

STR

SECTION

STARTING SYSTEM

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PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:0000000014418440

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. 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, it is recommended that all maintenance and repair be performed by an authorized NISSAN/INFINITI dealer.
- Improper repair, 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 Air Bag Diagnosis Sensor Unit or other Air Bag 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 or batteries, and wait at least three minutes before performing any service.

Precaution for Power Generation Voltage Variable Control System

INFOID:0000000014418441

CAUTION:

For this model, the battery current sensor that is installed to the battery cable at the negative terminal measures the charging/discharging current of the battery, and performs various controls. If the electrical component or the ground wire is connected directly to the battery terminal, the current other than that being measured with the battery current sensor is charging to or discharging from the battery. This condition causes the malfunction of the control, and then the battery discharge may occur. Do not connect the electrical component or the ground wire directly to the battery terminal.

PREPARATION

< PREPARATION >

PREPARATION

PREPARATION

Special Service Tool

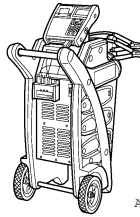
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The actual shape of the tools may differ from those illustrated here.

Tool number (TechMate No.) Tool name	Description
— (—) Model GR8-1200 NI Multitasking battery and electrical diagnostic station	Tests batteries, starting and charging systems and charges batteries. For operating instructions, refer to diagnostic station instruction manual.



AWI1A12392Z

C

D

E

Commercial Service Tool

INFOID:0000000014418443

Tool name	Description
Power tool	Loosening nuts, screws and bolts



PIIB1407E

F

G

H

I

J

K

L

M

N

O

P

COMPONENT PARTS

< SYSTEM DESCRIPTION >

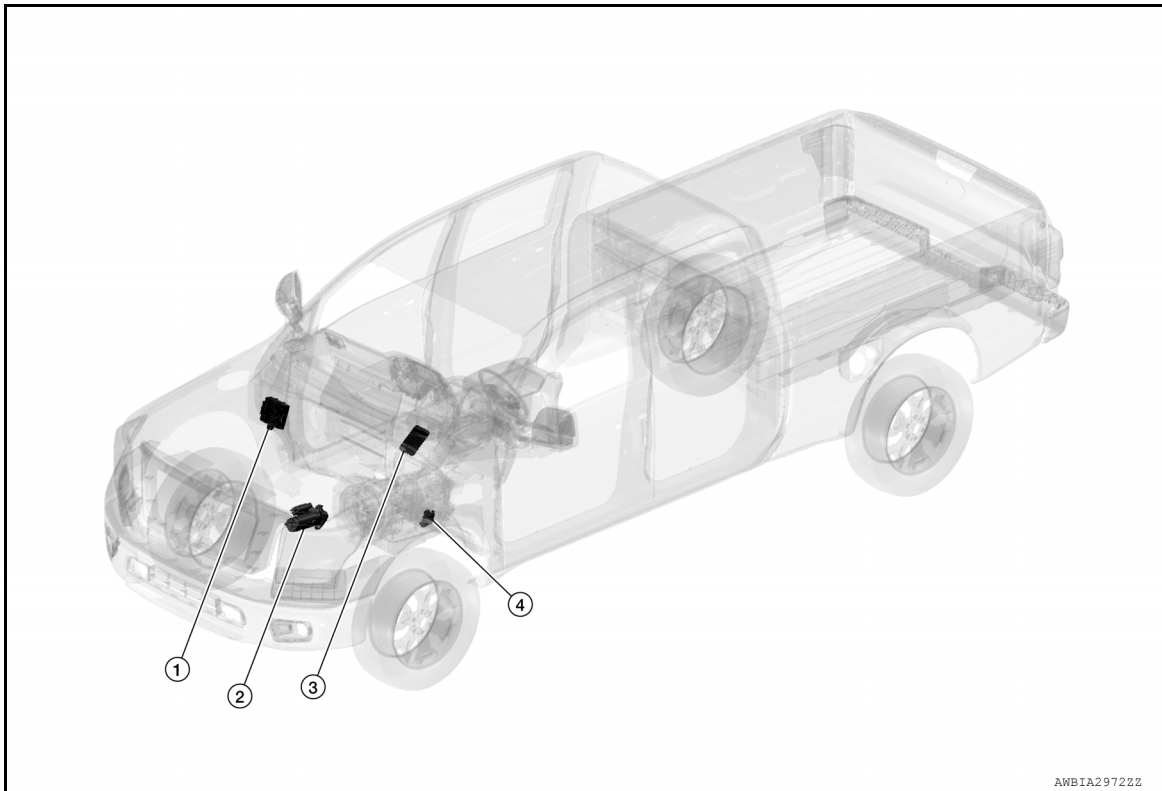
SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000014418444

WITH CUMMINS 5.0L

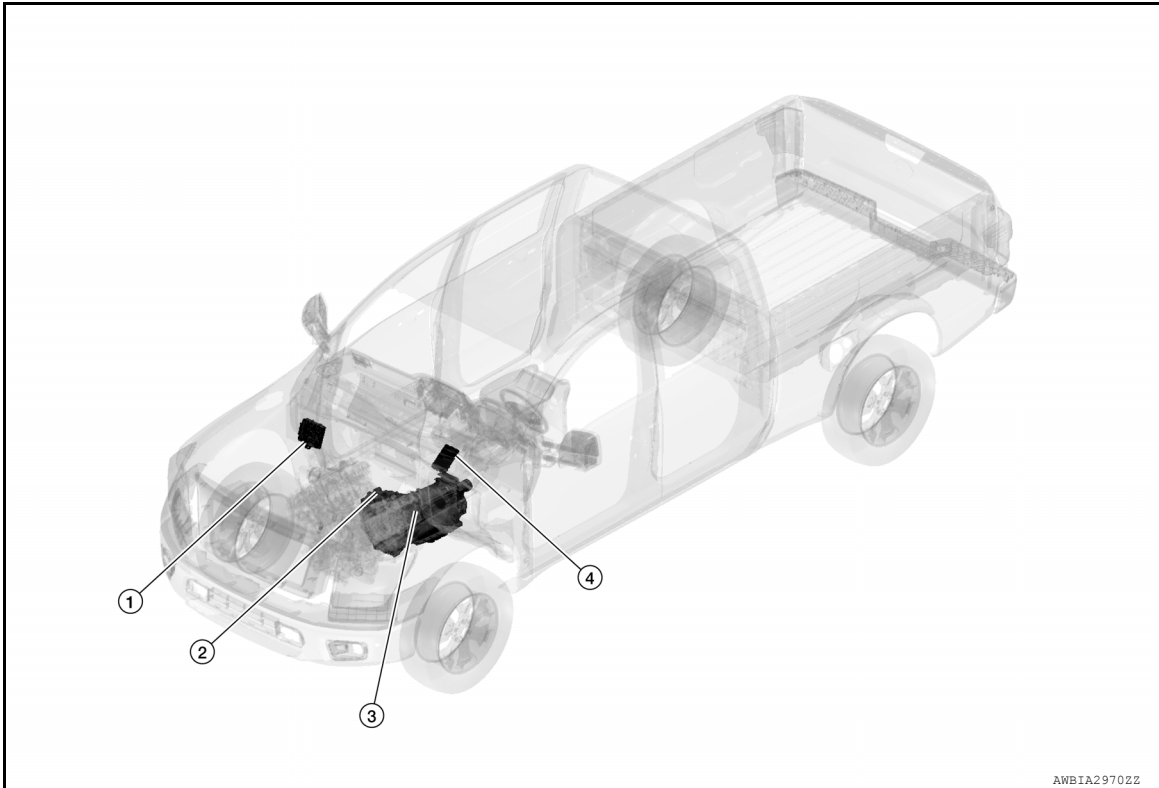


No.	Component	Description
1.	IPDM E/R	CPU inside IPDM E/R operates the starter relay when the ignition switch is in the start position. Refer to PCS-5, "Component Parts Location" .
2.	Starter motor	The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the S terminal is supplied with electric power.
3.	BCM	BCM controls the starter relay inside IPDM E/R. Refer to BCS-5, "BODY CONTROL SYSTEM : Component Parts Location" .
4.	Transmission range switch	Transmission range switch supplies power to the starter relay and starter control relay inside IPDM E/R when the A/T shift selector is shifted to the P or N position. Refer to TM-15, "A/T CONTROL SYSTEM : Component Parts Location" .

WITH VK56VD

COMPONENT PARTS

< SYSTEM DESCRIPTION >



No.	Component	Description
1.	IPDM E/R	CPU inside IPDM E/R operates the starter relay when the ignition switch is in the start position. Refer to PCS-5, "Component Parts Location" .
2.	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.
3.	BCM	BCM controls the starter relay inside IPDM E/R. Refer to BCS-5, "BODY CONTROL SYSTEM : Component Parts Location" .
4.	A/T assembly	A/T assembly supplies power to the starter relay and starter control relay inside IPDM E/R when the A/T shift selector is shifted to the P or N position. Refer to TM-15, "A/T CONTROL SYSTEM : Component Parts Location" .

STARTING SYSTEM

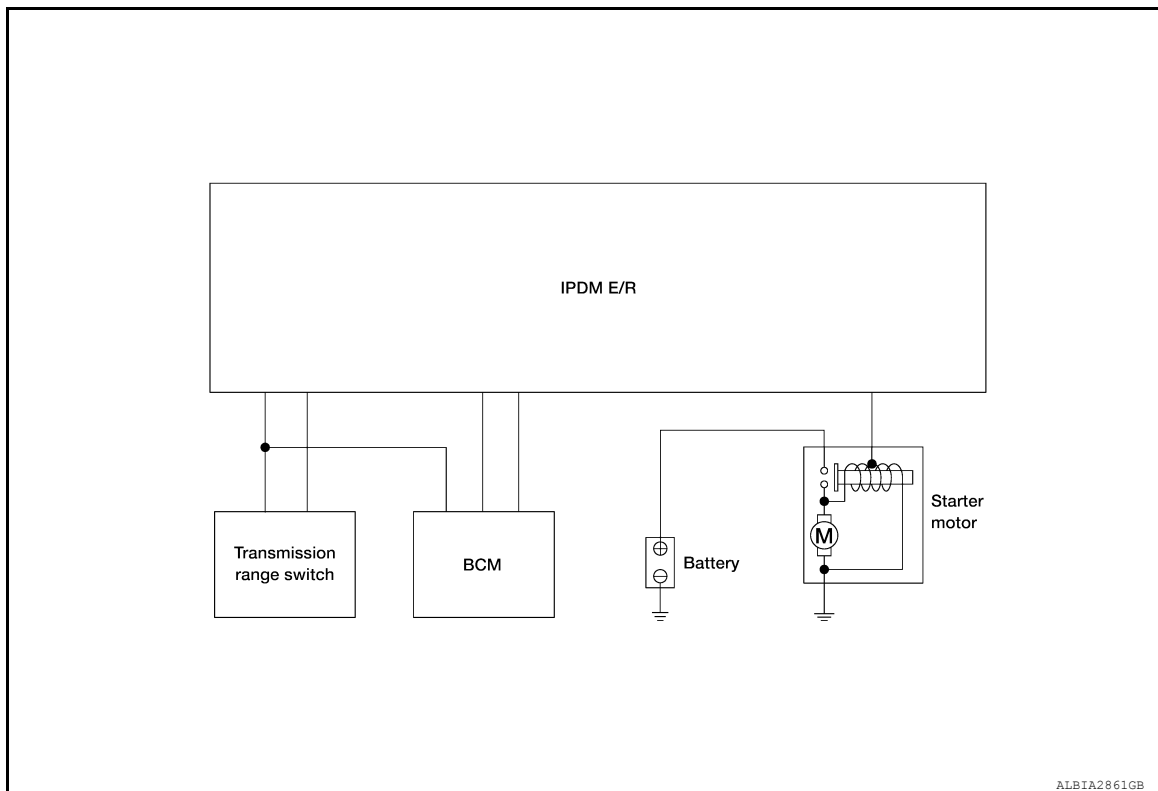
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STARTING SYSTEM

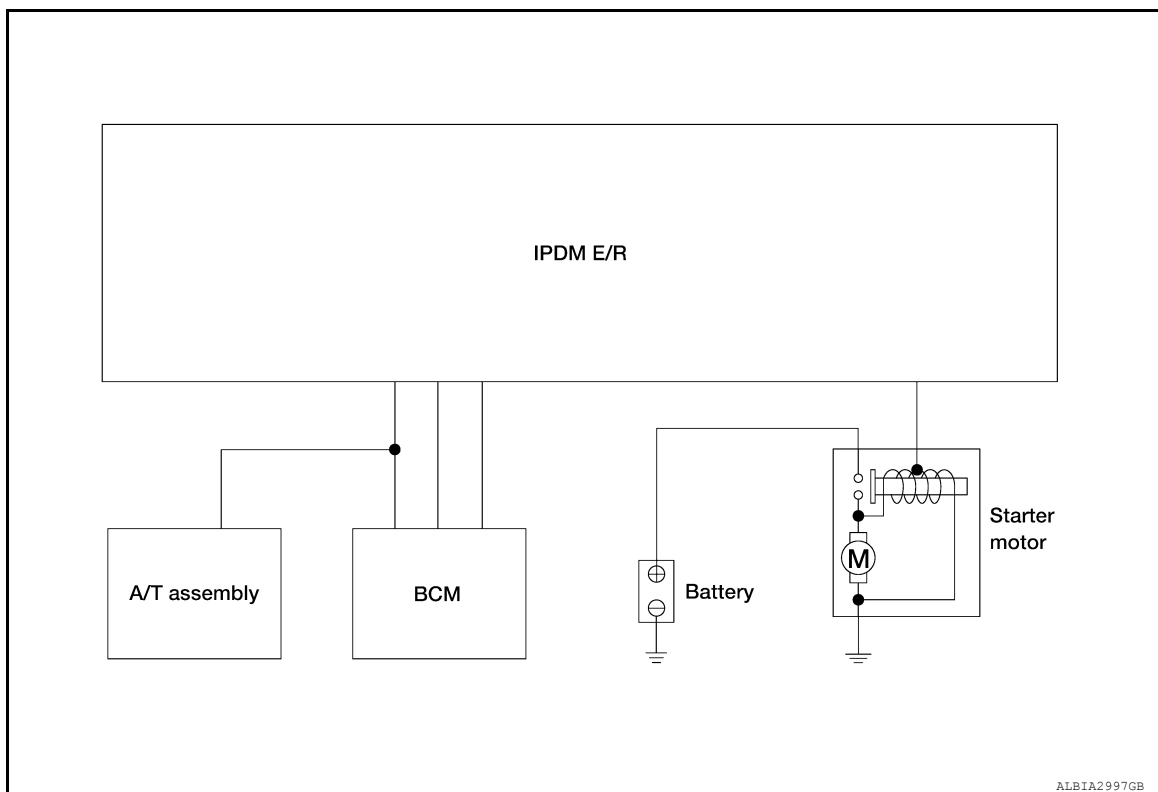
System Diagram

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WITH CUMMINS 5.0L



WITH VK56VD



STARTING SYSTEM

< SYSTEM DESCRIPTION >

System Description

INFOID:0000000014418446

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.

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

STR

< WIRING DIAGRAM >

STARTING SYSTEM

INFOID:0000000014418447



STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH Cummins 5.0L

Connector No.	E52
Connector Name	WIRE TO WIRE
Connector Type	RK26FGY-RS20-X6
Connector Color	GRAY

5F	4F	3F	2F	1F
11F	10F	9F	8F	7F
6F	5F	4F	3F	2F
1F	2F	3F	4F	5F
6F	7F	8F	9F	10F
11F	12F	13F	14F	15F
16F	17F	18F	19F	20F
21F	22F	23F	24F	25F
26F	27F	28F	29F	30F
31F	32F	33F	34F	35F
36F	37F	38F	39F	40F
41F	42F	43F	44F	45F
46F	47F	48F	49F	50F

21F	L/R	TO ENGINE CONTROL NO. 2 HARNESS
22F	L/W	TO ENGINE CONTROL NO. 2 HARNESS
23F	R/L	TO ENGINE CONTROL NO. 2 HARNESS
24F	W/L	TO ENGINE CONTROL NO. 2 HARNESS
25F	W/R	TO ENGINE CONTROL NO. 2 HARNESS
26F	B/R	TO ENGINE CONTROL NO. 2 HARNESS
27F	Y	TO ENGINE CONTROL NO. 2 HARNESS
28F	W/R	TO ENGINE CONTROL NO. 2 HARNESS
29F	L/O	TO ENGINE CONTROL NO. 2 HARNESS
30F	B	TO ENGINE CONTROL NO. 2 HARNESS
31F	B	TO ENGINE CONTROL NO. 2 HARNESS
32F	V/W	TO ENGINE CONTROL NO. 2 HARNESS
33F	GR	TO ENGINE CONTROL NO. 2 HARNESS
34F	L/R	TO ENGINE CONTROL NO. 2 HARNESS
35F	R/W	TO ENGINE CONTROL NO. 2 HARNESS
36F	L/B	TO ENGINE CONTROL NO. 2 HARNESS
37F	L	TO ENGINE CONTROL NO. 2 HARNESS
38F	R/Y	TO ENGINE CONTROL NO. 2 HARNESS
39F	R/Y	TO ENGINE CONTROL NO. 2 HARNESS
40F	B/R	TO ENGINE CONTROL NO. 2 HARNESS
41F	W	TO ENGINE CONTROL NO. 2 HARNESS
42F	Y	TO ENGINE CONTROL NO. 2 HARNESS
43F	B/P	TO ENGINE CONTROL NO. 2 HARNESS
44F	Y/B	TO ENGINE CONTROL NO. 2 HARNESS
45F	L/Y	TO ENGINE CONTROL NO. 2 HARNESS
46F	O	TO ENGINE CONTROL NO. 2 HARNESS
47F	W/R	TO ENGINE CONTROL NO. 2 HARNESS
48F	L	TO ENGINE CONTROL NO. 2 HARNESS
49F	BR	TO ENGINE CONTROL NO. 2 HARNESS
50F	SHIELD	TO ENGINE CONTROL NO. 2 HARNESS
51F	L	TO ENGINE CONTROL NO. 2 HARNESS

Terminal No.	Color of Wire	Signal Name
1F	Y	TO ENGINE CONTROL NO. 2 HARNESS
2F	B	TO ENGINE CONTROL NO. 2 HARNESS
3F	BR	TO ENGINE CONTROL NO. 2 HARNESS
4F	W/R	TO ENGINE CONTROL NO. 2 HARNESS
5F	B/R	TO ENGINE CONTROL NO. 2 HARNESS
6F	O	TO ENGINE CONTROL NO. 2 HARNESS
7F	GR/Y	TO ENGINE CONTROL NO. 2 HARNESS
8F	V	TO ENGINE CONTROL NO. 2 HARNESS
9F	BR	TO ENGINE CONTROL NO. 2 HARNESS
10F	Y/B	TO ENGINE CONTROL NO. 2 HARNESS
11F	L	TO ENGINE CONTROL NO. 2 HARNESS
12F	R	TO ENGINE CONTROL NO. 2 HARNESS
13F	Y	TO ENGINE CONTROL NO. 2 HARNESS
14F	V	TO ENGINE CONTROL NO. 2 HARNESS
15F	SB	TO ENGINE CONTROL NO. 2 HARNESS
16F	P	TO ENGINE CONTROL NO. 2 HARNESS
17F	Y/R	TO ENGINE CONTROL NO. 2 HARNESS
18F	R	TO ENGINE CONTROL NO. 2 HARNESS
19F	V	TO ENGINE CONTROL NO. 2 HARNESS
20F	BR	TO ENGINE CONTROL NO. 2 HARNESS

52F	BR	TO ENGINE CONTROL NO. 2 HARNESS
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9	8	7	6	5	4	3
18	17	16	15	14	13	12
11	10	9	8	7	6	5
4	3	2	1	0	0	0

Terminal No.	Color of Wire	Signal Name
3	-	-
4	B/R	NP SW
5	L/W	H/LAMP HI RH
6	G	H/LAMP HI LH
7	L	H/LAMP LO LH
8	R/Y	H/LAMP LO RH
9	G/W	FR FOGL LH
10	-	-
11	P	ETC VB - (WITH CUMMINS 5.0L)
12	W/R	ETC VB - (WITH CUMMINS 5.0L)
13	Y/R	FR FOGL RH
14	G	REVERSE LAMP IGN
15	GR	ABS ECU IGN
16	G	ETC RLY CONT - (WITH CUMMINS 5.0L)
17	W/R	ETC RLY CONT - (WITH CUMMINS 5.0L)
18	W	IGN COIL - (WITH CUMMINS 5.0L)

Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FW-LC
Connector Color	WHITE

21	20	19
24	23	22

Terminal No.	Color of Wire	Signal Name
19	W/R	STARTER MOTOR
20	L	F/LIGNSW
21	-	-
22	-	-
23	-	-
24	-	-

Connector No.	E122
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH12FW-NH
Connector Color	WHITE

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

Terminal No.	Color of Wire	Signal Name
37	-	-
38	-	-
39	L/Y	WIPER AUTO STOP SW
40	P	CAN-L
41	L	CAN-H
42	BR	DTFL RLY
43	-	-
44	W/B	START CONT
45	GR	FUEL RLY CONT
46	Y	HOOD SW
47	Y	ALT C - (WITH VK66VD)
48	R/W	HORN RLY CONT

STARTING SYSTEM

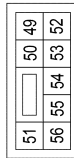
< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH Cummins 5.0L

Connector No.	E123	Connector No.	E130
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)	Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS08FBR-CS	Connector Type	TH10FB-NH
Connector Color	BROWN	Connector Color	BLACK



H.S.



Terminal No.	Color of Wire	Signal Name	Terminal No.	Color of Wire	Signal Name
49	Y/B	A/C COMP - (WITH CUMMINS 5.0L)	63	-	-
49	GR/R	A/C COMP - (WITH VK56VD)	64	R	DETENT SW
50	BR	TRAILER TOW	65	-	-
51	-	-	66	P	PUSH START SW
52	B	S-GND	67	-	-
53	-	-	68	L	IGN SIGNAL
54	-	-	69	-	-
55	-	-	70	-	-
56	-	-	71	SB	HOOD SW2
			72	W	E-PLG - (WITH VK56VD)

Connector No.	E124	Connector No.	E130
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)	Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M08FB-LC	Connector Type	TH10FB-NH
Connector Color	BLACK	Connector Color	BLACK



H.S.



Terminal No.	Color of Wire	Signal Name
57	W/B	RR DEF
58	BR	FUEL PUMP - (WITH CUMMINS 5.0L)
58	B/Y	FUEL PUMP - (WITH VK56VD)
59	-	-
60	-	-
61	-	-
62	B	P GND

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< WIRING DIAGRAM >

Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4
Connector Color	WHITE



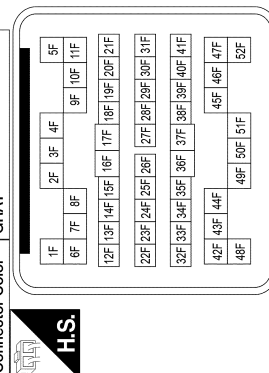
24G	G/B	TO MAIN HARNESS
25G	R/W	TO MAIN HARNESS
26G	R	TO MAIN HARNESS
27G	L/G	TO MAIN HARNESS
28G	G/B	TO MAIN HARNESS
29G	G/B	TO MAIN HARNESS
30G	BR/Y	TO MAIN HARNESS
31G	P	TO MAIN HARNESS - (WITH CUMMINGS 5.0L)
31G	R	TO MAIN HARNESS - (WITH W96P/D)
32G	P	TO MAIN HARNESS
33G	V/L	TO MAIN HARNESS
34G	G/R	TO MAIN HARNESS
35G	G/R	TO MAIN HARNESS
36G	S/B	TO MAIN HARNESS
37G	R/W	TO MAIN HARNESS
38G	BR	TO MAIN HARNESS
39G	BR	TO MAIN HARNESS
40G	-	TO MAIN HARNESS
41G	R/G	TO MAIN HARNESS
42G	O	TO MAIN HARNESS
43G	B	TO MAIN HARNESS - (WITH CUMMINGS 5.0L)
43G	G	TO MAIN HARNESS - (WITH W96P/D)
44G	RY/Y	TO MAIN HARNESS
45G	G	TO MAIN HARNESS
46G	L/G	TO MAIN HARNESS
47G	R	TO MAIN HARNESS
48G	W	TO MAIN HARNESS
49G	-	TO MAIN HARNESS
50G	BR	TO MAIN HARNESS
51G	R	TO MAIN HARNESS
52G	L	TO MAIN HARNESS
53G	W	TO MAIN HARNESS
54G	W	TO MAIN HARNESS
55G	G	TO MAIN HARNESS
56G	W	TO MAIN HARNESS
57G	Y	TO MAIN HARNESS
58G	B/G	TO MAIN HARNESS
59G	B/G	TO MAIN HARNESS
60G	B/G	TO MAIN HARNESS
61G	B	TO MAIN HARNESS
62G	W	TO MAIN HARNESS
63G	R	TO MAIN HARNESS
64G	W/L	TO MAIN HARNESS
65G	W/R	TO MAIN HARNESS
66G	B/G	TO MAIN HARNESS
67G	B/G	TO MAIN HARNESS
68G	B	TO MAIN HARNESS
69G	Y	TO MAIN HARNESS
70G	L	TO MAIN HARNESS
71G	RY/Y	TO MAIN HARNESS

Terminal No.	Color of Wire	Signal Name
1G	G	TO MAIN HARNESS
2G	B/R	TO MAIN HARNESS
3G	W/B	TO MAIN HARNESS
4G	BR/W	TO MAIN HARNESS
5G	BR	TO MAIN HARNESS
6G	P	TO MAIN HARNESS - (WITH VK69/D)
6G	R/W	TO MAIN HARNESS - (WITH CUMMINS 5.0L)
7G	Y	TO MAIN HARNESS
8G	G	TO MAIN HARNESS
9G	R	TO MAIN HARNESS
10G	W	TO MAIN HARNESS
11G	P/G	TO MAIN HARNESS
12G	W/B	TO MAIN HARNESS
13G	BR	TO MAIN HARNESS
14G	Y/B	TO MAIN HARNESS
15G	G/W	TO MAIN HARNESS
16G	G	TO MAIN HARNESS
17G	G/Y	TO MAIN HARNESS
18G	G/Y	TO MAIN HARNESS
19G	Y/V	TO MAIN HARNESS
20G	G/Y	TO MAIN HARNESS
21G	B/Y	TO MAIN HARNESS
22G	G/R	TO MAIN HARNESS
23G	Y/P	TO MAIN HARNESS

AABTA2210GB

72G	L/W	TO MAIN HARNESS
73G	SHIELD	TO MAIN HARNESS
74G	W	TO MAIN HARNESS
75G	R	TO MAIN HARNESS
76G	R/G	TO MAIN HARNESS
77G	G	TO MAIN HARNESS
78G	W	TO MAIN HARNESS
79G	-	TO MAIN HARNESS
80G	R	TO MAIN HARNESS
81G	L	TO MAIN HARNESS
82G	R	TO MAIN HARNESS
83G	L	TO MAIN HARNESS
84G	L	TO MAIN HARNESS
85G	W/B	TO MAIN HARNESS
86G	B/R	TO MAIN HARNESS
87G	W/B	TO MAIN HARNESS
88G	P	TO MAIN HARNESS
89G	L	TO MAIN HARNESS
90G	G	TO MAIN HARNESS
91G	G	TO MAIN HARNESS
92G	V/W	TO MAIN HARNESS
93G	BR	TO MAIN HARNESS
94G	G	TO MAIN HARNESS
95G	G	TO MAIN HARNESS
96G	W	TO MAIN HARNESS
97G	R	TO MAIN HARNESS
98G	W/B	TO MAIN HARNESS
99G	BR	TO MAIN HARNESS
100G	GR/W	TO MAIN HARNESS

Connector No.	F209
Connector Name	WIRE TO WIRE
Connector Type	RK26MGY-RS20-X6
Connector Color	GRAY



Terminal No.	Color of Wire	Signal Name
1F	Y/R	TO ENGINE ROOM HARNESS
2F	B	TO ENGINE ROOM HARNESS
3F	B/W	TO ENGINE ROOM HARNESS

STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH Cummins 5.0L

Connector No.	F210
Connector Name	FUSIBLE LINK BOX RH (BATTERY)
Connector Type	24340_79907
Connector Color	-



H.S.

Terminal No.	8
Color of Wire	B
Signal Name	BATTERY

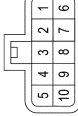
Connector No.	F227
Connector Name	STARTER MOTOR (WITH CUMMINS 5.0L)
Connector Type	24340-JA04D
Connector Color	-



H.S.

Terminal No.	B
Color of Wire	B
Signal Name	BATTERY

Connector No.	F212
Connector Name	TRANSMISSION RANGE SWITCH
Connector Type	HS10FB
Connector Color	BLACK



H.S.

Terminal No.	Color of Wire	Signal Name
1	L/W	RANGE SIGNAL C
2	P	RANGE SIGNAL B
3	R/Y	IGNITION
4	GR	RANGE SIGNAL PA
5	Y/R	RANGE SIGNAL A
6	O/L	BATTERY
7	R	REVERSE RELAY CONT
8	B/R	NP SW
9	BR/Y	IGNITION RELAY
10	-	-

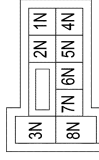
Connector No.	F228
Connector Name	STARTER MOTOR (WITH CUMMINS 5.0L)
Connector Type	X01FGY
Connector Color	GRAY



H.S.

Terminal No.	S
Color of Wire	W/R
Signal Name	STARTER RELAY

Connector No.	M3
Connector Name	FUSE BLOCK (J/B)
Connector Type	CS06FW-M2
Connector Color	WHITE



H.S.

Terminal No.	Color of Wire	Signal Name
1N	-	-
2N	W	BATTERY
3N	W	BLOWER FAN RELAY OUT
4N	V	BATTERY

5N	Y	BATTERY
6N	W	BATTERY
7N	L	ACC RELAY OUT
8N	W	IGNITION

Connector No.	M18
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FG-NH
Connector Color	GREEN



H.S.

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

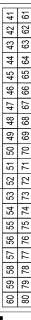
Terminal No.	Color of Wire	Signal Name
1	G	ENG START SW NO ESCL
2	-	-
3	R	A/L POWER SUPPLY 5V
4	W/R	A/L SIGNAL
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	SB	COMBI SW IN 5
11	G/Y	COMBI SW IN 4
12	Y	COMBI SW IN 3
13	G/B	COMBI SW IN 2
14	V	COMBI SW IN 1
15	-	-
16	-	-
17	P	GND RF A/L
18	V	SECURITY INDICATOR
19	-	-
20	R	SHIFT P
21	R/W	STEP LAMP CONT
22	-	-
23	Y	AIRCON SW
24	-	-
25	W	BRAKE SW FUSE
26	L	SHORT IN PIN INPUT
27	R/G	BRAKE SW LAMP
28	-	-
29	W	BLOWER FAN SW
30	P	DR DOOR LOCK STATUS
31	-	-
32	Y	REAR DEFROGGER SW
33	-	-

STARTING SYSTEM

< WIRING DIAGRAM >

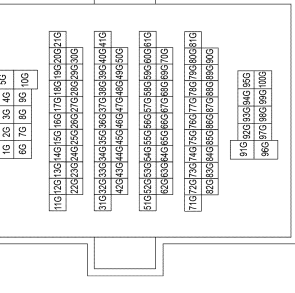
STARTING SYSTEM CONNECTORS - WITH Cummins 5.0L

Connector No.	M19
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FB-NH
Connector Color	BLACK

78	O/B	COMBI SW OUT 2
79	R/W	COMBI SW OUT 1
80	-	-

Connector No.	M31
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4
Connector Color	WHITE

Terminal No.	Color of Wire	Signal Name
41	Y/L	TRAILER LIGHT CHECK RELAY OUT
42	R/Y	CARGO LAMP OUT
43	-	-
44	-	-
45	-	-
46	-	-
47	-	-
48	R	HIGH SIDE START SW LED
49	-	-
50	-	-
51	-	-
52	W	AUDIO DONGLE
53	-	-
54	W/L	PW UART
55	W/B	L&R SENSOR K-LINE
56	-	-
57	-	-
58	-	-
59	P	CAN-L
60	L	CAN-H
61	O	REAR DEFROGGER RELAY OUT
62	W	STARTER RELAY OUT
63	-	-
64	P	BUZZER OUT
65	-	-
66	W	BLOWER FAN RELAY OUT
67	G	IGN ELEC RELAY OUT 2
68	L	MR OUTPUT
69	R/B	AT DEVICE OUT
70	P	IGN USM OUT 1
71	O	DR REQUEST SW
72	G	AS REQUEST SW
73	-	-
74	-	-
75	L/W	COMBI SW OUT 5
76	P	COMBI SW OUT 4
77	L	COMBI SW OUT 3

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23G	Y/R	TO ENGINE ROOM HARNESS
24G	G/B	TO ENGINE ROOM HARNESS
25G	R/W	TO ENGINE ROOM HARNESS
26G	R	TO ENGINE ROOM HARNESS
27G	L/G	TO ENGINE ROOM HARNESS
28G	G/B	TO ENGINE ROOM HARNESS
29G	G/B	TO ENGINE ROOM HARNESS
30G	BR/Y	TO ENGINE ROOM HARNESS
31G	R	TO ENGINE ROOM HARNESS
32G	R	TO ENGINE ROOM HARNESS
33G	Y/L	TO ENGINE ROOM HARNESS
34G	GR	TO ENGINE ROOM HARNESS
35G	G/R	TO ENGINE ROOM HARNESS
36G	SB	TO ENGINE ROOM HARNESS
37G	R/W	TO ENGINE ROOM HARNESS
38G	BR	TO ENGINE ROOM HARNESS
39G	BR	TO ENGINE ROOM HARNESS
40G	-	TO ENGINE ROOM HARNESS
41G	R/G	TO ENGINE ROOM HARNESS
42G	O	TO ENGINE ROOM HARNESS
43G	G	TO ENGINE ROOM HARNESS
44G	R/Y	TO ENGINE ROOM HARNESS
45G	G	TO ENGINE ROOM HARNESS
46G	L/G	TO ENGINE ROOM HARNESS
47G	R	TO ENGINE ROOM HARNESS
48G	W	TO ENGINE ROOM HARNESS
49G	-	TO ENGINE ROOM HARNESS
50G	BR	TO ENGINE ROOM HARNESS
51G	R	TO ENGINE ROOM HARNESS
52G	L	TO ENGINE ROOM HARNESS
53G	W	TO ENGINE ROOM HARNESS
54G	W	TO ENGINE ROOM HARNESS
55G	G	TO ENGINE ROOM HARNESS
56G	W	TO ENGINE ROOM HARNESS
57G	Y	TO ENGINE ROOM HARNESS
58G	BG	TO ENGINE ROOM HARNESS
59G	BG	TO ENGINE ROOM HARNESS
60G	BG	TO ENGINE ROOM HARNESS
61G	O	TO ENGINE ROOM HARNESS
62G	W	TO ENGINE ROOM HARNESS
63G	O	TO ENGINE ROOM HARNESS
64G	W/L	TO ENGINE ROOM HARNESS
65G	W/R	TO ENGINE ROOM HARNESS
66G	BG	TO ENGINE ROOM HARNESS
67G	O	TO ENGINE ROOM HARNESS
68G	B	TO ENGINE ROOM HARNESS
69G	Y	TO ENGINE ROOM HARNESS
70G	L	TO ENGINE ROOM HARNESS
71G	R/W	TO ENGINE ROOM HARNESS
72G	L/W	TO ENGINE ROOM HARNESS
73G	SHIELD	TO ENGINE ROOM HARNESS
74G	W	TO ENGINE ROOM HARNESS
75G	R	TO ENGINE ROOM HARNESS

76G	R/G	TO ENGINE ROOM HARNESS
77G	BG	TO ENGINE ROOM HARNESS
78G	P	TO ENGINE ROOM HARNESS
79G	-	TO ENGINE ROOM HARNESS
80G	R	TO ENGINE ROOM HARNESS
81G	L	TO ENGINE ROOM HARNESS
82G	R	TO ENGINE ROOM HARNESS
83G	L	TO ENGINE ROOM HARNESS
84G	L	TO ENGINE ROOM HARNESS
85G	W	TO ENGINE ROOM HARNESS
86G	B/R	TO ENGINE ROOM HARNESS
87G	W	TO ENGINE ROOM HARNESS
88G	G	TO ENGINE ROOM HARNESS
89G	P	TO ENGINE ROOM HARNESS
90G	G	TO ENGINE ROOM HARNESS
91G	P	TO ENGINE ROOM HARNESS
92G	W/W	TO ENGINE ROOM HARNESS
93G	BR	TO ENGINE ROOM HARNESS
94G	B	TO ENGINE ROOM HARNESS
95G	G	TO ENGINE ROOM HARNESS
96G	R	TO ENGINE ROOM HARNESS
97G	R	TO ENGINE ROOM HARNESS
98G	W/B	TO ENGINE ROOM HARNESS
99G	R	TO ENGINE ROOM HARNESS
100G	GR/W	TO ENGINE ROOM HARNESS

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STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH Cummins 5.0L

Connector No.	M81
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	FEA09FW-FHA6-SA
Connector Color	WHITE



137	136	135	134	133	132	131	130	129
143	142	141	140	139	138			

Terminal No.	Color of Wire	Signal Name
129	P/G	BATTERY SAVER OUT
130	LG	SUPER LOCK/DOOR UNLOCK AS
131	W	BAT BCM FUSE
132	Y	DOOR LOCK AS/RR/RL
133	BR	DOOR UNLOCK AS/RR/RL
134	B	GND2
135	O	DOOR LOCK DR/AS/FL
136	L	ROOM LAMP CONT
137	V	DOOR UNLOCK DR/AS/FL
138	V	BAT REAR DOOR
139	W	BAT-POWER F/L
140	LG	P/W POWER SUPPLY IGN
141	V	P/W POWER SUPPLY BAT
142	Y	BAT FRONT DOOR
143	B	GND1

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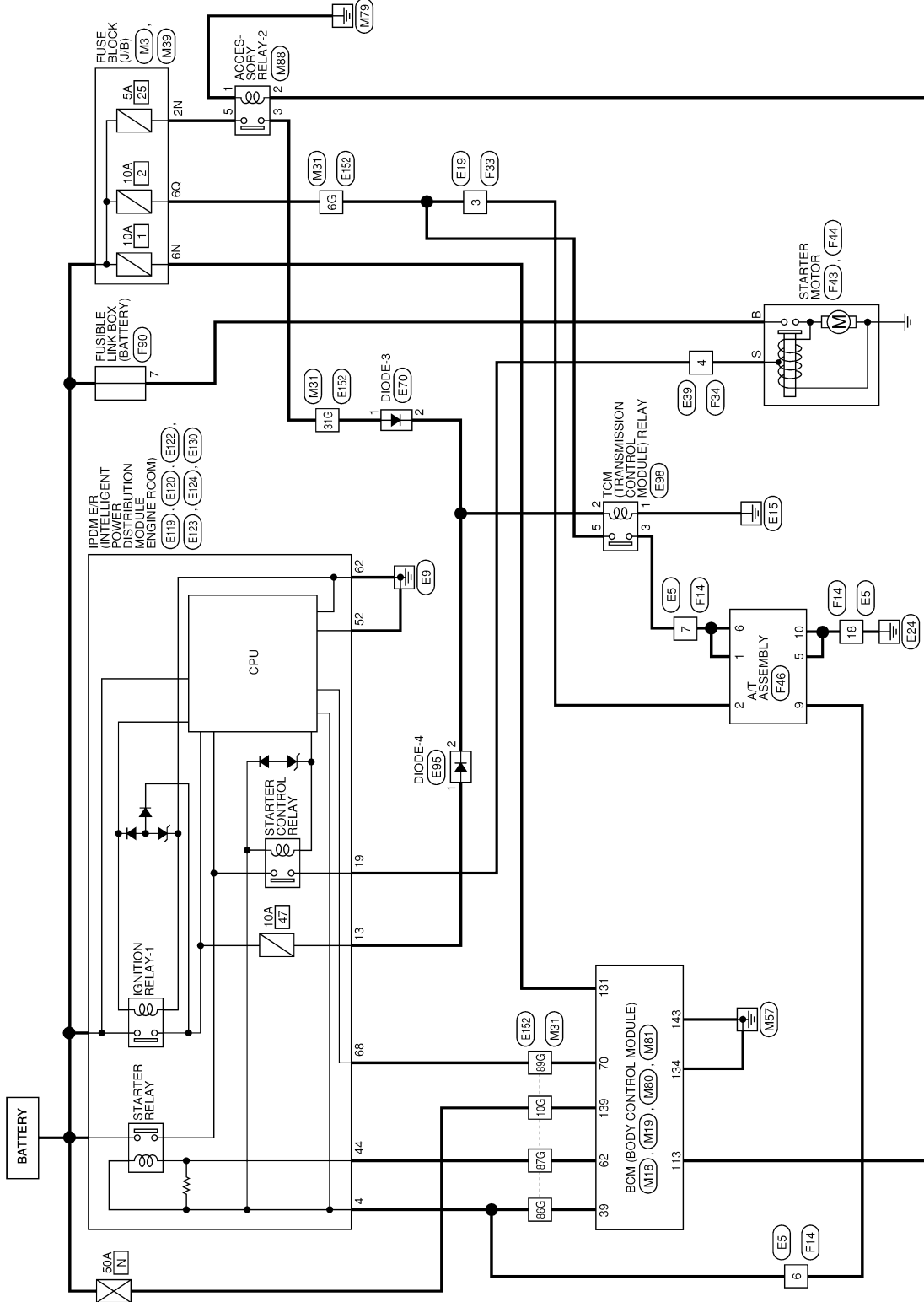
STARTING SYSTEM

< WIRING DIAGRAM >

Wiring Diagram- with VK56VD

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STARTING SYSTEM - WITH VK56VD



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STARTING SYSTEM

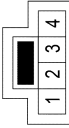
< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH VK56VD

Connector No.	E5
Connector Name	WIRE TO WIRE
Connector Type	TH24MW-NH
Connector Color	WHITE




Connector No.	E19
Connector Name	WIRE TO WIRE
Connector Type	NS04MW-CS
Connector Color	WHITE

Connector No.	E70
Connector Name	DIODE-3
Connector Type	24335_C9900
Connector Color	WHITE




5	P	BATTERY
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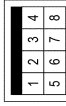
Connector No.	E119
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS16FW-CS
Connector Color	WHITE




Terminal No.	Color of Wire	Signal Name
1	L/R	TO ENGINE CONTROL HARNESS
2	BR	TO ENGINE CONTROL HARNESS
3	V	TO ENGINE CONTROL HARNESS
4	L/O	TO ENGINE CONTROL HARNESS
5	W	TO ENGINE CONTROL HARNESS
6	B/R	TO ENGINE CONTROL HARNESS
7	Y/R	TO ENGINE CONTROL HARNESS
8	W/L	TO ENGINE CONTROL HARNESS
9	W/L	TO ENGINE CONTROL HARNESS
10	L/Y	TO ENGINE CONTROL HARNESS
11	SB	TO ENGINE CONTROL HARNESS
12	L	TO ENGINE CONTROL HARNESS
13	W/R	TO ENGINE CONTROL HARNESS
14	Y	TO ENGINE CONTROL HARNESS
15	B	TO ENGINE CONTROL HARNESS
16	B	TO ENGINE CONTROL HARNESS
17	R	TO ENGINE CONTROL HARNESS
18	B	TO ENGINE CONTROL HARNESS
19	B/R	TO ENGINE CONTROL HARNESS
20	GR	TO ENGINE CONTROL HARNESS
21	V/R	TO ENGINE CONTROL HARNESS
22	B	TO ENGINE CONTROL HARNESS
23	B	TO ENGINE CONTROL HARNESS
24	P	TO ENGINE CONTROL HARNESS

Terminal No.	Color of Wire	Signal Name
1	L	TO ENGINE CONTROL HARNESS
2	W	TO ENGINE CONTROL HARNESS
3	P	TO ENGINE CONTROL HARNESS
4	SB	TO ENGINE CONTROL HARNESS

Connector No.	E39
Connector Name	WIRE TO WIRE
Connector Type	M08MW-GY-LC
Connector Color	GRAY

Terminal No.	Color of Wire	Signal Name
1	R	ACC
2	BR	ACC

Connector No.	E95
Connector Name	DIODE-4
Connector Type	24335_C9900
Connector Color	WHITE




Terminal No.	Color of Wire	Signal Name
1	Y/R	A/T ECU IGN
2	BR	A/T ECU IGN

Connector No.	E98
Connector Name	TCM (TRANSMISSION CONTROL MODULE) RELAY
Connector Type	MS02FL-M2-LC
Connector Color	BLUE




Terminal No.	Color of Wire	Signal Name
1	B	GROUND
2	BR	IGNITION RELAY CONT
3	Y/R	VIGN

Terminal No.	Color of Wire	Signal Name
3	-	-
4	B/R	NP SW
5	L/W	H/LAMP HI LH
6	G	H/LAMP HI RH
7	L	H/LAMP LO LH
8	R/Y	H/LAMP LO RH
9	G/W	FR FOG/L LH
10	-	-
11	P	ETC VB - (WITH CUMMINS 5.0L)
12	O	ETC VB - (WITH VK56VD)
13	W/R	FR FOG/L RH
14	G	A/T ECU IGN
15	GR	REVERSE LAMP IGN
16	G	ABS ECU IGN
17	G	ETC RLY CONT - (WITH CUMMINS 5.0L)
18	G	ETC RLY CONT - (WITH VK56VD)
19	L/W	IGN COIL - (WITH CUMMINS 5.0L)
20	W	IGN COIL - (WITH VK56VD)
21	-	-

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STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH VK56VD

Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FW-LC
Connector Color	WHITE

Terminal No.	Color of Wire	Signal Name
19	W/R	STARTER MOTOR
20	L	F/L IGNSW
21	-	-
22	-	-
23	-	-
24	-	-

Connector No.	E122
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH12FW-NH
Connector Color	WHITE

Connector No.	E123
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS08FBR-CS
Connector Color	BROWN

Terminal No.	Color of Wire	Signal Name
49	Y/B	A/C COMP - (WITH CUMMINS 5.0L)
49	GR/R	A/C COMP - (WITH VK56VD)
50	BR	TRAILER TOW
51	-	-
52	B	S-GND
53	-	-
54	-	-
55	-	-
56	-	-

Connector No.	E124
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FB-LC
Connector Color	BLACK

Terminal No.	Color of Wire	Signal Name
57	W/B	RR DEF
58	BR	FUEL PUMP - (WITH CUMMINS 5.0L)
58	B/Y	FUEL PUMP - (WITH VK56VD)
59	-	-
60	-	-
61	-	-
62	B	P GND

Connector No.	E130
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH10FB-NH
Connector Color	BLACK

Terminal No.	Color of Wire	Signal Name
63	-	-
64	R	DETENT SW
65	-	-
66	P	PUSH START SW
67	-	-
68	L	IGN SIGNAL
69	-	-
70	-	-
71	SB	HOOD SW2
72	W	E-CPLG - (WITH VK56VD)

Terminal No.	Color of Wire	Signal Name
37	-	-
38	-	-
39	L/Y	WIPER AUTO STOP SW
40	P	CAN-L
41	L	CAN-H
42	BR	DTRL RLY
43	-	-
44	W/B	START CONT
45	GR	FUEL RLY CONT
46	Y	HOOD SW
47	Y	ALT C - (WITH VK56VD)
48	R/W	HORN RLY CONT

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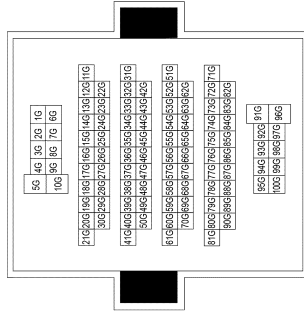
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STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH VK56VD

Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4
Connector Color	WHITE

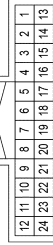


Terminal No.	Color of Wire	Signal Name
1G	G	TO MAIN HARNESS
2G	B/R	TO MAIN HARNESS
3G	W/B	TO MAIN HARNESS
4G	BR/W	TO MAIN HARNESS
5G	BR	TO MAIN HARNESS
6G	P	TO MAIN HARNESS - (WITH VK56VD)
6G	R/W	TO MAIN HARNESS - (WITH CUMMINS 5.0L)
7G	Y	TO MAIN HARNESS
8G	G	TO MAIN HARNESS
9G	R	TO MAIN HARNESS
10G	W	TO MAIN HARNESS
11G	R/G	TO MAIN HARNESS
12G	W/B	TO MAIN HARNESS
13G	BR	TO MAIN HARNESS
14G	Y/B	TO MAIN HARNESS
15G	G/W	TO MAIN HARNESS
16G	G	TO MAIN HARNESS
17G	G/Y	TO MAIN HARNESS
18G	G/Y	TO MAIN HARNESS
19G	Y/W	TO MAIN HARNESS
20G	G/Y	TO MAIN HARNESS
21G	B/Y	TO MAIN HARNESS
22G	G/R	TO MAIN HARNESS
23G	Y/R	TO MAIN HARNESS

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72G	L/W	TO MAIN HARNESS
73G	SHIELD	TO MAIN HARNESS
74G	W	TO MAIN HARNESS
75G	R	TO MAIN HARNESS
76G	R/G	TO MAIN HARNESS
77G	G	TO MAIN HARNESS
78G	W	TO MAIN HARNESS
79G	-	TO MAIN HARNESS
80G	R	TO MAIN HARNESS
81G	L	TO MAIN HARNESS
82G	R	TO MAIN HARNESS
83G	L	TO MAIN HARNESS
84G	L	TO MAIN HARNESS
85G	W/B	TO MAIN HARNESS
86G	B/R	TO MAIN HARNESS
87G	W/B	TO MAIN HARNESS
88G	P	TO MAIN HARNESS
89G	L	TO MAIN HARNESS
90G	G	TO MAIN HARNESS
91G	G	TO MAIN HARNESS
92G	V/W	TO MAIN HARNESS
93G	BR	TO MAIN HARNESS
94G	G	TO MAIN HARNESS
95G	G	TO MAIN HARNESS
96G	W	TO MAIN HARNESS
97G	R	TO MAIN HARNESS
98G	W/B	TO MAIN HARNESS
99G	BR	TO MAIN HARNESS
100G	GR/W	TO MAIN HARNESS

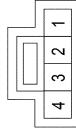
Connector No.	F14
Connector Name	WIRE TO WIRE
Connector Type	TH24FW-NH
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	L/R	TO ENGINE ROOM HARNESS
2	BR	TO ENGINE ROOM HARNESS
3	V	TO ENGINE ROOM HARNESS
4	L/O	TO ENGINE ROOM HARNESS
5	W	TO ENGINE ROOM HARNESS
6	B/R	TO ENGINE ROOM HARNESS
7	Y/R	TO ENGINE ROOM HARNESS
8	BR	TO ENGINE ROOM HARNESS
9	W/L	TO ENGINE ROOM HARNESS

10	L/Y	TO ENGINE ROOM HARNESS
11	SB	TO ENGINE ROOM HARNESS
12	L	TO ENGINE ROOM HARNESS
13	W/R	TO ENGINE ROOM HARNESS
14	Y	TO ENGINE ROOM HARNESS
15	B	TO ENGINE ROOM HARNESS
16	B	TO ENGINE ROOM HARNESS
17	R	TO ENGINE ROOM HARNESS
18	B	TO ENGINE ROOM HARNESS
19	B/R	TO ENGINE ROOM HARNESS
20	GR	TO ENGINE ROOM HARNESS
21	V/R	TO ENGINE ROOM HARNESS
22	SHIELD	TO ENGINE ROOM HARNESS
23	SHIELD	TO ENGINE ROOM HARNESS
24	P	TO ENGINE ROOM HARNESS

Connector No.	F33
Connector Name	WIRE TO WIRE
Connector Type	NS04FW-CS
Connector Color	WHITE



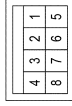
Terminal No.	Color of Wire	Signal Name
1	L	TO ENGINE ROOM HARNESS
2	W	TO ENGINE ROOM HARNESS
3	P	TO ENGINE ROOM HARNESS
4	SB	TO ENGINE ROOM HARNESS

STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH VK56VD

Connector No.	F34
Connector Name	WIRE TO WIRE
Connector Type	M08FW-GY-LC
Connector Color	GRAY

Connector No.	F44
Connector Name	STARTER MOTOR (WITH VK56VD)
Connector Type	X01FGY
Connector Color	GRAY




Connector No.	F90
Connector Name	FUSIBLE LINK BOX (BATTERY) (WITH VK56VD)
Connector Type	24340_79907
Connector Color	-




Terminal No.	Color of Wire	Signal Name
1	B	TO ENGINE ROOM HARNESS
2	B	TO ENGINE ROOM HARNESS
3	B	TO ENGINE ROOM HARNESS
4	W/R	TO ENGINE ROOM HARNESS
5	P	TO ENGINE ROOM HARNESS
6	O	TO ENGINE ROOM HARNESS
7	SB	TO ENGINE ROOM HARNESS
8	R	TO ENGINE ROOM HARNESS

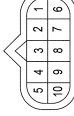
Terminal No.	S
Color of Wire	W/R
Signal Name	STARTER RELAY

Terminal No.	7
Color of Wire	B
Signal Name	BATTERY

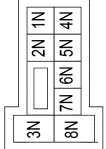
Connector No.	F43
Connector Name	STARTER MOTOR (WITH VK56VD)
Connector Type	E-BA8
Connector Color	-




Connector No.	F46
Connector Name	A/T ASSEMBLY (WITH VK56VD)
Connector Type	RK10FG
Connector Color	GREEN

Connector No.	M3
Connector Name	FUSE BLOCK (J/B)
Connector Type	CS06FW-M2
Connector Color	WHITE

Terminal No.	Color of Wire	Signal Name
1	Y/R	VIGN
2	P	BATT
3	L	CAN-H
4	BR	K-LINE
5	B	GND
6	Y/R	VIGN
7	R	REV LAMP RELAY
8	P	CAN-L
9	B/R	STARTER RELAY
10	B	GND

Terminal No.	Color of Wire	Signal Name
1N	-	-
2N	W	BATTERY
3N	W	BLOWER FAN RELAY OUT
4N	V	BATTERY
5N	Y	BATTERY
6N	W	BATTERY
7N	L	ACC RELAY OUT
8N	W	IGNITION

Terminal No.	B
Color of Wire	B
Signal Name	BATTERY

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STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH VK56VD

75	L/W	COMBI SW OUT 5
76	P	COMBI SW OUT 4
77	L	COMBI SW OUT 3
78	O/B	COMBI SW OUT 2
79	R/W	COMBI SW OUT 1
80	-	-

39	B/R	SHIFT N/P
40	-	-

Connector No.	M19
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FB-NH
Connector Color	BLACK

60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61

Connector No.	M18
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FG-NH
Connector Color	GREEN

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

Terminal No.	Color of Wire	Signal Name
1	G	ENG START SW NO ESCL
2	-	-
3	R	ALL POWER SUPPLY SW
4	W/R	ALL SIGNAL
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	SB	COMBI SW IN 5
11	G/Y	COMBI SW IN 4
12	Y	COMBI SW IN 3
13	G/B	COMBI SW IN 2
14	V	COMBI SW IN 1
15	-	-
16	-	-
17	P	GND RF ALL
18	V	SECURITY INDICATOR
19	-	-
20	R	SHIFT P
21	R/W	STEP LAMP CONT
22	-	-
23	Y	AIRCON SW
24	-	-
25	W	BRAKE SW FUSE
26	L	SHORT IN PIN INPUT
27	P/G	BRAKE SW LAMP
28	-	-
29	W	BLOWER FAN SW
30	P	DR DOOR LOCK STATUS
31	-	-
32	Y	REAR DEFROGGER SW
33	-	-
34	-	-
35	P/G	REVERSE SW
36	W/B	HAZARD SW
37	-	-
38	-	-

Terminal No.	Color of Wire	Signal Name
41	Y/L	TRAILER LIGHT CHECK RELAY OUT
42	R/Y	CARGO LAMP OUT
43	-	-
44	-	-
45	-	-
46	-	-
47	-	-
48	R	HIGH SIDE START SW LED
49	-	-
50	-	-
51	-	-
52	W	AUDIO DONGLE
53	-	-
54	W/L	PW UART
55	W/B	LAR SENSOR K-LINE
56	-	-
57	-	-
58	-	-
59	P	CAN-L
60	L	CAN-H
61	O	REAR DEFROGGER RELAY OUT
62	W	STARTER RELAY OUT
63	-	-
64	P	BUZZER OUT
65	-	-
66	W	BLOWER FAN RELAY OUT
67	G	IGN ELEC RELAY OUT 2
68	L	MR OUTPUT
69	R/B	AT DEVICE OUT
70	P	IGN USM OUT 1
71	O	DR REQUEST SW
72	G	AS REQUEST SW
73	-	-
74	-	-

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2017 Titan NAM

STARTING SYSTEM

< WIRING DIAGRAM >

STARTING SYSTEM CONNECTORS - WITH VK56VD

Connector No.	M81
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	FEA09FW-FHA6-SA
Connector Color	WHITE



137	136	135	134	133	132	131	130	129
143	142	141	140	139	138			

Terminal No.	Color of Wire	Signal Name
129	P/G	BATTERY SAVER OUT
130	LG	SUPER LOCK/DOOR UNLOCK AS
131	W	BAT BCM FUSE
132	Y	DOOR LOCK AS/RR/RL
133	BR	DOOR UNLOCK AS/RR/RL
134	B	GND2
135	O	DOOR LOCK DR/AS/FL
136	L	ROOM LAMP CONT
137	V	DOOR UNLOCK DR/AS/FL
138	V	BAT REAR DOOR
139	W	BAT-POWER F/L
140	LG	P/W POWER SUPPLY IGN
141	V	P/W POWER SUPPLY BAT
142	Y	BAT FRONT DOOR
143	B	GND1

Connector No.	M88
Connector Name	ACCESSORY RELAY-2
Connector Type	MS02FL-M2-LC
Connector Color	BLUE



3	5
2	1

Terminal No.	Color of Wire	Signal Name
1	B	GROUND
2	L	RELAY CONTROL
3	R	RELAY OUTPUT
5	W	BATTERY

AABTA2220GB

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow (With GR8-1200 NI)

INFOID:0000000014418449

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STARTING SYSTEM DIAGNOSIS WITH GR8-1200 NI

To test the starting system, use the following special service tool:

- Multitasking battery and electrical diagnostic station GR8-1200 NI

NOTE:

Refer to the diagnostic station Instruction Manual for proper starting system diagnosis procedures.

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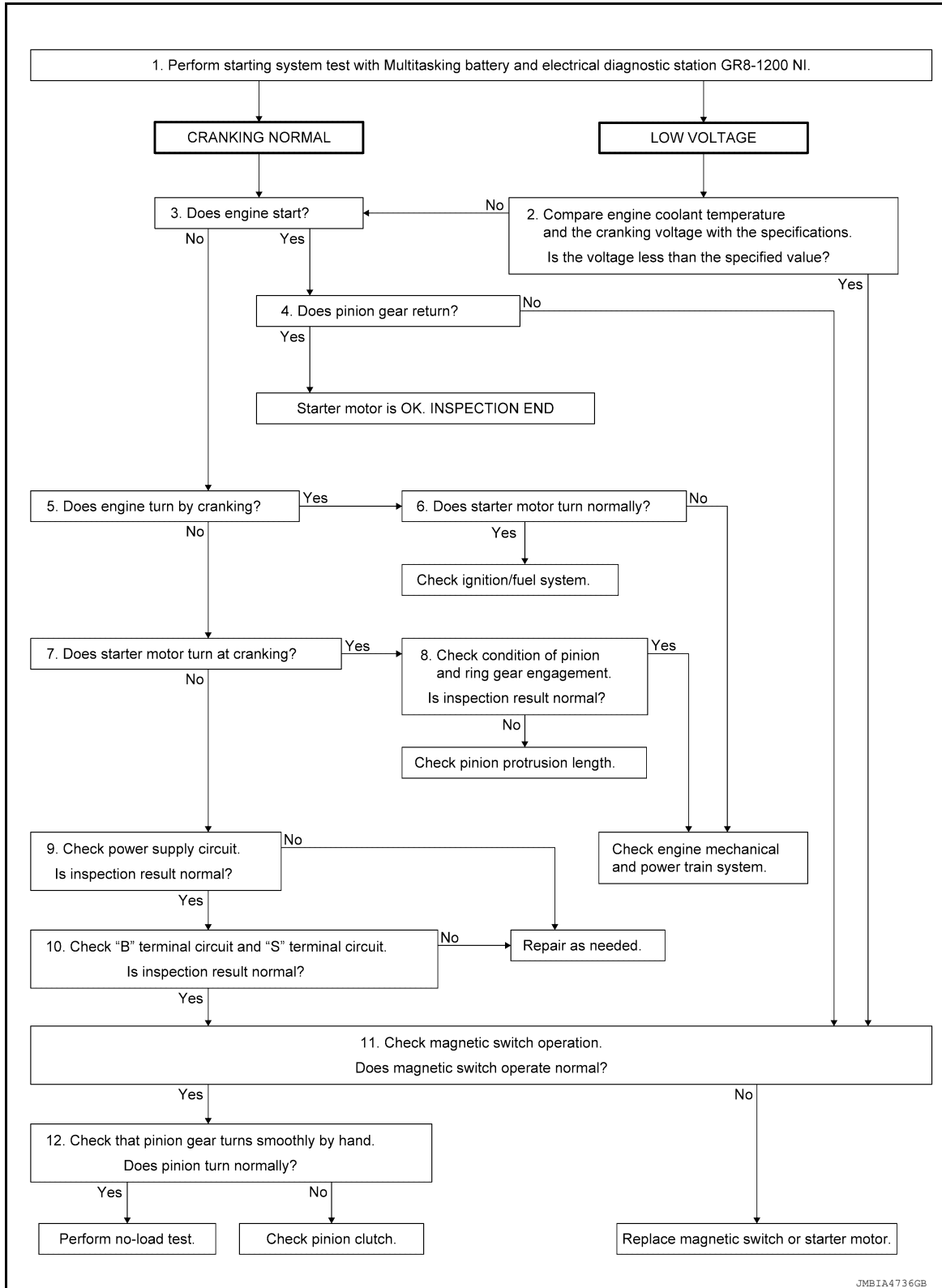
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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

OVERALL SEQUENCE



DETAILED FLOW

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 MULTITASKING BATTERY AND ELECTRICAL DIAGNOSTIC STATION GR8-1200 NI

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

Perform the starting system test with Multitasking battery and electrical diagnostic station GR8-1200 NI. For details and operating instructions, refer to diagnostic station Instruction Manual.

How is the test result?

CRANKING NORMAL>> GO TO 3.

LOW VOLTAGE>> GO TO 2.

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.COMPARISON BETWEEN ENGINE COOLANT AND CRANKING VOLTAGE

Compare engine coolant temperature and the cranking voltage with the specifications.

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 11.

NO >> GO TO 3.

3.CHECK ENGINE START

Crank engine and check that engine starts.

Does engine start?

YES >> GO TO 4.

NO >> GO TO 5.

4.CHECK RETURN OF PINION GEAR

Check that pinion gear returns to original position after engine starts.

Does pinion gear return?

YES >> Starter motor is OK. INSPECTION END.

NO >> GO TO 11.

5.CHECK ENGINE SPEED WITH CRANKING

Check that engine turns while cranking.

Does engine turns while cranking?

YES >> GO TO 6.

NO >> GO TO 7.

6.CHECK STARTER MOTOR TURNING WITH CRANKING

Check that starter motor runs smoothly without abnormal noise at cranking.

Does starter motor turn normally?

YES >> Check ignition/fuel system.

NO >> Check engine mechanical and powertrain system.

7.CHECK STARTER MOTOR SPEED WITH CRANKING

Check that starter motor turns while cranking.

Does starter motor turn at cranking?

YES >> GO TO 8.

NO >> GO TO 9.

8.CHECK PINION GEAR AND RING GEAR ENGAGEMENT

Check condition of pinion and ring gear engagement.

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

Is inspection result normal?

- YES >> Check engine mechanical and powertrain system.
NO >> Check pinion protrusion length. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).

9. CHECK POWER SUPPLY CIRCUIT

Check the following conditions.

- Fuse and fusible link
- Charge condition, corrosion and connection condition of battery. Refer to [STR-23, "Work Flow \(With GR8-1200 NI\)"](#).

Are these inspection result normal?

- YES >> GO TO 10.
NO >> Repair as needed.

10. CHECK STARTING SYSTEM WIRING

Check the following.

- "B" terminal circuit. Refer to [STR-30, "Diagnosis Procedure"](#).
- "S" terminal circuit. Refer to [STR-32, "Diagnosis Procedure"](#).

Are these inspection results normal?

- YES >> GO TO 11.
NO >> Repair as needed.

11. CHECK MAGNETIC SWITCH OPERATION

Check magnetic switch operation. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).

Does magnetic switch operate normal?

- YES >> GO TO 12.
NO >> Replace magnetic switch or starter motor.

12. CHECK PINION TURNING

1. Remove starter motor.
2. Check that pinion turns smoothly by hand.

Does pinion turn normally?

- YES >> Perform no-load test of starter motor. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).
NO >> Check pinion clutch. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).

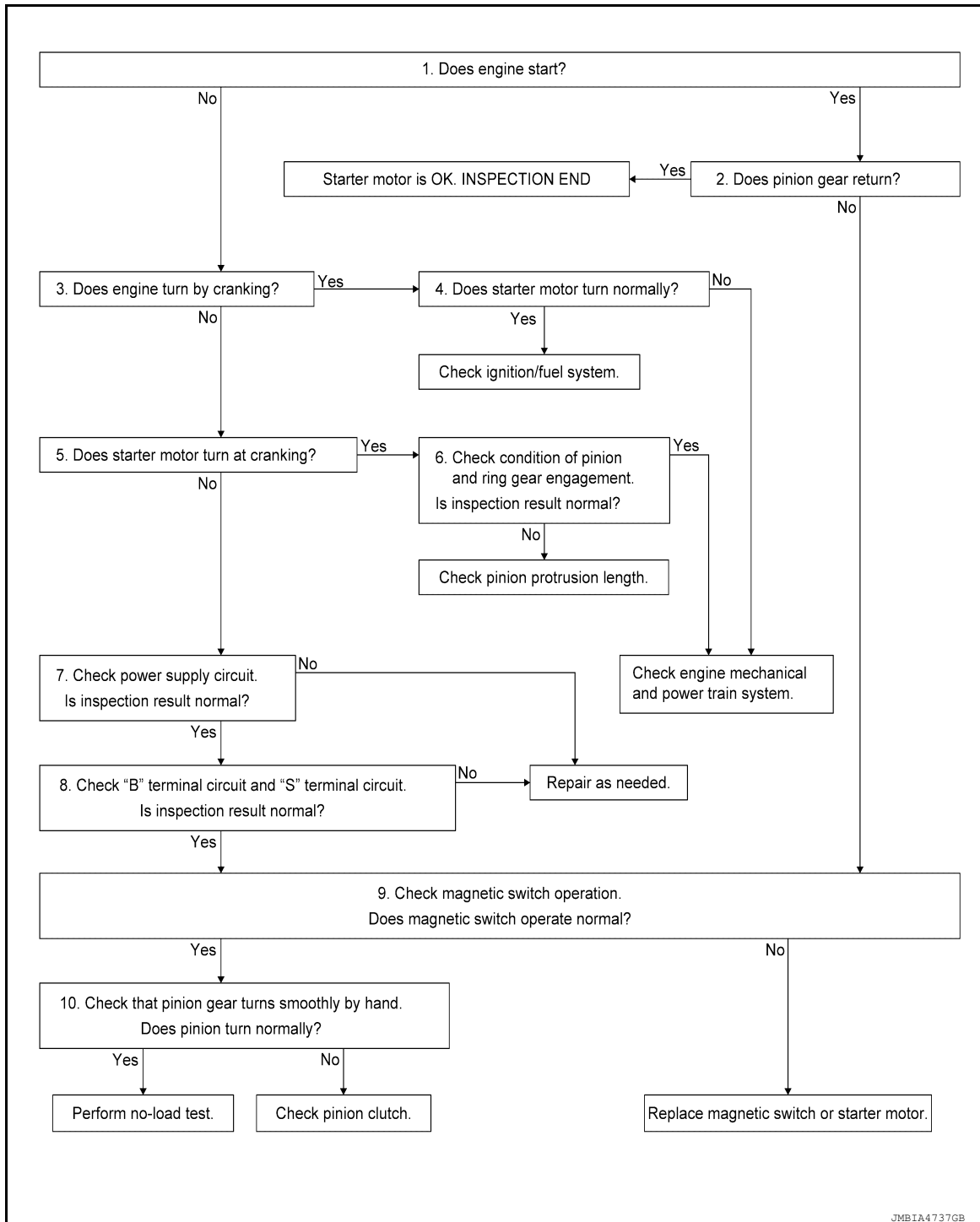
DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

Work Flow (Without GR8-1200 NI)

INFOID:000000014418450

OVERALL SEQUENCE



DETAILED FLOW

NOTE:

If any malfunction is found, immediately disconnect the battery cable from the negative terminal.

1. CHECK ENGINE START

Crank the engine and check that the engine starts.

Does the engine start?

YES >> GO TO 2.

NO >> GO TO 3.

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

2.CHECK RETURN OF PINION GEAR

Check that pinion gear returns to original position after engine starts.

Does pinion gear return?

- YES >> Starter motor is OK. INSPECTION END.
NO >> GO TO 9.

3.CHECK ENGINE SPEED WITH CRANKING

Check that engine turns while cranking.

Does engine turn by cranking?

- YES >> GO TO 4.
NO >> GO TO 5.

4.CHECK STARTER MOTOR TURNING WITH CRANKING

Check that starter motor runs smoothly without abnormal noise at cranking.

Does starter motor turn normally?

- YES >> Check ignition/fuel system.
NO >> Check engine mechanical and power train system.

5.CHECK STARTER MOTOR SPEED WITH CRANKING

Check that starter motor turns while cranking.

Does starter motor turn at cranking?

- YES >> GO TO 6.
NO >> GO TO 7.

6.CHECK PINION GEAR AND RING GEAR ENGAGEMENT

Check condition of pinion and ring gear engagement.

Is inspection result normal?

- YES >> Check engine mechanical and power train system.
NO >> Check pinion protrusion length. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).

7.CHECK POWER SUPPLY CIRCUIT

Check the following conditions.

- Fuse and fusible link.
- Charge condition, corrosion and connection condition of battery. Refer to [STR-27, "Work Flow \(Without GR8-1200 NI\)"](#).

Are the inspection results normal?

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

8.CHECK STARTING SYSTEM WIRING

Check the following.

- "B" terminal circuit. Refer to [STR-30, "Diagnosis Procedure"](#).
- "S" terminal circuit. Refer to [STR-32, "Diagnosis Procedure"](#).

Are the inspection results normal?

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

9.CHECK MAGNETIC SWITCH OPERATION

Check magnetic switch operation. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).

Does magnetic switch operate normal?

- YES >> GO TO 10.
NO >> Replace magnetic switch or starter motor.

10.CHECK PINION TURNING

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

1. Remove starter motor.
2. Check that pinon turns smoothly by hand.

Does pinion turn normally?

- YES >> Perform no-load test of starter motor. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).
- NO >> Check pinion clutch. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#) or [STR-38, "Removal and Installation - For VK56VD"](#).

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B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:0000000014418451

Terminal B is constantly supplied with battery power.

Diagnosis Procedure

INFOID:0000000014418452

Regarding Wiring Diagram information, refer to [STR-8, "Wiring Diagram- with Cummins 5.0L"](#), or [STR-15, "Wiring Diagram- with VK56VD"](#).

CAUTION:

Before testing, perform the following procedure to ensure the engine cannot start.

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

1.CHECK TERMINAL B POWER SUPPLY VOLTAGE

1. Turn ignition switch OFF.
2. Make sure that starter motor connector F227 (with Cummins 5.0L), or F43 (with VK56VD), connection is clean and tight.
3. Check voltage between starter motor connector F227 (with Cummins 5.0L), or F43 (with VK56VD), and ground.

(+) Connector Terminal		(-) Ground	Voltage (Approx.) Battery voltage
F227 (with Cummins 5.0L) F43 (with VK56VD)	B	Ground	

Is the inspection normal?

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 F227 (with Cummins 5.0L), or F43 (with VK56VD), while cranking the engine.

(+) Battery (+) terminal	(-) Connector Terminal		Condition While cranking the engine	Voltage (Approx.) Less than 0.2V
	F227 (with Cummins 5.0L) F43 (with VK56VD)	B		

Is the inspection normal?

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.

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

Is the inspection normal?

B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

- YES
- >> Terminal B circuit is OK. Further inspection is necessary. Refer to [STR-23, "Work Flow \(With GR8-1200 NI\)"](#) or [STR-27, "Work Flow \(Without GR8-1200 NI\)"](#).
- NO
- >> Check the starter motor case to engine mounting for high resistance.

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S CONNECTOR CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

S CONNECTOR CIRCUIT

Description

INFOID:000000014418453

Terminal S is the power supply for the starter motor magnetic switch. Terminal S is supplied with power when the ignition switch is turned to the START position while the A/T shift selector is in the P or N position.

Diagnosis Procedure

INFOID:000000014418454

Regarding Wiring Diagram information, refer to [STR-8, "Wiring Diagram- with Cummins 5.0L"](#), or [STR-15, "Wiring Diagram- with VK56VD"](#).

CAUTION:

Before testing, perform the following procedure to ensure the engine cannot start.

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

1.CHECK STARTER MOTOR MAGNETIC SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect starter motor connector F228 (with Cummins 5.0L), or F44 (with VK56VD).
3. Shift transmission into park or neutral.
4. Check voltage between starter motor harness connector F228 (with Cummins 5.0L), or F44 (with VK56VD) and ground with the ignition in START.

(+) Connector		Terminal	(-)	Condition	Voltage (Approx.)
Connector					
F228 (with Cummins 5.0L)		S	Ground	Ignition in START position	Battery voltage
F44 (with VK56VD)					

Is battery voltage present?

YES >> Magnetic switch circuit is OK. Further inspection is necessary. Refer to [STR-23, "Work Flow \(With GR8-1200 NI\)"](#) or [STR-27, "Work Flow \(Without GR8-1200 NI\)"](#).

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 F228 (with Cummins 5.0L), or F44 (with VK56VD), 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 F228 (with Cummins 5.0L), or F44 (with VK56VD).
2. Check continuity between starter motor harness connector F228 (with Cummins 5.0L), or F44 (with VK56VD), and IPDM E/R harness connector E120.

Connector	Terminal	Connector	Terminal	Continuity
F228 (with Cummins 5.0L)	S	E120	19	Yes
F44 (with VK56VD)				

3. Check continuity between starter motor harness connector F228 (with Cummins 5.0L), or F44 (with VK56VD), and ground.

S CONNECTOR CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

Connector	Terminal	—	Continuity
F228 (with Cummins 5.0L) F44 (with VK56VD)	S	Ground	No

Are the continuity test results as specified?

- YES >> Further inspection is necessary. Refer to [STR-23. "Work Flow \(With GR8-1200 NI\)"](#) or [STR-27. "Work Flow \(Without GR8-1200 NI\)"](#).
- NO >> Repair the harness.

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STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:0000000014418455

Symptom	Reference
No normal cranking	Refer to STR-23, "Work Flow (With GR8-1200 NI)" or STR-27, "Work Flow (Without GR8-1200 NI)" .
Starter motor does not rotate	

STARTER MOTOR

< REMOVAL AND INSTALLATION >

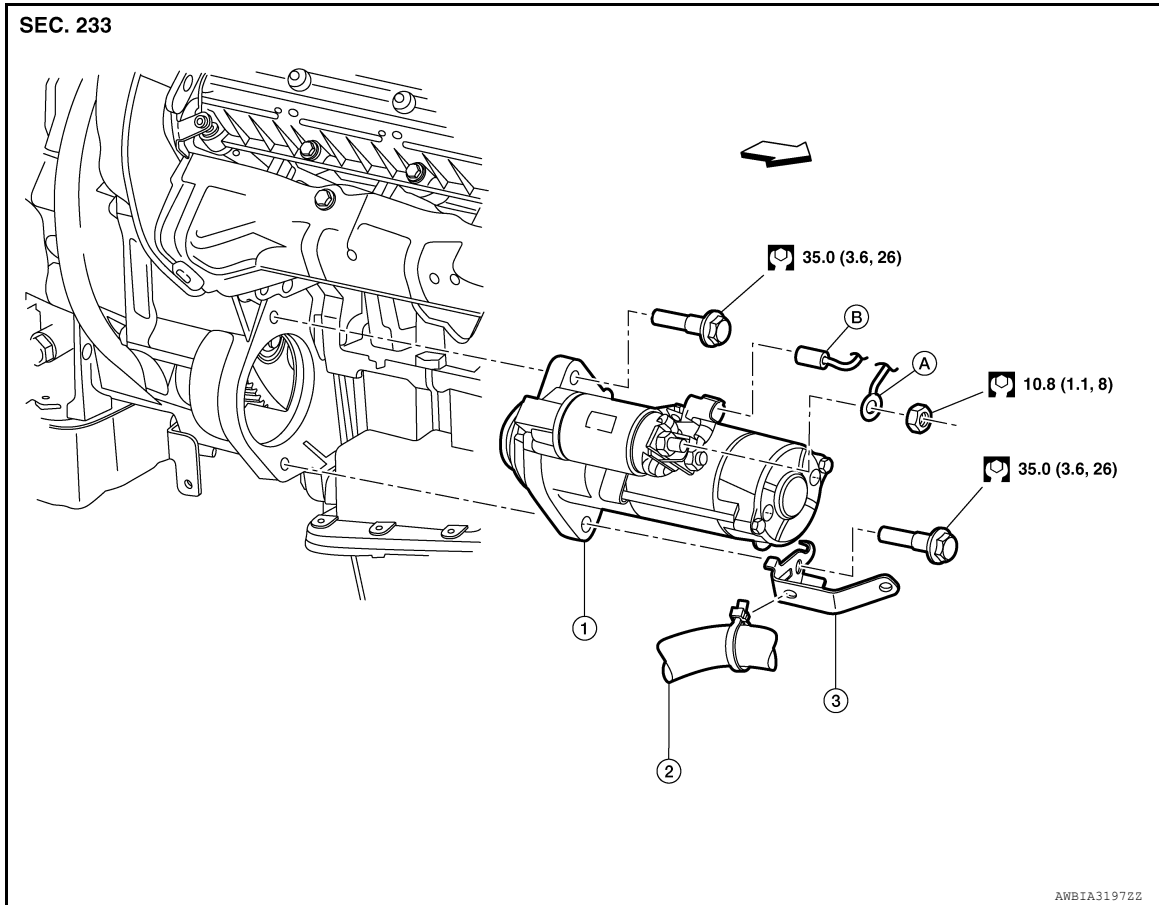
REMOVAL AND INSTALLATION

STARTER MOTOR

Removal and Installation - For CUMMINS 5.0L

INFOID:0000000014418456

STR



REMOVAL

1. Disconnect the battery or batteries negative terminal(s). Refer to [PG-185. "Battery Disconnect"](#).
2. Disconnect engine harness from engine harness bracket and move aside.
3. Disconnect terminal S harness.
4. Remove terminal B nut and terminal B cable.
5. Remove lower starter motor bolt and engine harness bracket.
6. Remove upper starter motor bolt.
7. Remove starter motor.

INSTALLATION

Installation is in the reverse order of removal.

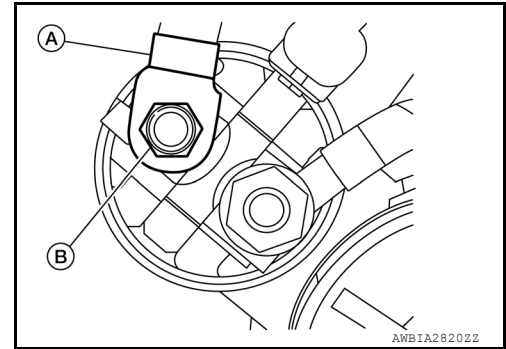
STARTER MOTOR

< REMOVAL AND INSTALLATION >

- Orient terminal B cable (A) on starter motor as shown.
- Hand-tighten terminal B nut (B), then torque to specification.

CAUTION:

Tighten terminal B nut carefully.



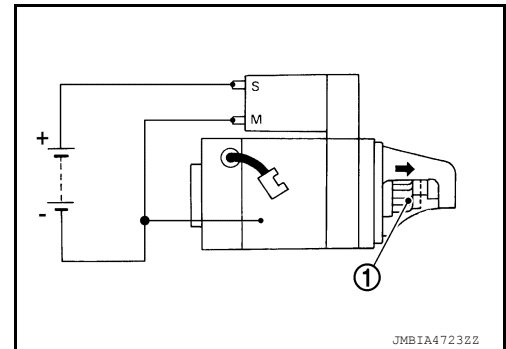
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Inspection

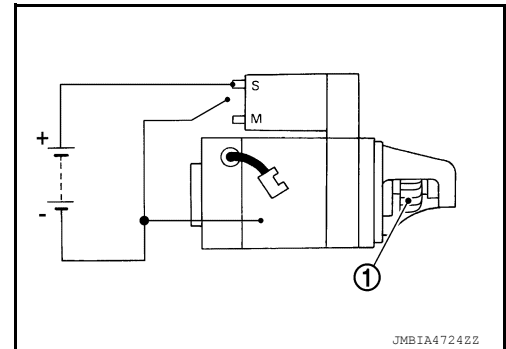
INSPECTION

MAGNETIC SWITCH

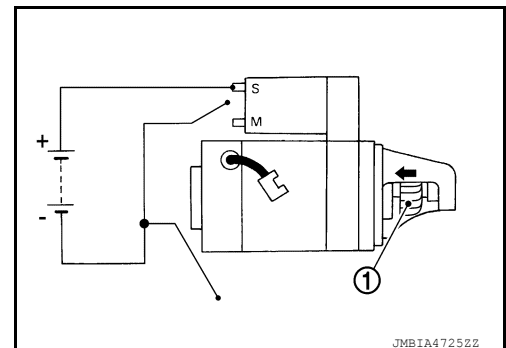
1. Remove starter motor from vehicle. Refer to [STR-35. "Removal and Installation - For CUMMINS 5.0L"](#).
2. Connect 12V battery to starter motor as shown. Check that pinion gear (1) is driven out by magnetic switch.
 - Replace starter motor if pinion gear is not driven out.



3. Disconnect "M" terminal as shown. Check that pinion gear (1) does not return to original position.
 - Replace starter motor if pinion gear returns.



4. Disconnect (-) wire from starter motor body as shown. Check that pinion gear (1) returns to original position.
 - Replace starter motor if pinion gear does not return.



PINION PROTRUSION LENGTH

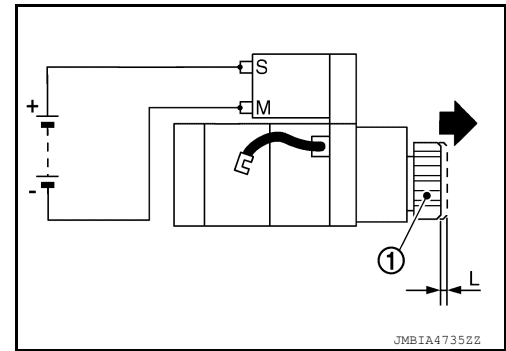
STARTER MOTOR

< REMOVAL AND INSTALLATION >

1. Compare movement "L" in height of pinion gear (1) when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

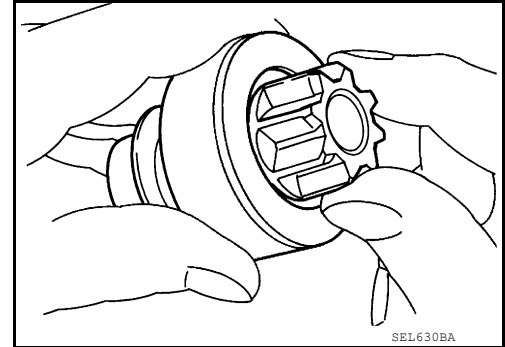
Movement "L" : Refer to SDS [STR-41, "Start-er"](#).

- Replace starter motor if the measurement value is not within specifications.



PINION CLUTCH

1. Check pinion gear teeth.
 - Replace starter motor if teeth are worn or damaged. (Also check condition of ring gear teeth).
2. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
 - Replace starter motor if pinion is locked, rotates in both directions or unusual resistance is evident.

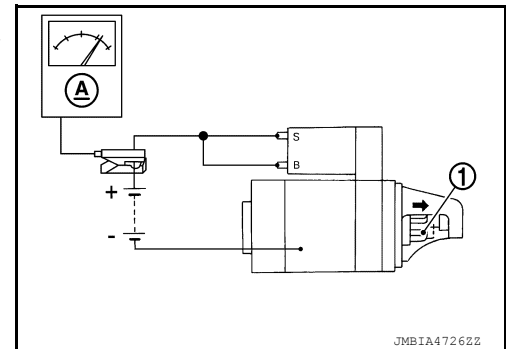


NO-LOAD TEST

1. Remove starter motor from vehicle. Refer to [STR-35, "Removal and Installation - For CUMMINS 5.0L"](#).
2. Connect 12V battery and ammeter to starter motor as shown. Check no load current with pinion gear (1) driven out and starter motor operating.

No-load current : Refer to SDS [STR-41, "Start-er"](#).

- Replace starter motor if the measurement value is not within specifications.

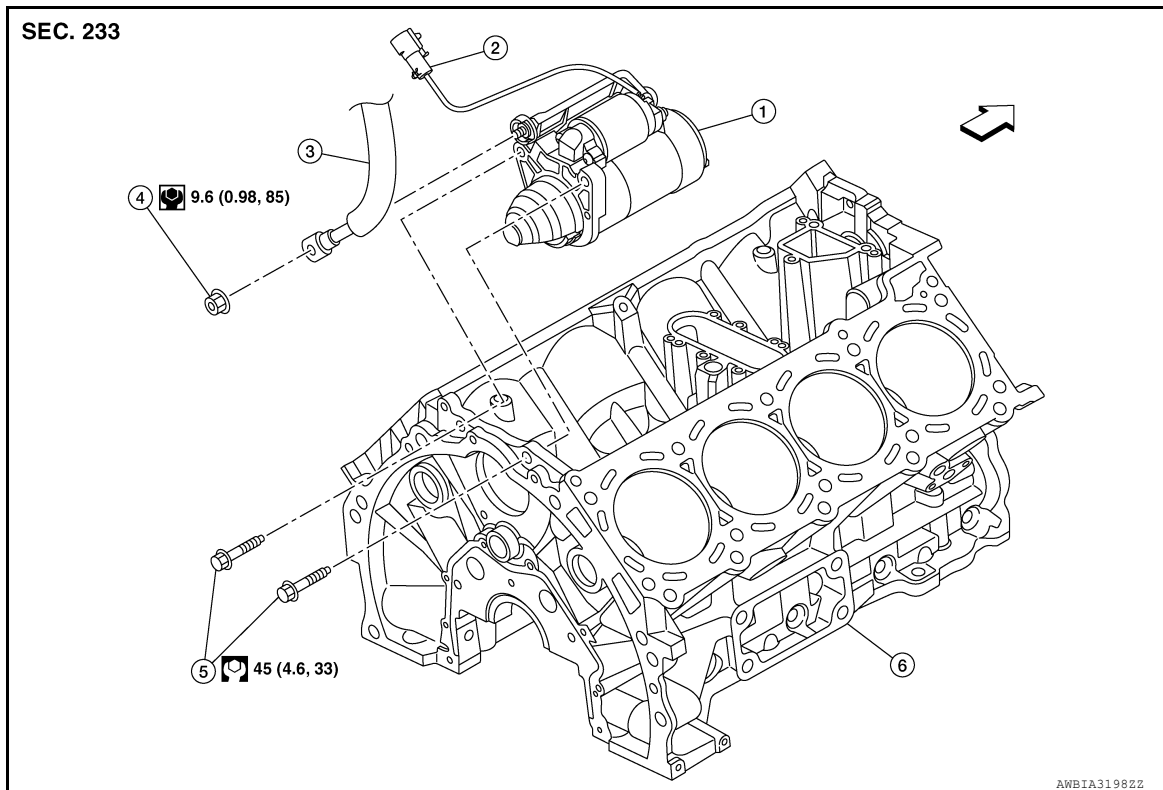


STARTER MOTOR

< REMOVAL AND INSTALLATION >

Removal and Installation - For VK56VD

INFOID:0000000014418457



- | | | |
|-------------------|-----------------------|---------------------|
| 1. Starter motor | 2. Terminal S harness | 3. Terminal B cable |
| 4. Terminal B nut | 5. Starter motor bolt | 6. Cylinder block |

⇐ Front

REMOVAL

1. Disconnect the battery or batteries negative terminal(s). Refer to [PG-185. "Battery Disconnect"](#).
2. Remove intake manifold. Refer to [EM-35. "Removal and Installation"](#).
3. Remove terminal B nut and terminal B cable.
4. Disconnect terminal S harness.
5. Remove starter motor bolts.
6. Remove starter motor upward from vehicle.

INSTALLATION

Installation is in the reverse order of removal.

- Hand-tighten terminal B nut, then torque to specification.

CAUTION:

Tighten terminal B nut carefully.

Inspection

INFOID:0000000014727265

INSPECTION

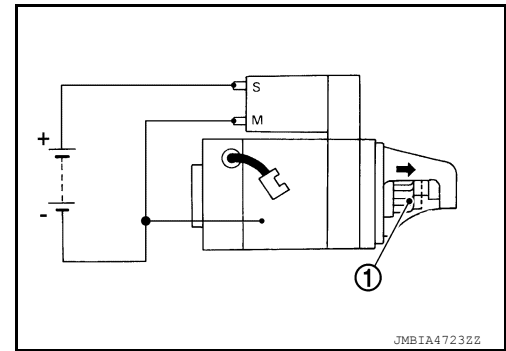
MAGNETIC SWITCH

1. Remove starter motor from vehicle. Refer to [STR-38. "Removal and Installation - For VK56VD"](#).

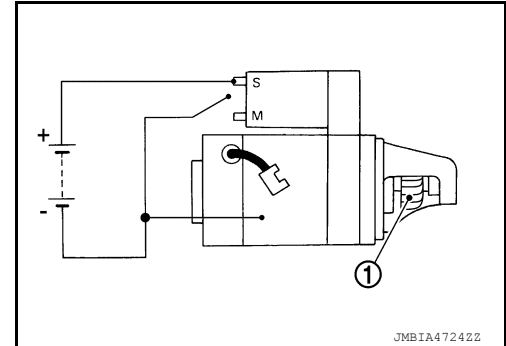
STARTER MOTOR

< REMOVAL AND INSTALLATION >

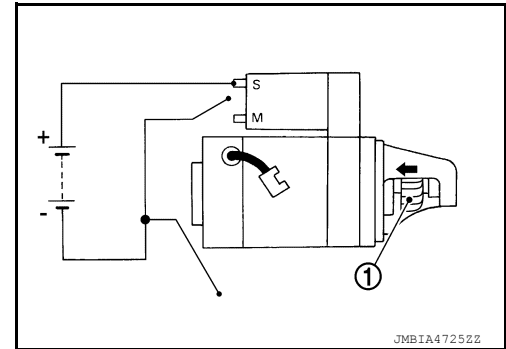
2. Connect 12V battery to starter motor as shown. Check that pinion gear (1) is driven out by magnetic switch.
 - Replace starter motor if pinion gear is not driven out.



3. Disconnect "M" terminal as shown. Check that pinion gear (1) does not return to original position.
 - Replace starter motor if pinion gear returns.



4. Disconnect (-) wire from starter motor body as shown. Check that pinion gear (1) returns to original position.
 - Replace starter motor if pinion gear does not return.

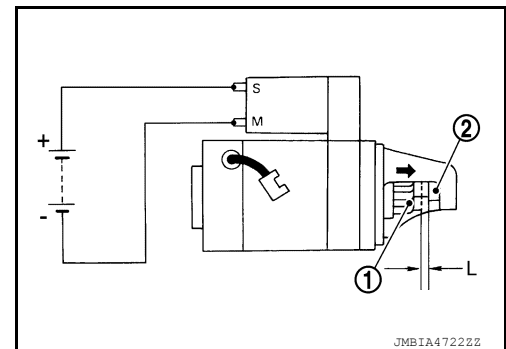


PINION PROTRUSION LENGTH

1. With pinion gear (1) driven out by magnetic switch, push pinion gear back to remove slack and measure the clearance "L" between the front edge of the pinion gear and the pinion stopper (2).

Clearance "L" : Refer to SDS [STR-41, "Start-er"](#).

- Replace starter motor if the measurement value is not within specifications.

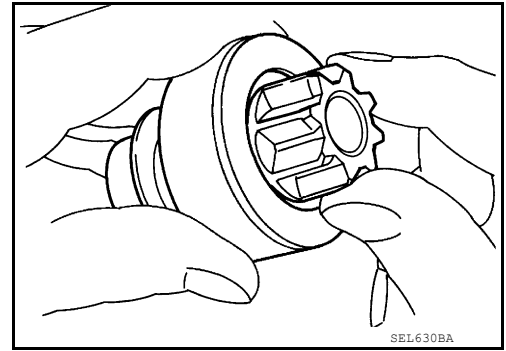


PINION CLUTCH

STARTER MOTOR

< REMOVAL AND INSTALLATION >

1. Check pinion gear teeth.
 - Replace starter motor if teeth are worn or damaged. (Also check condition of ring gear teeth).
2. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
 - Replace starter motor if pinion is locked, rotates in both directions or unusual resistance is evident.

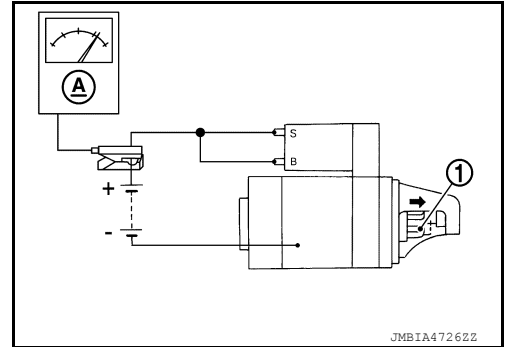


NO-LOAD TEST

1. Remove starter motor from vehicle. Refer to [STR-38, "Removal and Installation - For VK56VD"](#).
2. Connect 12V battery and ammeter to starter motor as shown. Check no load current with pinion gear (1) driven out and starter motor operating.

No-load current : Refer to SDS [STR-41, "Starter"](#).

- Replace starter motor if the measurement value is not within specifications.



STARTER MOTOR

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

STARTER MOTOR

Starter

INFOID:0000000014418458

STR

VK56VD

Engine Type		VK56VD
Type	M001T30673*	
	Mitsubishi	
	Reduction gear type	
System voltage		12V
No-load	Terminal voltage	11V
	Current	Less than 120A
	Revolution	More than 3,220 rpm
Clearance "L" between pinion front edge and pinion stopper [mm (in)]		0.5 - 2.0 (0.02 - 0.079)

*: Always check with the Parts Department for the latest parts information.

CUMMINS 5.0L

Engine Type		Cummins 5.0L
Type	M008T50871ZC*	
	Mitsubishi	
	Reduction gear type	
System voltage		12V
No-load	Terminal voltage	11V
	Current	Less than 170A
	Revolution	More than 3,400 rpm
Movement "L" in height of pinion assembly [mm (in)]		0.3 - 2.5 (0.012 - 0.098)

*: Always check with the Parts Department for the latest parts information.