

# STARTING & CHARGING SYSTEM

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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"

NESCO001

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

The vehicle (except crew cab model) is equipped with a passenger air bag deactivation switch. Because no rear seat exists where a rear-facing child restraint can be placed, the switch is designed to turn off the passenger air bag so that a rear-facing child restraint can be used in the front passenger seat. The switch is located in the center of the instrument panel, near the ashtray. When the switch is turned to the ON position, the passenger air bag is enabled and could inflate in a frontal collision. When the switch is turned to the OFF position, the passenger air bag is disabled and will not inflate in a frontal collision. A passenger air bag OFF indicator on the instrument panel lights up when the passenger air bag is switched OFF. The driver air bag always remains enabled and is not affected by the passenger air bag deactivation switch.

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 should 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, see the RS section.
- 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") are covered with yellow insulation either just before the harness connectors or on the complete harness, for easy identification.
- The vehicle (except crew cab model) is equipped with a passenger air bag deactivation switch which can be operated by the customer. When the passenger air bag is switched OFF, the passenger air bag is disabled and will not inflate in a frontal collision. When the passenger air bag is switched ON, the passenger air bag is enabled and could inflate in a frontal collision. After SRS maintenance or repair, make sure the passenger air bag deactivation switch is in the same position (ON or OFF) as when the vehicle arrived for service.

### Wiring Diagrams and Trouble Diagnosis

NESCO002

When you read wiring diagrams, refer to the following:

- "HOW TO READ WIRING DIAGRAMS", **GI-11**
- "POWER SUPPLY ROUTING" for power distribution circuit, **EL-8**

When you perform trouble diagnosis, refer to the following:

- "HOW TO FOLLOW TEST GROUP IN TROUBLE DIAGNOSIS", **GI-35**
- "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT", **GI-24**

# BATTERY

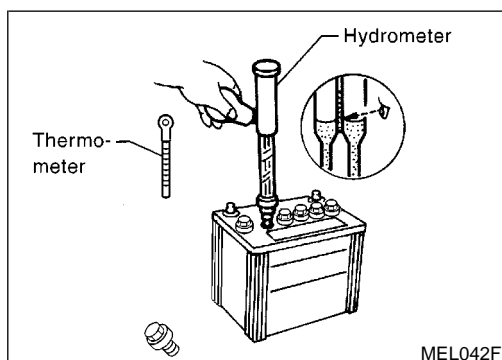
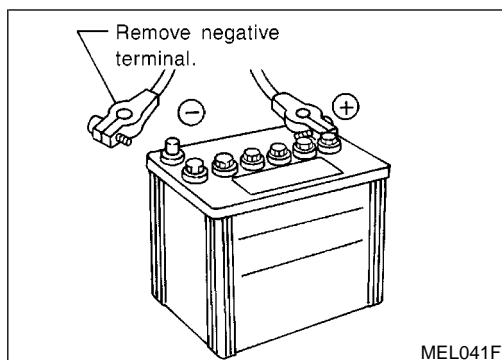
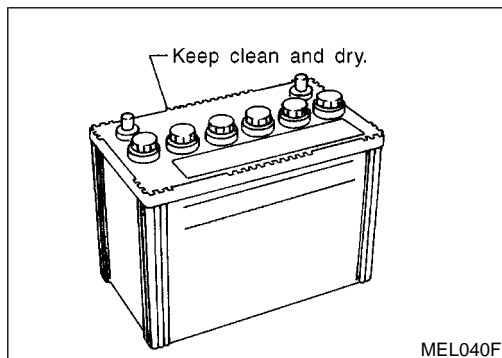
How to Handle Battery

## How to Handle Battery

NESEC0003

### 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

NESEC0003S01

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

NESEC0003S02

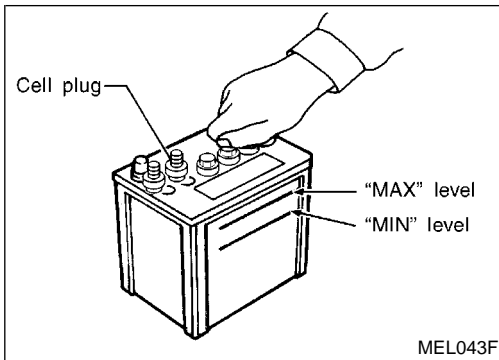
### WARNING:

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.

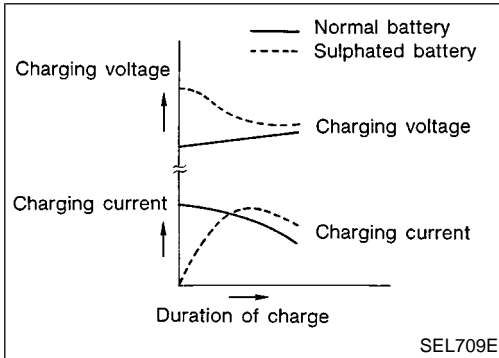
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# BATTERY

## How to Handle Battery (Cont'd)



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



## Sulphation

NESC0003S0201

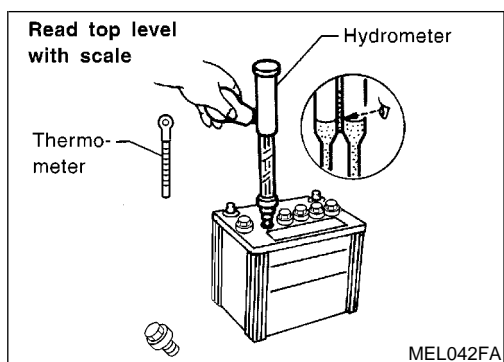
A battery will be completely discharged if it is left unattended for a long time and the specific gravity will become less than 1.100. This may result in sulphation on the cell plates.

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.

# BATTERY

How to Handle Battery (Cont'd)



## SPECIFIC GRAVITY CHECK

=NESC0003S03

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

NESC0003S0301

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
4 (39)	-0.016
-1 (30)	-0.020
-7 (20)	-0.024
-12 (10)	-0.028
-18 (0)	-0.032

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

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# BATTERY

## CHARGING THE BATTERY

=NESC0003S04

### 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

NESC0003S0401

Amps	Time
50	1 hour
25	2 hours
10	5 hours
5	10 hours

**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.

# STARTING SYSTEM

System Description

## System Description

NESC0004

NESC0004S07

### KA24DE M/T 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 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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## KA24DE A/T MODELS

-NESC0004S06

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. 11, 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

System Description (Cont'd)

## VG33E M/T MODELS

-NESC0004S02

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

-NESC0004S03

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 7.5A 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

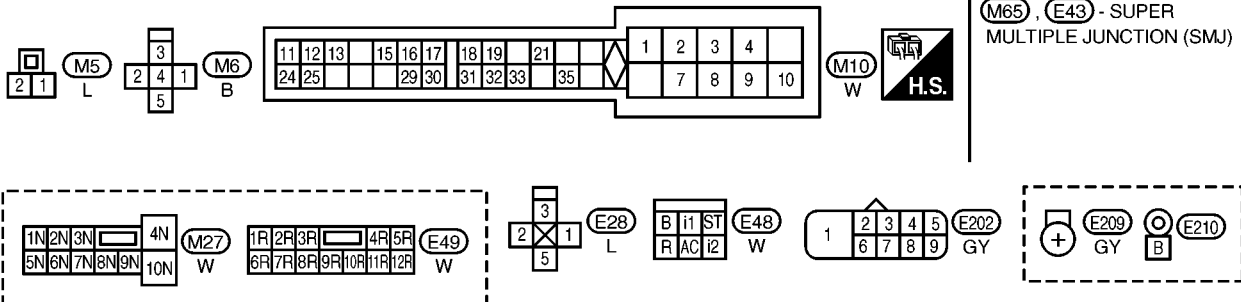
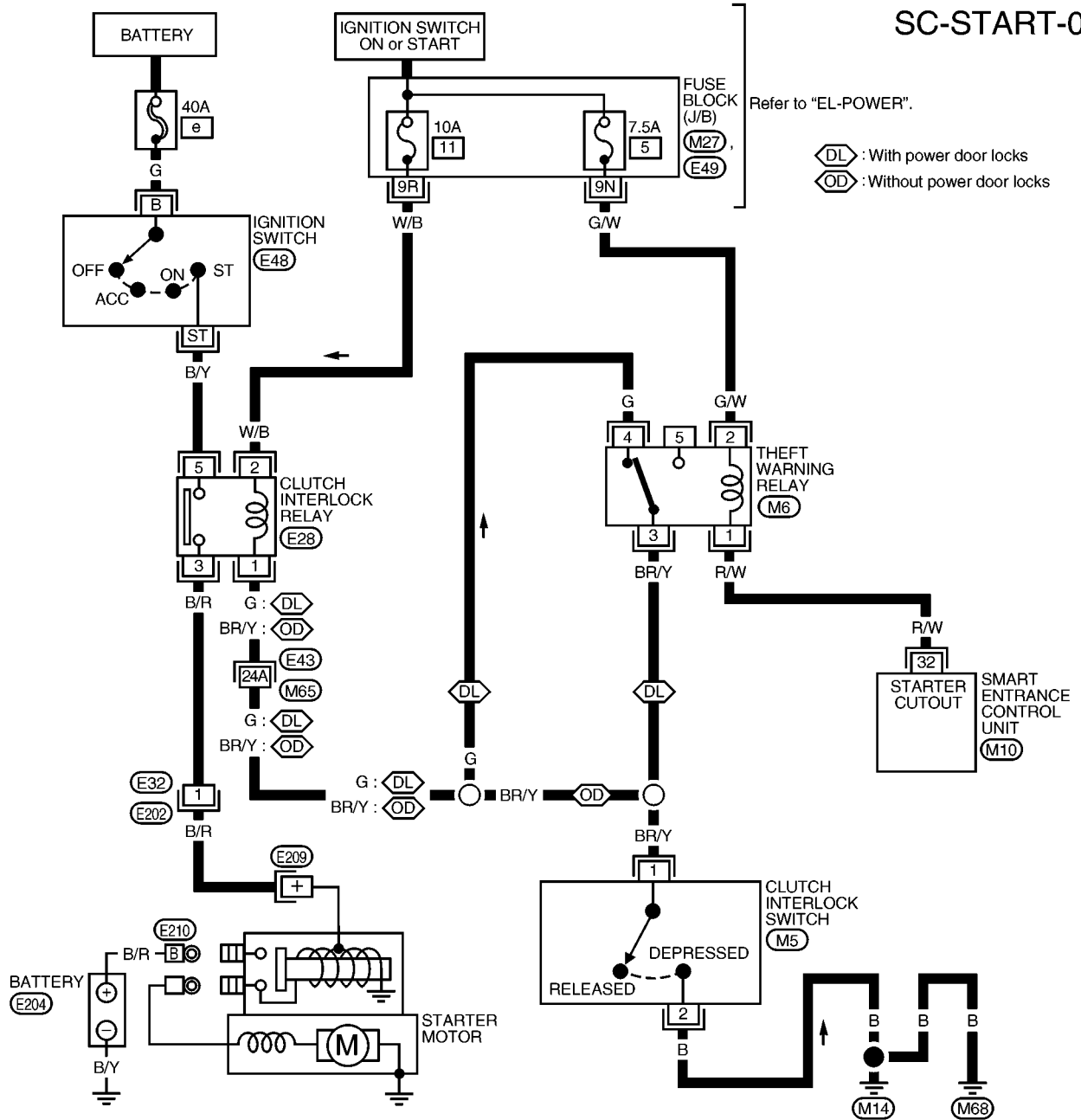
Wiring Diagram — START —

KA24DE M/T MODELS

NESC0005  
NESC0005S01

## Wiring Diagram — START —

SC-START-01



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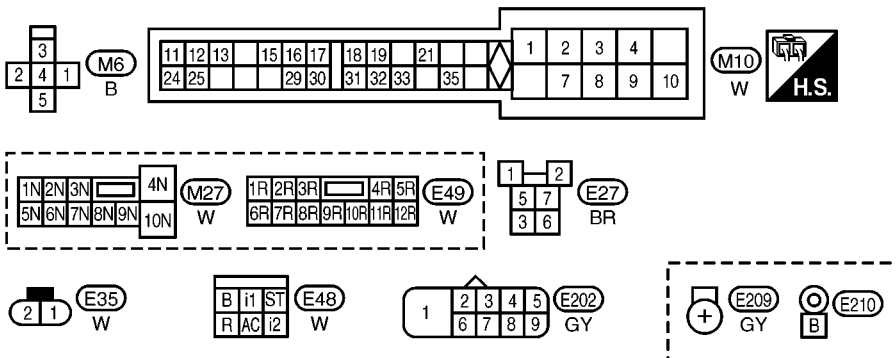
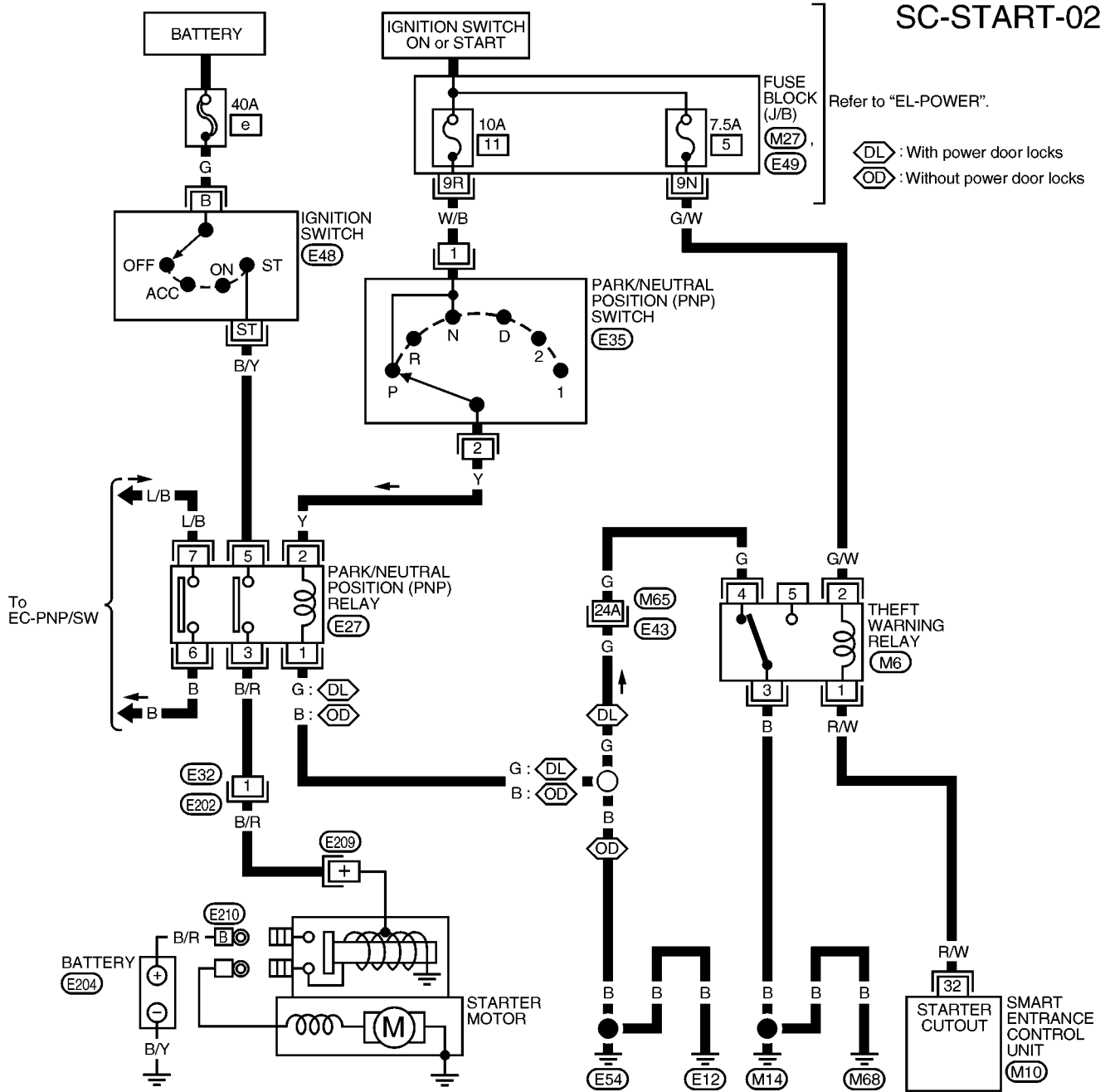
# STARTING SYSTEM

Wiring Diagram — START — (Cont'd)

KA24DE A/T MODELS

NESS0005S02

SC-START-02



Refer to the following.  
 (M65), (E43) - SUPER  
 MULTIPLE JUNCTION (SMJ)

ASC017

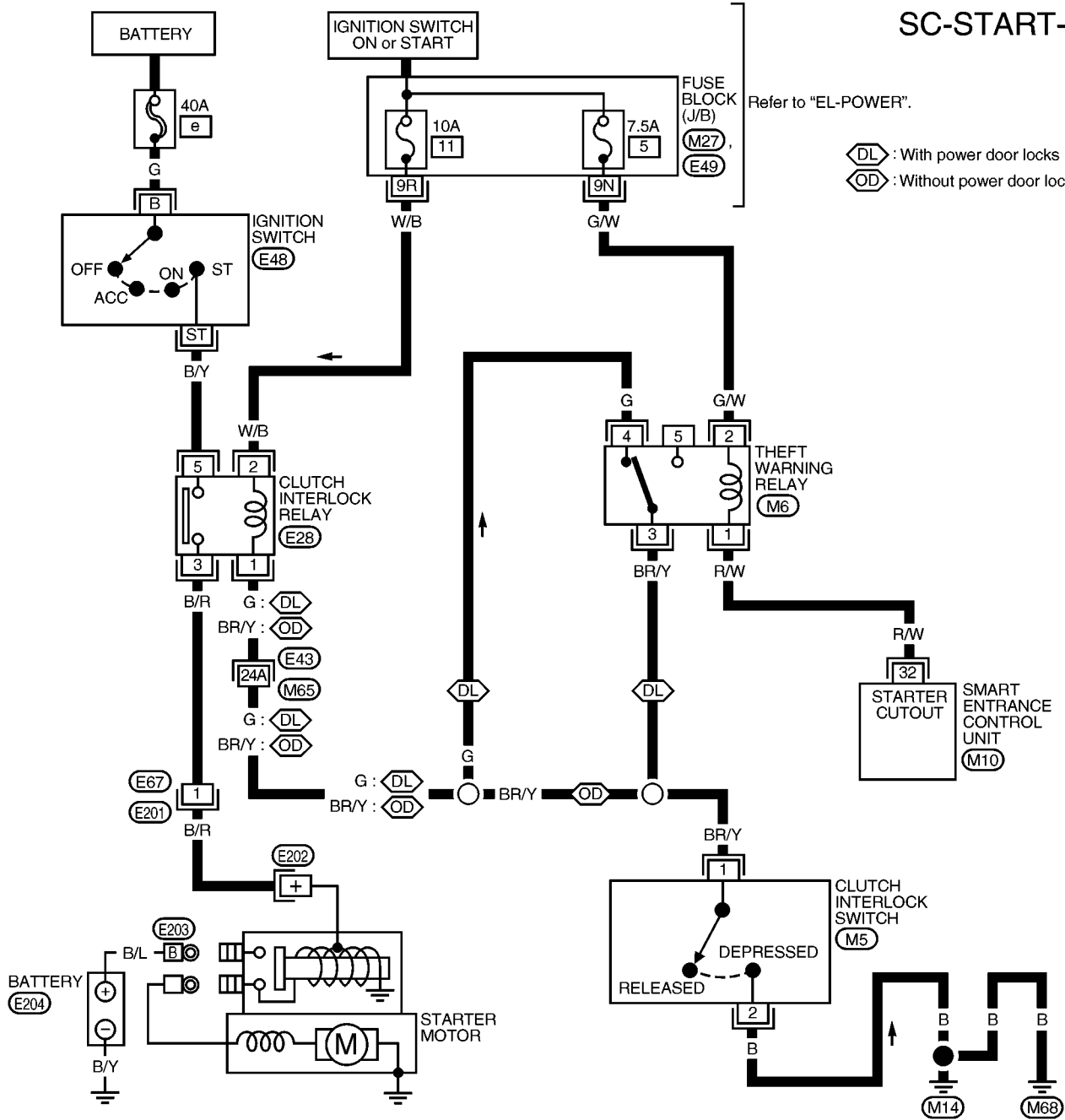
# STARTING SYSTEM

Wiring Diagram — START — (Cont'd)

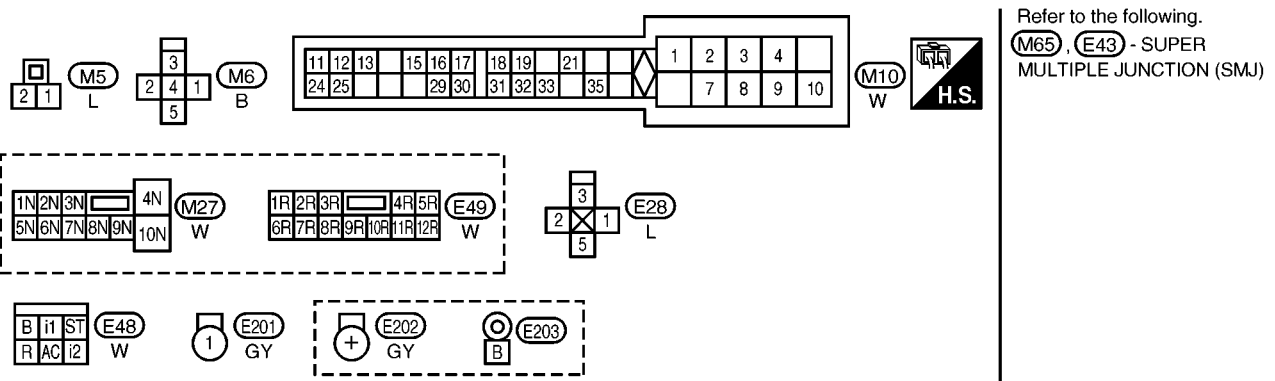
VG33E M/T MODELS

NESC0005S03

SC-START-03



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ASC018

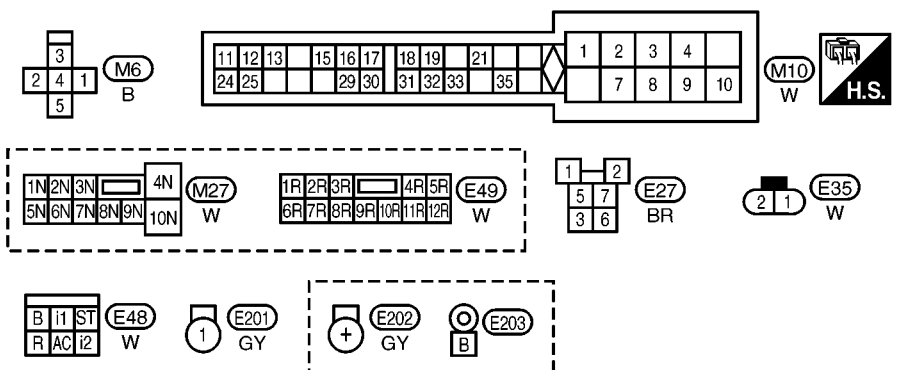
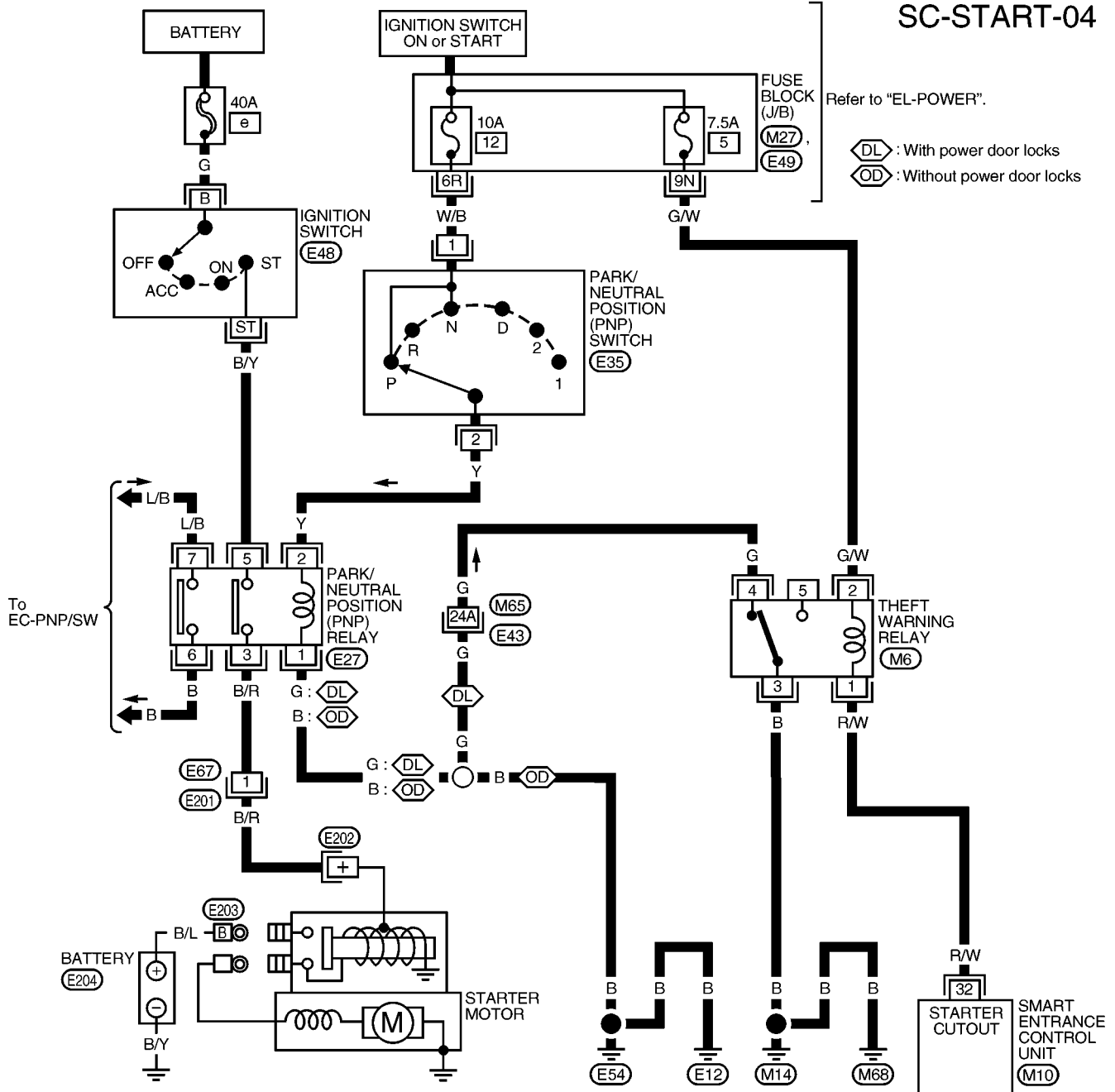
# STARTING SYSTEM

Wiring Diagram — START — (Cont'd)

VG33E A/T MODELS

NESC0005S04

SC-START-04



Refer to the following.  
M65, E43 - SUPER MULTIPLE JUNCTION (SMJ)

ASC019

# STARTING SYSTEM

Construction

## Construction

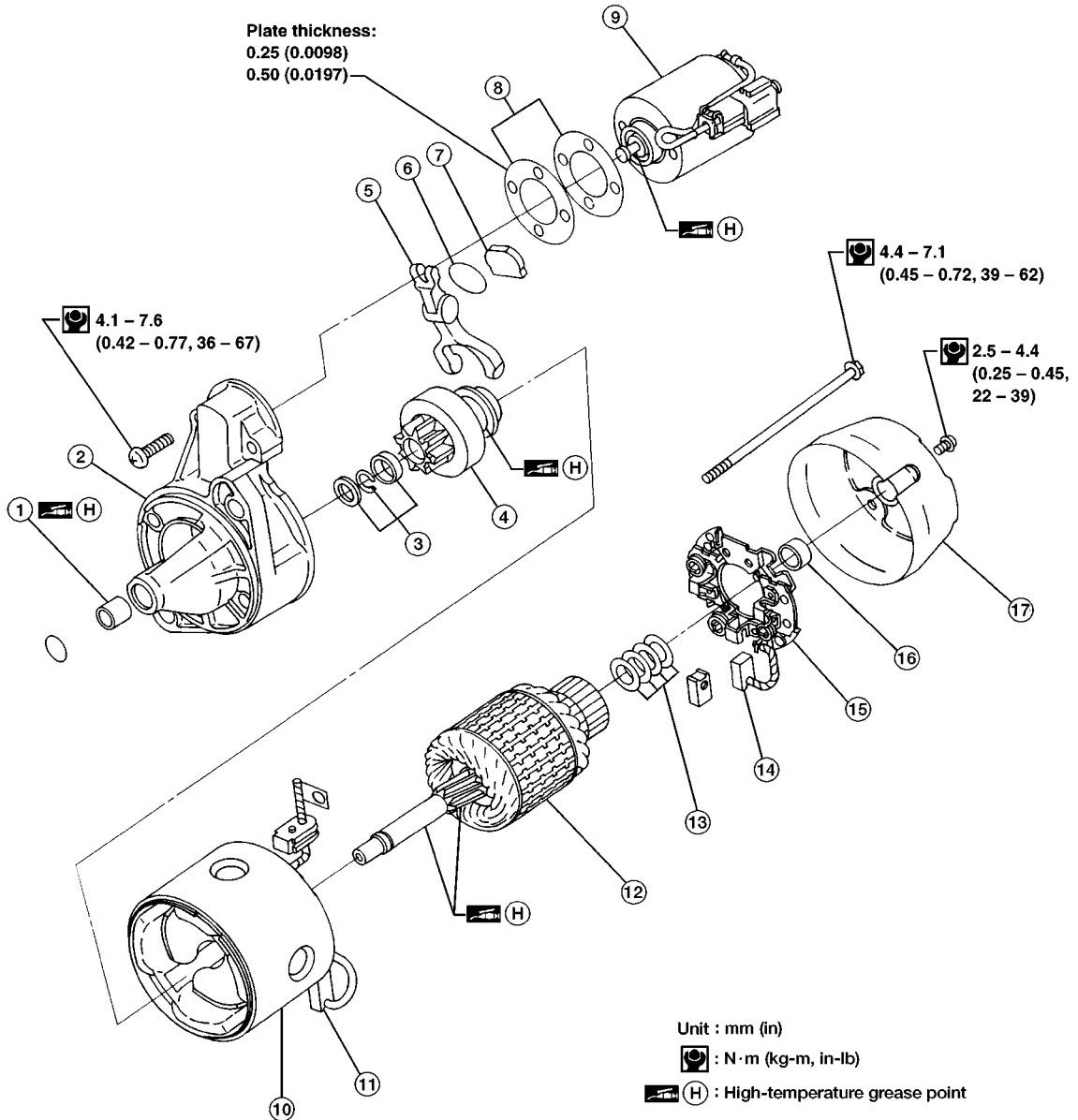
KA24DE MODELS  
California, USA

NESC0006

NESC0006S01

NESC0006S0101

SEC. 233  
M003T70381ZC



ASC015

1. Sleeve bearing
2. Gear case
3. Pinion stopper set
4. Pinion assembly
5. Shift lever
6. Plate

7. Packing
8. Adjusting plate
9. Magnetic switch assembly
10. Yoke
11. Brush (+)
12. Armature

13. Washer
14. Brush (-)
15. Brush holder
16. Sleeve bearing
17. Rear cover

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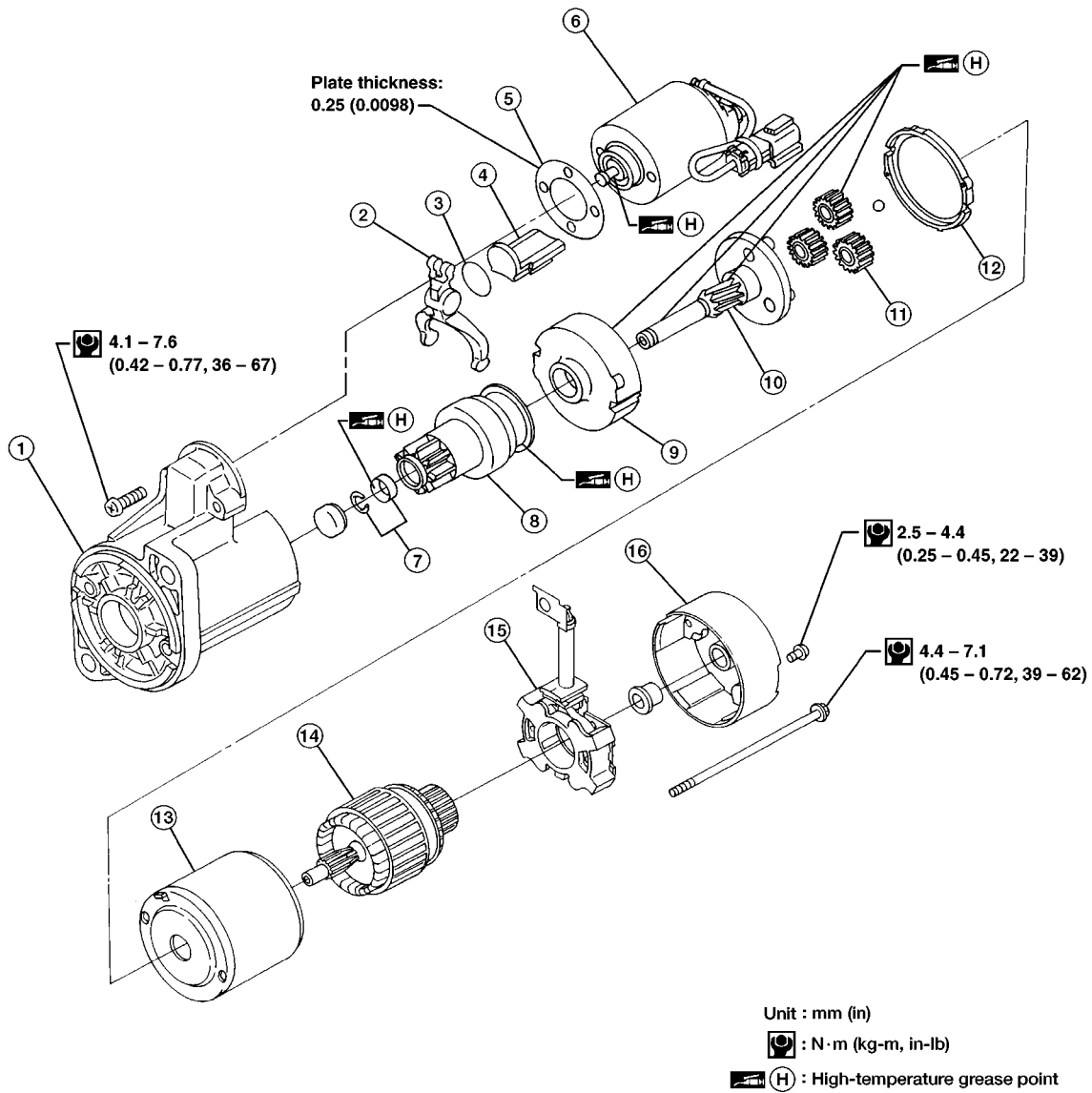
# STARTING SYSTEM

Construction (Cont'd)

Non-California, USA and Canada

NESC0006S0102

SEC. 233  
M000T60081AC



ASC014

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|-----------------------------|-----------------------|---------------------------|
| 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 |                       |                           |



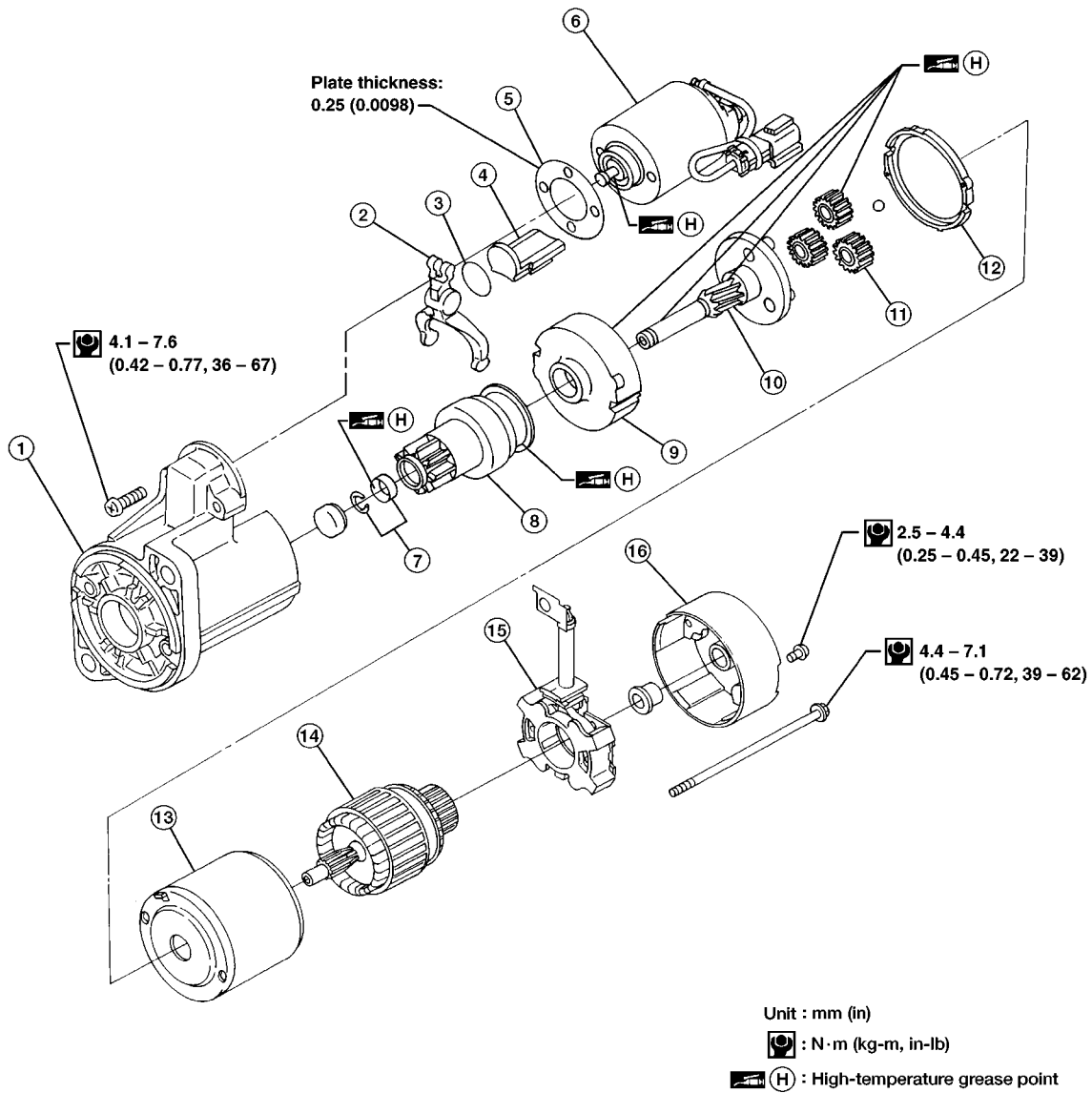
# STARTING SYSTEM

Construction (Cont'd)

## VG33E MODELS

NECS0006S02

SEC. 233  
M000T60081AC



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 |                       |                           |

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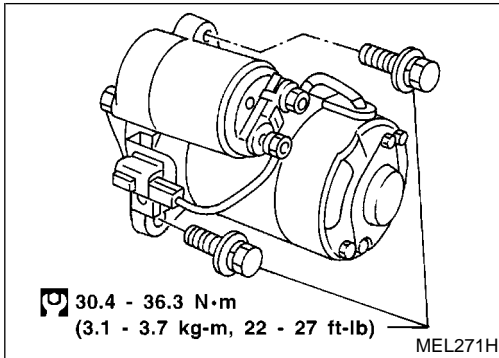
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# STARTING SYSTEM

## Removal and Installation



### Removal and Installation

#### KA24DE MODELS

##### Removal

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

##### Installation

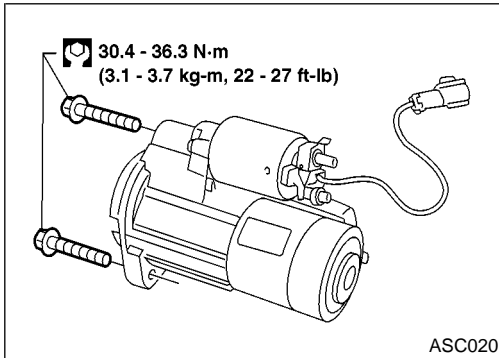
To install, reverse the removal procedure.

NESC0007

NESC0007S01

NESC0007S0101

NESC0007S0102



#### VG33E MODELS

##### Removal

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

##### Installation

To install, reverse the removal procedure.

NESC0007S02

NESC0007S0201

NESC0007S0202

### Pinion/Clutch Check

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.

NESC0008

## System Description

NESC0009

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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RS

BT

HA

SC

EL

IDX

# CHARGING SYSTEM

Wiring Diagram — CHARGE —

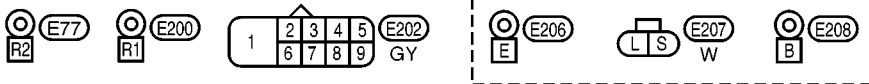
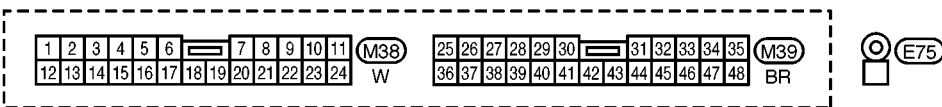
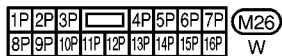
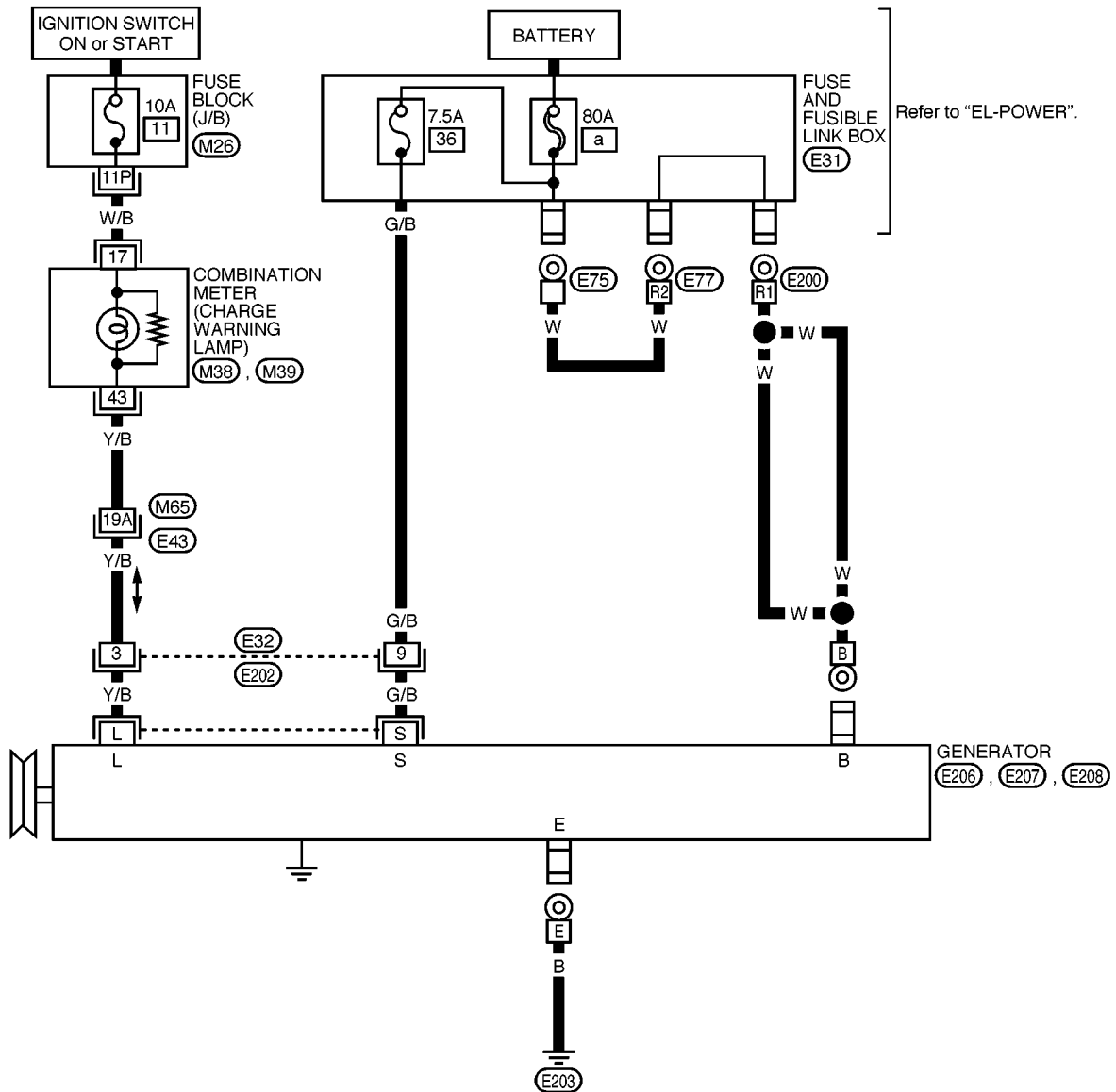
## Wiring Diagram — CHARGE —

NESC0010

NESC0010S01

KA24DE MODELS

SC-CHARGE-01



Refer to last page (Foldout page).

(M65), (E43)  
(E31)

ASC010

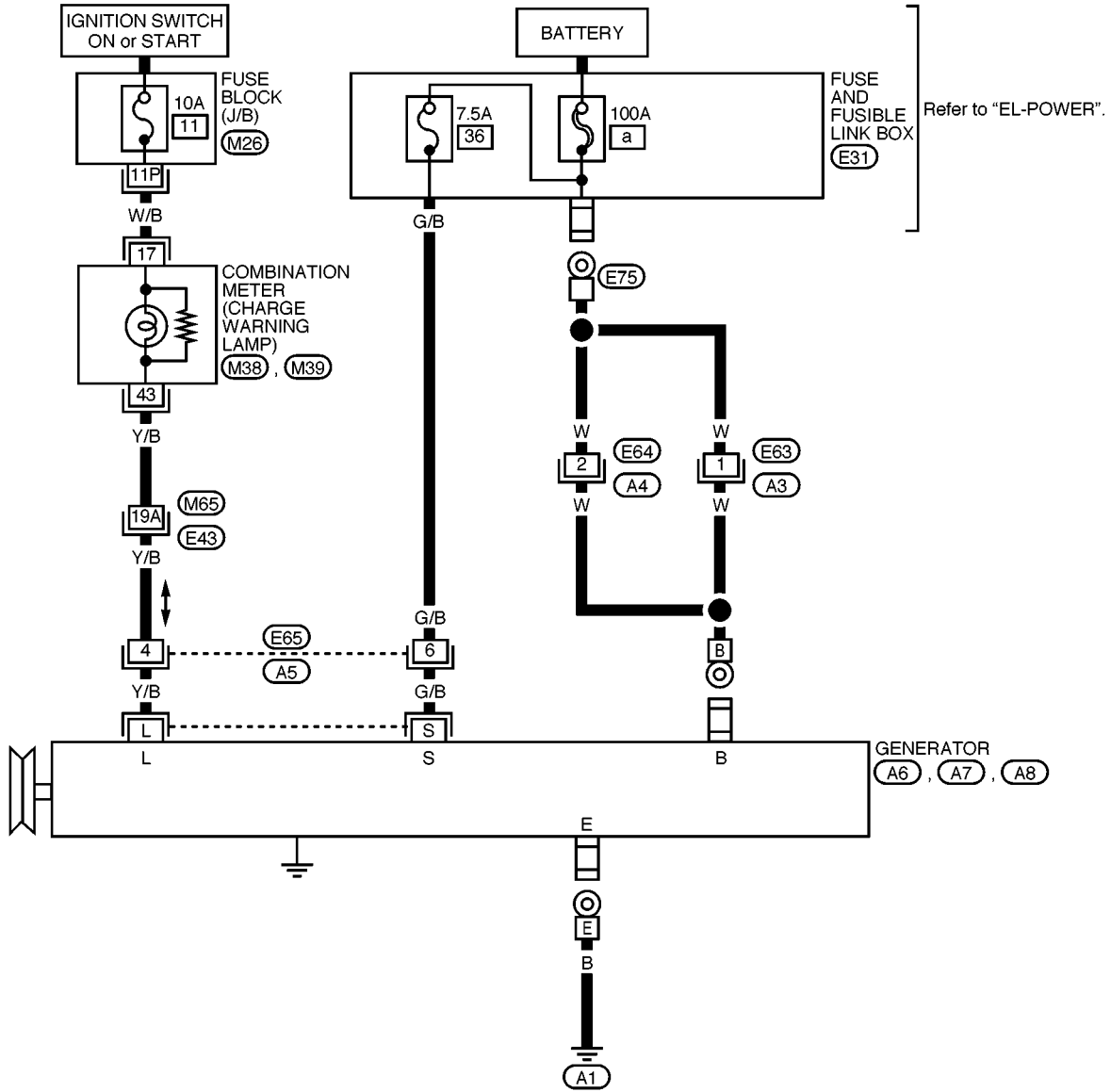
# CHARGING SYSTEM

Wiring Diagram — CHARGE — (Cont'd)

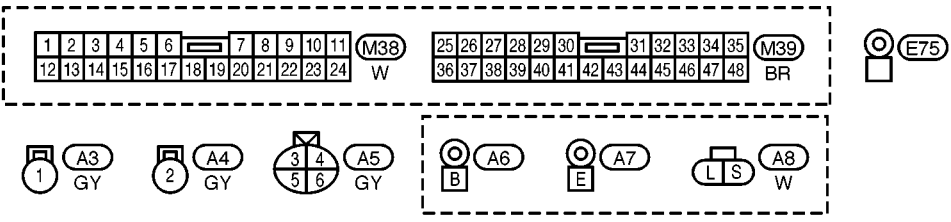
VG33E MODELS

NESC0010S02

SC-CHARGE-02



GI  
MA  
EM  
LC  
EC  
FE  
CL  
MT  
AT  
TF  
PD  
AX  
SU  
BR  
ST



Refer to last page (Foldout page).

M65, E43  
E31

RS  
BT  
HA

SC

ASC011

EL

IDX

# CHARGING SYSTEM

Trouble Diagnoses

## Trouble Diagnoses

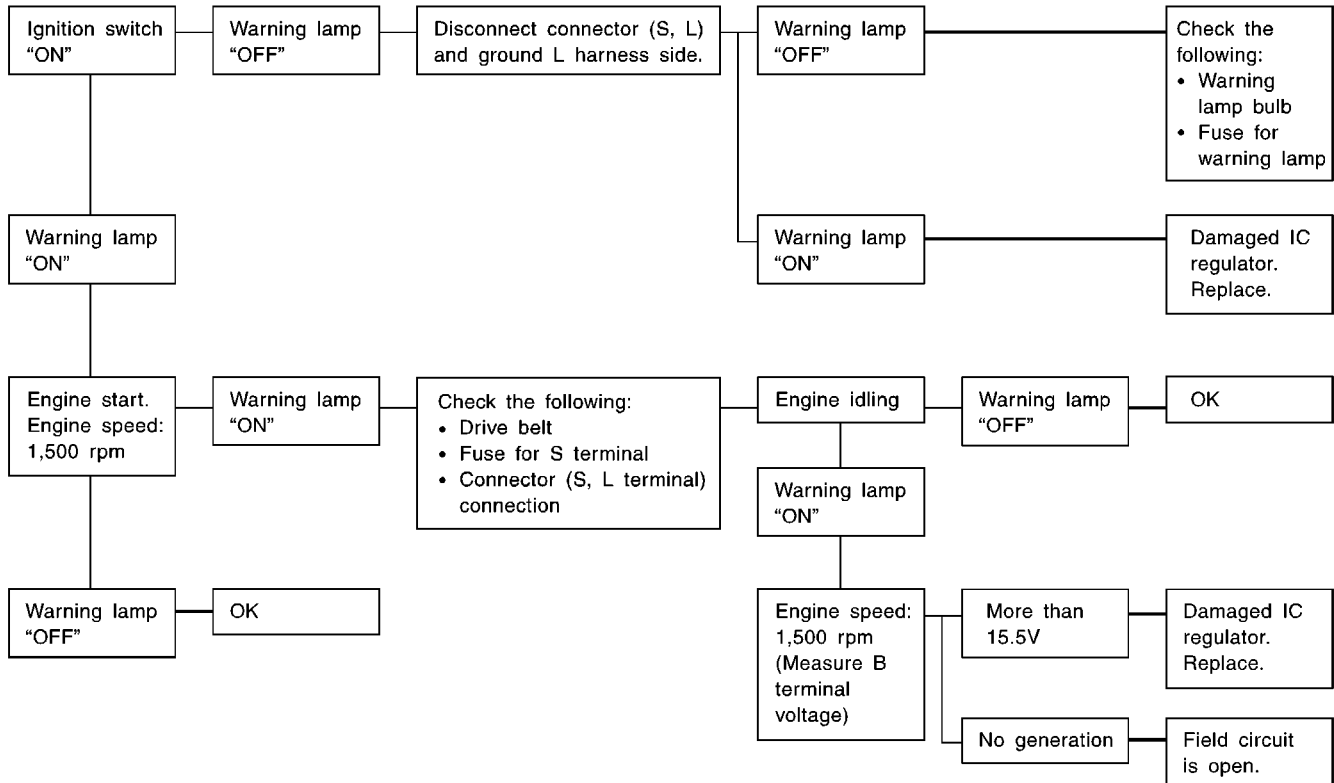
NESC0011

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

NESC0011S01



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

NESC0011S02

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.

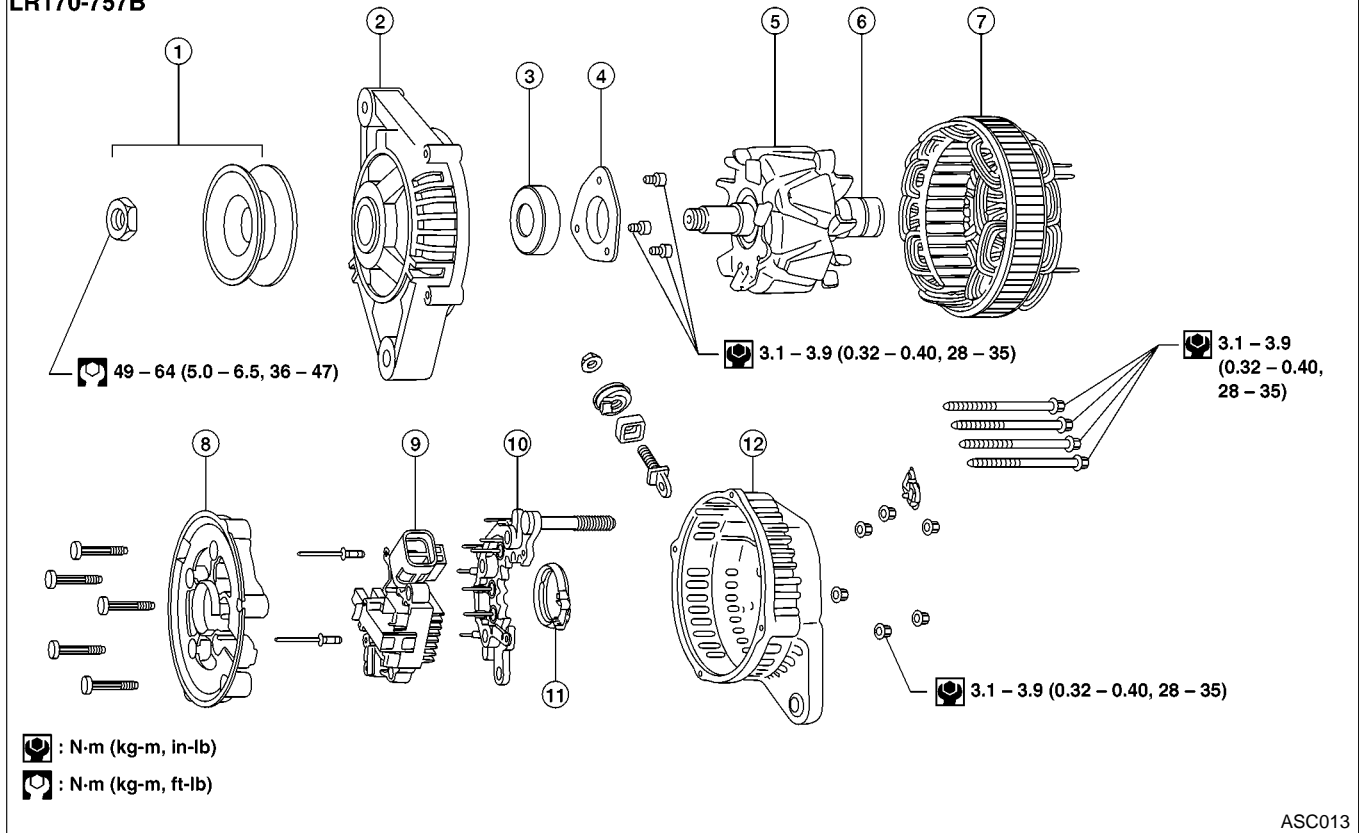
## Construction

### KA24DE MODELS

NESC0012

NESC0012S01

#### SEC. 231 LR170-757B



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

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

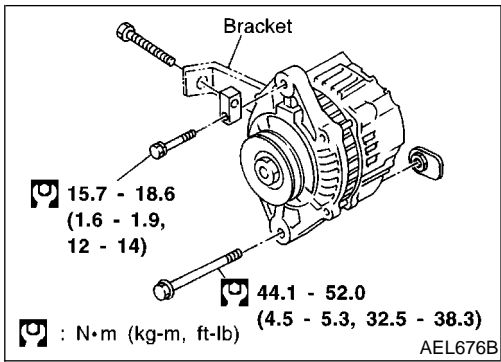
9. IC regulator assembly
10. Diode assembly
11. Packing
12. Rear cover

ASC013

GI  
MA  
EM  
LC  
EC  
FE  
CL  
MT  
AT  
TF  
PD  
AX  
SU  
BR  
ST  
RS  
BT  
HA  
SC  
EL  
IDX







## 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.

=NESC0013

NESC0013S01

NESC0013S0101

GI

MA

EM

NESC0013S0102

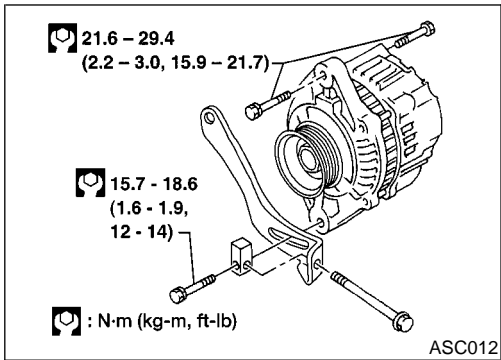
LC

EC

FE

CL

MT



## 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.

NESC0013S02

NESC0013S0201

AT

TF

PD

NESC0013S0202

AX

SU

BR

ST

RS

BT

HA

SC

EL

IDX

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Battery

### Battery

NESC0014

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

### Starter

NESC0015

Engine	KA24DE		VG33E
Type	M003T70381ZC	M000T60081AC	M000T60185ZC
	MITSUBISHI make		
	Non-reduction	Reduction gear type	
System voltage	12 V		
No-load	Terminal voltage	11.5 V	11.0 V
	Current	Less than 60 A	Less than 90 A
	Revolution	More than 6500 rpm	More than 2,500 rpm
Minimum diameter of commutator	31.4 mm (1.236 in)	28.8 mm (1.134 in)	
Minimum length of brush	11.5 mm (0.453 in)	7.0 mm (0.276 in)	
Brush spring tension	13.7 - 25.5 N (1.4 - 2.6 kg, 3.1 - 5.7 lb)	11.8 - 23.5 N (1.20 - 2.40 kg, 2.65 - 5.28 lb)	
Clearance of bearing metal and armature shaft	0.2 mm (0.008 in)		
Clearance between pinion front edge and pinion stopper	0.5 - 2.0 mm (0.020 - 0.079 in)		

### Generator

NESC0016

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