SECTION STR
STARTING SYSTEM

CONTENTS

PRECAUTION 2

PRECAUTIONS 2
Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" 2
Precaution for Power Generation Variable Voltage Control System 2

PREPARATION 3

PREPARATION 3
Special Service Tool 3
Commercial Service Tool 3

BASIC INSPECTION 4

DIAGNOSIS AND REPAIR WORKFLOW 4
Work Flow 4

FUNCTION DIAGNOSIS 7

STARTING SYSTEM 7
System Diagram 7
System Description 7
Component Parts Location 7
Component Description 8

COMPONENT DIAGNOSIS 9

B TERMINAL CIRCUIT 9
Description 9
Diagnosis Procedure 9

S CONNECTOR CIRCUIT 10
Description 10
Diagnosis Procedure 10

STARTING SYSTEM 11
Wiring Diagram 11

SYMPTOM DIAGNOSIS 15

STARTING SYSTEM 15
Symptom Table 15

ON-VEHICLE REPAIR 16

STARTER MOTOR 16
Removal and Installation 16

SERVICE DATA AND SPECIFICATIONS (SDS) 17

STARTER MOTOR 17
Starter 17

PRECAUTION

PRECAUTIONS

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

INFOID:0000000005713680

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.**

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- **When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precaution for Power Generation Variable Voltage Control System

INFOID:0000000005387813

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

Special Service Tool

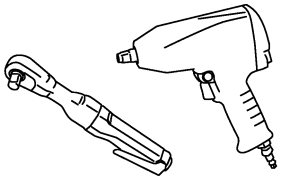
INFOID:0000000005387814

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent Moore No.) Tool name	Description
— (—) Model GR-8 Multitasking Battery Diagnostic Station AWIIA1239ZZ	Tests Batteries, starting and charging system. For operating instructions, refer to diagnostic station instruction manual.

Commercial Service Tool

INFOID:0000000005387815

Tool name	Description
Power tool  PBIC0190E	Loosening bolts and nuts

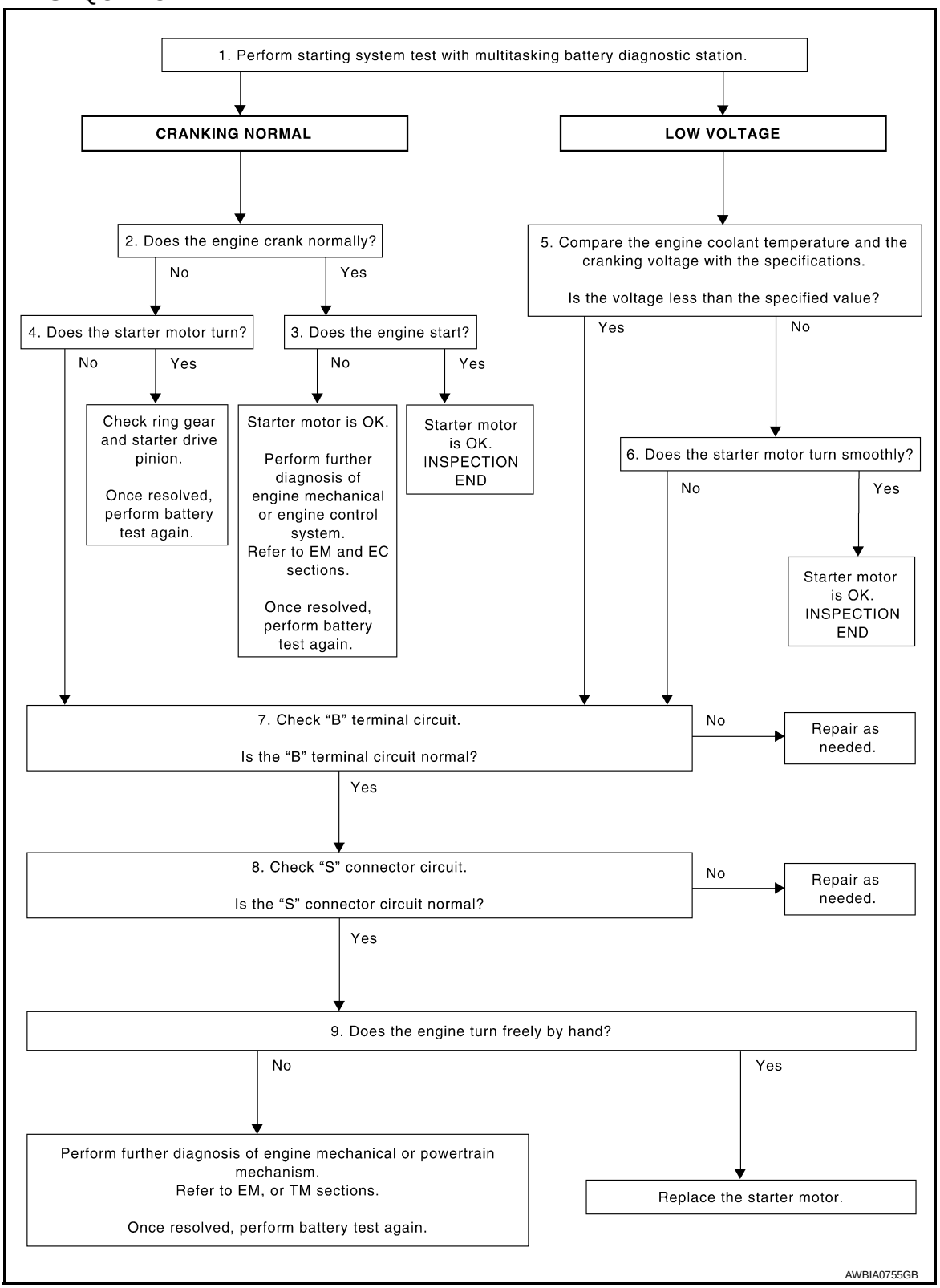
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000005661316

OVERALL SEQUENCE



DETAILED FLOW

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

1.DIAGNOSIS WITH MULTITASKING BATTERY DIAGNOSTIC STATION

Perform the starting system test with multitasking battery diagnostic station. For details and operating instructions, refer to diagnostic station instruction manual.

Test result

CRANKING NORMAL>>GO TO 2
LOW VOLTAGE>>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 diagnostic station instruction manual.
REPLACE BATTERY>>Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again. Refer to diagnostic station instruction manual. 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?

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?

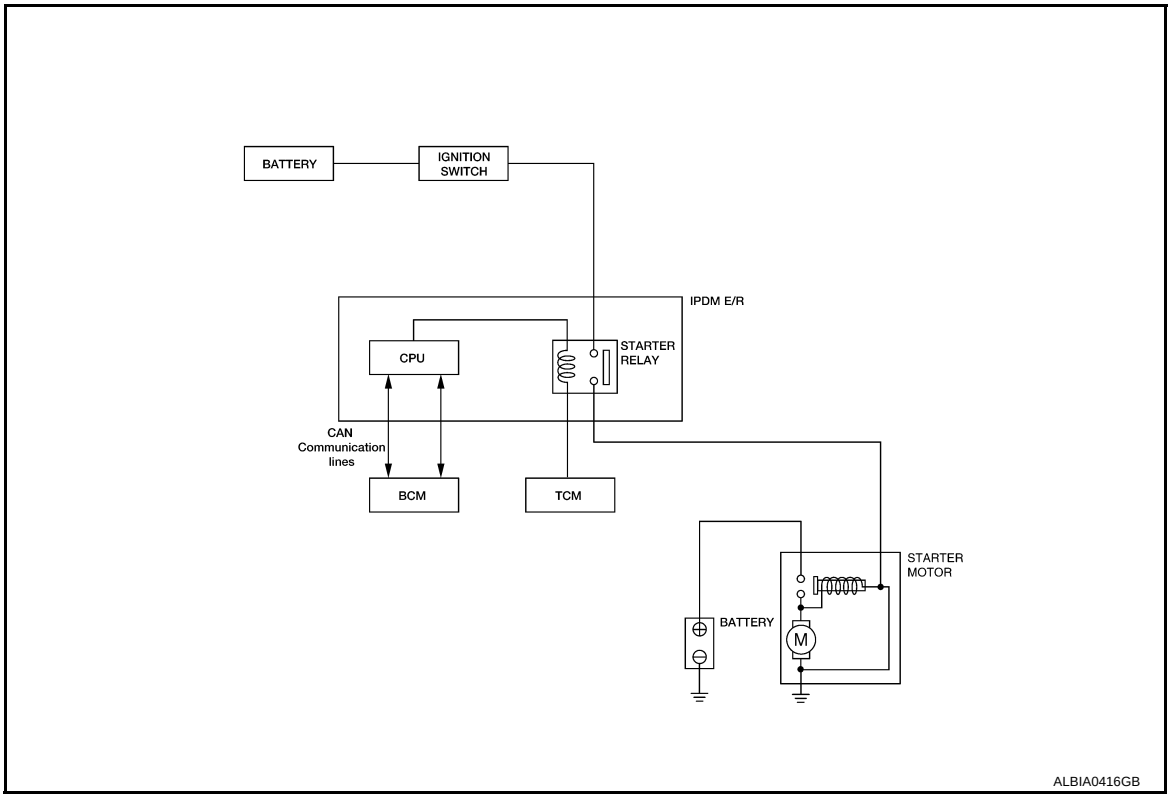
YES >> Replace starter motor.
NO >> Perform further diagnosis of engine mechanical or powertrain mechanism. Refer to EM or TM sections. Once resolved, perform battery test again. Refer to diagnostic station instruction manual.

FUNCTION DIAGNOSIS

STARTING SYSTEM

System Diagram

INFOID:0000000005387817



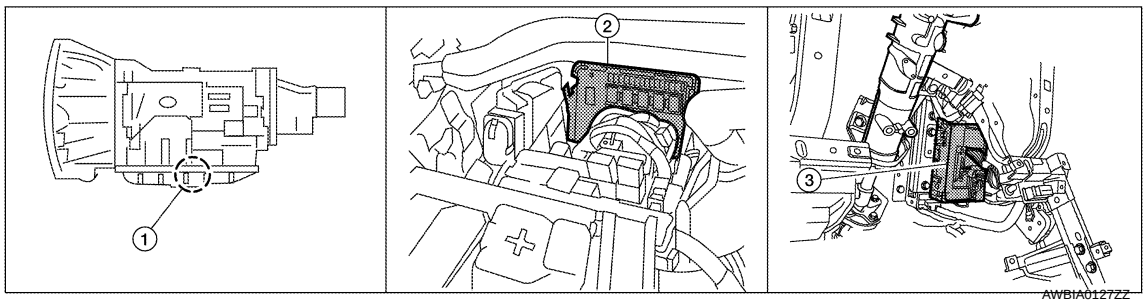
System Description

INFOID:0000000005387818

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:0000000005387819



1. A/T assembly
   F9 (floor shift)
   F17 (column shift)
2. IPDM E/R E119, E120, E122, E124
3. BCM M18 (view with instrument panel lower LH panel removed)

Component Description

INFOID:0000000005387820

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.

COMPONENT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:0000000005387821

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

Diagnosis Procedure

INFOID:0000000005387822

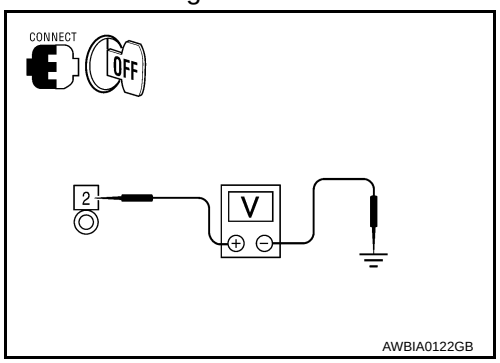
CAUTION:

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 F27 terminal 2 connection is clean and tight.
3. Check voltage between starter motor connector F27 terminal 2 and ground.



(+)		(-)	Voltage
Connector	Terminal		
F27	2	Ground	Battery voltage

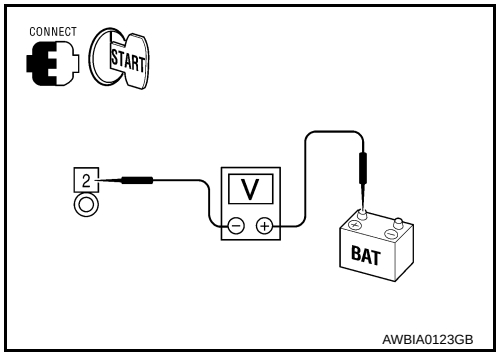
Is there battery voltage present?

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 F27 terminal 2 while cranking the engine.



(+)		(-)	Condition	Voltage
Connector	Terminal			
F27	2	Battery (+) terminal	While cranking the engine	Less than 0.2V

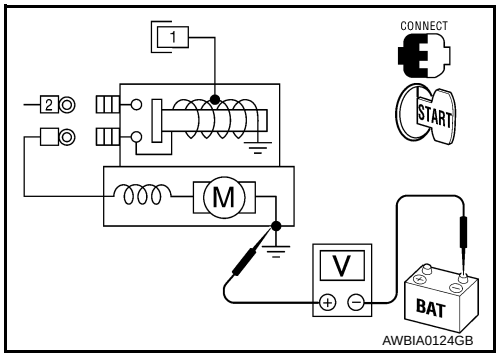
Is the voltage drop less than 0.2V?

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

Description

INFOID:0000000005387823

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:0000000005387824

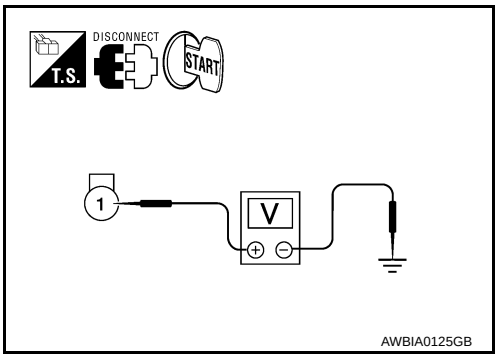
CAUTION:

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 F28.
3. Shift transmission into park or neutral.
4. Check voltage between starter motor harness connector F28 terminal 1 and ground with the ignition in START.



(+)		(-)	Condition	Voltage
Connector	Terminal			
F28	1	Ground	Ignition in START	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

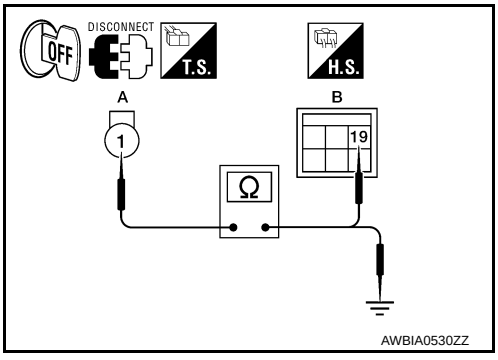
1. Turn ignition switch OFF.
2. Check the IPDM E/R harness connector E120 and starter motor harness connector F28 for damage, bent pins and loose connections.

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 F28.
2. Check continuity between starter motor harness connector F28 (A) terminal 1 and IPDM E/R harness connector E120 (B) terminal 19.



A		B		Continuity
Connector	Terminal	Connector	Terminal	
F28	1	E120	19	Yes

3. Check continuity between starter motor harness connector F28 (A) terminal 1 and ground.

A		—	Continuity
Connector	Terminal		
F28	1	Ground	No

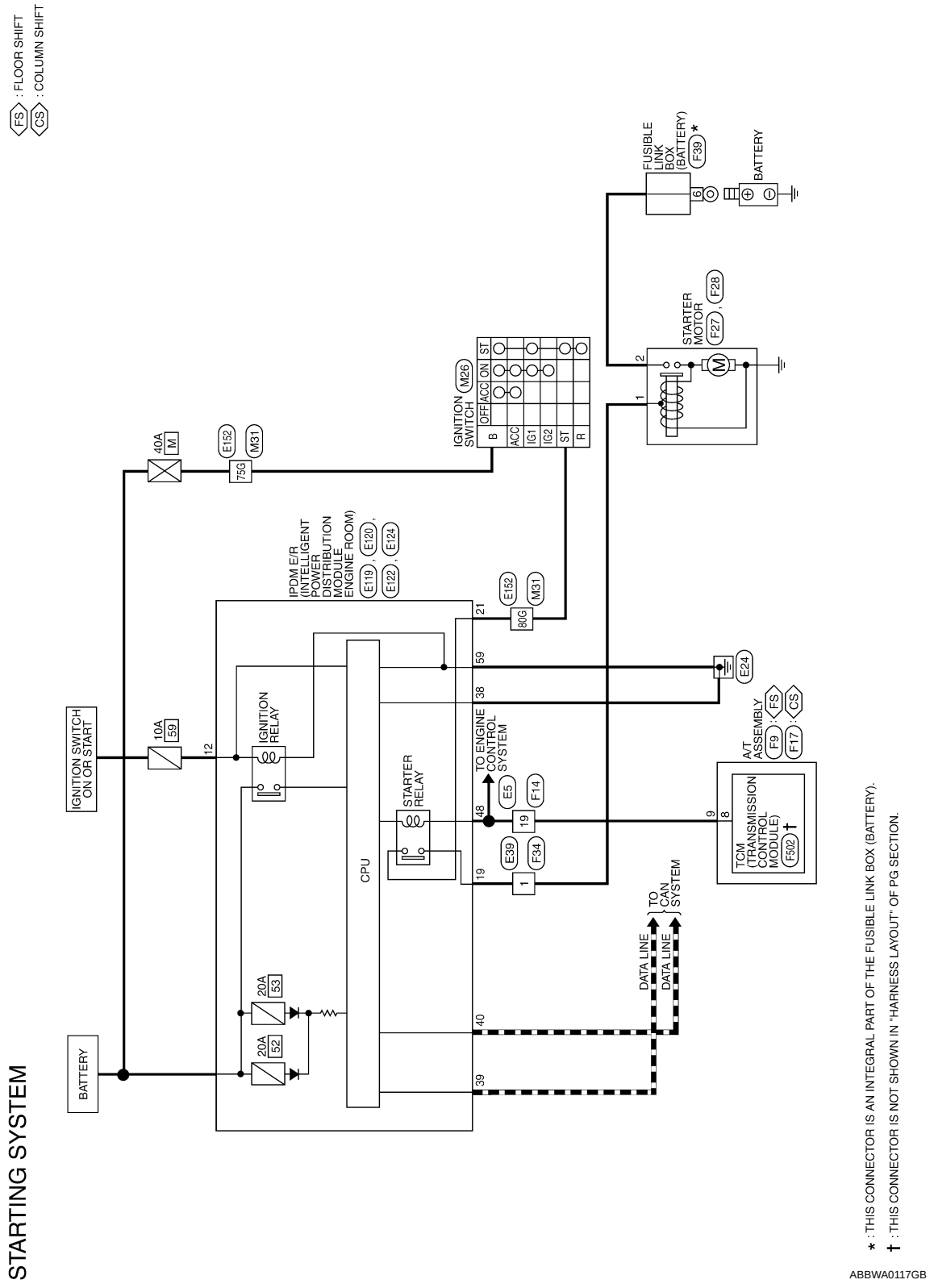
Are the continuity test results as specified?

YES >> Further inspection necessary. Refer to STR-4, "Work Flow".
NO >> Repair the harness.

STARTING SYSTEM

Wiring Diagram

INFOID:0000000005387825



STARTING SYSTEM CONNECTORS

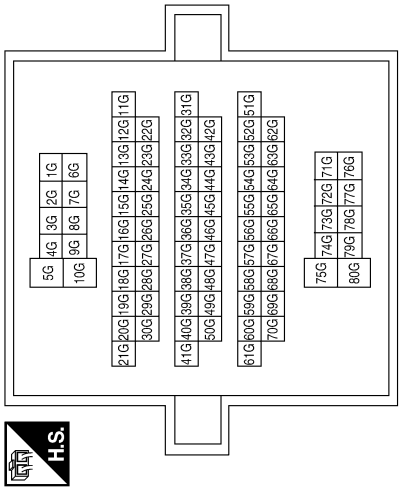
Connector No.	M26
Connector Name	IGNITION SWITCH
Connector Color	WHITE

H.S.

Terminal No.	Color of Wire	Signal Name
B	G	–
ST	BR	–

Connector No.	M31
Connector Name	WIRE TO WIRE
Connector Color	WHITE

H.S.



Terminal No.	Color of Wire	Signal Name
75G	G	–
80G	BR	–

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

H.S.

Terminal No.	Color of Wire	Signal Name
19	B/R	–

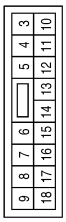
Connector No.	E39
Connector Name	WIRE TO WIRE
Connector Color	WHITE

H.S.

Terminal No.	Color of Wire	Signal Name
1	W/R	–

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

H.S.



Terminal No.	Color of Wire	Signal Name
12	L/W	IGN SW(IG)

ABBIA0686GB

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

H.S.

21	20	19
24	23	22

Terminal No.	Color of Wire	Signal Name
19	W/R	STARTER MTR
21	BR	IGN SW(ST)

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

H.S.

42	41	40	39	38	37
48	47	46	45	44	43

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

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

H.S.

59	58	57
62	61	60

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

Connector No.	F9
Connector Name	A/T ASSEMBLY (FLOOR SHIFT)
Connector Color	GREEN

H.S.

5	4	3	2	1
10	9	8	7	6

Terminal No.	Color of Wire	Signal Name
9	B/R	–

Terminal No.	Color of Wire	Signal Name
75G	G	–
80G	BR	–

Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Color	WHITE

H.S.

1G	2G	3G	4G	5G
6G	7G	8G	9G	10G

11G	12G	13G	14G	15G	16G	17G	18G	19G	20G	21G
22G	23G	24G	25G	26G	27G	28G	29G	30G		

31G	32G	33G	34G	35G	36G	37G	38G	39G	40G	41G
42G	43G	44G	45G	46G	47G	48G	49G	50G		

51G	52G	53G	54G	55G	56G	57G	58G	59G	60G	61G
62G	63G	64G	65G	66G	67G	68G	69G	70G		

71G	72G	73G	74G	75G
76G	77G	78G	79G	80G

ABBIA0330GB

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

H.S.

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

Terminal No.	Color of Wire	Signal Name
19	B/R	–

Connector No.	F17
Connector Name	A/T ASSEMBLY (COLUMN SHIFT)
Connector Color	GREEN

H.S.

5	4	3	2	1
10	9	8	7	6

Terminal No.	Color of Wire	Signal Name
9	B/R	–

Connector No.	F27
Connector Name	STARTER MOTOR
Connector Color	–

H.S.

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

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

H.S.

10	9	8	7	6	5	4	3	2	1

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

Connector No.	F34
Connector Name	WIRE TO WIRE
Connector Color	WHITE

H.S.

Terminal No.	Color of Wire	Signal Name
1	W/R	–

Connector No.	F28
Connector Name	STARTER MOTOR
Connector Color	GRAY

H.S.

Terminal No.	Color of Wire	Signal Name
1	W/R	–

ABBIA0687GB

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000005387826

Symptom	Reference
No normal cranking	Refer to STR-4, "Work Flow".
Starter motor does not rotate	

ON-VEHICLE REPAIR

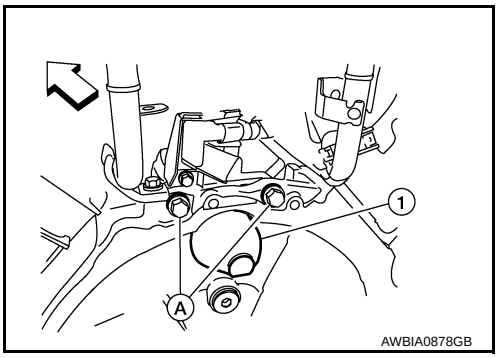
STARTER MOTOR

Removal and Installation

INFOID:0000000005387827

REMOVAL

1. Remove the intake manifold. Refer to EM-26, "Removal and Installation".
2. Remove the starter harness terminal nut and connector.
3. Remove the two starter bolts (A), using power tools.
4. Remove the starter (1).
   ⇦: Vehicle front



INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

Tighten terminal nut carefully.

Starter bolt	**: 45 N·m (4.6 kg-m, 33 ft-lb)**
Terminal nut	**: 9.6 N·m (0.98 kg-m, 85 in-lb)**

SERVICE DATA AND SPECIFICATIONS (SDS)

STARTER MOTOR

Starter

INFOID:0000000005387828

Application		FFV models	Non-FFV models
Manufacturer		Mitsubishi	
Model number		M001T30571ZC	M001T30671ZC
Type		Reduction gear type	
System voltage		12V	
No-load	Terminal voltage	11V	
	Current	Less than 120A	
	Revolution	More than 3,220 rpm	