

# STARTING & CHARGING SYSTEM

## SECTION SC

### CONTENTS

<b>PRECAUTIONS</b> .....	2		
Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" .....	2		
Wiring Diagrams and Trouble Diagnosis .....	2		
<b>BATTERY</b> .....	3		
How to Handle Battery .....	3		
METHODS OF PREVENTING OVER-DISCHARGE .....	3		
CHECKING ELECTROLYTE LEVEL .....	3		
SPECIFIC GRAVITY CHECK .....	4		
CHARGING THE BATTERY .....	5		
<b>STARTING SYSTEM</b> .....	6		
System Description .....	6		
KA24DE MODELS .....	6		
VG33E M/T MODELS .....	7		
VG33E A/T MODELS .....	8		
Wiring Diagram - START - .....	9		
KA24DE MODELS .....	9		
VG33E M/T MODELS .....	10		
VG33E A/T MODELS .....	11		
Construction .....	12		
KA24DE MODELS .....	12		
VG33E MODELS .....	13		
Removal and Installation .....	14		
		KA24DE MODELS .....	14
		VG33E MODELS .....	14
		Pinion/Clutch Check .....	14
		<b>CHARGING SYSTEM</b> .....	15
		System Description .....	15
		Wiring Diagram - CHARGE - .....	16
		KA24DE MODELS .....	16
		VG33E MODELS .....	17
		Trouble Diagnoses .....	18
		WITH IC REGULATOR .....	18
		MALFUNCTION INDICATOR .....	18
		Construction .....	19
		KA24DE MODELS .....	19
		VG33E MODELS .....	20
		Removal and Installation .....	20
		KA24DE MODELS .....	20
		VG33E MODELS .....	21
		<b>SERVICE DATA AND SPECIFICATIONS (SDS)</b> .....	22
		Battery .....	22
		Starter .....	22
		Generator .....	22

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## PRECAUTIONS

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

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### Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

NGSC0001

The supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioners, a diagnosis sensor unit, a crash zone sensor (4WD models), warning lamp, wiring harness and spiral cable.

Information necessary to service the system safely is included in the **RS section** of this Service Manual.

#### **WARNING:**

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, refer to *RS-16*.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses (except "SEAT BELT PRE-TENSIONER") covered with yellow insulation either just before the harness connectors or for the complete harness are related to the SRS.

### Wiring Diagrams and Trouble Diagnosis

NGSC0002

When you read wiring diagrams, refer to the following:

- "HOW TO READ WIRING DIAGRAMS", *GI-10*
- "POWER SUPPLY ROUTING" for power distribution circuit, *EL-11*

When you perform trouble diagnosis, refer to the following:

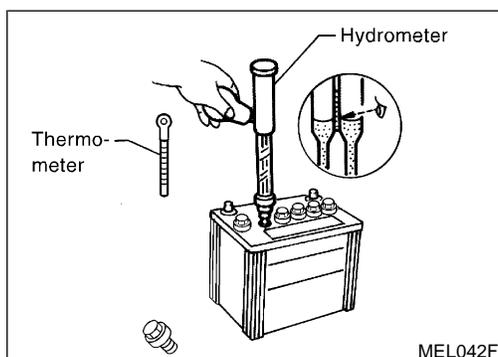
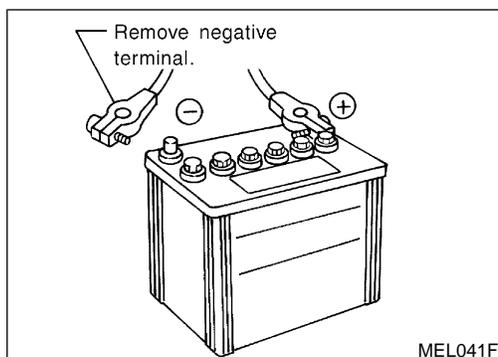
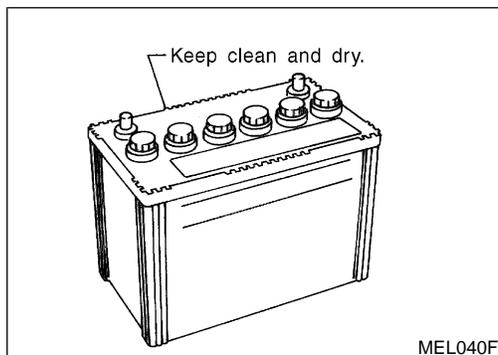
- "HOW TO FOLLOW TEST GROUP IN TROUBLE DIAGNOSIS", *GI-34*
- "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT", *GI-23*

## How to Handle Battery

NGSC0003

### CAUTION:

- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.



## METHODS OF PREVENTING OVER-DISCHARGE

NGSC0003S01

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as “low maintenance” and “maintenance-free”.
- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)

- Check the charge condition of the battery. Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

## CHECKING ELECTROLYTE LEVEL

NGSC0003S02

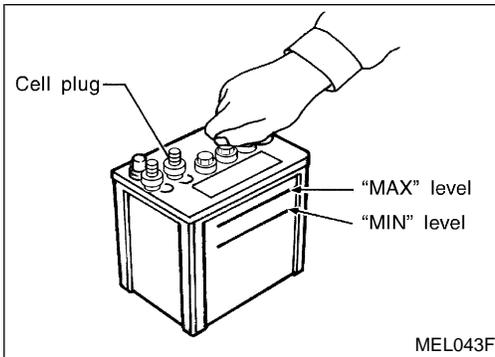
### WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

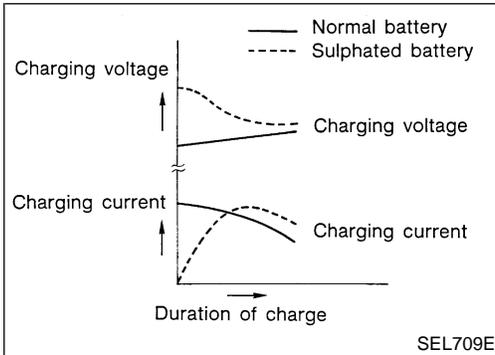
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# BATTERY

## How to Handle Battery (Cont'd)



- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



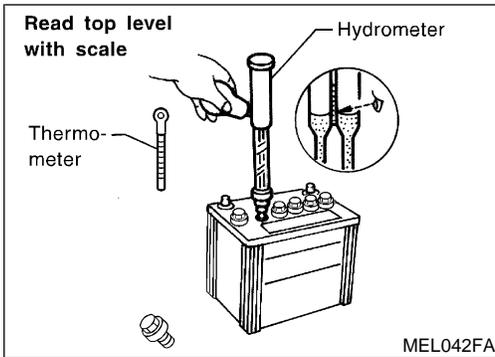
### Sulphation

NGSC0003S0201

A battery will be completely discharged if it is left unattended for a long time and the specific gravity will become less than 1.100. This may result in sulphation on the cell plates.

To determine if a battery has been "sulphated", note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.

A sulphated battery may sometimes be brought back into service by means of a long, slow charge, 12 hours or more, followed by a battery capacity test.



### SPECIFIC GRAVITY CHECK

NGSC0003S03

1. Read hydrometer and thermometer indications at eye level.

2. Use the chart below to correct your hydrometer reading according to electrolyte temperature.

### Hydrometer Temperature Correction

NGSC0003S0301

Battery electrolyte temperature °C (°F)	Add to specific gravity reading
71 (160)	0.032
66 (150)	0.028
60 (140)	0.024
54 (129)	0.020
49 (120)	0.016
43 (110)	0.012
38 (100)	0.008
32 (90)	0.004
27 (80)	0
21 (70)	-0.004
16 (60)	-0.008
10 (50)	-0.012

# BATTERY

How to Handle Battery (Cont'd)

Battery electrolyte temperature °C (°F)	Add to specific gravity reading	
4 (39)	-0.016	GI
-1 (30)	-0.020	
-7 (20)	-0.024	MA
-12 (10)	-0.028	
-18 (0)	-0.032	EM

Corrected specific gravity	Approximate charge condition	
1.260 - 1.280	Fully charged	LC
1.230 - 1.250	3/4 charged	EC
1.200 - 1.220	1/2 charged	
1.170 - 1.190	1/4 charged	FE
1.140 - 1.160	Almost discharged	
1.110 - 1.130	Completely discharged	CL

## CHARGING THE BATTERY

NGSC0003S04

### CAUTION:

- Do not “quick charge” a fully discharged battery.
- Keep the battery away from open flame while it is being charged.
- When connecting the charger, connect the leads first, then turn on the charger. Do not turn on the charger first, as this may cause a spark.
- If battery electrolyte temperature rises above 60°C (140°F), stop charging. Always charge battery at a temperature below 60°C (140°F).

## Charging Rates

NGSC0003S0401

Amps	Time	
50	1 hour	SU
25	2 hours	
10	5 hours	BR
5	10 hours	ST

Do not charge at more than 50 ampere rate.

### NOTE:

The ammeter reading on your battery charger will automatically decrease as the battery charges. This indicates that the voltage of the battery is increasing normally as the state of charge improves. The charging amps indicated above refer to initial charge rate.

- If, after charging, the specific gravity of any two cells varies more than .050, the battery should be replaced.

SC

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# STARTING SYSTEM

System Description

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## System Description

NGSC0004

NGSC0004S01

### KA24DE MODELS

Power is supplied at all times

- through 40A fusible link (letter **e**, located in the fuse and fusible link box)
- to ignition switch terminal **B**.

With the ignition switch in the **START** position, power is supplied

- through ignition switch terminal **ST**
- to clutch interlock relay terminal **5**.

With the ignition switch in the **ON** or **START** position, power is supplied

- through 10A fuse [No. 11, located in the fuse block (J/B)]
- to clutch interlock relay terminal **2**.

With the clutch pedal depressed, ground is supplied

- to clutch interlock relay terminal **1**
- through clutch interlock switch terminal **1**
- through clutch interlock switch terminal **2**
- through body grounds **M14** and **M68**.

The clutch interlock relay is energized and power is supplied

- through clutch interlock relay terminal **3**
- to starter motor windings terminal **+**.

The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates.

# STARTING SYSTEM

System Description (Cont'd)

## VG33E M/T MODELS

=NGSC0004S02

Power is supplied at all times

- through 40A fusible link (letter e, located in the fuse and fusible link box)
- to ignition switch terminal B.

With the ignition switch in the START position, power is supplied

- through ignition switch terminal ST
- to clutch interlock relay terminal 5.

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 11, located in the fuse block (J/B)]
- to clutch interlock relay terminal 2 and
- through 7.5A fuse [No. 5, located in the fuse block (J/B)]
- to theft warning relay terminal 2 (models with power door locks).

If the theft warning system is not triggered (models with power door locks) and clutch pedal is depressed, ground is supplied

- to clutch interlock relay terminal 1
- through theft warning relay terminals 3, 4 (models with power door locks) and
- through clutch interlock switch terminal 1
- through clutch interlock switch terminal 2
- through body grounds M14 and M68.

The clutch interlock relay is energized and power is supplied

- through clutch interlock relay terminal 3
- to starter motor windings terminal +.

The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates. If the theft warning system is triggered (models with power door locks), ground is supplied to theft warning relay terminal 1 through smart entrance control unit terminal 32, disengaging the clutch interlock relay and preventing starter motor operation.

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# STARTING SYSTEM

System Description (Cont'd)

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## VG33E A/T MODELS

=NGSC0004S03

Power is supplied at all times

- through 40A fusible link (letter e, located in the fuse and fusible link box)
- to ignition switch terminal B.

With the ignition switch in the START position, power is supplied

- through ignition switch terminal ST
- to park/neutral position (PNP) relay terminal 5.

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to PNP switch terminal 1 and
- through 7.5A fuse [No. 5, located in the fuse block (J/B)]
- to theft warning relay terminal 2 (models with power door locks).

With the selector lever in the P or N position, power is supplied

- through PNP switch terminal 2
- to PNP relay terminal 2.

If the theft warning system is not triggered (models with power door locks), ground is supplied

- to PNP relay terminal 1
- through body grounds E12 and E54 (models without power door locks) or
- through theft warning relay terminals 3, 4 (models with power door locks) and
- through body grounds M14 and M68.

The PNP relay is energized and power is supplied

- through PNP relay terminal 3
- to starter motor windings terminal +.

The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates. If the theft warning system is triggered (models with power door locks), ground is supplied to theft warning relay terminal 1 through smart entrance control unit terminal 32, disengaging the PNP relay and preventing starter motor operation.

# STARTING SYSTEM

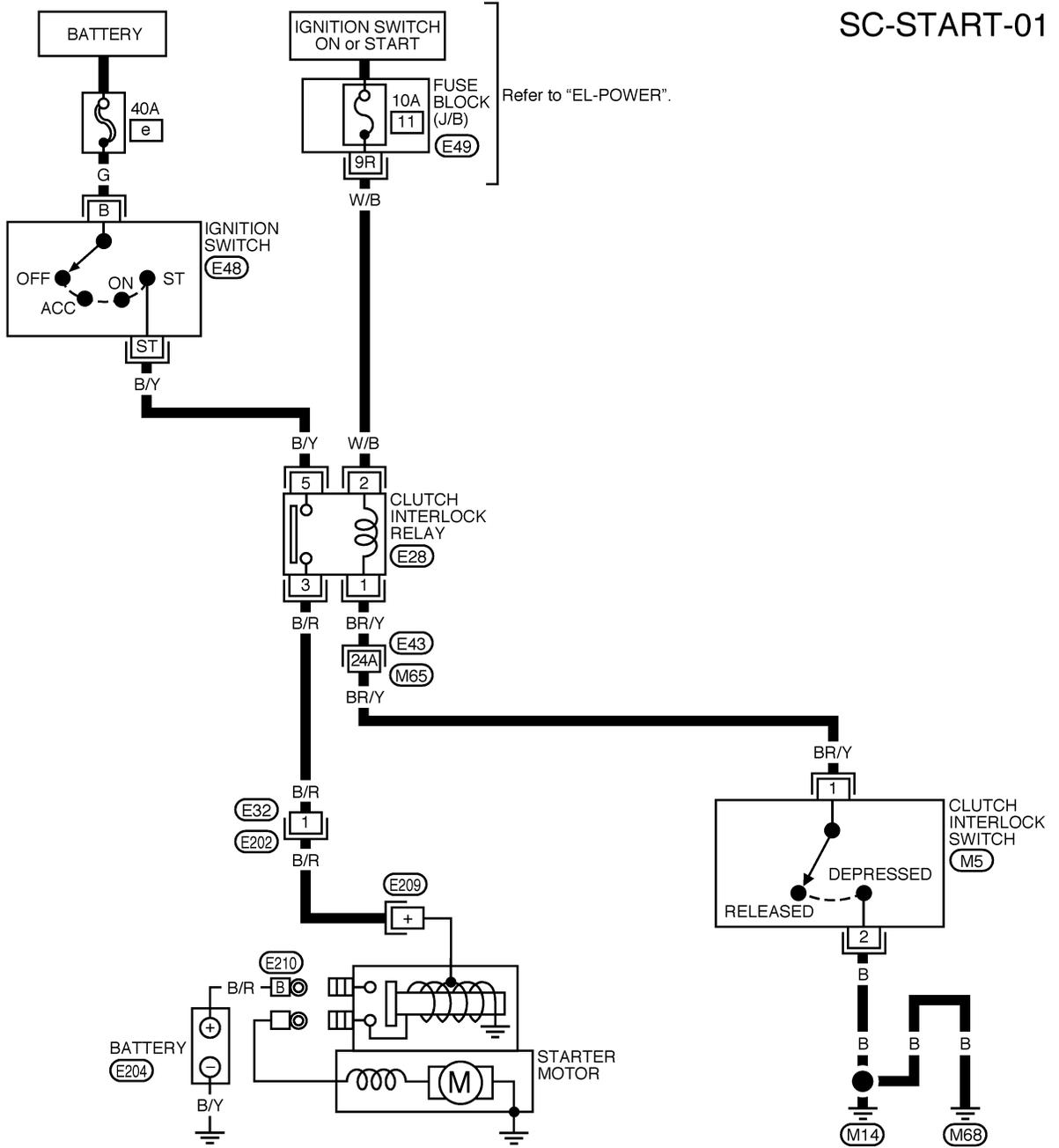
Wiring Diagram — START —

## KA24DE MODELS

NGSC0005

NGSC0005S01

## SC-START-01



Refer to last page (Foldout page).  
 (M65), (E43)

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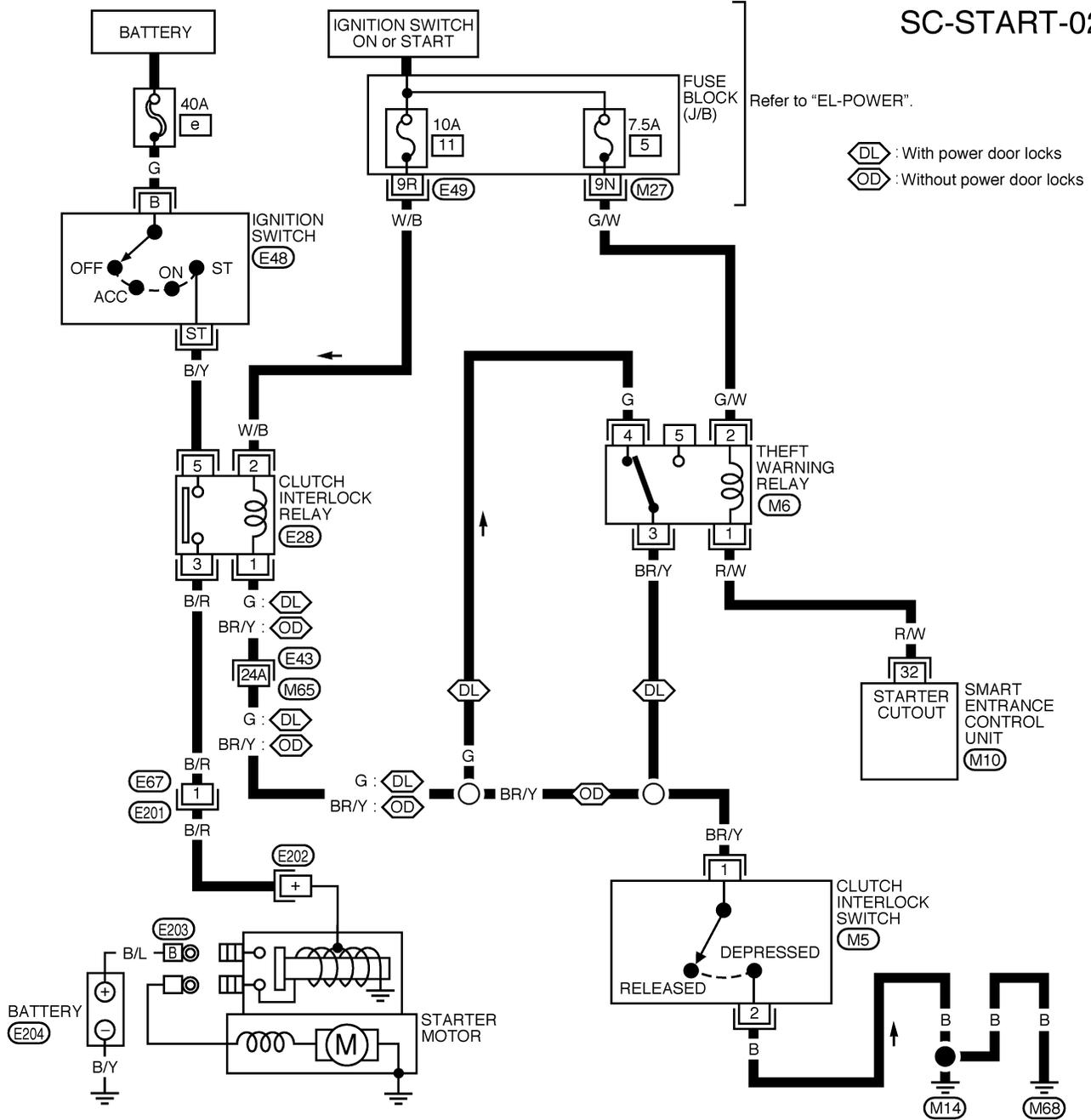
# STARTING SYSTEM

Wiring Diagram — START — (Cont'd)

## VG33E M/T MODELS

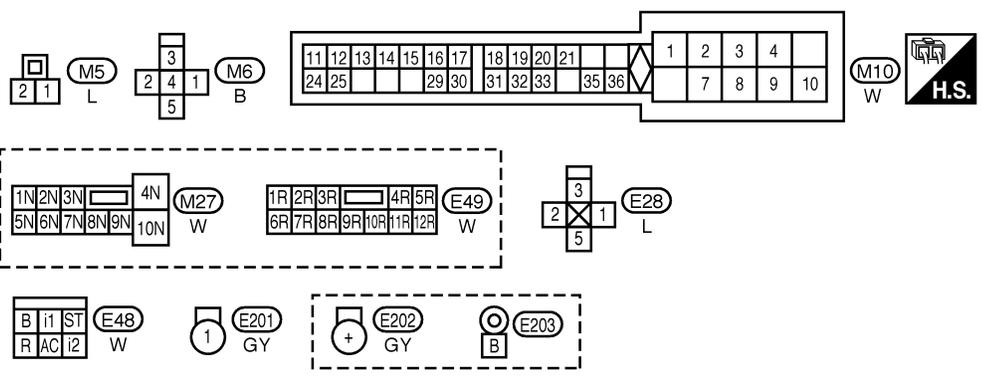
NGSC0005S02

### SC-START-02



Refer to "EL-POWER".

- : With power door locks
- : Without power door locks



Refer to last page (Foldout page).  
 (M65), (E43)

ASC008

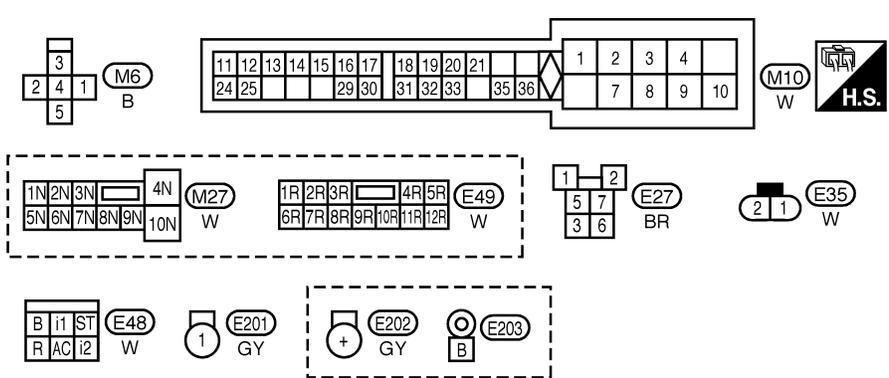
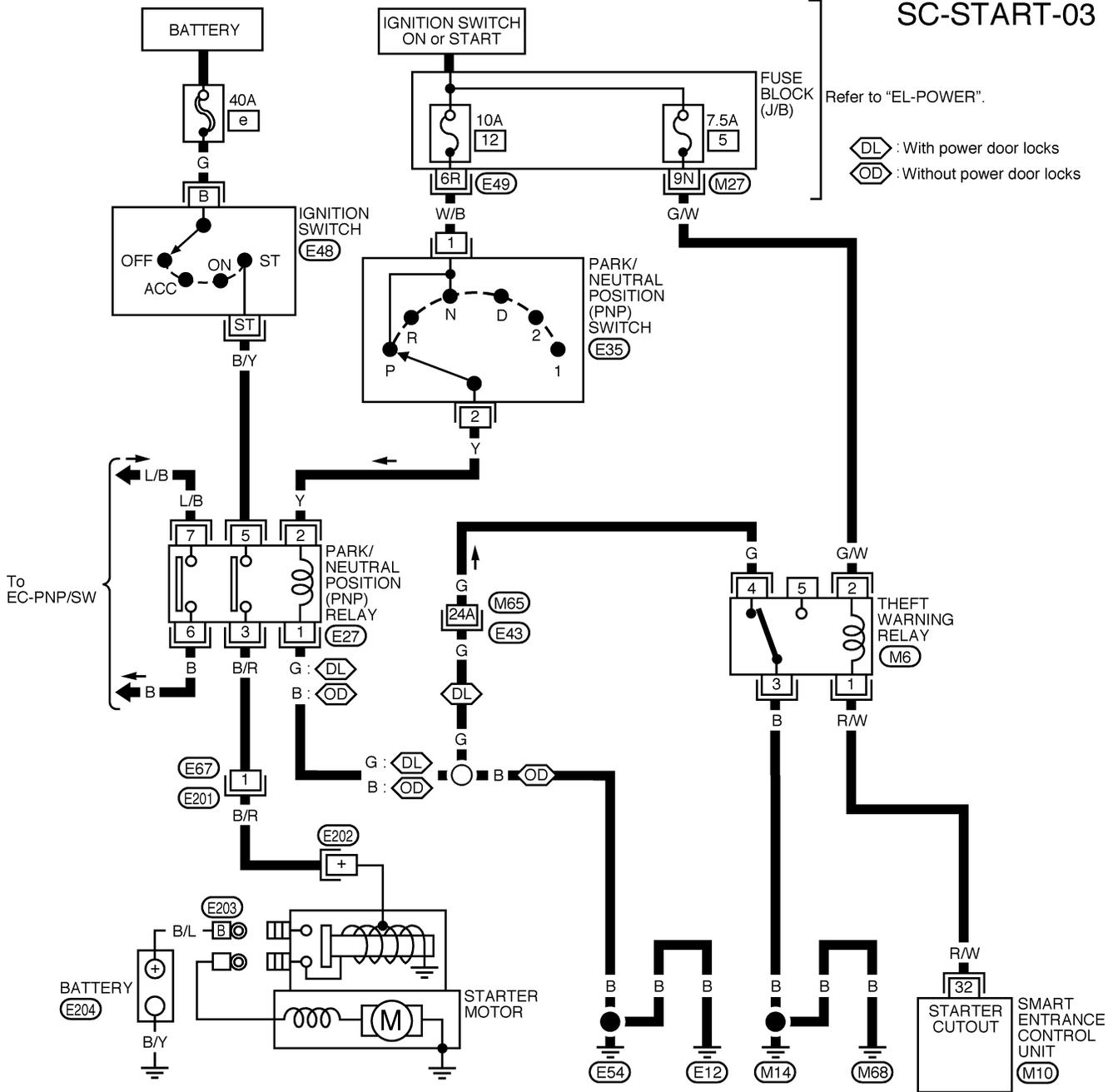
# STARTING SYSTEM

Wiring Diagram — START — (Cont'd)

VG33E A/T MODELS

NGSC0005S03

SC-START-03



Refer to last page (Foldout page).

M65, E43

ASC009

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# STARTING SYSTEM

Construction

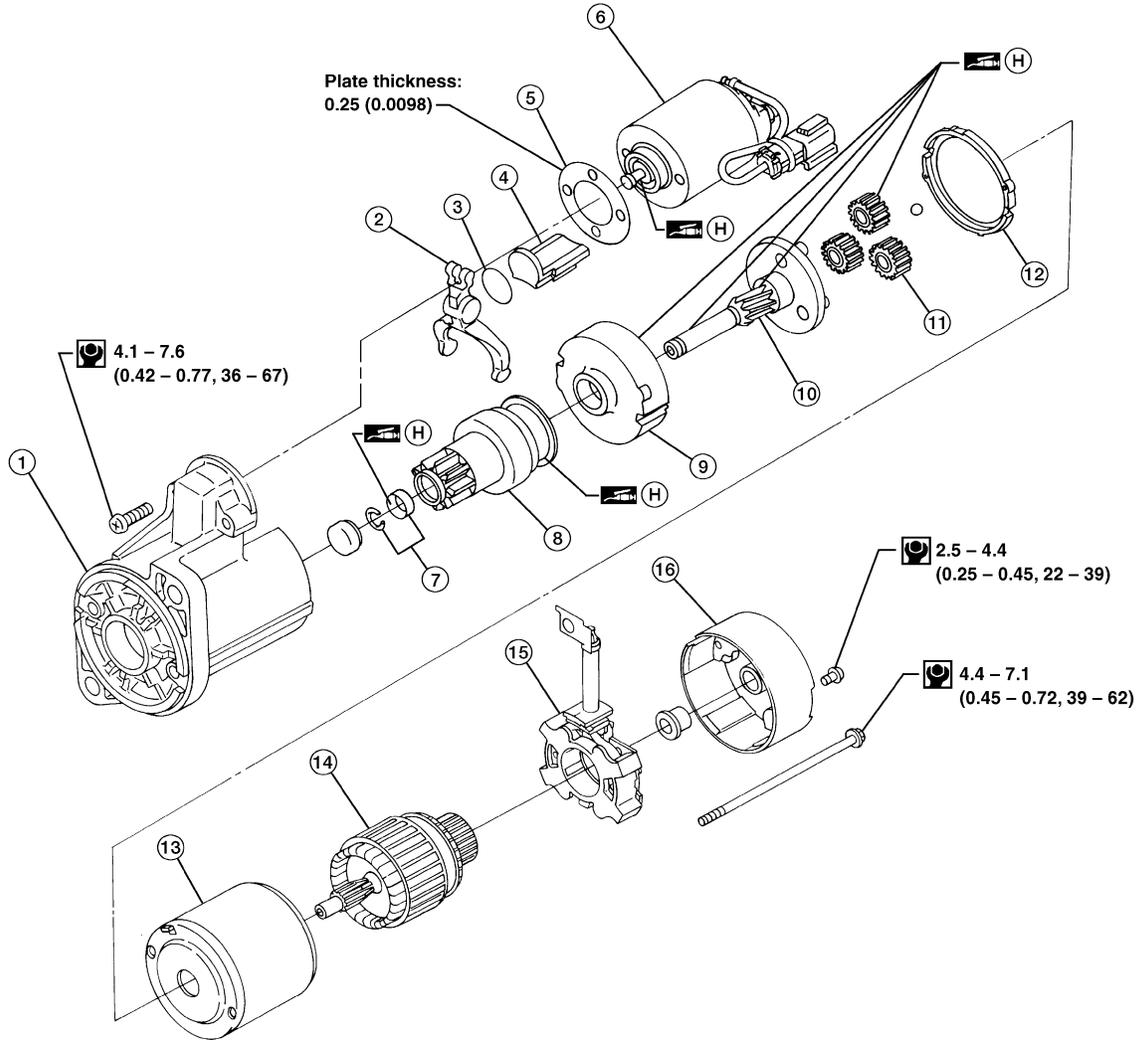
## Construction

NGSC0006

### KA24DE MODELS

NGSC0006S01

SEC. 233  
M000T60081AC



Unit : mm (in)

: N·m (kg-m, in-lb)

(H) : High-temperature grease point

ASC014

- |                             |                       |                           |
|-----------------------------|-----------------------|---------------------------|
| 1. Gear case                | 7. Pinion stopper set | 12. Packing               |
| 2. Shift lever              | 8. Pinion assembly    | 13. Yoke                  |
| 3. Plate                    | 9. Internal gear      | 14. Armature              |
| 4. Packing                  | 10. Pinion shaft      | 15. Brush holder assembly |
| 5. Adjusting plate          | 11. Planetary gear    | 16. Rear cover            |
| 6. Magnetic switch assembly |                       |                           |

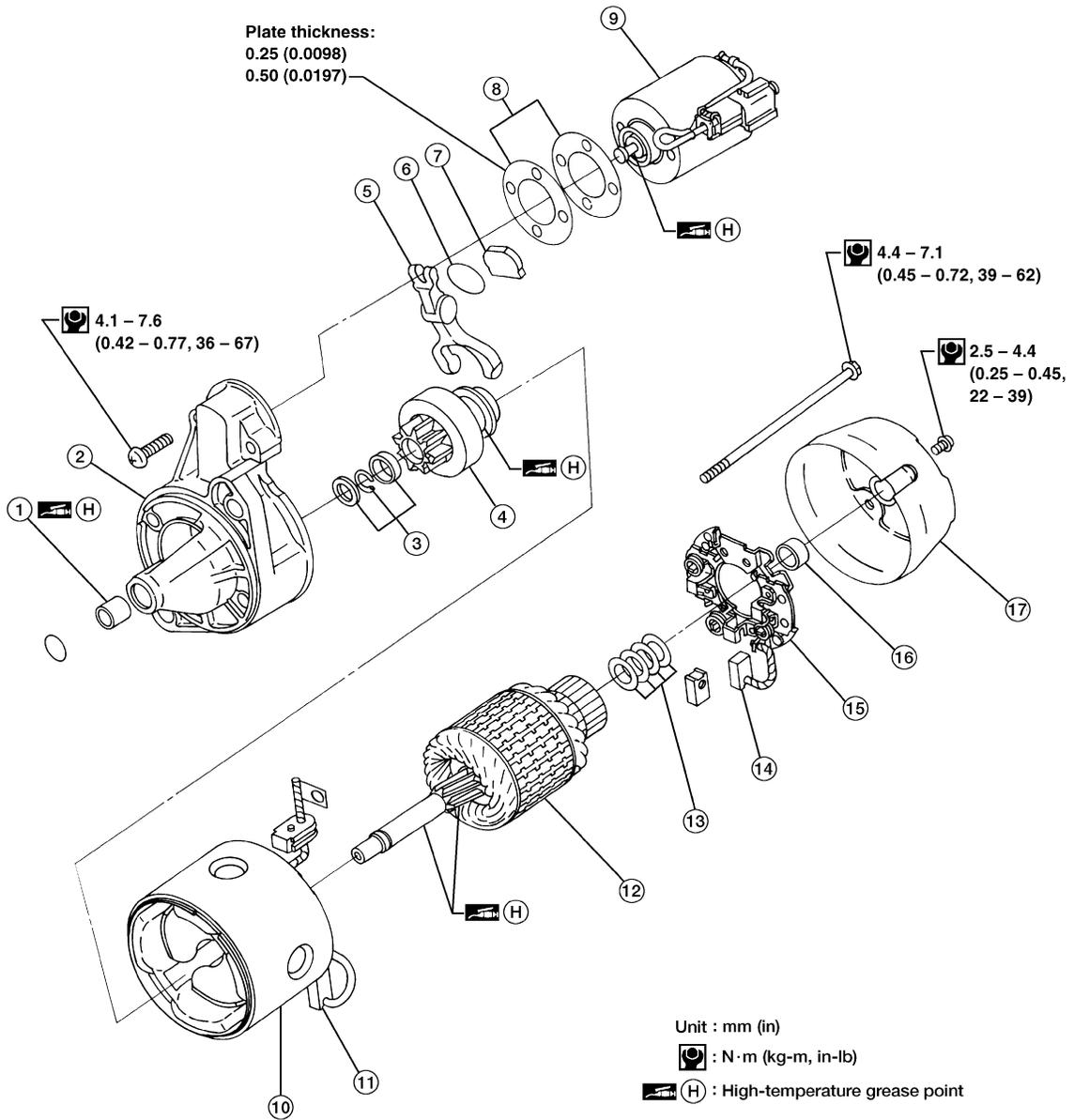
# STARTING SYSTEM

Construction (Cont'd)

## VG33E MODELS

NGCS0006S02

SEC. 233  
M003T70381ZC



ASC015

- |                       |                             |                    |
|-----------------------|-----------------------------|--------------------|
| 1. Sleeve bearing     | 7. Packing                  | 13. Washer         |
| 2. Gear case          | 8. Adjusting plate          | 14. Brush (-)      |
| 3. Pinion stopper set | 9. Magnetic switch assembly | 15. Brush holder   |
| 4. Pinion assembly    | 10. Yoke                    | 16. Sleeve bearing |
| 5. Shift lever        | 11. Brush (+)               | 17. Rear cover     |
| 6. Plate              | 12. Armature                |                    |

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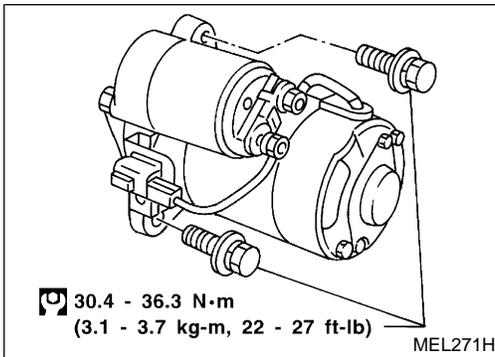
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# STARTING SYSTEM

## Removal and Installation



### Removal and Installation KA24DE MODELS

NGSC0007

NGSC0007S01

NGSC0007S0101

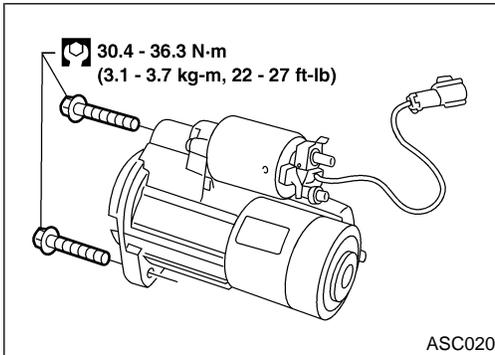
#### Removal

1. Remove engine under cover.
2. Remove two bolts and starter.

#### Installation

To install, reverse the removal procedure.

NGSC0007S0102



### VG33E MODELS

NGSC0007S02

#### Removal

NGSC0007S0201

1. Remove engine under cover.
2. Remove two bolts and starter.

#### Installation

To install, reverse the removal procedure.

NGSC0007S0202

### Pinion/Clutch Check

NGSC0008

1. Inspect pinion teeth.
  - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth.
  - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
  - If it locks or rotates in both directions, or unusual resistance is evident, replace.

## System Description

NGSC0009

The generator provides DC voltage to operate the vehicle's electrical system and to keep the battery charged. The voltage output is controlled by the IC regulator.

Power is supplied at all times to generator terminal S through:

- 80A fusible link [letter **a**, located in the fuse and fusible link box (with KA24DE engine)] or
- 100A fusible link [letter **a**, located in the fuse and fusible link box (with VG33E engine)] and
- 7.5A fuse (No. 36, located in the fuse and fusible link box).

Generator terminal B supplies power to charge the battery and operate the vehicle's electrical system. Output voltage is controlled by the IC regulator at generator terminal S detecting the input voltage. The charging circuit is protected by the 80A fusible link (with KA24DE engine) or the 100A fusible link (with VG33E engine). Ground is supplied to generator terminal E through body ground E203 (with KA24DE engine) or body ground A1 (with VG33E engine).

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 11, located in the fuse block (J/B)]
- to combination meter terminal 17 for the charge warning lamp.

Ground is supplied to combination meter terminal 43 through generator terminal L. With power and ground supplied, the charge warning lamp will illuminate. When the generator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.

If the charge warning lamp illuminates with the engine running, a fault is indicated.

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# CHARGING SYSTEM

Wiring Diagram — CHARGE —

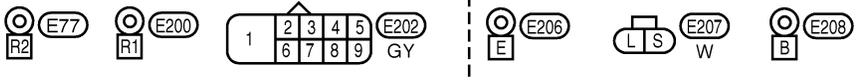
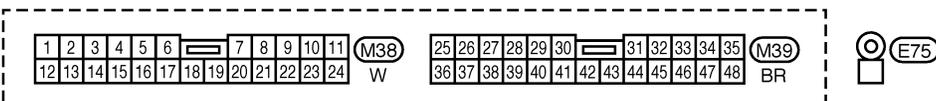
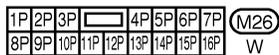
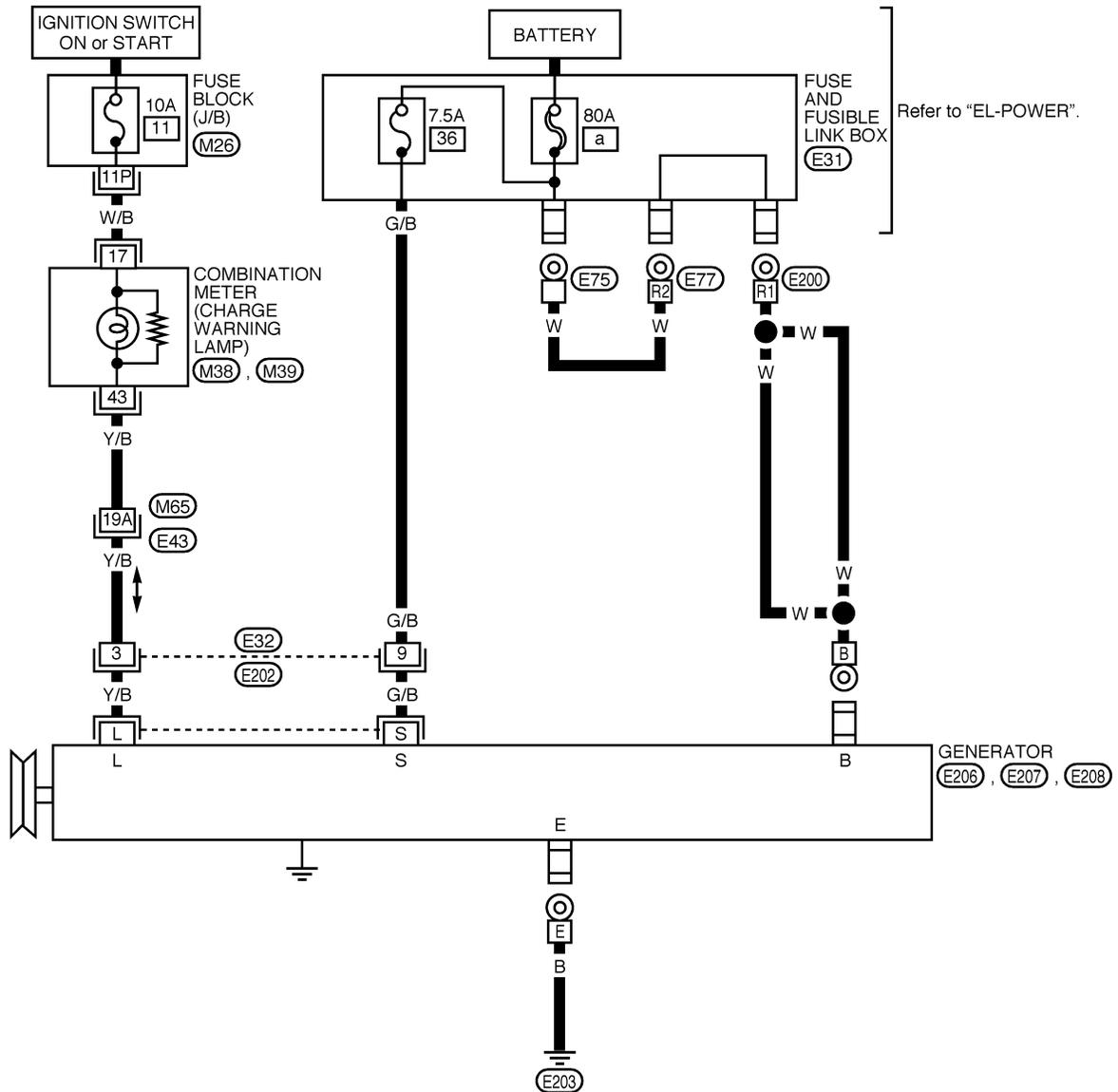
## Wiring Diagram — CHARGE —

NGSC0010

NGSC0010S01

KA24DE MODELS

SC-CHARGE-01



Refer to last page (Foldout page).

(M65), (E43)  
(E31)

ASC010

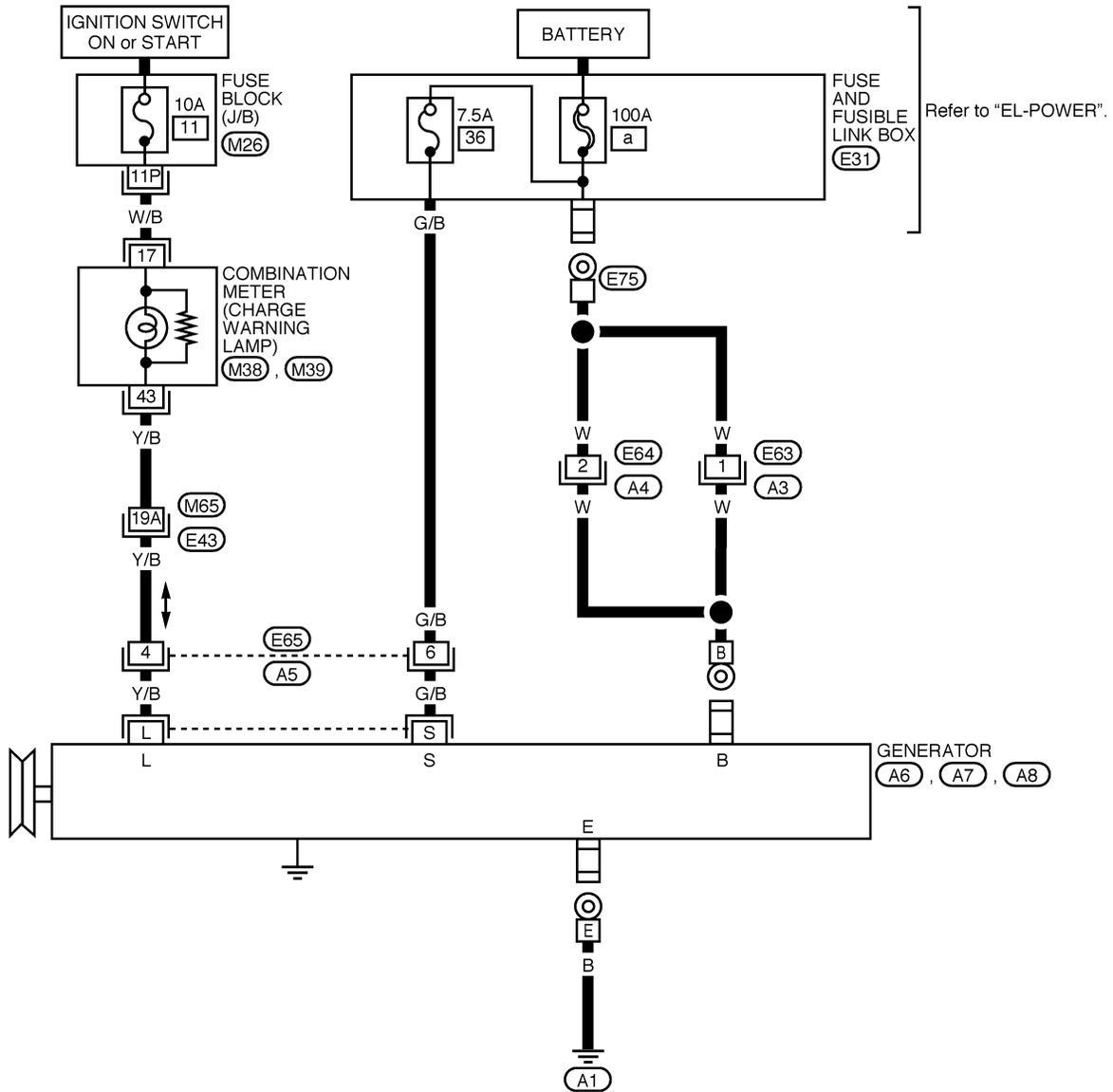
# CHARGING SYSTEM

Wiring Diagram — CHARGE — (Cont'd)

VG33E MODELS

NGSC0010S02

SC-CHARGE-02



Refer to "EL-POWER".

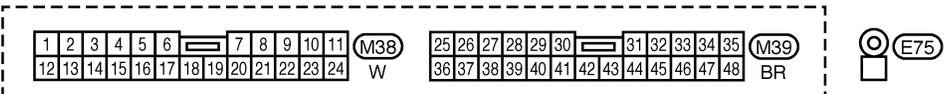
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Refer to last page (Foldout page).

(M65), (E43)  
(E31)

ASC011

# CHARGING SYSTEM

Trouble Diagnoses

## Trouble Diagnoses

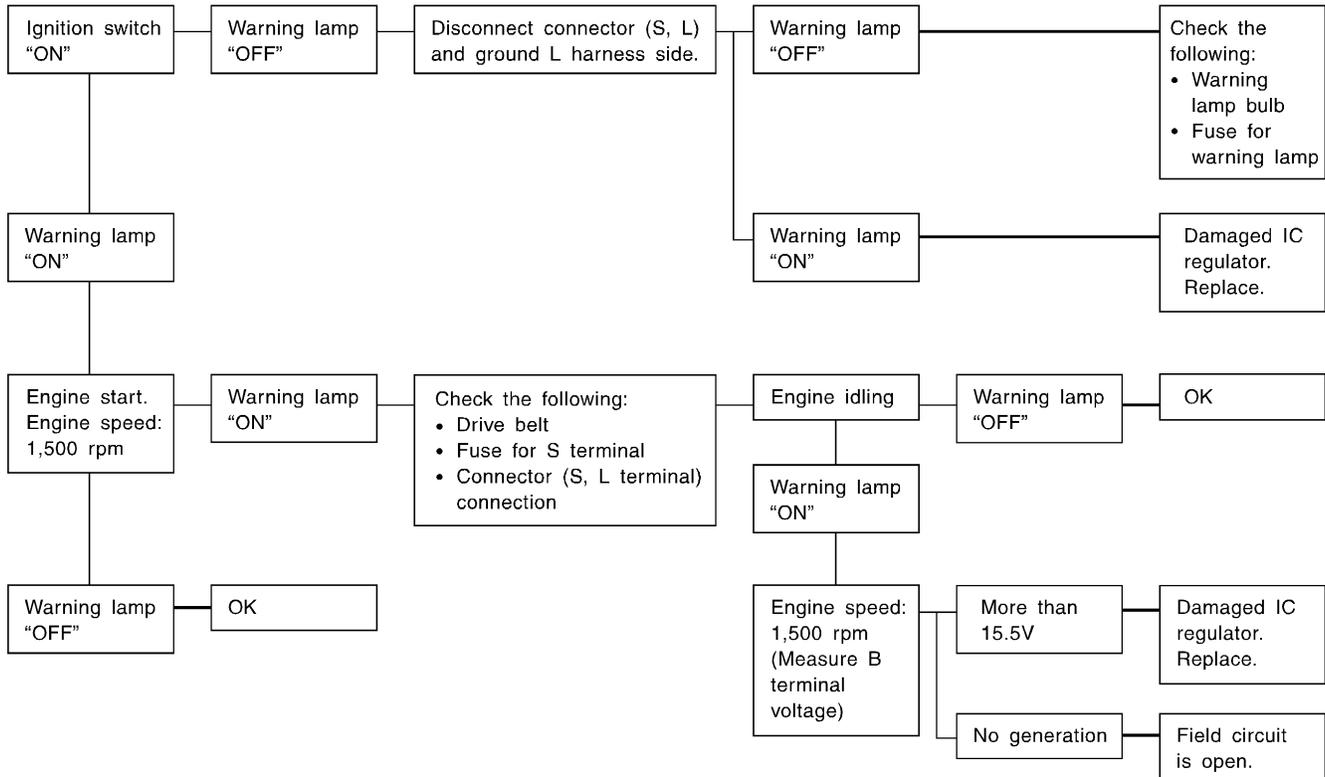
NGSC0011

Before conducting an generator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The generator can be checked easily by referring to the Inspection Table.

- Before starting, inspect the fusible link.
- Use fully charged battery.

### WITH IC REGULATOR

NGSC0011S01



Warning lamp: "CHARGE" warning lamp in combination meter

SEL338V

### NOTE:

- If the inspection result is OK even though the charging system is malfunctioning, check the B terminal connection. (Check the tightening torque.)
- When field circuit is open, check condition of rotor coil, rotor slip ring and brush. If necessary, replace faulty parts with new ones.

### MALFUNCTION INDICATOR

NGSC0011S02

The IC regulator warning function activates to illuminate "CHARGE" warning lamp, if any of the following symptoms occur while generator is operating:

- Excessive voltage is produced.
- No voltage is produced.

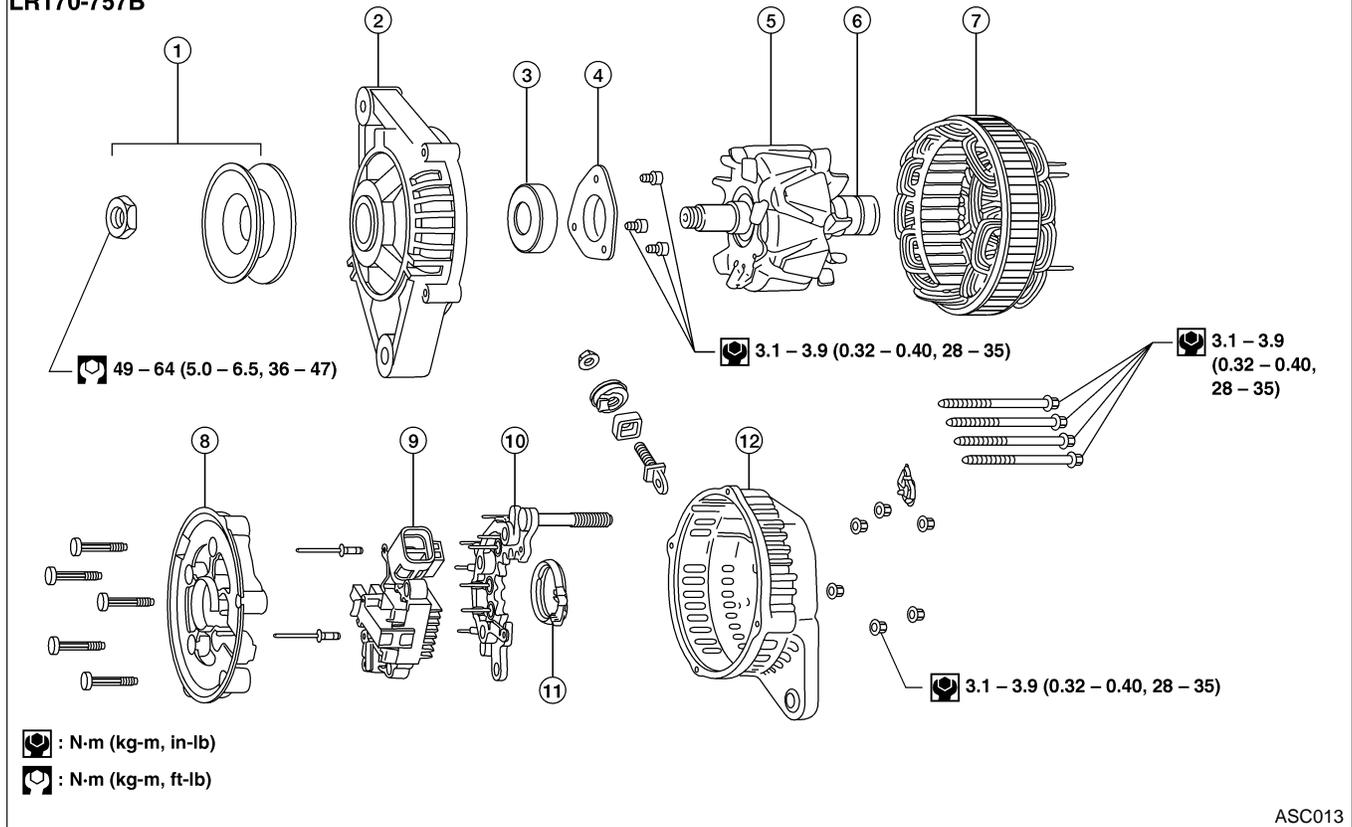
## Construction

NGSC0012

NGSC0012S01

### KA24DE MODELS

SEC. 231  
LR170-757B



ASC013

1. Pulley assembly
2. Front cover
3. Front bearing
4. Retainer

5. Rotor
6. Slip ring
7. Stator
8. Fan guide

9. IC regulator assembly
10. Diode assembly
11. Packing
12. Rear cover

GI

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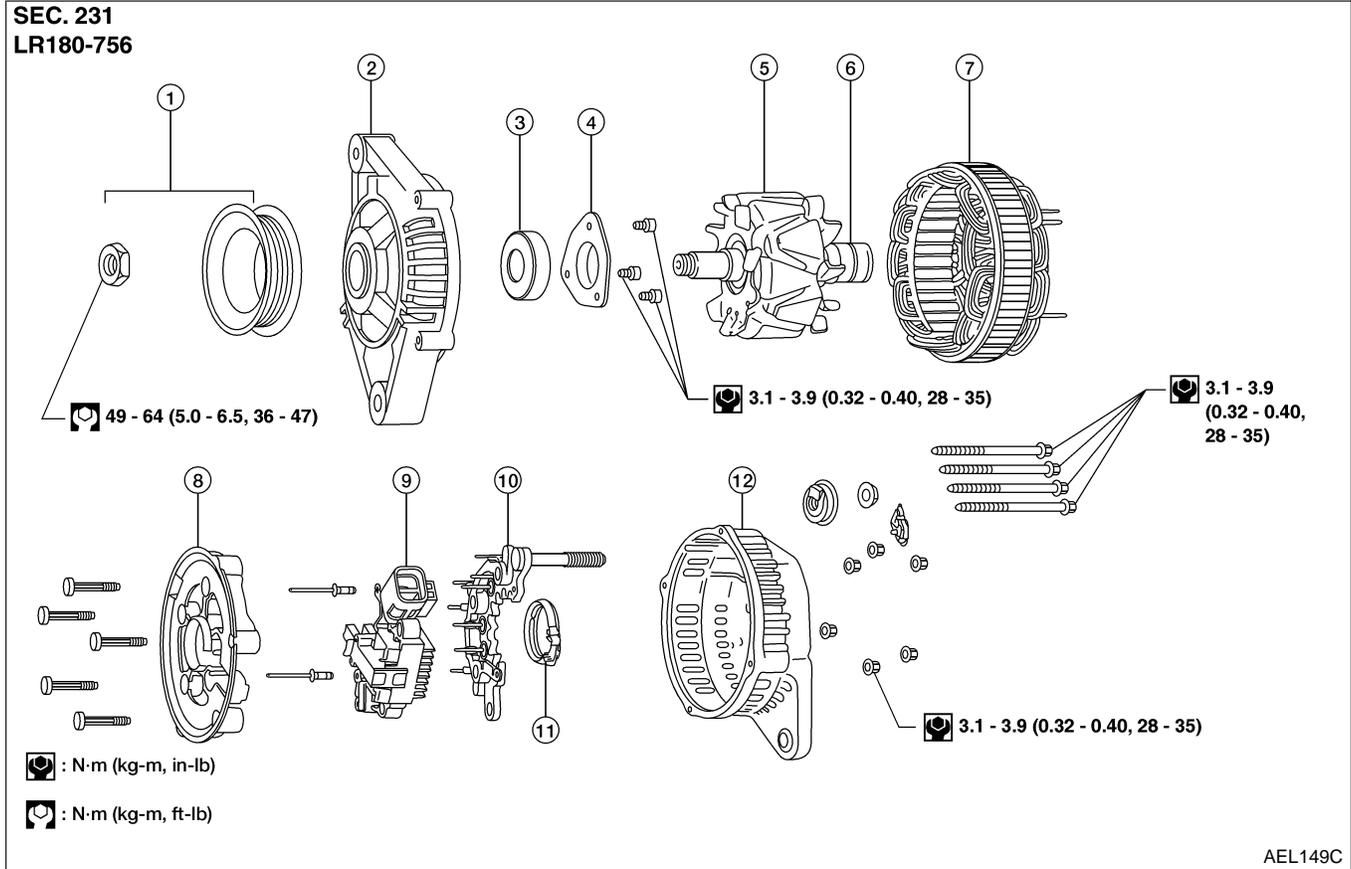
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# CHARGING SYSTEM

Construction (Cont'd)

## VG33E MODELS

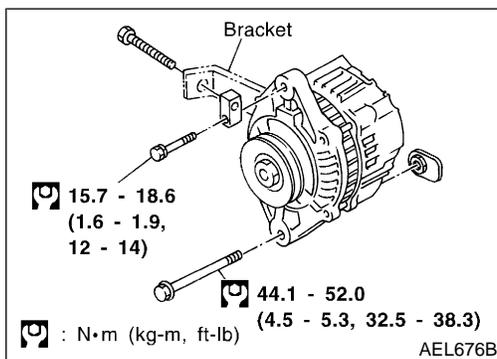
NGSC0012S02



1. Pulley assembly
2. Front cover
3. Front bearing
4. Retainer

5. Rotor
6. Slip ring
7. Stator
8. Fan guide

9. IC regulator assembly
10. Diode assembly
11. Packing
12. Rear cover



## Removal and Installation

### KA24DE MODELS

#### Removal

1. Remove engine undercover.
2. Remove RH side splash shield.
3. Disconnect harness connectors.
4. Loosen adjustment bolt, remove belt.
5. Remove two generator bolts and generator.

#### Installation

To install, reverse the removal procedure.

NGSC0013

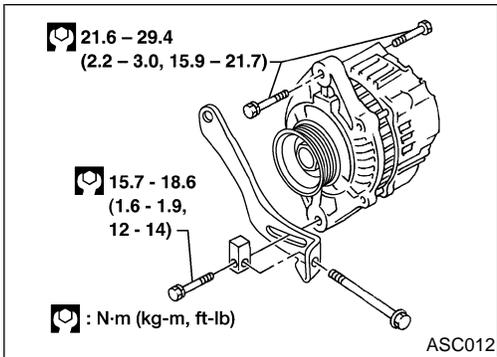
NGSC0013S01

NGSC0013S0101

NGSC0013S0102

# CHARGING SYSTEM

Removal and Installation (Cont'd)



## VG33E MODELS

### Removal

1. Disconnect harness connectors.
2. Remove engine undercover.
3. Loosen adjustment bolt, remove belt.
4. Remove 3 generator bolts and generator.

### Installation

To install, reverse the removal procedure.

NGSC0013S02

NGSC0013S0201

GI

MA

EM

NGSC0013S0202

LC

EC

FE

CL

MT

AT

TF

PD

AX

SU

BR

ST

RS

BT

HA

SC

EL

IDX

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Battery

### Battery

NGSC0014

Applied area	USA	Canada
Type	55D23R	65D26R
Capacity V-AH	12-60	12-65
Cold cranking current A (For reference value)	356	413

### Starter

NGSC0015

Engine	KA24DE	VG33E
Type	M000T60081AC	M000T60185ZC
	MITSUBISHI make	
	Reduction gear type	
System voltage	12 V	
No-load	Terminal voltage	11.0 V
	Current	Less than 90 A
	Revolution	More than 2,500 rpm
Minimum diameter of commutator	28.8 mm (1.134 in)	
Minimum length of brush	7.0 mm (0.276 in)	
Brush spring tension	11.8 - 23.5 N (1.20 - 2.40 kg, 2.65 - 5.28 lb)	
Clearance of bearing metal and armature shaft mm (in)	0.2 (0.008)	
Clearance between pinion front edge and pinion stopper mm (in)	0.5 - 2.0 (0.020 - 0.079)	

### Generator

NGSC0016

Engine	KA24DE	VG33E
Type	LR170-757B	LR180-756
	HITACHI make	
Nominal rating	12 V-70 A	12 V-90 A
Ground polarity	Negative	
Minimum revolution under no-load (When 13.5 volts is applied)	Less than 1,000 rpm	
Hot output current (When 13.5 volts is applied)	More than 17 A/1,300 rpm More than 54 A/2,500 rpm More than 72 A/5,000 rpm	More than 23 A/1,300 rpm More than 65 A/2,500 rpm More than 77 A/5,000 rpm
Regulated output voltage	14.1 - 14.7 V	
Minimum length of brush	6.0 mm (0.236 in)	
Brush spring pressure	1.000 - 2.452 N (102 - 250 g, 3.60 - 8.82 oz)	
Slip ring minimum outer diameter	26.0 mm (1.024 in)	
Rotor (Field coil) resistance	2.6 Ω	2.7 Ω