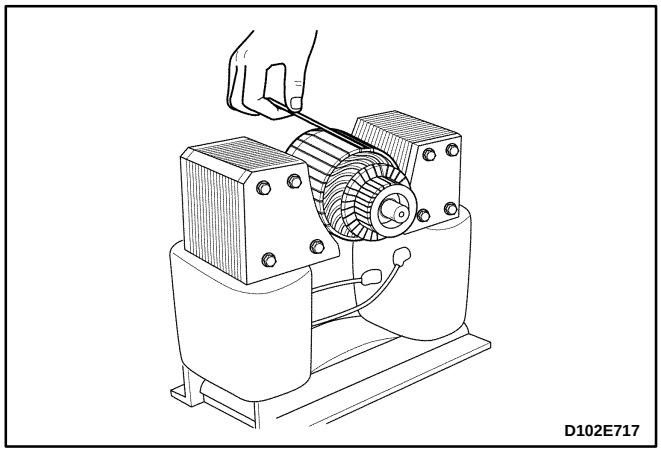
5. Remove the armature set and solenoid from the starter housing.
   - Remove the armature set (1).
   - Remove the rubber sealer (2).
   - Remove the shift lever plate (3).
   - Remove the shift lever (4).
   - Remove the solenoid (5).
   - Remove the gasket (6).



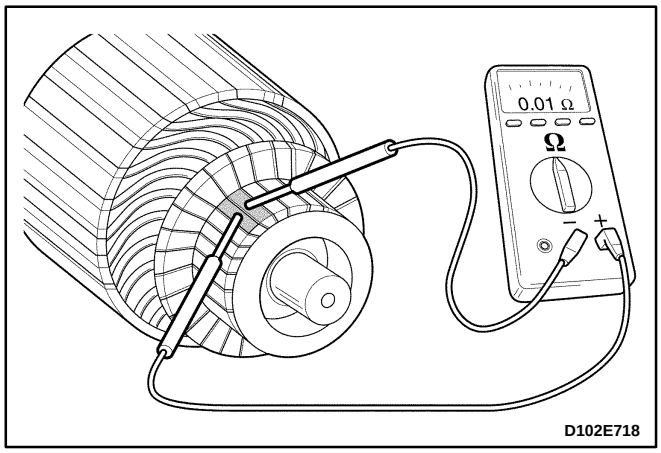
D102E716

Inspection / Measurement (After the Overhaul)

1. Ground test for armature coil.
   - Inspect the insulation between commutator and armature coil using the voltmeter.
   - Replace the armature assembly if necessary.

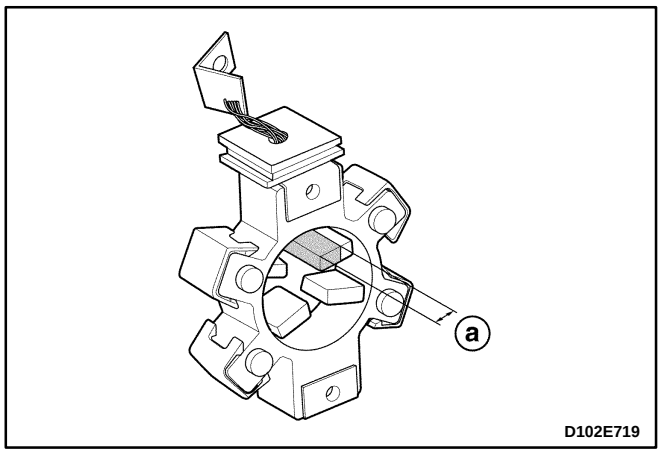

D102E717

2. Short circuit test for armature coil.
   - If test equipment is available, check the armature for short circuit by placing it on a growler, and holding back a saw blade over the armature core while the armature is rotated. If the saw blade vibrates, replace the armature.



D102E718

3. Open circuit test for armature coil.
   - Check the continuity between the commutator bars using multimeter.
   - Replace the armature assembly if necessary.

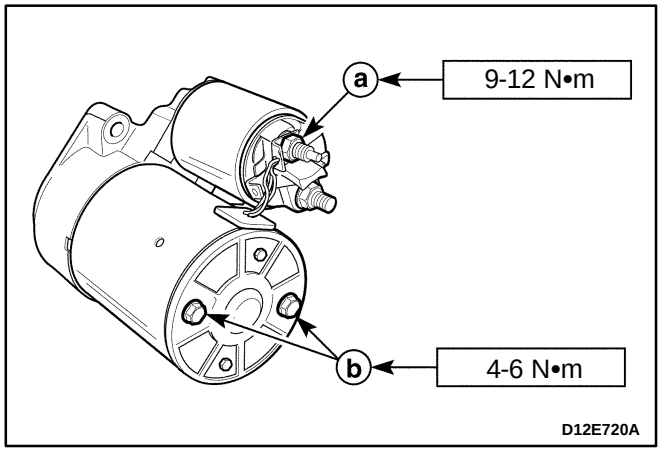


D102E719

4. Inspect the brushes wear.
   - Inspect the brushes, the pop-out springs and the brush holder for wear and damage. Replace the brushes, if necessary.

   a. Brushes wear limit.

Desciption	Standard	Limit
Brushes wear	11.3–11.5 mm (0.445–0.453 in)	7.0–7.25 mm (0.275–0.285 in)



Assembly Procedure

1. Install in the reverse order of removal.
2. Install the bolts / nuts.

Tighten

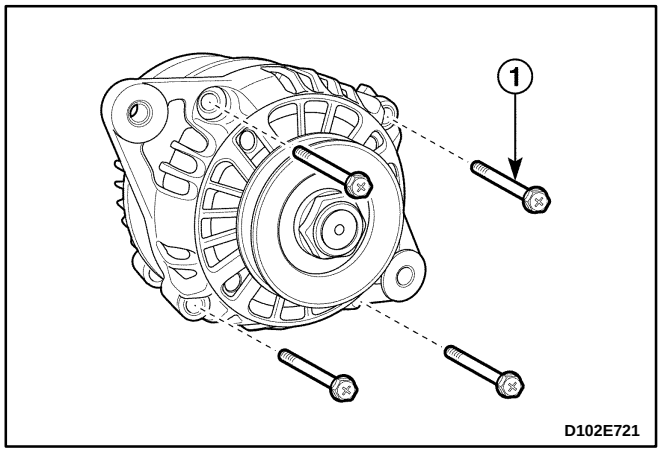
Tighten the starter motor terminal M nut to 9–12 N•m (80–106 lb-in) (a).

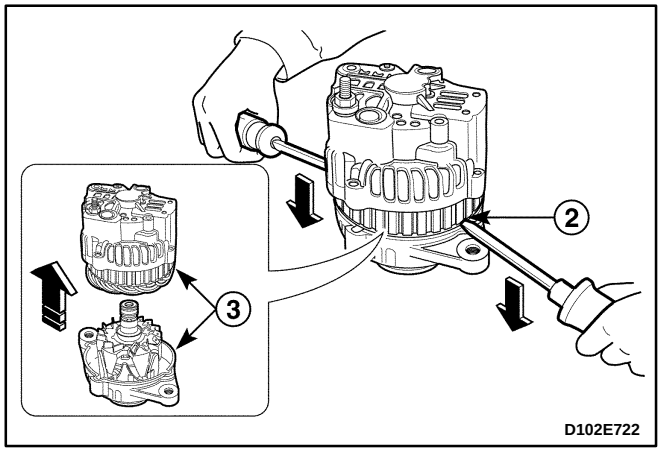
Tighten the through-bolts to 4–6 N•m (35–53 lb-in) (b).

GENERATOR (A-TYPE : MANDO)

Disassembly Procedure

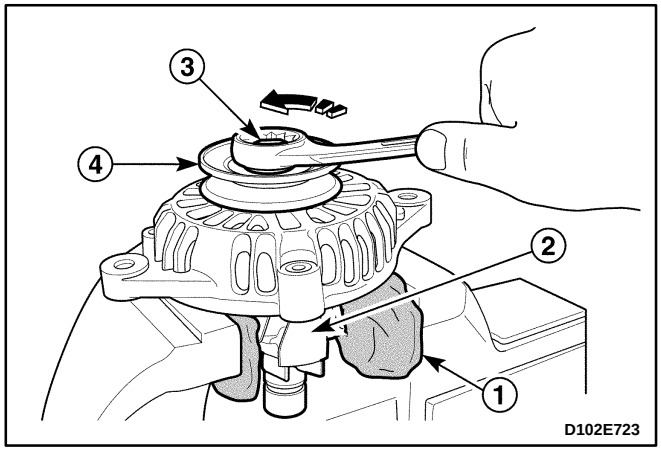
1. Remove the generator. Refer to “Generator” in this section.
2. Remove the front bracket and rear bracket.
   - Remove the through-bolts (1).

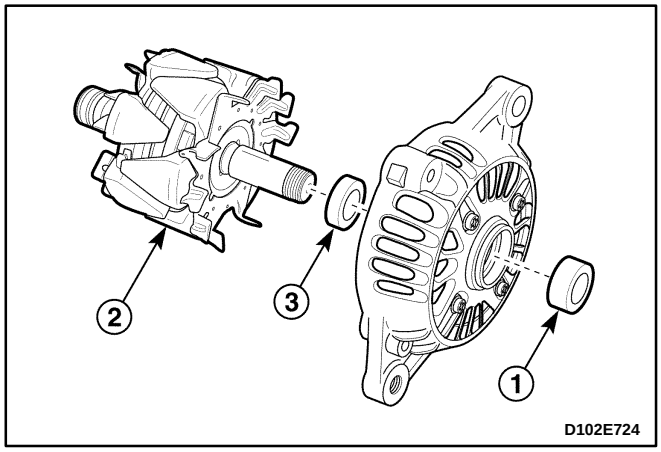




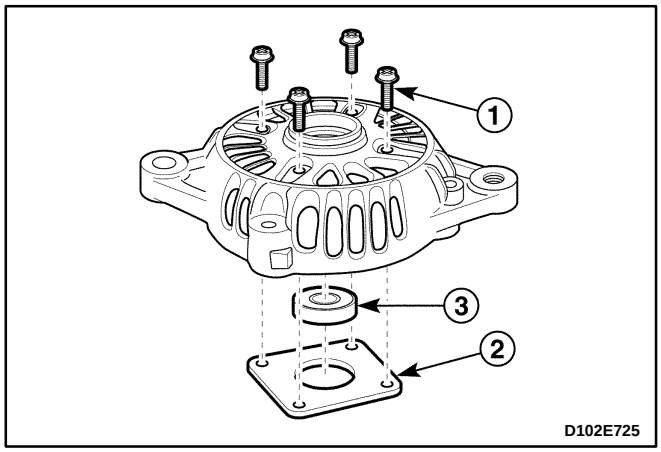
   - Pry front bracket downwards using a screwdriver (2).
   - Separate the front bracket and rear bracket (3).

3. Remove the pulley and rotor assembly from the front bracket.
   - Cover the rotor with the cloth (1).
   - Place the pulley upwards and vice the rotor (2).
   - Remove the pulley nut (3).
   - Remove the pulley (4).

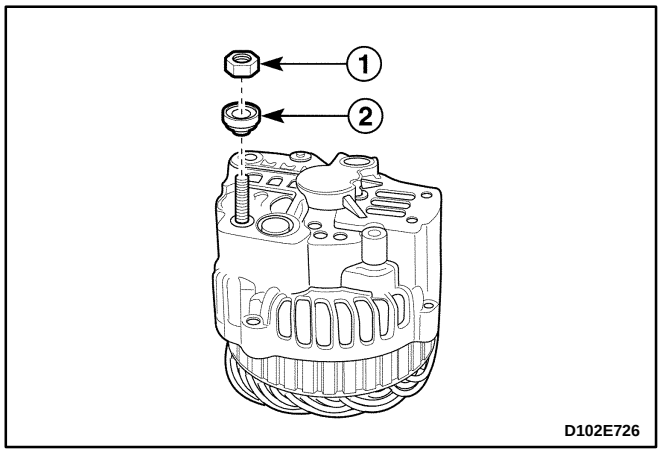




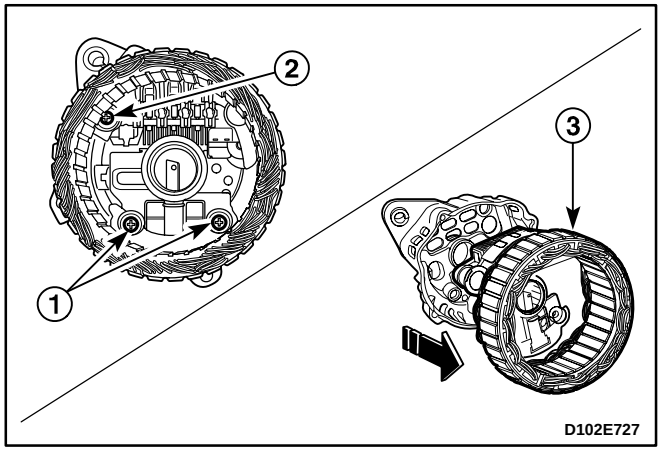
4. Remove the front bracket, rotor and collar.
   - Remove the collar (large) (1).
   - Remove the rotor from the front bracket (2).
   - Remove the collar (small) from the rotor shaft (3).



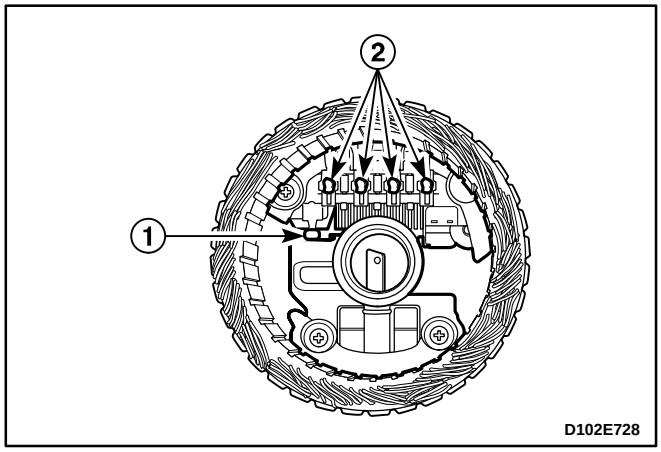
5. Remove the front bearing.
   - Remove the support plate screws (1).
   - Remove the plate (2).
   - Remove the front bearing using the press (3).



6. Remove the battery positive terminal nut from the rear bracket.
   - Remove the battery position terminal nut (1).
   - Remove the washer (2).

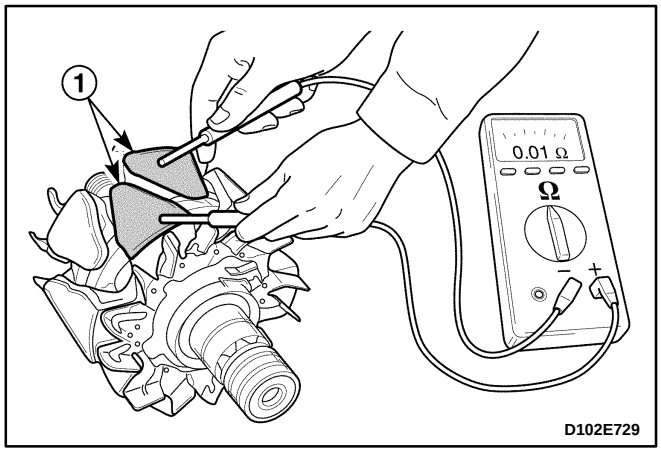


7. Remove the stator assembly from the rear bracket.
   - Remove the rectifier screw (1).
   - Remove the brush holder and regulator assembly screws (2).
   - Remove the stator assembly with the rectifier / brush holder / regulator (3).



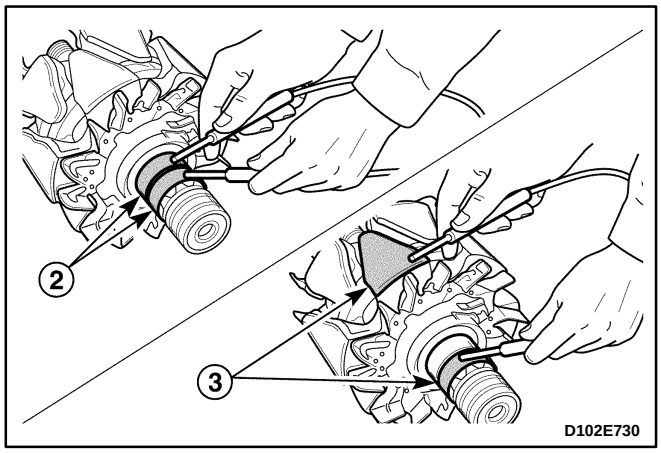
8. Remove the rectifier / brush holder / regulator from the stator.
   - Remove the rectifier / brush holder / regulator connections (1).
   - Remove the stator and rectifier connections (2).

Notice: If the stator connections are welded, melt the lead. Avoid overheating as it can damage the diodes.



Inspection / Measurement

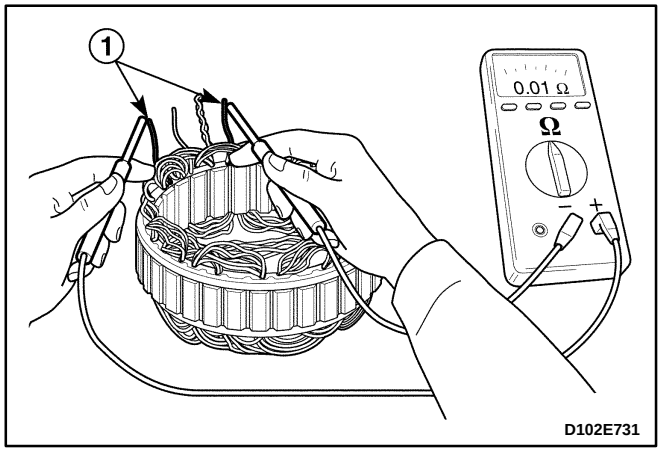
1. Inspect the rotor assembly.
   - Test the rotor for an open circuit by using the ohmmeter (1). Replace the rotor if necessary.



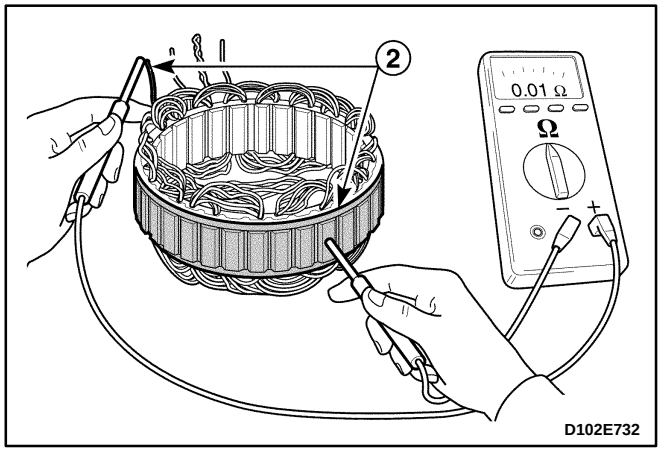
   - Test the rotor for open or short circuit (2).

Desciption	Limit
The measured resistance	2.9Ω

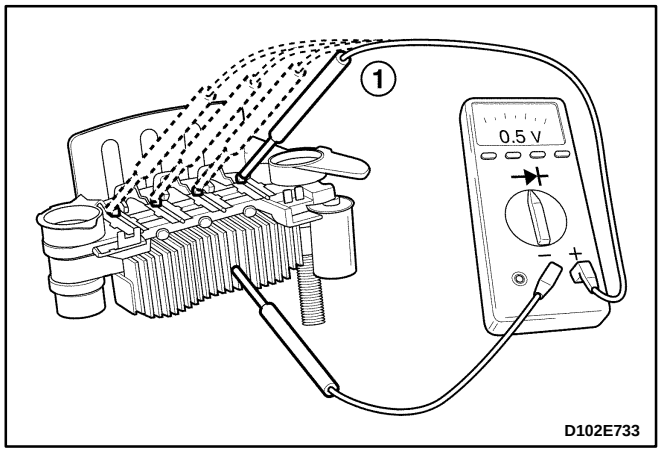
   - Replace the rotor if necessary.
   - Test the rotor for open or ground circuit by using the ohmmeter (3). Replace the rotor if necessary.



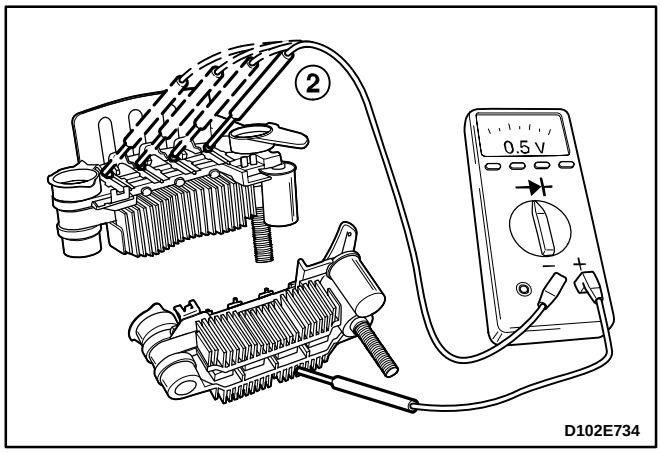
2. Inspect the stator.
   - Test the stator for an open circuit by using the ohmmeter (1). Replace the stator if necessary.



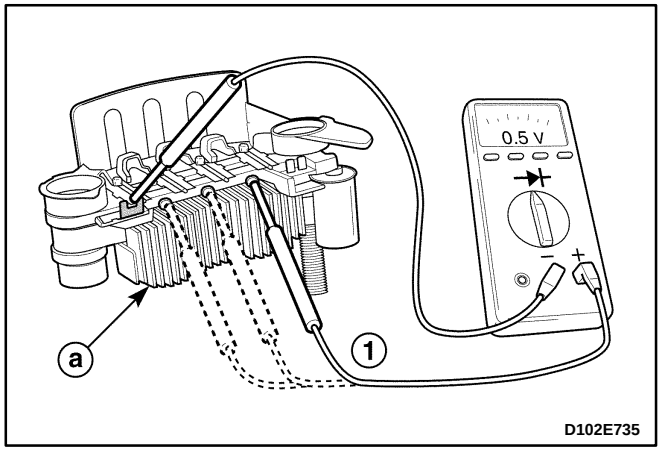
- Test the stator for open or ground circuit by using the ohmmeter (2). Replace the starter if necessary.



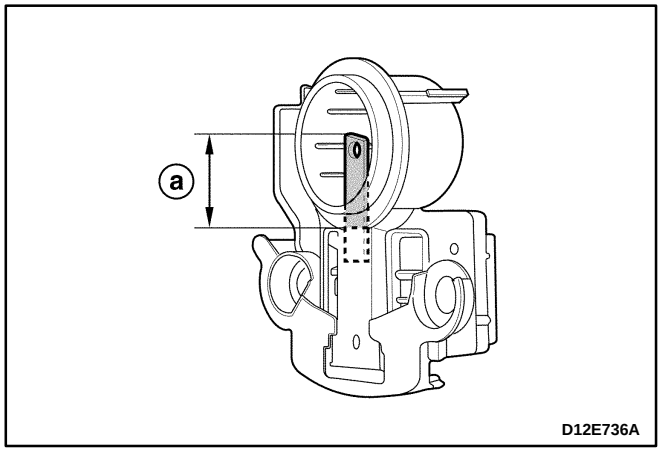
3. Inspect the rectifier.
   - Positive rectifier test:
     Inspect the open circuit for stator coil lead terminals using the ohmmeter (1).
     Replace the rectifier if necessary.



   - Negative rectifier test:
     Inspect the open circuit for stator coil lead terminals using the ohmmeter (2).
     Replace the rectifier if necessary.

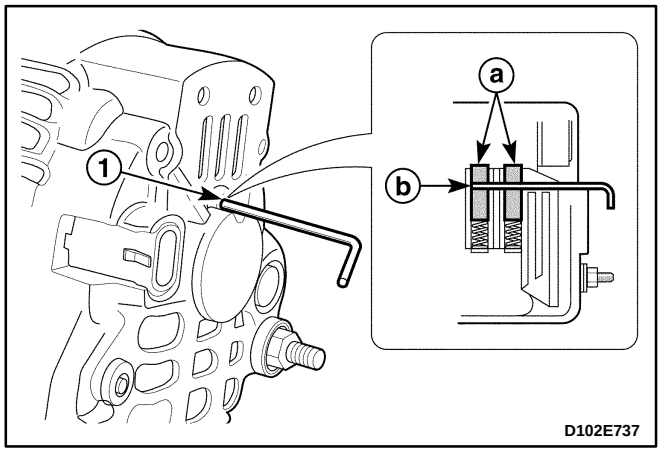


4. Inspect trio diodes.
   - Inspect the open circuit for trio diodes using the ohmmeter (1).
   - Replace the heat sink if necessary (a).



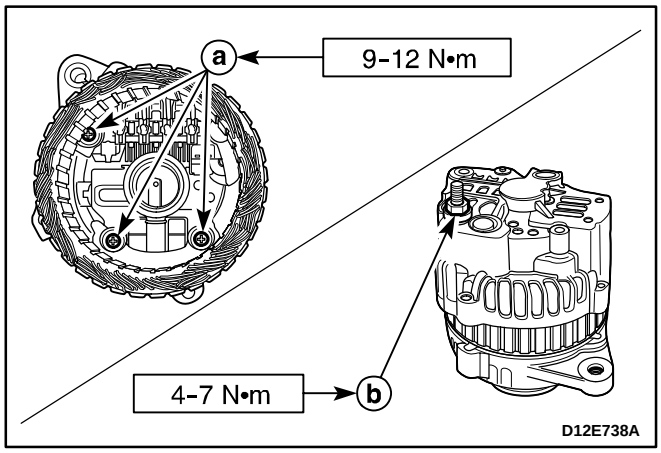
5. Inspect the brush wear.
   - If the brush wear exceeds the specified valve (a), replace the brush.

Desciption	Standard	Limit
Brushes wear	18.5 (0.73)	13.5 (0.53)



Assembly Procedure

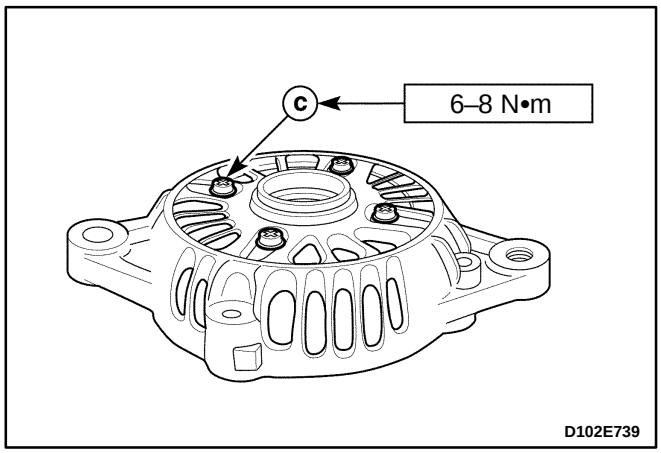
1. Install in the reverse order of removal.
   - Assemble the stator assembly into the rear bracket and rotor assembly.
   a. Brushes.
   b. Hole.



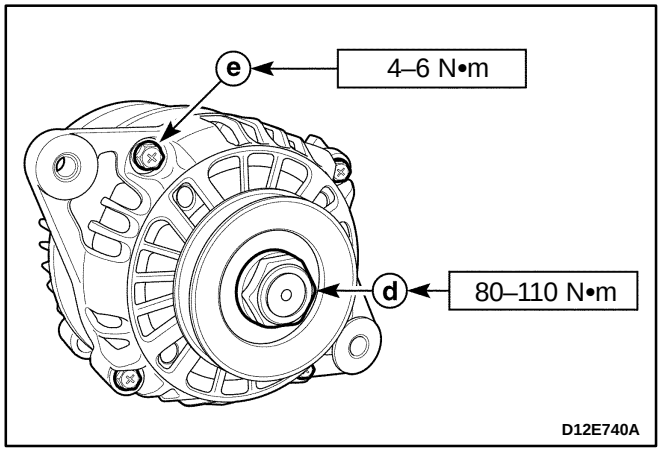
2. Install the bolts / nuts / screws.

Tighten

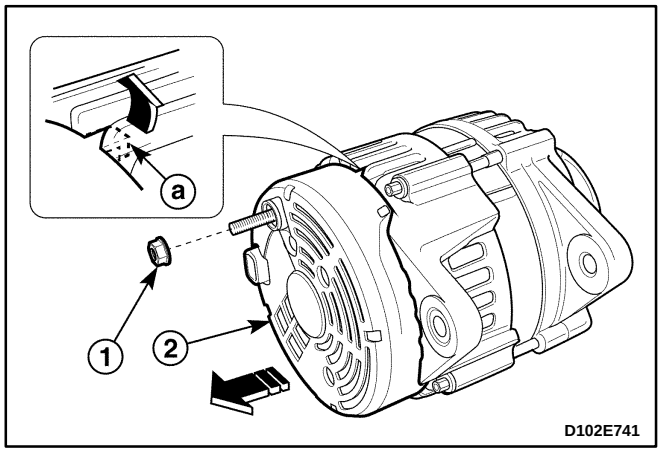
- Tighten the brush holder / regulator / rectifier screws to 9–12 N•m (80–106 lb-in) (a).
- Tighten the battery positive terminal nut to 4–7 N•m (35–62 lb-in) (b).



- Tighten the front bearing spot plate screws to 6–8 N•m (53–71 lb-in) (c).



- Tighten the generator pulley nut to 80–110 N•m (59–81 lb-ft) (d).
- Tighten the through-bolts to 4–6 N•m (35–53 lb-in) (e).

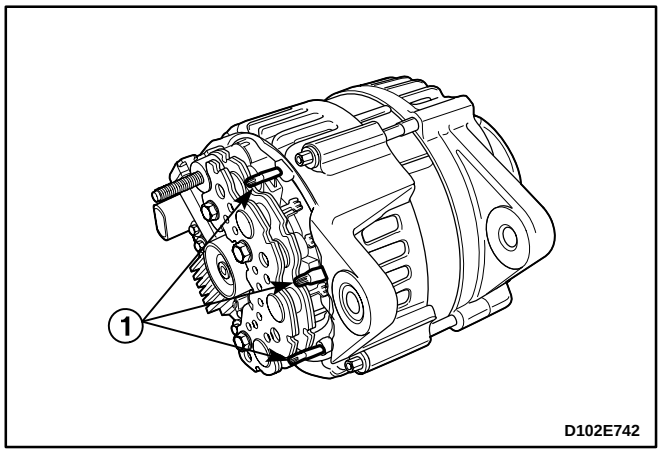


GENERATOR (B-TYPE: DAC)

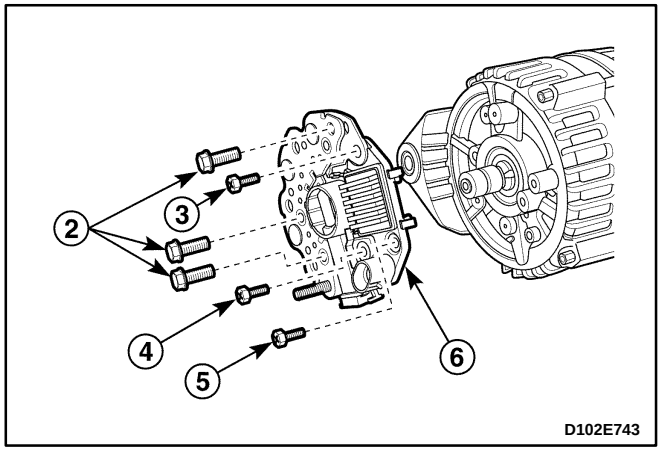
Disassembly Procedure

1. Remove the generator. Refer to “Generator” in this section.
2. Remove the cover from the generator.
   - Remove the battery positive terminal nut (1).
   - Remove the cover (2).

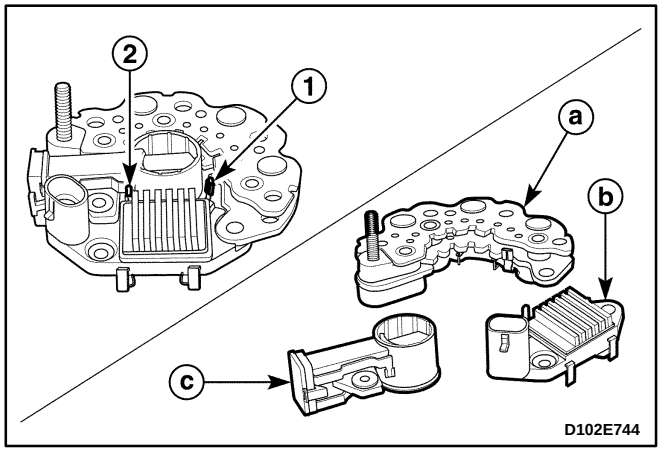
   a. Cover.



3. Remove the regulator / brush holder / rectifier assembly.
   - Remove the stator coil lead and rectifier diode lead connections (1).

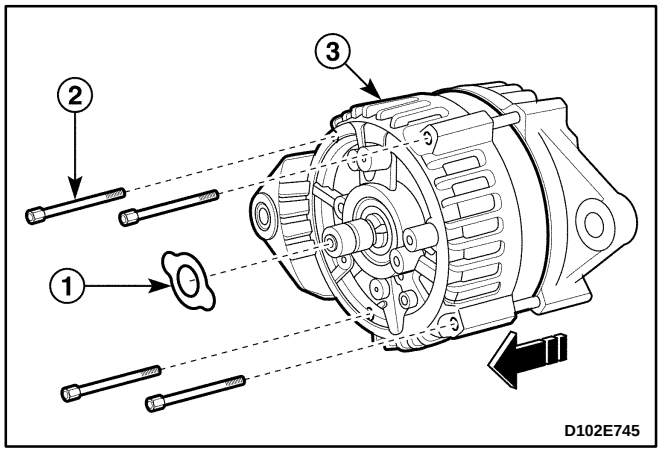


- Remove the rectifier bolts (2).
- Remove the rectifier / regulator screw (3).
- Remove the brush holder / regulator screw (4).
- Remove the regulator screw (5).
- Remove the regulator / brush holder / rectifier assembly (6).

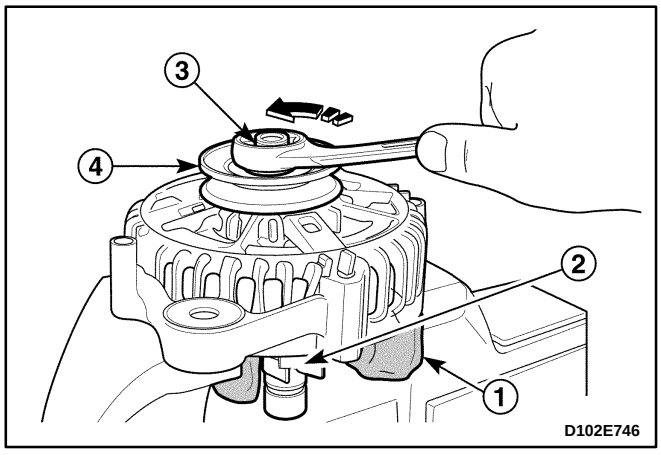


4. Remove the regulator / brush holder / rectifier.
   - Remove the rectifier and regulator connection (1).
   - Remove the regulator and brush holder connection (2).
   - Visibly inspect the rectifier / regulator / brush holder for damage or broken.

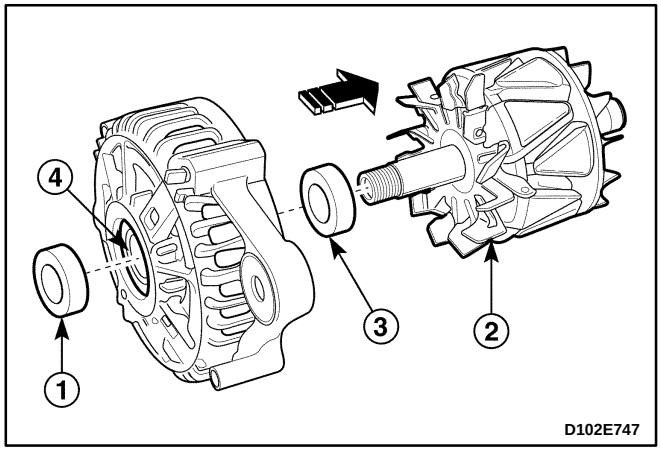
   a. Rectifier.
   b. Regulator.
   c. Brush holder.



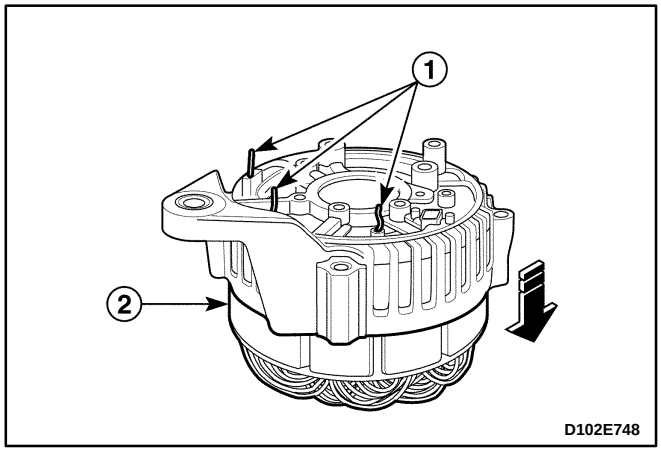
5. Remove the shield before the drive end bracket and the frame.
   - Remove the shield (1).
   - Remove the through-bolts (2).
   - Remove the frame from the drive end bracket (3).



6. Remove the pulley and rotor assembly from the drive end bracket.
   - Cover the rotor with the cloth (1).
   - Place the pulley upwards and vice the rotor (2).
   - Remove the pulley nut (3).
   - Remove the pulley (4).

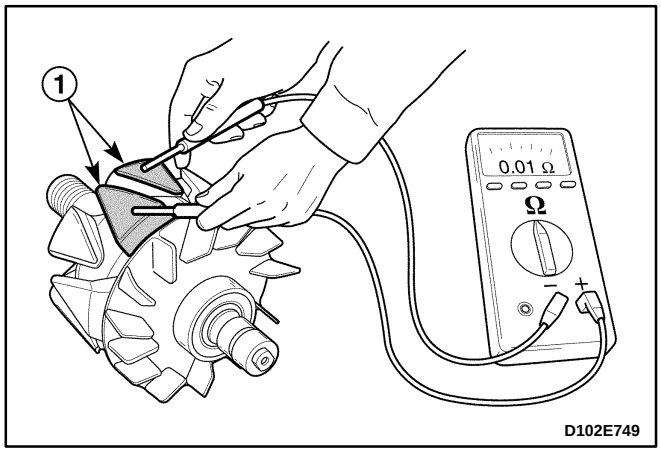


7. Remove the drive end bracket, rotor and space.
   - Remove the collar (1).
   - Remove the rotor from the driver end bracket (2).
   - Remove the collar from the rotor shaft (3).
   - Inspect the front bearing for corrosion, wear, noisy and other damage (4).

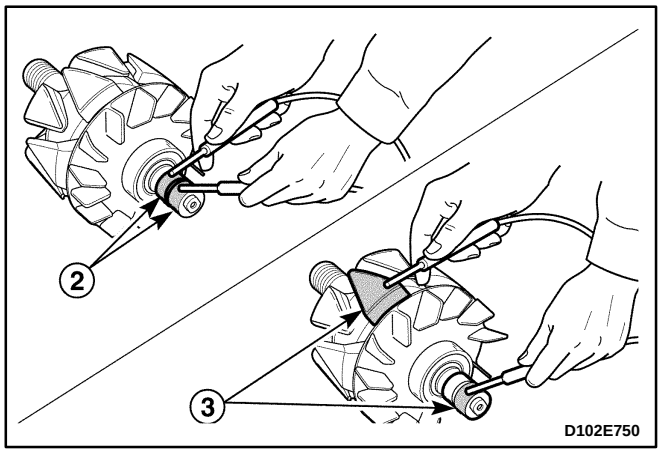


8. Remove the stator assembly from the frame.
   - Remove the remains after the welding.
   - Remove the stator assembly (2).

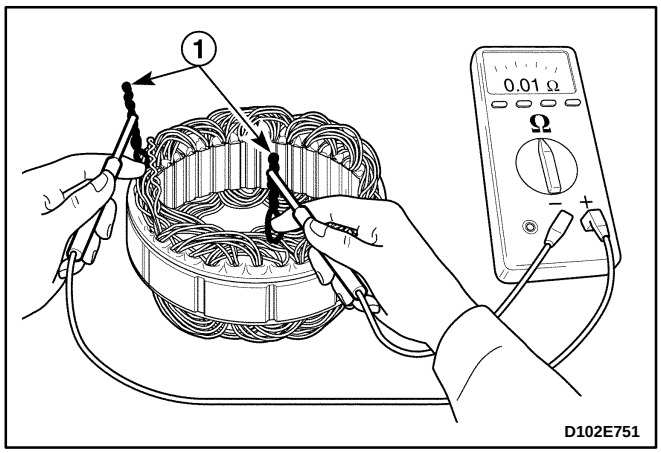
Inspection / Measurement



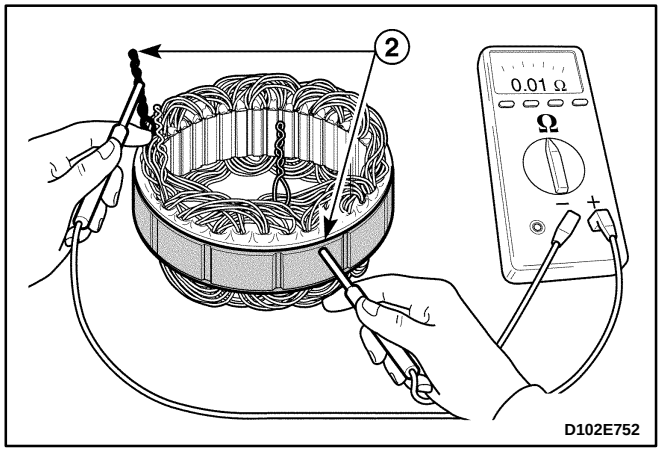
1. Inspect the rotor assembly.
   - Test the rotor coil for an open circuit by using the ohmmeter. The reading should be sufficiently low, or the rotor must be replaced (1).



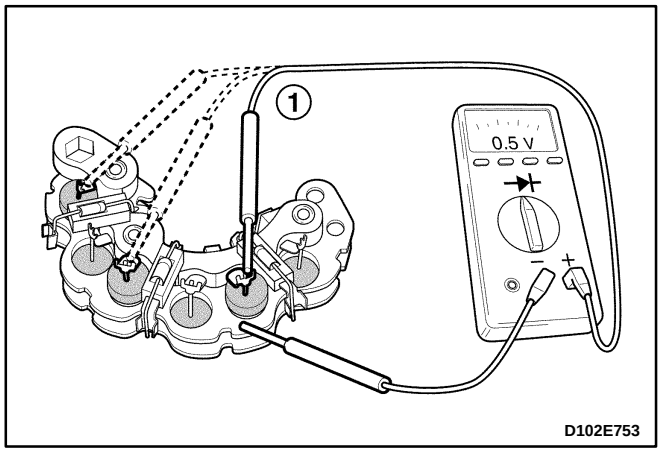
   - Test the rotor for open or short circuits. The reading should be 2.6 to 2.8 ohms, or the rotor should be replaced (2).
   - Test the rotor for open or ground circuits by using the ohmmeter. The reading should be sufficiently high, or the rotor must be replaced (3).
   - Inspect the fan blade for damage.



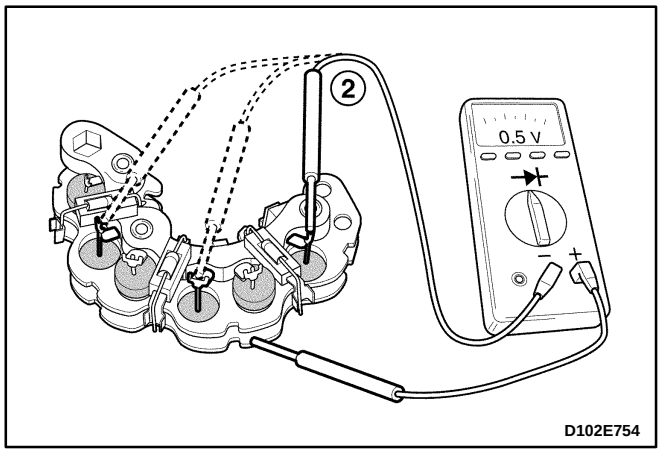
2. Inspect the stator.
   - Test the rotor for an open circuit by using the ohmmeter. The reading should be sufficiently low, or the stator must be replaced (1).



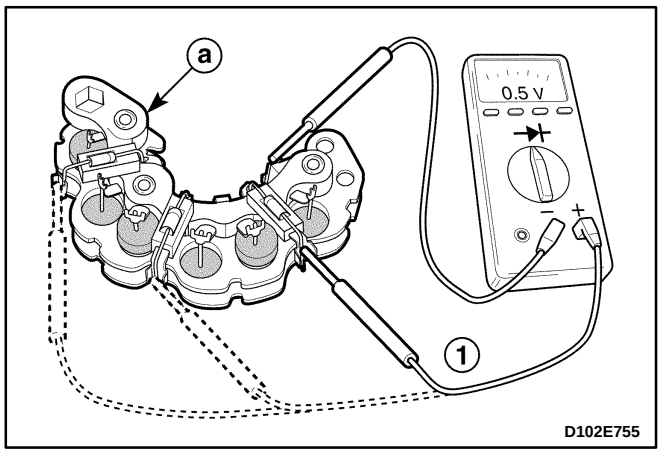
- Test the stator for open or ground circuits by using the ohmmeter. The reading should be sufficiently high, or the stator must be replaced (2).



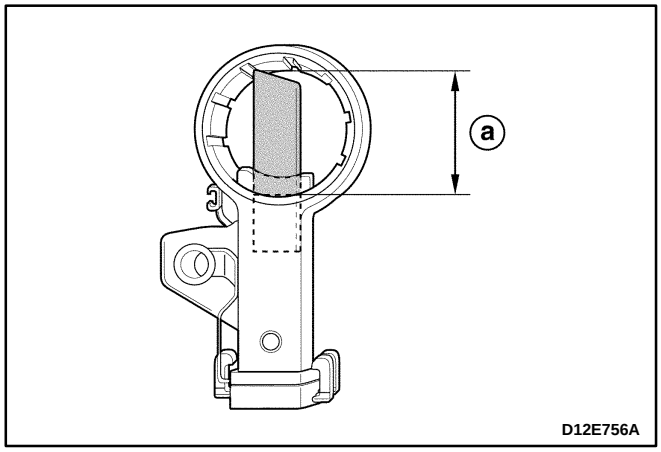
3. Inspect the rectifier.
   - Positive rectifier test:
     Inspect the open circuit for stator coil lead terminals using the ohmmeter (1).
     Replace the rectifier if necessary.



   - Negative rectifier test:
     Inspect the open circuit for stator coil lead terminals using the ohmmeter (2).
     Replace the rectifier if necessary.

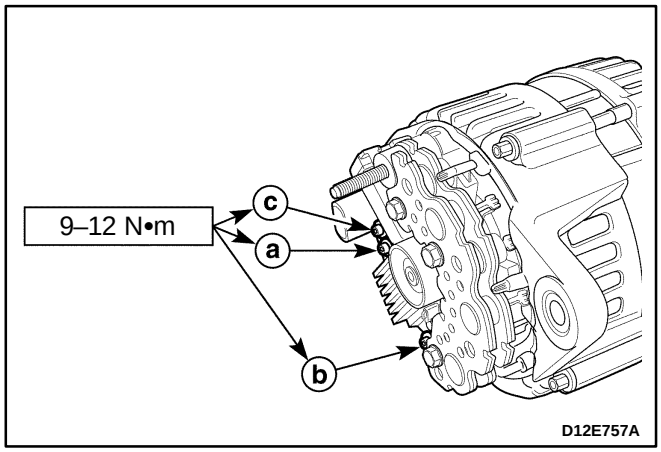


4. Inspect trio diodes.
   - Inspect the open circuit for trio diodes using the ohmmeter (1).
     Replace the heat sink if necessary (a).



5. Inspect the brush wear
   - If the brush wear exceeds the specified value, replace the brush.
   a. Brush wear limit.

Desciption	Standard	Limit
Brushes wear	20 (0.79)	14 (0.55)

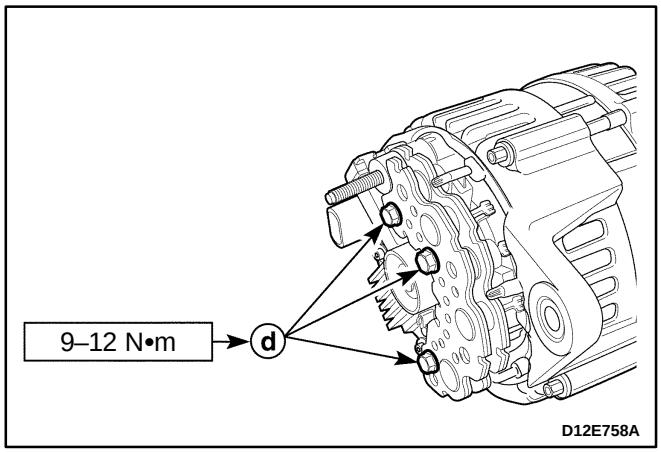


Assembly Procedure

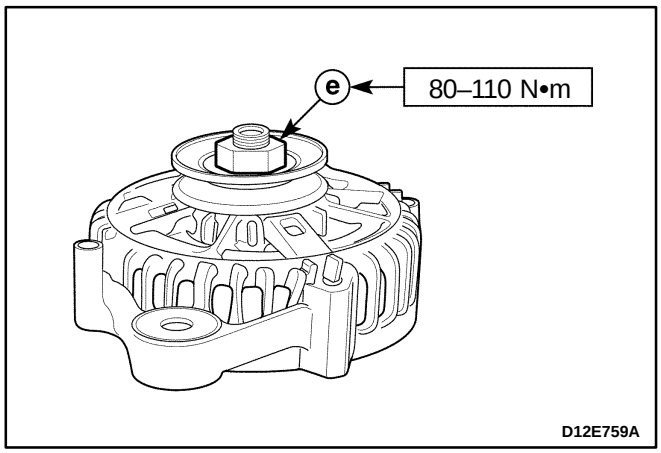
1. Install in the reverse order of removal.
2. Install the screws / nuts / bolts.

Tighten

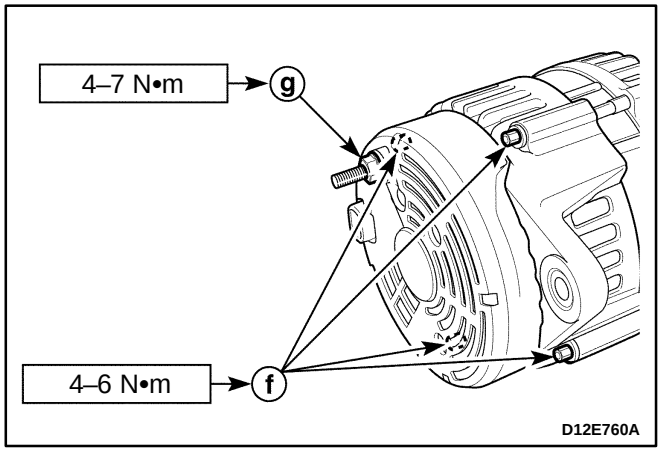
- Tighten the regulator screw to 9–12 N•m (80–106 lb-in) (a).
- Tighten the rectifier / regulator screw to 9–12 N•m (80–106 lb-in) (b).
- Tighten the brush holder / regulator screw to 9–12 N•m (80–106 lb-in) (c).



- Tighten the rectifier bolts to 9–12 N•m (80–106 lb-in) (d).



- Tighten the pulley nut to 80-110 N•m (59–81 lb-ft) (e).

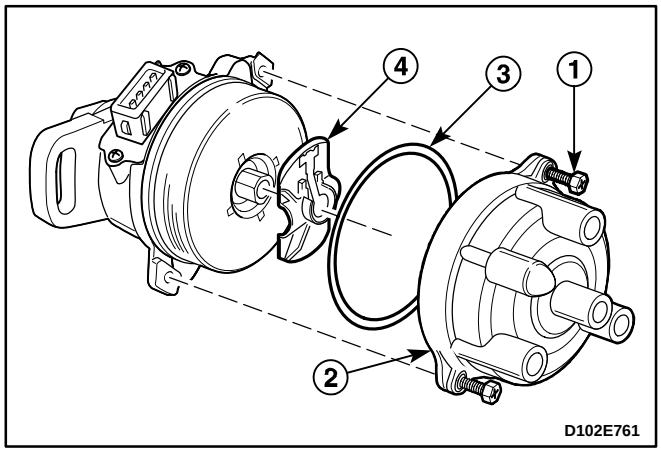


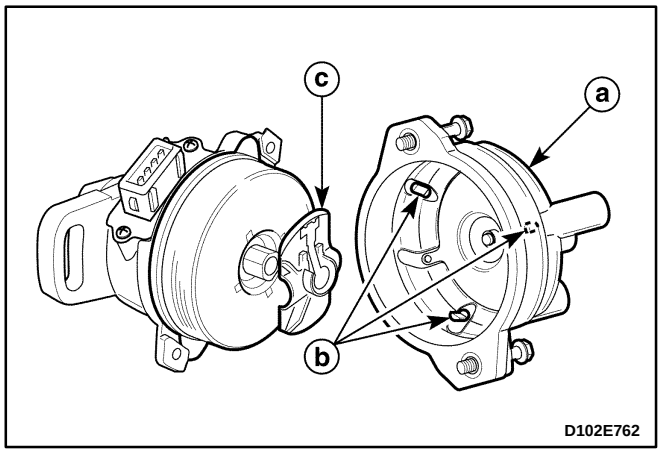
- Tighten the through-bolts to 4–6 N•m (35–53 lb-in) (f).
- Tighten the battery positive terminal nut to 4–7 N•m (35–62 lb-in) (g).

DISTRIBUTOR ASSEMBLY

Disassembly Procedure

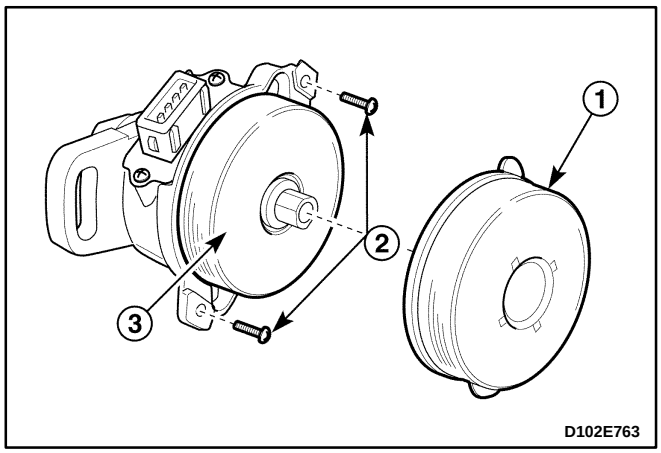
1. Remove the distributor. Refer to “Distributor” in this section.
2. Remove the cap, seal and rotor from the distributor housing.
   - Remove the bolts (1).
   - Remove the distributor cap (2).
   - Remove the seal (3).
   - Remove the rotor (4).

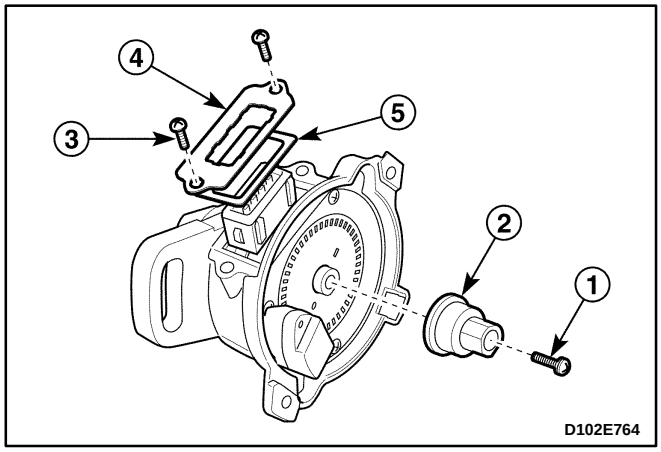




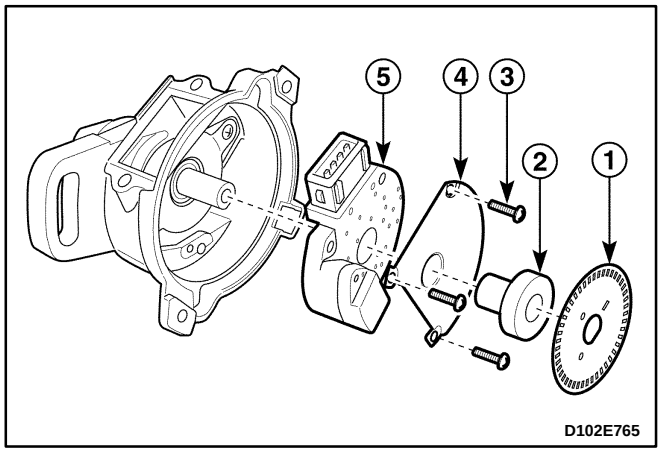
- Inspect the cap for cracks or damage (a).
- Inspect the cap electrode for damage / wear or carbon traces (b).
- Inspect the rotor for damage or carbon traces (c).

3. Remove the inner / outer cover from the distributor housing.
   - Remove the outer cover (1).
   - Remove the screws (2).
   - Remove the inner cover (3).

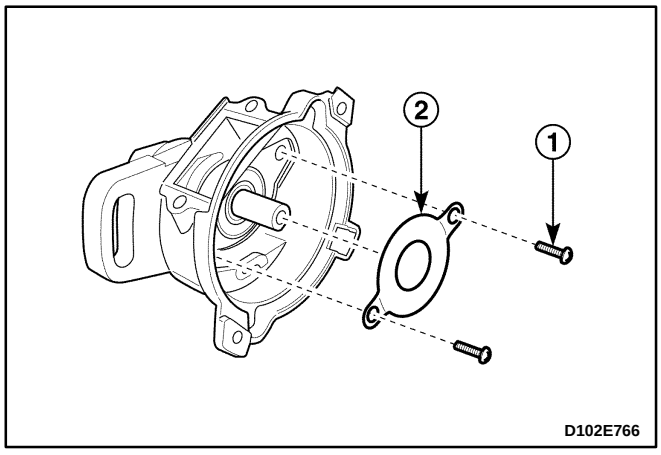




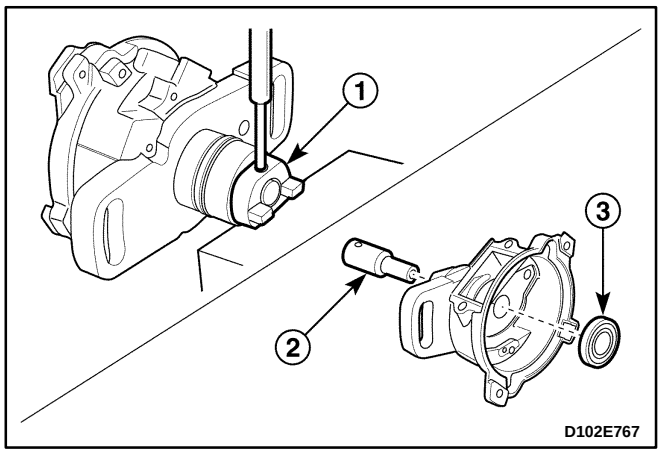
4. Remove the optical sensor cover and adaptor from the distributor housing.
   - Remove the screw (1).
   - Remove the adaptor (2).
   - Remove the screws (3).
   - Remove the cover (4).
   - Remove the gasket (5).



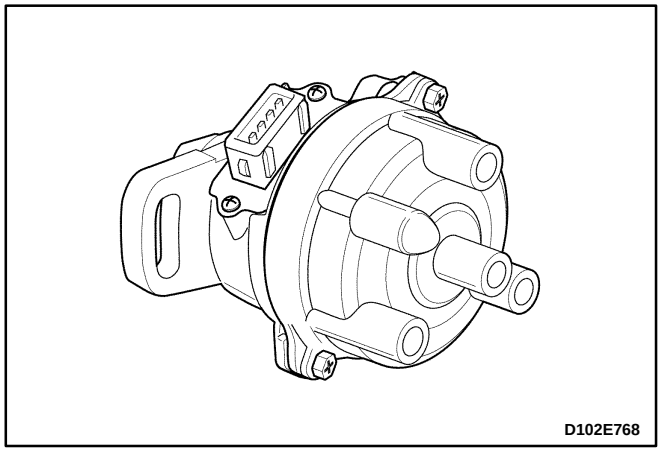
5. Remove the optical sensor unit from the distributor housing.
   - Carefully remove the disc wheel (1).
   - Remove the bushing (2).
   - Remove the screws (3).
   - Remove the optical sensor unit plate (4).
   - Remove the optical sensor unit (5).



6. Remove the bearing plate from the distributor housing.
   - Remove the screws (1).
   - Remove the bearing plate (2).



7. Remove the coupling, shaft and bearing from the distributor housing.
   - Remove the coupling (1).
   - Remove the shaft using the press (2).
   - Remove the bearing (3).

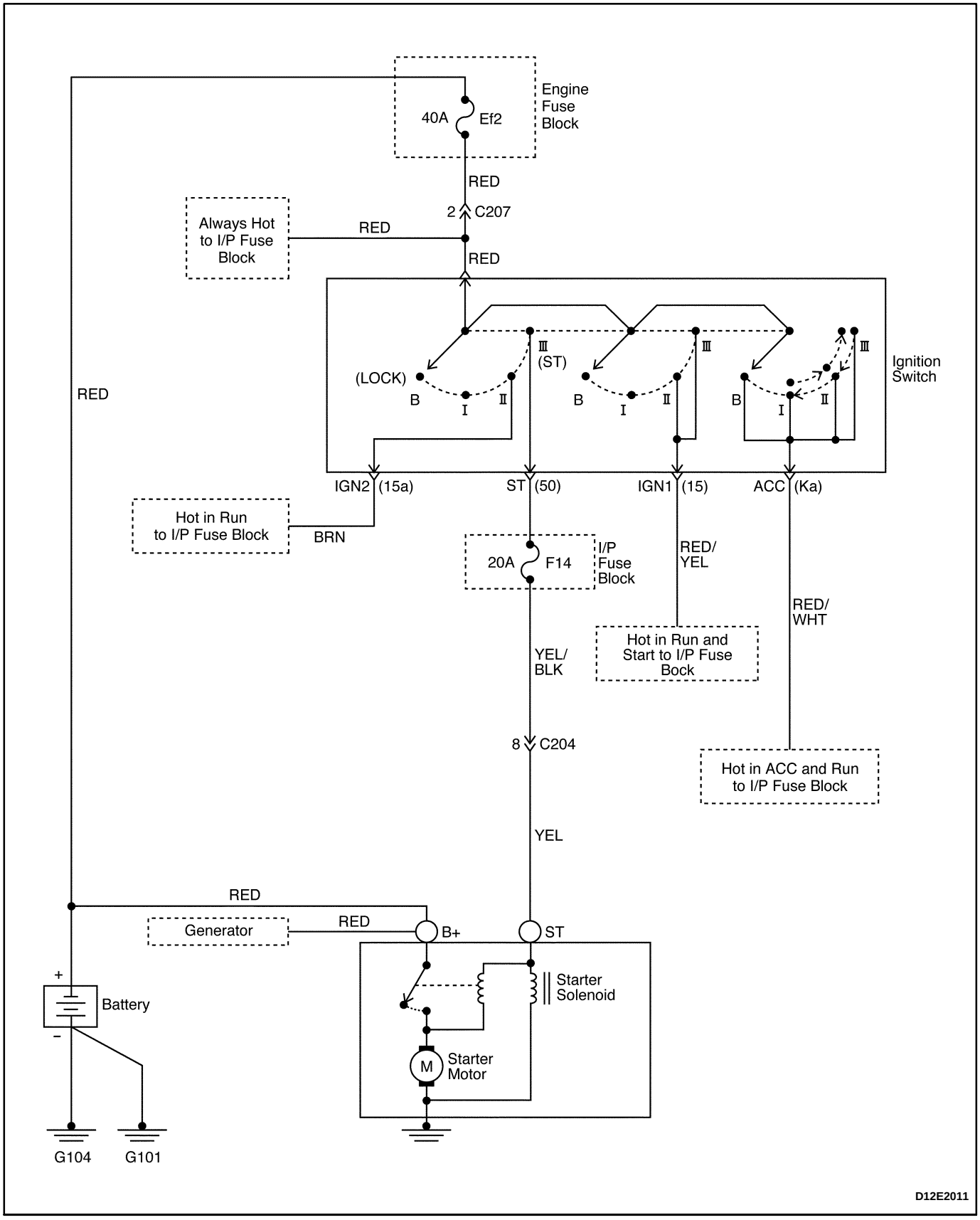


Assembly Procedure

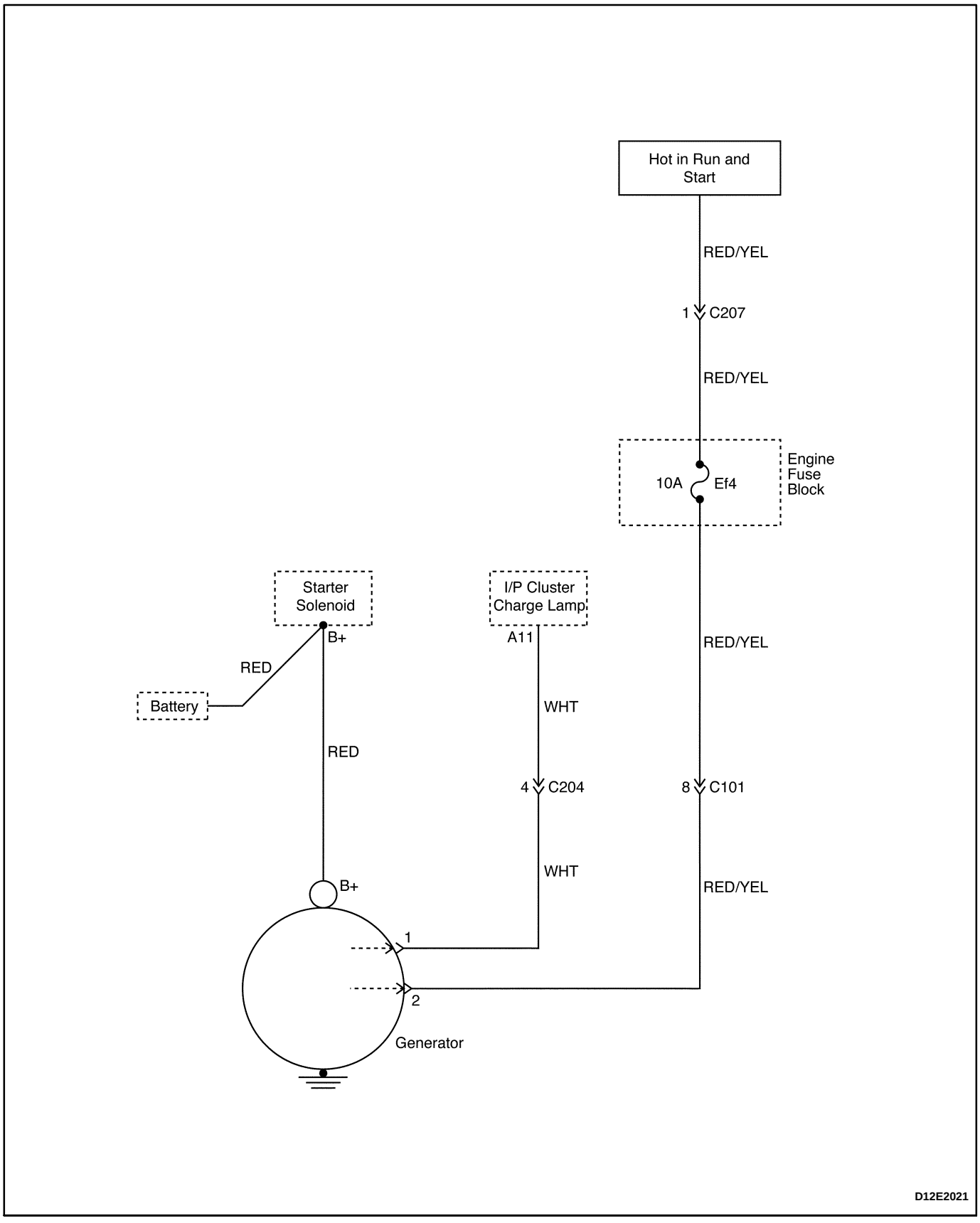
1. Install in the reverse order of removal.
   - Lubricate the shaft with clean engine oil.

SCHEMATIC AND ROUTING DIAGRAMS

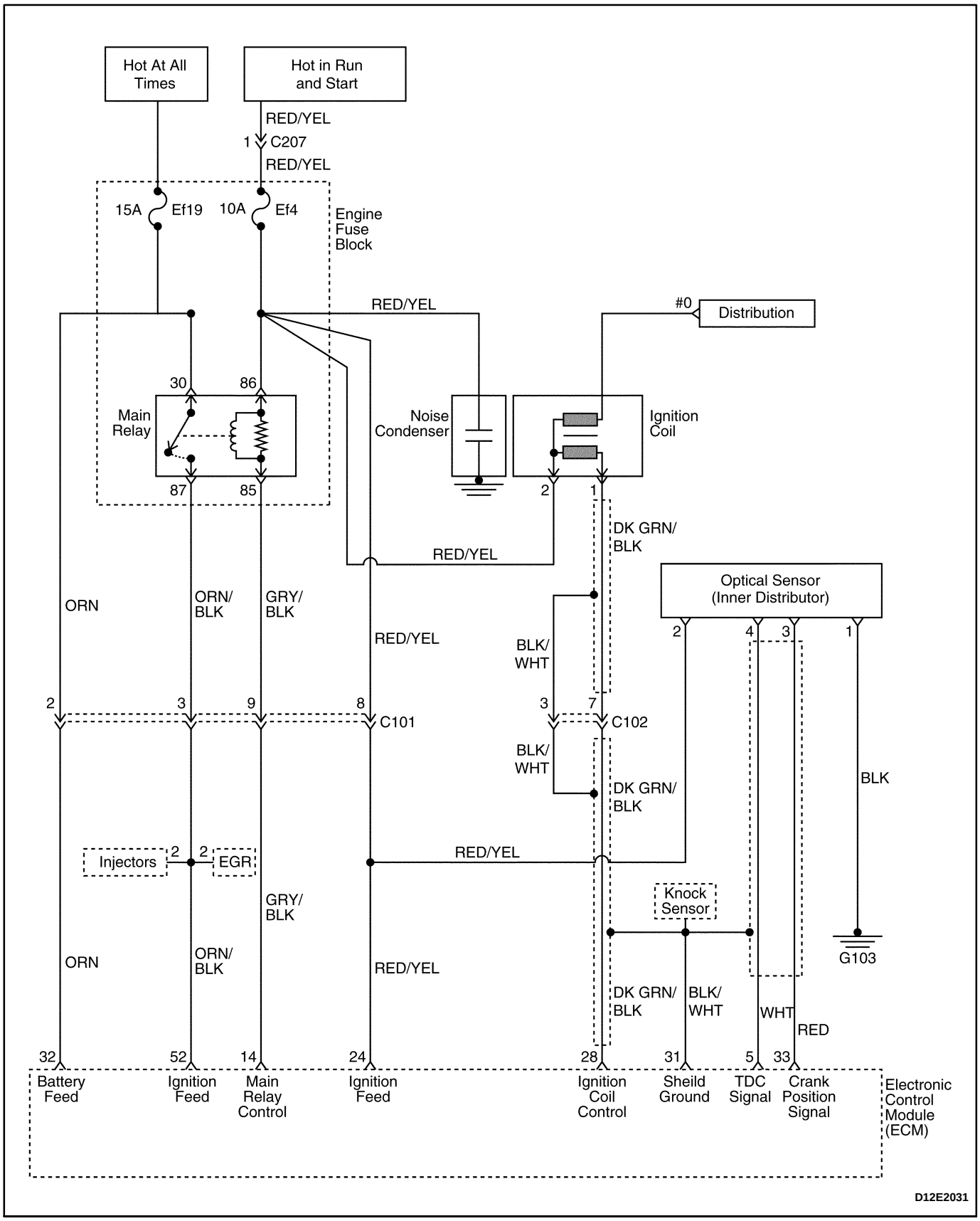
STARTING SYSTEM



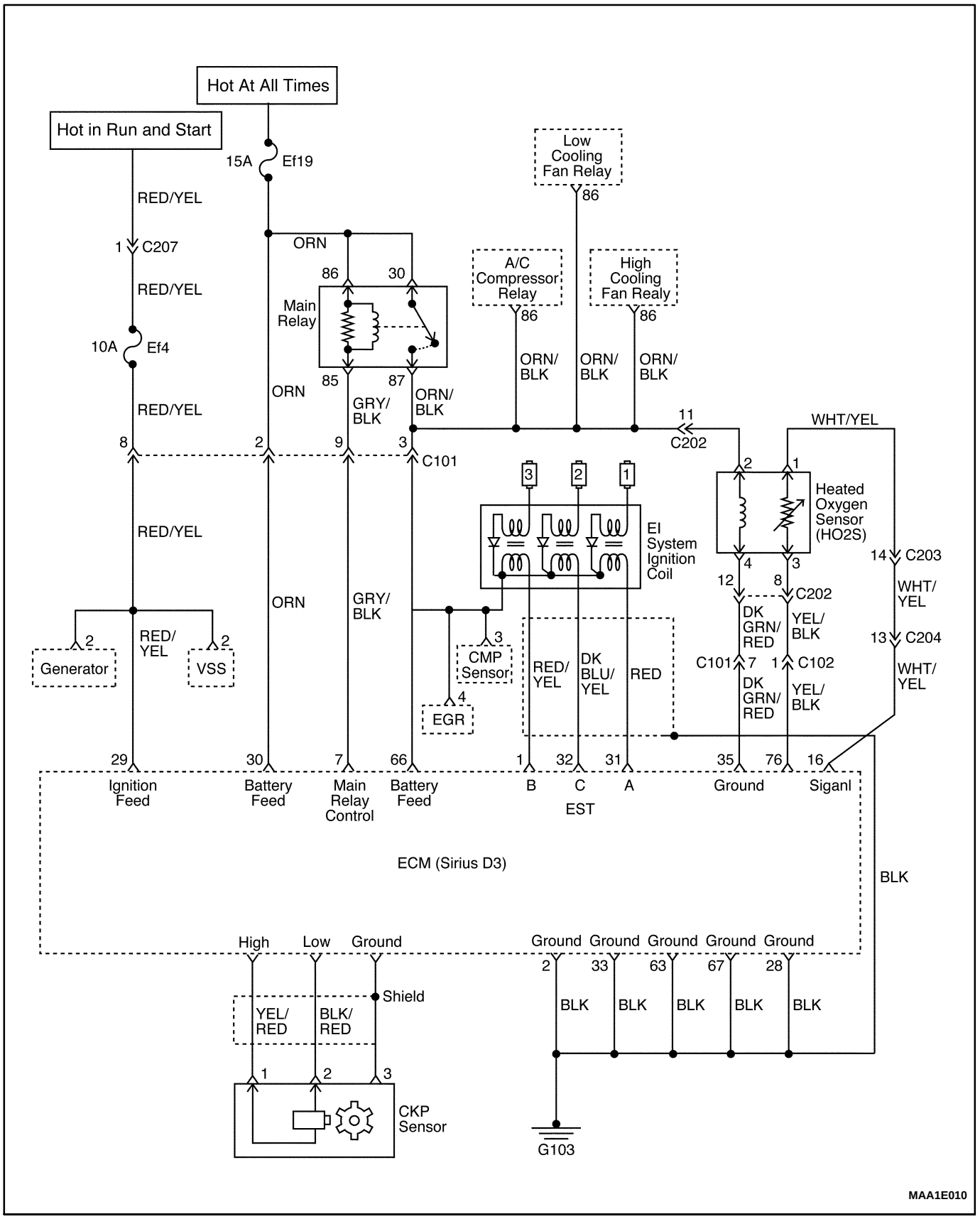
CHARGING SYSTEM



IGNITION SYSTEM CIRCUIT – TYPICAL



IGNITION SYSTEM CIRCUIT – EURO III



SPECIFICATIONS

STARTER SPECIFICATIONS

Application	Description	Unit	Standard	Limit
Starter Motor	Type	–	SD 80	–
	Output(Capacity)	kW	0.8	–
	No Load Test @ 9 volts Drive Pinion Speed	A RPM	150 2,000	–
	Brushes Length	mm (in.)	11.3–11.5 (0.445–0.453)	7.0–7.25 (0.275–0.285)

GENERATOR SPECIFICATIONS

Application	Description		Unit	Standard	Limit
Generator	Type	A-Type B-Type	–	J114D(MANDO) CS114D(DAC)	–
	Regulator Voltage	A-Type B-Type	V	14.4–15.0 14.3–4.9	–
	Brushes Length	A-Type B-Type	mm (in.)	18.5 (0.728) 20.0 (0.787)	13.5 (0.531) 14 (0.551)
	Output (Capacity)	A-Type B-Type	–	12V, 65A 12V, 65A	–

IGNITION SYSTEM SPECIFICATIONS

Application	Description		Unit	Standard	Limit
Ignition Coil	Type		–	Closed Magnetic Type	–
	First Coil Resistance		Ω	1.2 ± 10%	–
	Second Coil Resistance		KΩ	12.1 ± 15%	–
Distributor	Type		–	Optical Sensor Type	–
Spark Plug	Type	Unlead	–	BPR5EY-11	–
				RN9YC4	–
				WR8DCX	–
	Type	Lead	–	BPR5EY	–
				RN9YC	–
				WR8DC	–
Spark Plug	Gap	Unlead	mm (in.)	1.1 (0.043)	–
				1.2 (0.047)	–
		Lead	mm (in.)	0.8 (0.031)	–
Ignition Wire	Ignition Wire Resistance		KΩ/m	2.5–12.0	–

BATTERY SPECIFICATIONS

Application	Description	Unit	Standard	Limit
Battery	Type	–	MF	–
	Capacity	AH	35	–
	Cold Cranking Amps	CCA	246	–

FASTENER TIGHTENING SPECIFICATIONS

Application	N•m	Lb-Ft	Lb-In
Distributor Bolts	10–16	–	89–142
Battery Retainer Clamp–to–Battery Rod Nuts	6–8	–	53–71
Battery Carrier Tray Bolts	9–12	–	80–106
Battery Cable Nuts	9–12	–	80–106
Starter field Connector Nut	9–12	–	80–106
Starter Through–Bolts	4–6	–	35–53
Starter Mounting Bolts	55–65	41–48	–
Starter Solenoid Assembly Screws	6–8	–	53–71
Starter Solenoid Nuts	9–12	–	80–106
Spark Plug	20–30	15–22	–
Generator Through–Bolts	4–6	–	35–53
Generator Drive End Nut	80–110	59–81	–
Generator Battery Lead Connector Nut	4–7	–	35–62
Generator Bearing Plate Bolt	6–8	–	53–71
Generator Brush Holder / Rectifier Screw	9–12	–	80–106
Generator Belt Tension Adjusting Bolt	18–28	13–21	–
Generator Shackle Bracket Bolt	45–55	33–41	–
Generator Lower Bracket–to–Generator Bolt/Nut	18–28	13–21	–
Ground Bolt	35–41	26–30	–
Ignition Coil Screw	4–7	–	35–62
Ignition Coil Bracket Bolt	9–12	–	80–106