

A

# SECTION STR

STR

## STARTING SYSTEM

C

### CONTENTS

D

E

<b>PRECAUTION</b> .....	2	<b>COMPONENT DIAGNOSIS</b> .....	9	F
<b>PRECAUTIONS</b> .....	2	<b>B TERMINAL CIRCUIT</b> .....	9	
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" .....	2	Description .....	9	G
Precaution for Power Generation Variable Voltage Control System .....	2	Diagnosis Procedure .....	9	
<b>PREPARATION</b> .....	3	<b>S CONNECTOR CIRCUIT</b> .....	10	H
<b>PREPARATION</b> .....	3	Description .....	10	
Special Service Tool .....	3	Diagnosis Procedure .....	10	I
Commercial Service Tool .....	3	<b>STARTING SYSTEM</b> .....	11	
<b>BASIC INSPECTION</b> .....	4	Wiring Diagram .....	11	J
<b>DIAGNOSIS AND REPAIR WORKFLOW</b> .....	4	<b>SYMPTOM DIAGNOSIS</b> .....	16	
Work Flow .....	4	<b>STARTING SYSTEM</b> .....	16	K
<b>FUNCTION DIAGNOSIS</b> .....	7	Symptom Table .....	16	
<b>STARTING SYSTEM</b> .....	7	<b>ON-VEHICLE REPAIR</b> .....	17	L
System Diagram .....	7	<b>STARTER MOTOR</b> .....	17	
System Description .....	7	Removal and Installation .....	17	M
Component Parts Location .....	7	<b>SERVICE DATA AND SPECIFICATIONS (SDS)</b> .....	19	
Component Description .....	8	<b>STARTER MOTOR</b> .....	19	N
		Starter .....	19	O
				P

# PRECAUTIONS

< PRECAUTION >

## PRECAUTION

### PRECAUTIONS

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

INFOID:000000001281952

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB 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/INFINITI 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 SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

#### Precaution for Power Generation Variable Voltage Control System

INFOID:000000001303477

#### **CAUTION:**

For this model, the battery current sensor that is installed to the negative battery cable measures the charging/discharging current of the battery and performs various engine controls. If an electrical component is connected directly to the negative battery terminal, the current flowing through that component will not be measured by the battery current sensor. This condition may cause a malfunction of the engine control system and battery discharge may occur. Do not connect an electrical component or ground wire directly to the battery terminal.

# PREPARATION

< PREPARATION >

## PREPARATION


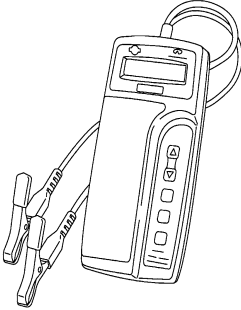
### PREPARATION

#### Special Service Tool

INFOID:000000001281953

A

STR

Tool number (Kent Moore No.) Tool name	Description
<p>— (J-48087) Battery Service Center</p>  <p>WKIA5280E</p>	<p>Tests Battery. For operating instructions, refer to Technical Service Bulletin and Battery Service Center User Guide.</p>
<p>— (J-44373) Model 620 Starting/Charging system tester</p>  <p>SEL403X</p>	<p>Tests starting and charging systems. For operating instructions, refer to Technical Service Bulletin.</p>

C

D

E

F

G

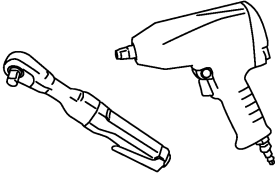
H

I

J

#### Commercial Service Tool

INFOID:000000001281954

Tool name	Description
<p>Power tool</p>  <p>PBIC0190E</p>	<p>Loosening bolts and nuts</p>

K

L

M

N

O

P

# DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

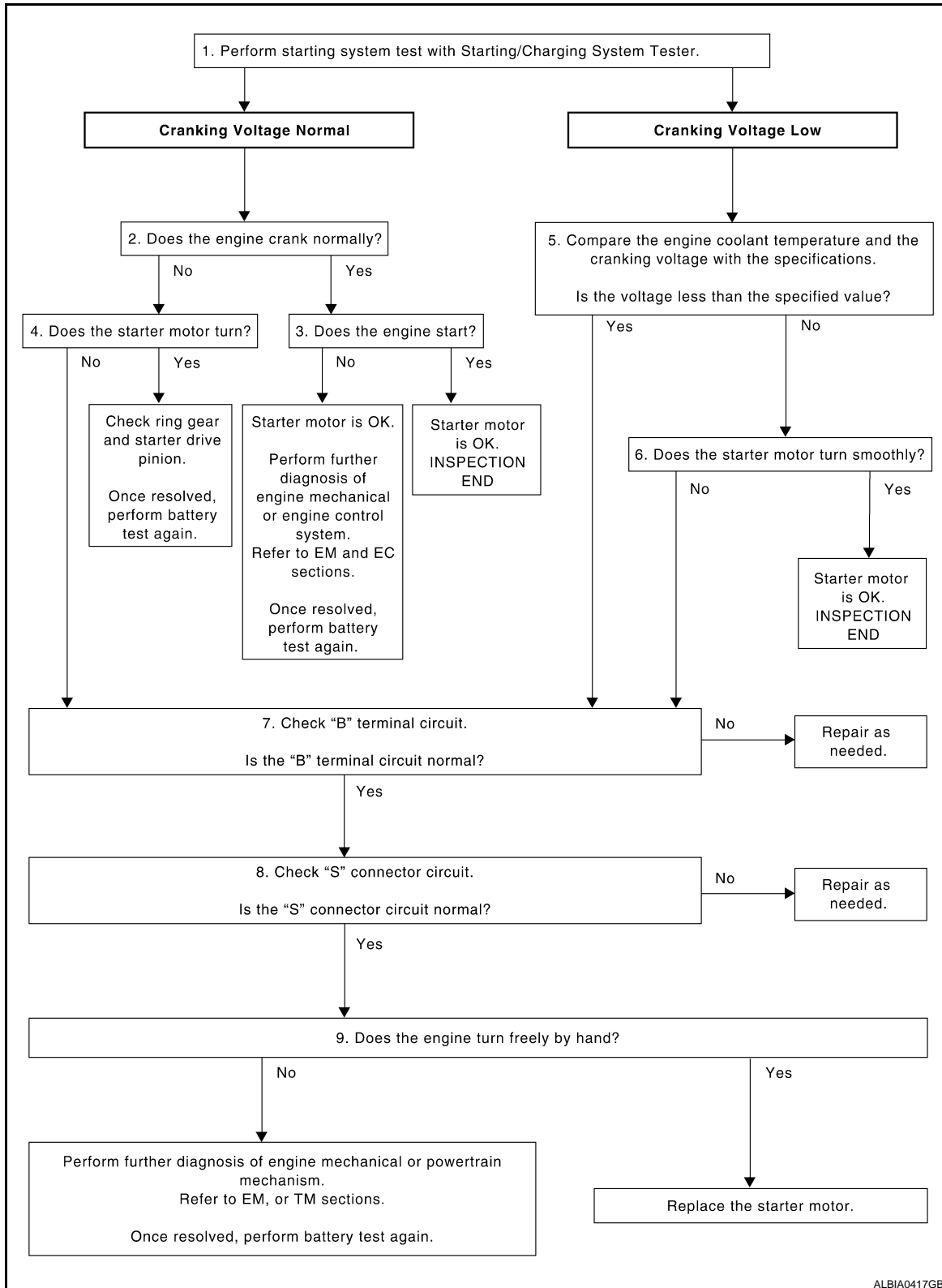
## BASIC INSPECTION

### DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000001714428

#### OVERALL SEQUENCE



ALBIA0417GB

DETAILED FLOW

# DIAGNOSIS AND REPAIR WORKFLOW

## < BASIC INSPECTION >

### NOTE:

To ensure a complete and thorough diagnosis, the battery, starter motor and alternator test segments must be done as a set from start to finish.

## 1. DIAGNOSIS WITH STARTING/CHARGING SYSTEM TESTER

Perform the starting system test with Starting/Charging System Tester (J-44373). For details and operating instructions, refer to Technical Service Bulletin.

### Test result

CRANKING VOLTAGE NORMAL>>GO TO 2

CRANKING VOLTAGE LOW>>GO TO 5

CHARGE BATTERY>>Perform the slow battery charging procedure. (Initial rate of charge is 10A for 12 hours.) Perform battery test again. Refer to Technical Service Bulletin.

REPLACE BATTERY>>Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again. Refer to Technical Service Bulletin. If second test result is "REPLACE BATTERY", then do so. Perform battery test again to confirm repair.

## 2. CRANKING CHECK

Check that the starter motor operates properly.

### Does the engine crank normally?

YES >> GO TO 3

NO >> GO TO 4

## 3. ENGINE START CHECK

Check that the engine starts.

### Does the engine start?

YES >> Starter motor is OK. Inspection end.

NO >> Perform further diagnosis of engine mechanical or engine control system. Refer to EM and EC sections. Once resolved, perform battery test again.

## 4. STARTER MOTOR ACTIVATION

Check that the starter motor operates.

### Does the starter motor turn?

YES >> Check ring gear and starter motor drive pinion. Once resolved, perform battery test again.

NO >> GO TO 7

## 5. COMPARISON BETWEEN ENGINE COOLANT AND CRANKING VOLTAGE

Compare the engine coolant temperature and verify the cranking voltage is within specification.

Minimum Specification of Cranking Voltage Referencing Coolant Temperature

Engine coolant temperature [°C (°F)]	Voltage [V]
-30 to -20 (-22 to -4)	8.6
-19 to -10 (-2 to 14)	9.1
-9 to 0 (16 to 32)	9.5
More than 1 (More than 34)	9.9

### Is the voltage less than the specified value?

YES >> GO TO 7

NO >> GO TO 6

## 6. STARTER OPERATION

Check the starter operation.

### Does the starter motor turn smoothly?

YES >> Starter motor is OK. Inspection end.

NO >> GO TO 7

## 7. "B" TERMINAL CIRCUIT INSPECTION

Check "B" terminal circuit. Refer to [STR-9, "Diagnosis Procedure"](#).

### Is "B" terminal circuit normal?

## DIAGNOSIS AND REPAIR WORKFLOW

### < BASIC INSPECTION >

---

- YES >> GO TO 8
- NO >> Repair as needed.

### 8. "S" CONNECTOR CIRCUIT INSPECTION

---

Check "S" connector circuit. Refer to [STR-10. "Diagnosis Procedure"](#).

#### Is "S" connector circuit normal?

- YES >> GO TO 9
- NO >> Repair as needed.

### 9. ENGINE ROTATION STATUS

---

Check that the engine can be rotated by hand.

#### Does the engine turn freely by hand?

- YES >> Replace starter motor.
- NO >> Perform further diagnosis of engine mechanical or powertrain mechanism. Refer to EM or TM sections. Once resolved, perform battery test again. Refer to Technical Service Bulletin.

# STARTING SYSTEM

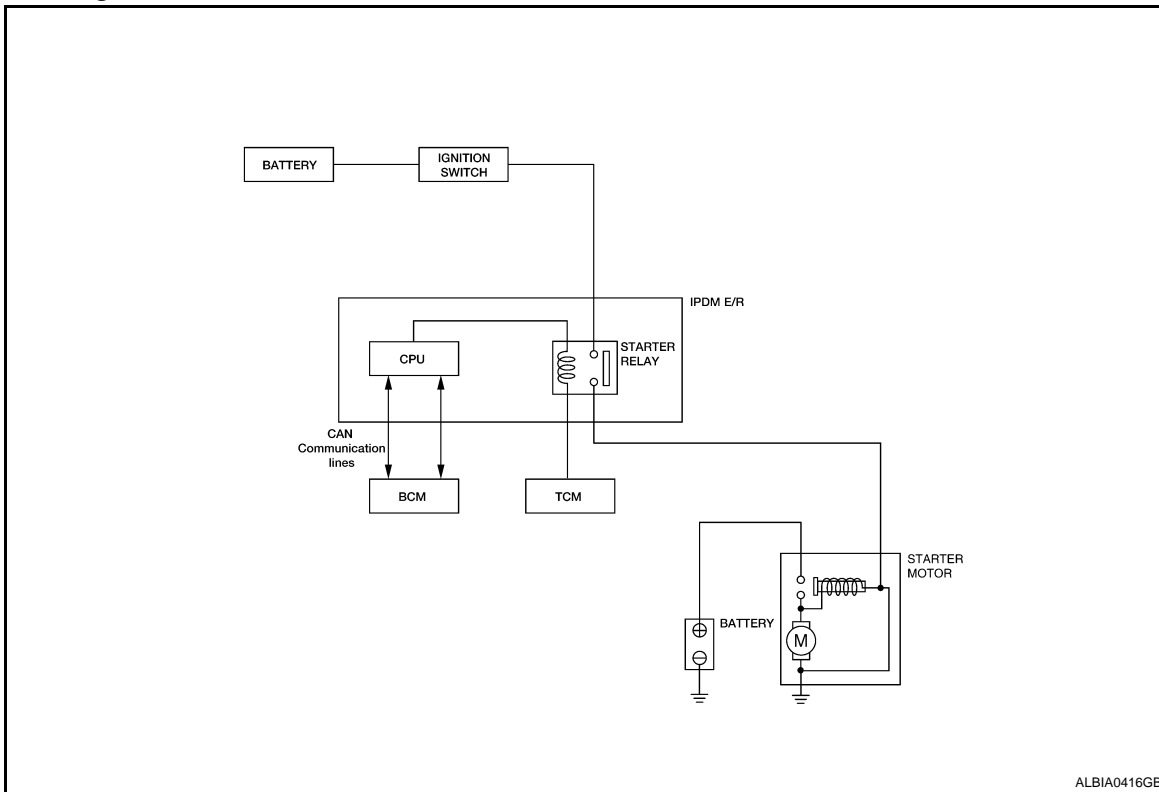
< FUNCTION DIAGNOSIS >

## FUNCTION DIAGNOSIS

### STARTING SYSTEM

#### System Diagram

INFOID:000000001714429



ALBIA0416GB

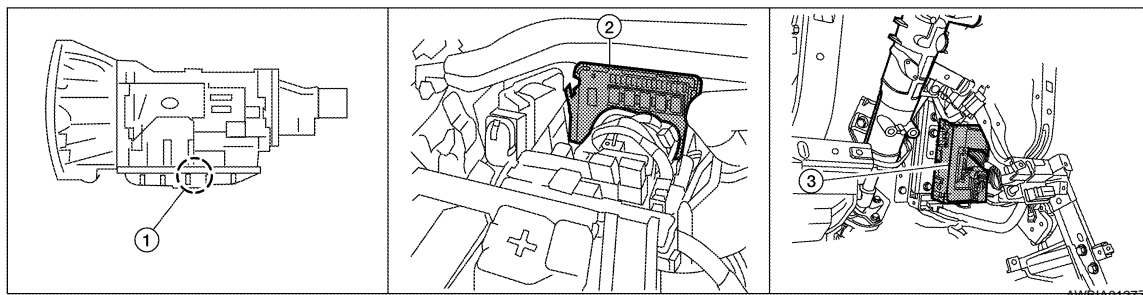
#### System Description

INFOID:000000001714430

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.

#### Component Parts Location

INFOID:000000001714431



1. A/T assembly F9 (with built in TCM F502)
2. IPDM E/R E119, E120, E122, E124
3. BCM M18 (view with instrument panel lower LH panel removed)

# STARTING SYSTEM

< FUNCTION DIAGNOSIS >

## Component Description

INFOID:000000001714432

Component part	Description
TCM	TCM supplies power to the starter relay inside the IPDM E/R when the selector lever is shifted to the P or N position.
BCM	BCM sends a starter request signal to the CPU of the IPDM E/R over the CAN communication lines.
IPDM E/R	CPU inside IPDM E/R operates the starter relay at the request of the BCM over the CAN communication lines.
Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the "S" terminal is supplied with electric power.



# B TERMINAL CIRCUIT

< COMPONENT DIAGNOSIS >

## COMPONENT DIAGNOSIS

### B TERMINAL CIRCUIT

#### Description

INFOID:000000001714434

Terminal "2" (B) is constantly supplied with battery power.

#### Diagnosis Procedure

INFOID:000000001714434

#### CAUTION:

Perform diagnosis under the condition that the engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is depleted.

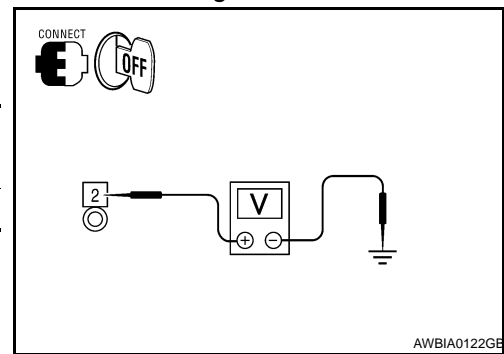
#### 1. CHECK TERMINAL 2 POWER SUPPLY VOLTAGE

1. Turn ignition switch OFF.
2. Make sure that starter motor connector E210 terminal 2 connection is clean and tight.
3. Check voltage between starter motor connector E210 terminal 2 and ground.

(+)		(-)	Voltage
Connector	Terminal		
E210	2	Ground	Battery voltage

Is there battery voltage present?

- YES >> GO TO 2  
 NO >> Check harness between battery and starter motor for open circuit.



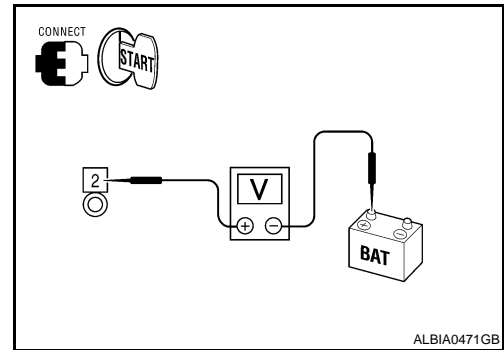
#### 2. CHECK BATTERY CABLE (VOLTAGE DROP TEST)

1. Shift the transmission into park or neutral.
2. Check voltage between battery positive terminal and starter motor connector E210 terminal 2 while cranking the engine.

(+)		(-)	Condition	Voltage
Connector	Terminal			
E210	2	Battery (+) terminal	While cranking the engine	Less than 0.2V

Is the voltage drop less than 0.2V?

- YES >> GO TO 3  
 NO >> Check harness between the battery and the starter motor for high resistance.



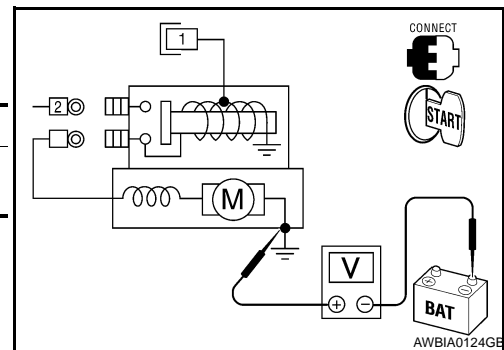
#### 3. CHECK GROUND CIRCUIT STATUS (VOLTAGE DROP TEST)

Check voltage between starter motor case and battery negative terminal while cranking the engine.

(+)	(-)	Condition	Voltage
Starter motor case	Battery (-) terminal	While cranking the engine	Less than 0.2V

Is the voltage drop less than 0.2V?

- YES >> Terminal 2 circuit is OK. Further inspection necessary. Refer to [STR-4, "Work Flow"](#).  
 NO >> Check the starter motor case to engine mounting for high resistance.



# S CONNECTOR CIRCUIT

< COMPONENT DIAGNOSIS >

## S CONNECTOR CIRCUIT

### Description

INFOID:000000001714435

Terminal "1" (S) is the power supply for the starter motor magnetic switch. Terminal 1 is supplied with power when the ignition switch is turned to the START position while the selector lever is in the P or N position.

### Diagnosis Procedure

INFOID:000000001714436

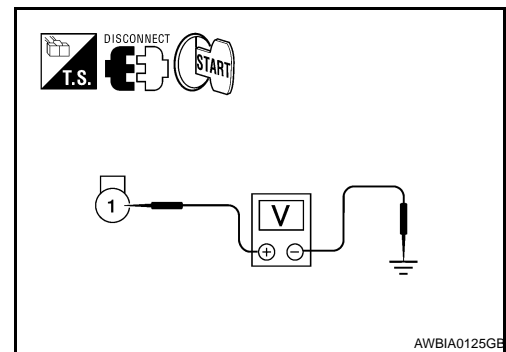
#### CAUTION:

Perform diagnosis under the condition that engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.

#### 1. CHECK STARTER MOTOR MAGNETIC SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect starter motor connector E207.
3. Shift transmission into park or neutral.
4. Check voltage between starter motor harness connector E207 terminal 1 and ground with the ignition in START.



(+)		(-)	Condition	Voltage
Connector	Terminal			
E207	1	Ground	While cranking the engine	Battery voltage

Is battery voltage present?

- YES >> Magnetic switch circuit is OK. Further inspection necessary. Refer to [STR-4. "Work Flow"](#).  
 NO >> GO TO 2

#### 2. CHECK CONNECTOR

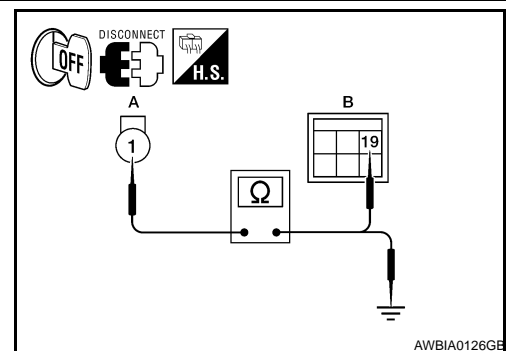
1. Turn ignition switch OFF.
2. Check the IPDM E/R harness connector E120 and starter motor harness connector E207 for damage, bent pins and loose connections.

Is the inspection result normal?

- YES >> GO TO 3  
 NO >> Repair the terminal and connector.

#### 3. CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

1. Disconnect IPDM E/R connector E120 and starter motor connector E207.
2. Check continuity between starter motor harness connector E207 (A) terminal 1 and IPDM E/R harness connector E120 (B) terminal 19.



A		B		Continuity
Connector	Terminal	Connector	Terminal	
E207	1	E120	19	Yes

3. Check continuity between starter motor harness connector E207 (A) terminal 1 and ground.

A		—	Continuity
Connector	Terminal		
E207	1	Ground	No

Are the continuity test results as specified?

- YES >> Further inspection necessary. Refer to [STR-4. "Work Flow"](#).  
 NO >> Repair the harness.

# STARTING SYSTEM

< COMPONENT DIAGNOSIS >

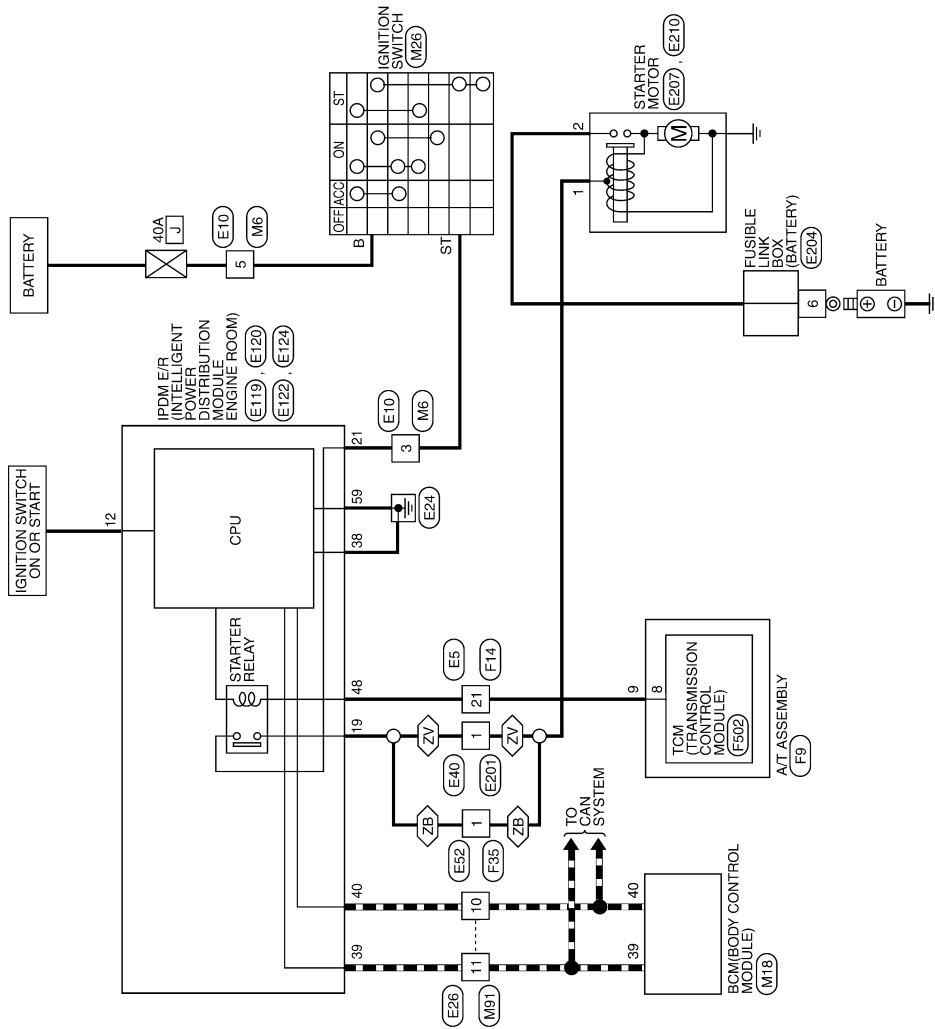
## STARTING SYSTEM

### Wiring Diagram

INFOID:000000001714437

■ : DATA LINE  
 ZV : WITH VQ40DE  
 ZB : WITH VK56DE

### STARTING SYSTEM



A  
STR  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P


ALBWA0165GE

# STARTING SYSTEM

## < COMPONENT DIAGNOSIS >

### STARTING SYSTEM

Connector No.	M6
Connector Name	WIRE TO WIRE
Connector Color	WHITE



4	3	2	1
8	7	6	5

Terminal No.	Color of Wire	Signal Name
3	GR	-
5	G	-

Connector No.	M18
Connector Name	BCM (BODY CONTROL MODULE)
Connector Color	WHITE



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

Terminal No.	Color of Wire	Signal Name
39	L	CAN-H
40	P	CAN-L


Connector No.	M26
Connector Name	IGNITION SWITCH
Connector Color	WHITE



B	ST	IG
R	ACC	IG2

Terminal No.	Color of Wire	Signal Name
B	G	-
ST	GR	-

Connector No.	M91
Connector Name	WIRE TO WIRE
Connector Color	WHITE



7	6	5	4	3	2	1
16	15	14	13	12	11	10
9	8					

Terminal No.	Color of Wire	Signal Name
10	P	-
11	L	-

Connector No.	E5
Connector Name	WIRE TO WIRE
Connector Color	WHITE



1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24

Terminal No.	Color of Wire	Signal Name
21	R	-

Connector No.	E10
Connector Name	WIRE TO WIRE
Connector Color	WHITE



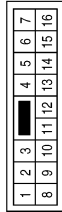
1	2	3	4
5	6	7	8

Terminal No.	Color of Wire	Signal Name
3	GR	-
5	G	-

# STARTING SYSTEM

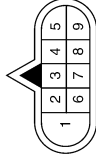
## < COMPONENT DIAGNOSIS >

Connector No.	E26
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
10	P	-
11	L	-

Connector No.	E40
Connector Name	WIRE TO WIRE
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1	W	-

Connector No.	E52
Connector Name	WIRE TO WIRE
Connector Color	WHITE



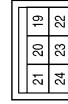
Terminal No.	Color of Wire	Signal Name
1	W	-

Connector No.	E119
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



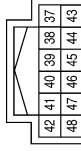
Terminal No.	Color of Wire	Signal Name
12	W/G	IGN_SW_(IG1)

Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
19	W	STARTER_MOTOR
21	GR	IGN_SW_(ST)

Connector No.	E122
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
38	B	GND (SIGNAL)
39	L	CAN-H
40	P	CAN-L
48	R	INHIBIT

ALBIA0420GB

# STARTING SYSTEM

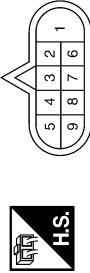
## < COMPONENT DIAGNOSIS >

Connector No.	E204
Connector Name	FUSIBLE LINK BOX (BATTERY)
Connector Color	—



Terminal No.	6	Color of Wire	B/R	Signal Name	—
--------------	---	---------------	-----	-------------	---

Connector No.	E201
Connector Name	WIRE TO WIRE
Connector Color	GRAY



Terminal No.	1	Color of Wire	W	Signal Name	—
--------------	---	---------------	---	-------------	---

Connector No.	E124
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	BLACK



Terminal No.	59	Color of Wire	B	Signal Name	GND (POWER)
--------------	----	---------------	---	-------------	-------------

Connector No.	E210
Connector Name	STARTER MOTOR
Connector Color	BLACK



Terminal No.	2	Color of Wire	B/R	Signal Name	—
--------------	---	---------------	-----	-------------	---

Connector No.	E207
Connector Name	STARTER MOTOR (WITH VK56DE)
Connector Color	GRAY



Terminal No.	1	Color of Wire	W	Signal Name	—
--------------	---	---------------	---	-------------	---

Connector No.	E207
Connector Name	STARTER MOTOR (WITH VQ40DE)
Connector Color	GRAY



Terminal No.	1	Color of Wire	W	Signal Name	—
--------------	---	---------------	---	-------------	---

ALBIA0421GB

# STARTING SYSTEM

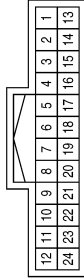
## < COMPONENT DIAGNOSIS >

Connector No.	F35
Connector Name	WIRE TO WIRE
Connector Color	WHITE



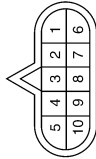
Terminal No.	1	Color of Wire	W	Signal Name	-
--------------	---	---------------	---	-------------	---

Connector No.	F14
Connector Name	WIRE TO WIRE
Connector Color	WHITE



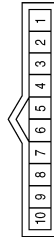
Terminal No.	21	Color of Wire	R	Signal Name	-
--------------	----	---------------	---	-------------	---

Connector No.	F9
Connector Name	A/T ASSEMBLY
Connector Color	GREEN



Terminal No.	9	Color of Wire	R	Signal Name	-
--------------	---	---------------	---	-------------	---

Connector No.	F502
Connector Name	TCM (TRANSMISSION CONTROL MODULE)
Connector Color	GRAY



Terminal No.	8	Color of Wire	G	Signal Name	START-RLY
--------------	---	---------------	---	-------------	-----------

A

STR

C

D

E

F

G

H

I

J

K

L

M

N

O

P

ALBIA0422GB

# STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

## SYMPTOM DIAGNOSIS

### STARTING SYSTEM

#### Symptom Table

INFOID:000000001714438

Symptom	Reference
No normal cranking	Refer to <a href="#">STR-4, "Work Flow"</a> .
Starter motor does not rotate	



# STARTER MOTOR

< ON-VEHICLE REPAIR >

## ON-VEHICLE REPAIR

### STARTER MOTOR

#### Removal and Installation

INFOID:000000001282715

A

STR

VQ40DE MODELS

C

D

E

F

G

H

I

J

K

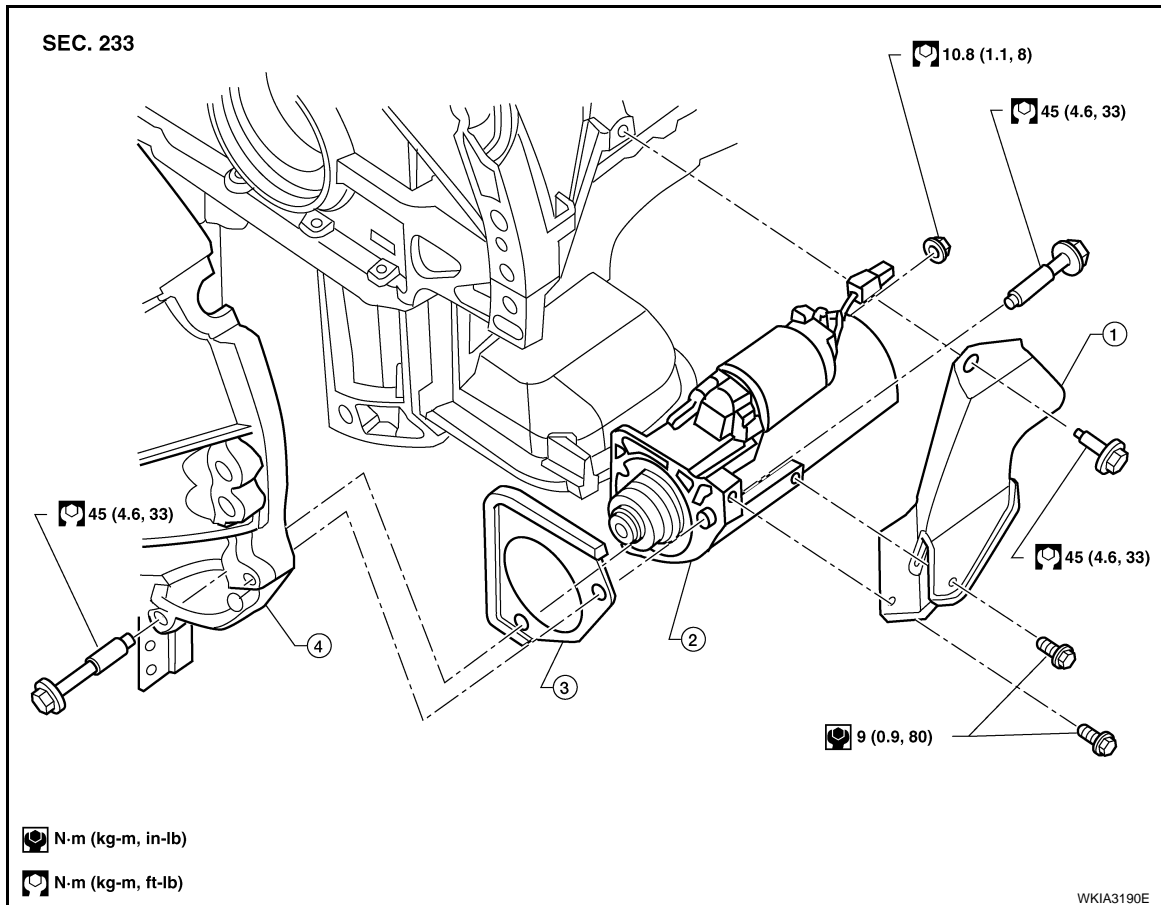
L

M

N

O

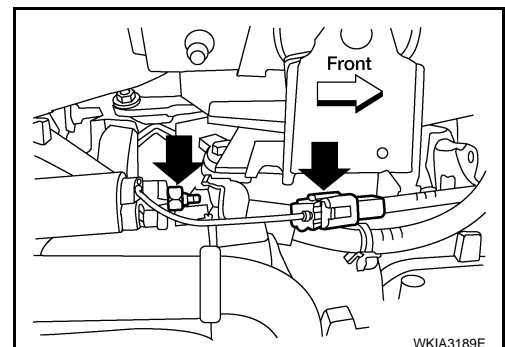
P



1. Starter cover
2. Starter motor assembly
3. Starter cover plate (rear)
4. Transmission housing

#### Removal

1. Disconnect the negative battery terminal.
2. Remove engine undercover, using power tools.
3. Remove exhaust manifold cover from exhaust manifold (right bank) to gain access to starter cover bolts. Refer to [EM-31. "Removal and Installation"](#).
4. Remove starter cover bolts and starter cover.
5. Disconnect terminal "1" connector and terminal "2" nut.
6. Remove the two starter bolts, using power tools.
7. Remove the starter.



# STARTER MOTOR

## < ON-VEHICLE REPAIR >

### Installation

Installation is in the reverse order of removal.

**Terminal "2" nut : 10.8 N·m (1.1 kg-m, 8 ft-lb)**

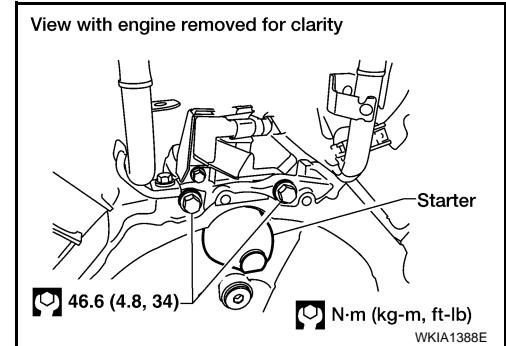
### **CAUTION:**

**Tighten terminal "2" nut carefully.**

## VK56DE MODELS

### Removal

1. Remove the intake manifold. Refer to [EM-166. "Removal and Installation"](#).
2. Disconnect terminal "1" connector and terminal "2" nut.
3. Remove the two starter bolts, using power tools.
4. Remove the starter.



### Installation

Installation is in the reverse order of removal.

**Terminal "2" nut : 10.8 N·m (1.1 kg-m, 8 ft-lb)**

### **CAUTION:**

**Tighten terminal "2" nut carefully.**

# STARTER MOTOR

< SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

### STARTER MOTOR

Starter

INFOID:000000001283042

A

STR

Application	VQ40DE	VK56DE	
Manufacturer	Mitsubishi M002T85571ZCKD		
Type	Reduction gear type		
System voltage	12V		
No-load	Terminal voltage	11V	
	Current	Less than 120A	Less than 145A
	Revolution	More than 3,100 rpm	More than 3,300 rpm

C

D

E

F

G

H

I

J

K

L

M

N

O

P