

ENGINE CONTROL SYSTEM

SECTION EC

MODIFICATION NOTICE:

Gasoline engine

- KA24DE engine (Euro-OBD) has been added for Europe.
- Wiring Diagrams of KA24DE, engines have been changed.

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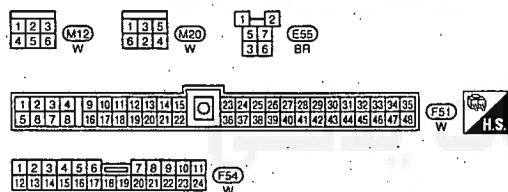
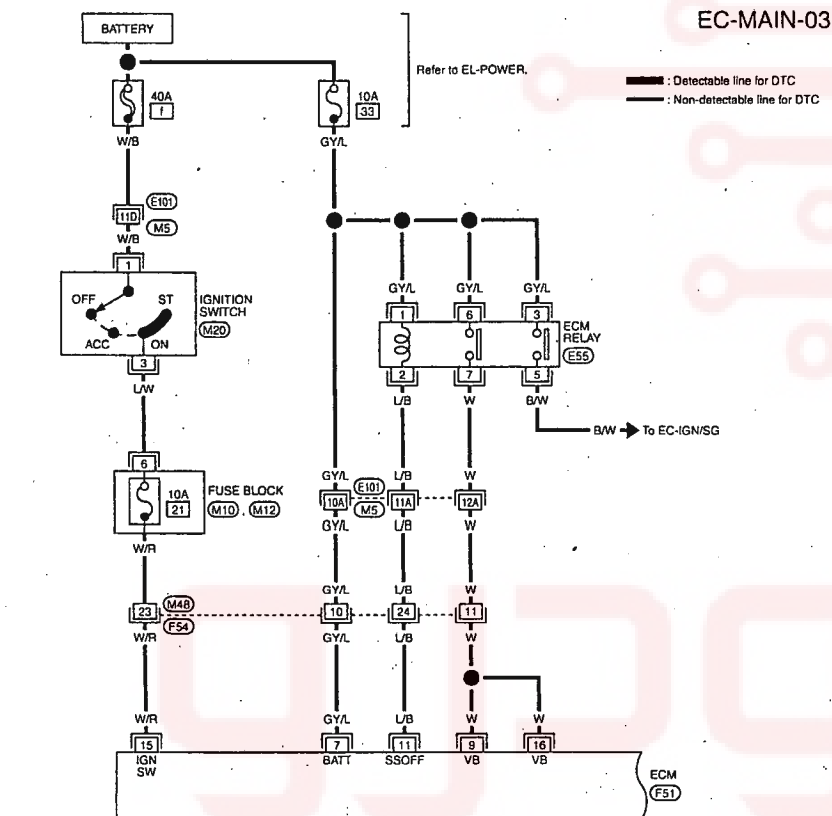
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KA24DE

TROUBLE DIAGNOSIS FOR POWER SUPPLY

KA24DE

FOR RHD MODELS



Refer to last page (Foldout page).
 (M5), (E101)
 (M10)

EC-14

Specification data are reference values and are measured between each terminal and body ground.

CAUTION:

CAUTION: Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

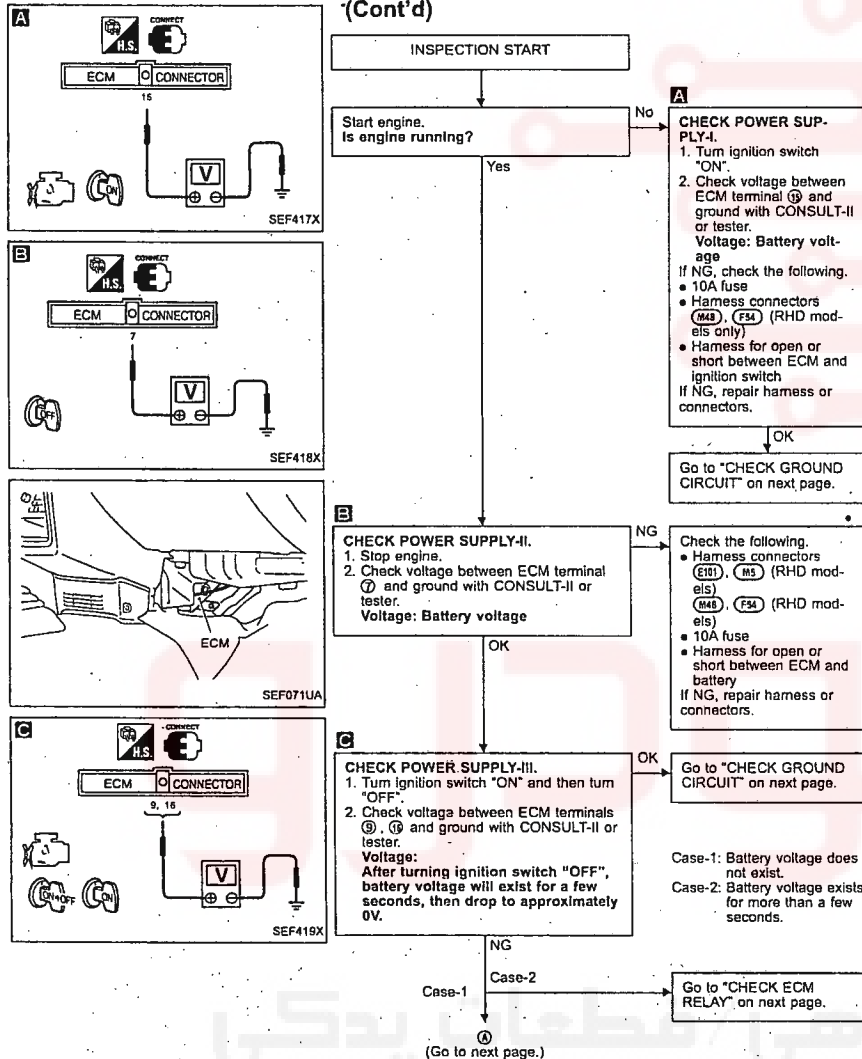
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
7	GY/L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
9	W	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
11	L/B	ECM relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
15	W/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

: EC-13

TROUBLE DIAGNOSIS FOR POWER SUPPLY

KA24DE

Main Power Supply and Ground Circuit (Cont'd)



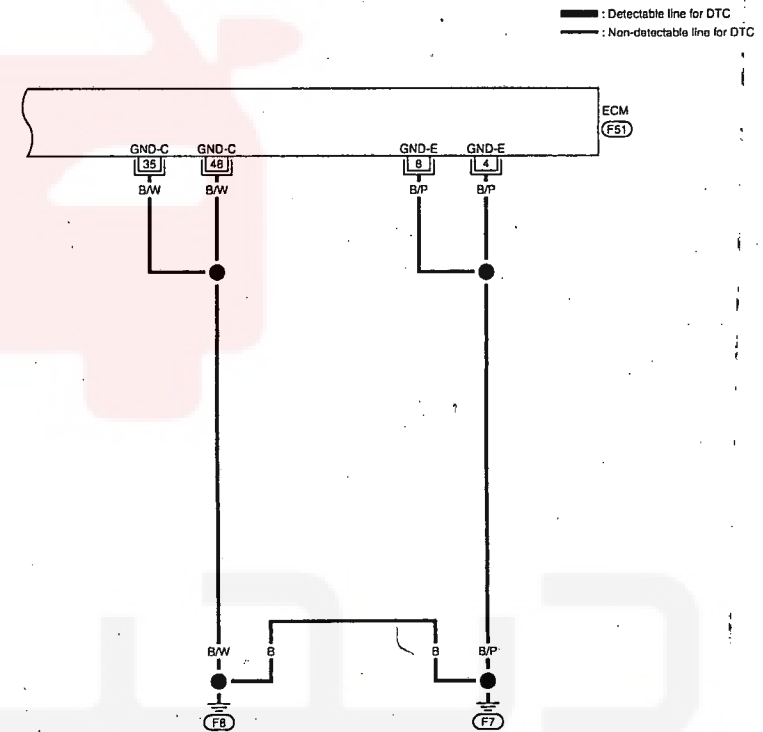
EC-16

TROUBLE DIAGNOSIS FOR POWER SUPPLY

KA24DE

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-04

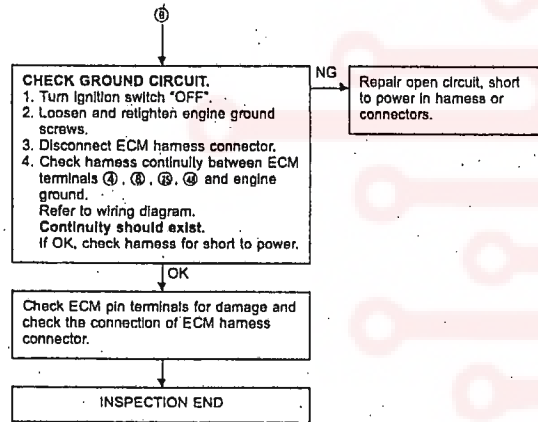


EC-15

TROUBLE DIAGNOSIS FOR POWER SUPPLY

KA24DE

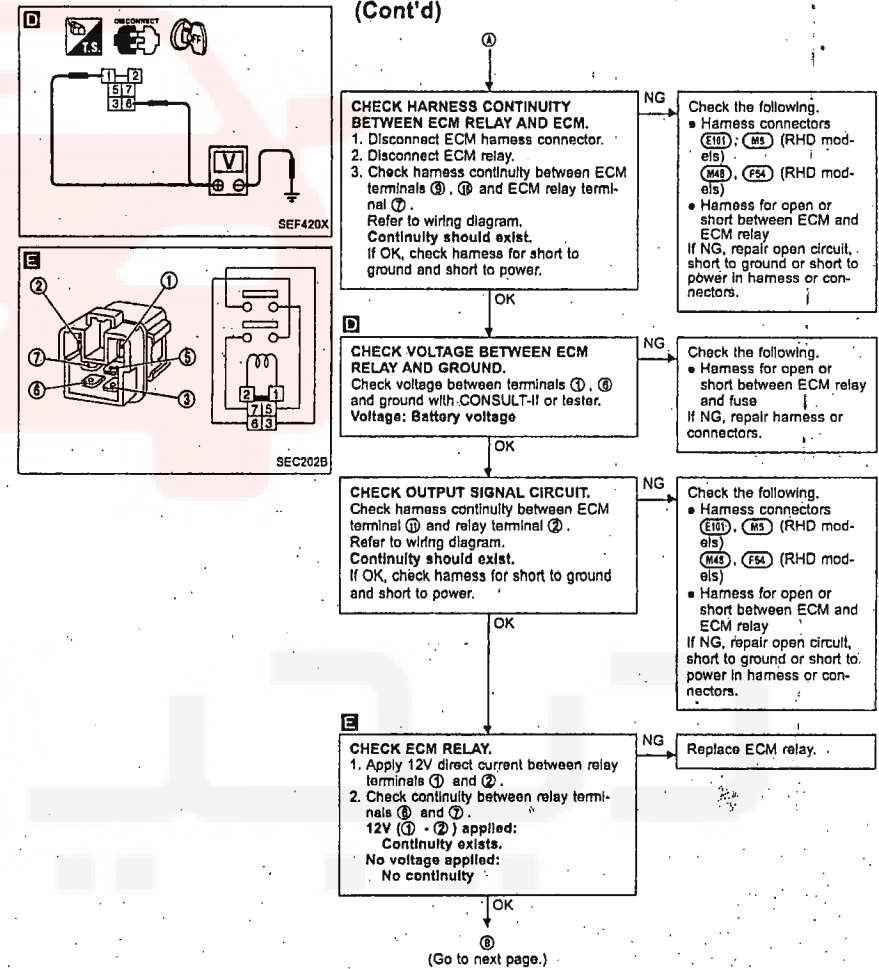
Main Power Supply and Ground Circuit (Cont'd)



TROUBLE DIAGNOSIS FOR POWER SUPPLY

KA24DE

Main Power Supply and Ground Circuit (Cont'd)



ORD-18

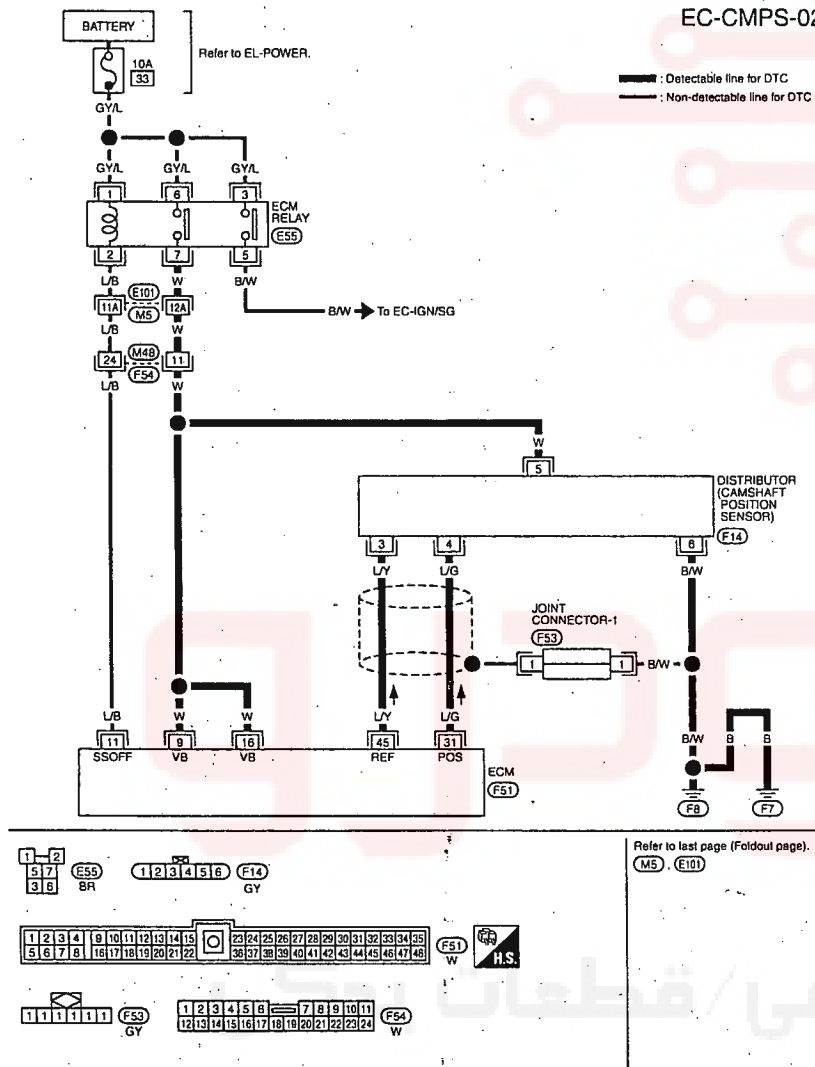
ORD-17

TROUBLE DIAGNOSIS FOR "CAMSHAFT POSI SEN"
(DTC 11)

FOR RHD MODELS

Camshaft Position Sensor (CMPS) (Cont'd)

EC-CMPS-02



EC-20

GEC184A

TROUBLE DIAGNOSIS FOR "CAMSHAFT POSI SEN"
(DTC 11)

Camshaft Position Sensor (CMPS)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and body ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

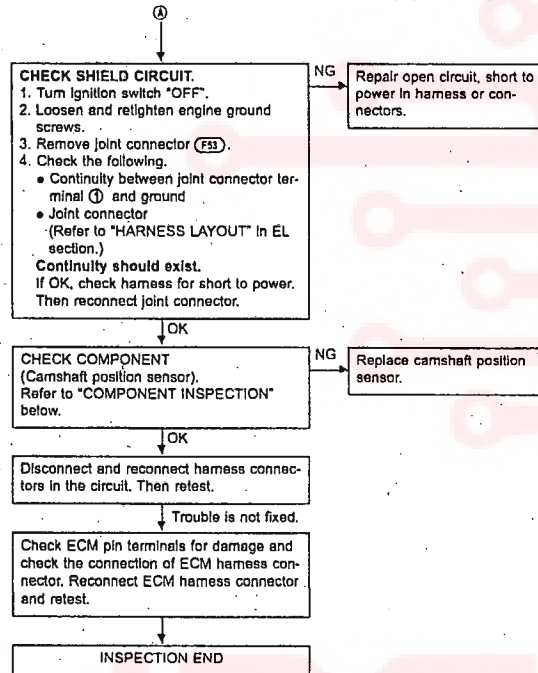
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
31	L/G	Camshaft position sensor (POS) (1° signal)	Engine is running. (Warm-up condition) Idle speed	Approximately 2.5V SEP068U
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	Approximately 2.5V SEP067U
45	L/Y	Camshaft position sensor (REF) (180° signal)	Engine is running. (Warm-up condition) Idle speed	Approximately 0.4V SEP064U
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	Approximately 0.4V SEP065U

EC-19

TROUBLE DIAGNOSIS FOR "CAMSHAFT POSI SEN"
(DTC 11)

KA24DE

Camshaft Position Sensor (CMPS) (Cont'd)

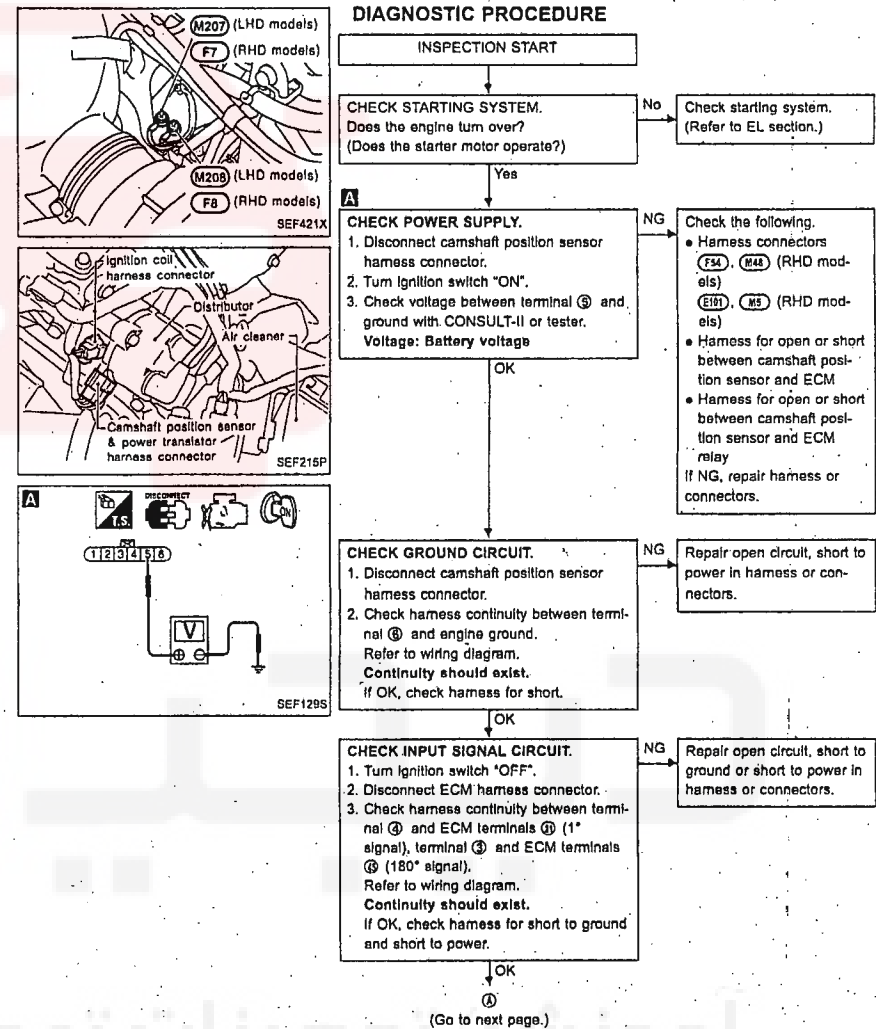


OBP-22

TROUBLE DIAGNOSIS FOR "CAMSHAFT POSI SEN"
(DTC 11)

KA24DE

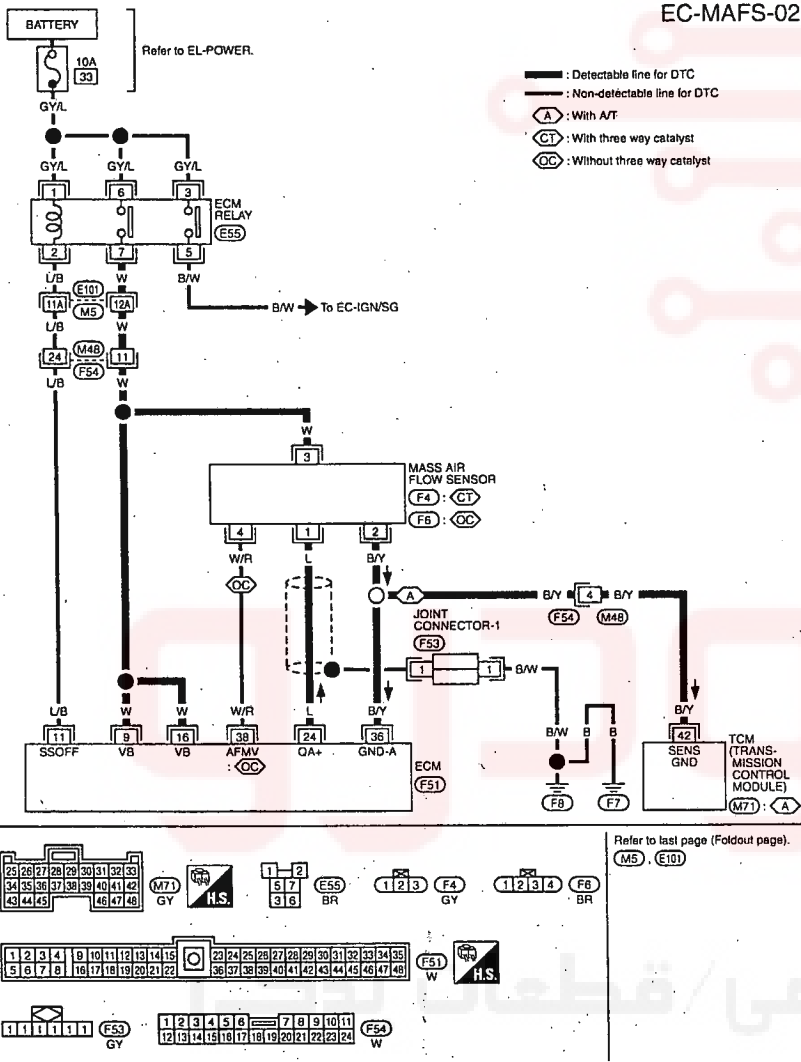
Camshaft Position Sensor (CMPS) (Cont'd)
DIAGNOSTIC PROCEDURE



OBP-21

TROUBLE DIAGNOSIS FOR "MASS AIR FLOW SEN"
(DTC 12)
KA24DE
Mass Air Flow Sensor (MAFS) (Cont'd)

FOR RHD MODELS

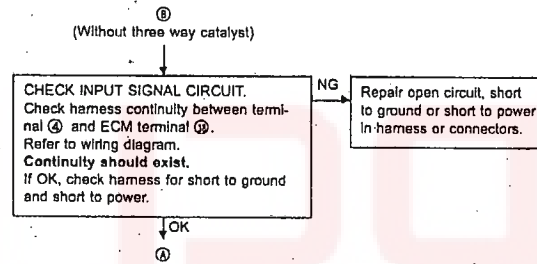
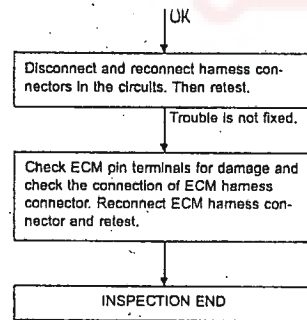


TROUBLE DIAGNOSIS FOR "MASS AIR FLOW SEN"
(DTC 12)
KA24DE
Mass Air Flow Sensor (MAFS)

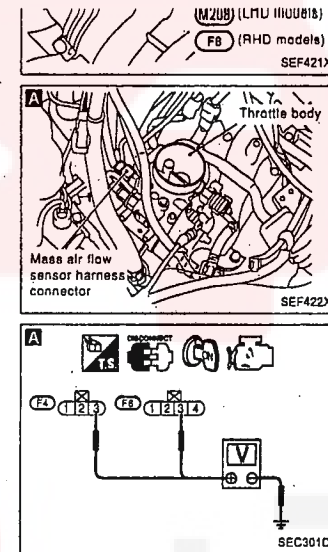
ECM TERMINALS AND REFERENCE VALUE
Specification data are reference values and are measured between each terminal and body ground.
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
24	L	Mass air flow sensor	Engine is running (Warm-up condition) Idle speed	0.9 - 1.8V
			Engine is running (Warm-up condition) Engine speed is 2,500 rpm.	1.8 - 2.3V
36	B/Y	Mass air flow sensor ground	Engine is running (Warm-up condition) Idle speed	0.001 - 0.02V
38*	W/R	Sensor's power supply	Ignition switch "ON"	Approximately 5V

*: Without three way catalyst.



0BD-26



- Turn ignition switch "ON".
- Check voltage between terminal ③ and ground with CONSULT-II or tester.
Voltage: Battery voltage

- Harness connectors (FS4, M44)
 - Harness for open or short between mass air flow sensor and ECM
 - Harness for open or short between mass air flow sensor and ECM relay
- If NG, repair harness or connectors.

- CHECK GROUND CIRCUIT.
- Turn ignition switch "OFF".
 - Disconnect ECM harness connector.
 - Check harness continuity between terminal ② and ground.
Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short to ground and short to power.

- Check the following.
- Harness connectors (FS4, M44) (A/T models)
 - Harness for open or short between mass air flow sensor and TCM
 - Harness for open or short between mass air flow sensor and ECM
- If NG, repair harness or connectors.

- CHECK INPUT SIGNAL CIRCUIT.
- Check harness continuity between terminal ① and ECM terminal ②.
Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short to ground and short to power.

- Repair open circuit, short to ground or short to power in harness or connectors.

- CHECK SHIELD CIRCUIT.
- Turn ignition switch "OFF".
 - Loosen and retighten engine ground screws.
 - Remove joint connector-1.
 - Check the following.
 - Continuity between joint connector terminal ① and ground
 - Joint connector (Refer to "HARNESS LAYOUT" in EL section.)
- Continuity should exist.
If OK, check harness for short to power.
Then reconnect joint connector.

- Repair open circuit, short to power in harness or connectors.

OK

①
(With three way catalyst)
(Go to next page.)

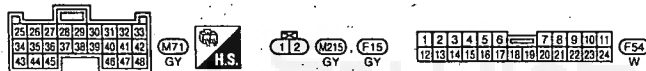
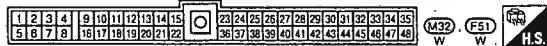
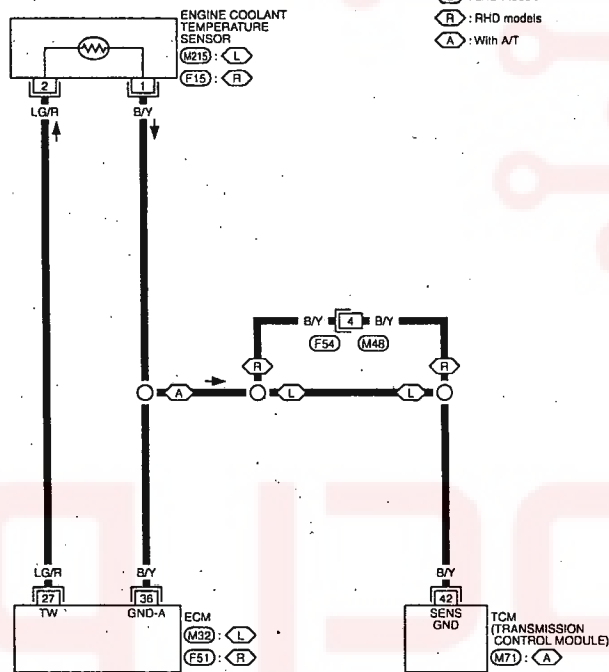
0BD-25

TROUBLE DIAGNOSIS FOR "COOLANT TEMP SEN"
(DTC 13)
KA24DE

Engine Coolant Temperature Sensor (ECTS)

EC-ECTS-01

- : Detectable line for DTC
- - - : Non-detectable line for DTC
- (L) : LHD models
- (R) : RHD models
- (A) : With A/T



EC-28

GEC185A

TROUBLE DIAGNOSIS FOR "MASS AIR FLOW SEN"
(DTC 12)
KA24DE

Mass Air Flow Sensor (MAFS) (Cont'd)

COMPONENT INSPECTION

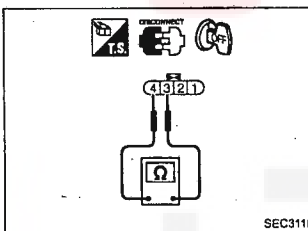
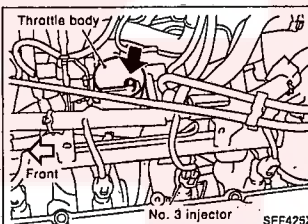
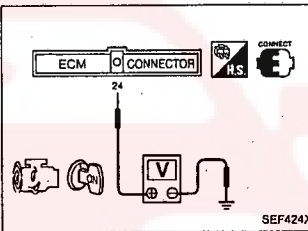
Mass air flow sensor

1. Turn ignition switch "ON".
2. Start engine and warm it up sufficiently.
3. Check voltage between ECM terminal 24 and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	0.9 - 1.8
2,500 rpm	1.8 - 2.3
Idle to about 4,000 rpm*	0.9 - 1.8 to Approx. 4.0

* Check for linear voltage rise in response to increase to about 4,000 rpm in engine speed.

4. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.



CO adjustment signal line (Without three way catalyst)

1. Turn ignition switch "OFF".
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals 3 and 4.

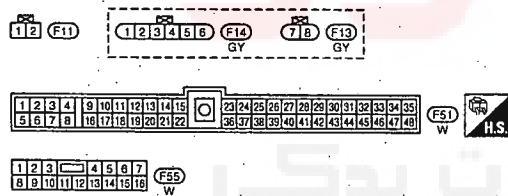
Resistance: Approx. 3.8 - 4.0 kΩ

4. If NG, replace mass air flow sensor.

EC-27

KA24DE

EC-IGN/SG-04

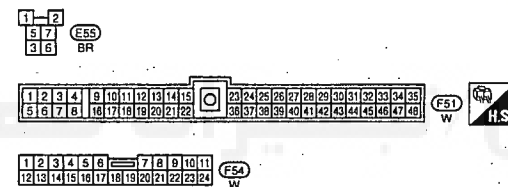


Refer to last page (Foldout page).
(M5) . (E101)

GEC188A

KA24DE

FOR RHD MODELS



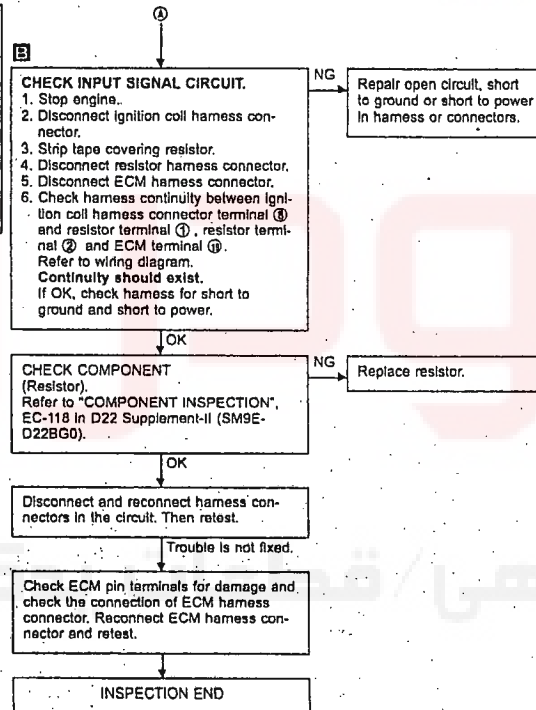
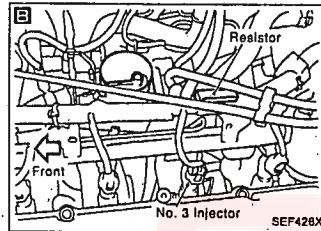
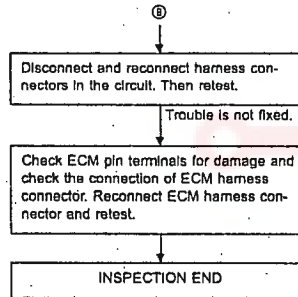
Refer to last page (Foldout page).
(M5) (E101)

GEC187A

TRouble DIAGNOSIS FOR "IGN SIGNAL-PRIMARY"
(DTC 21)

KA24DE

Ignition signal (Cont'd)

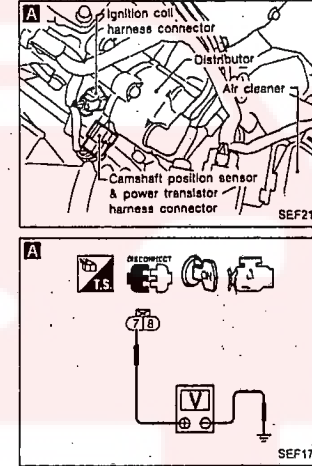
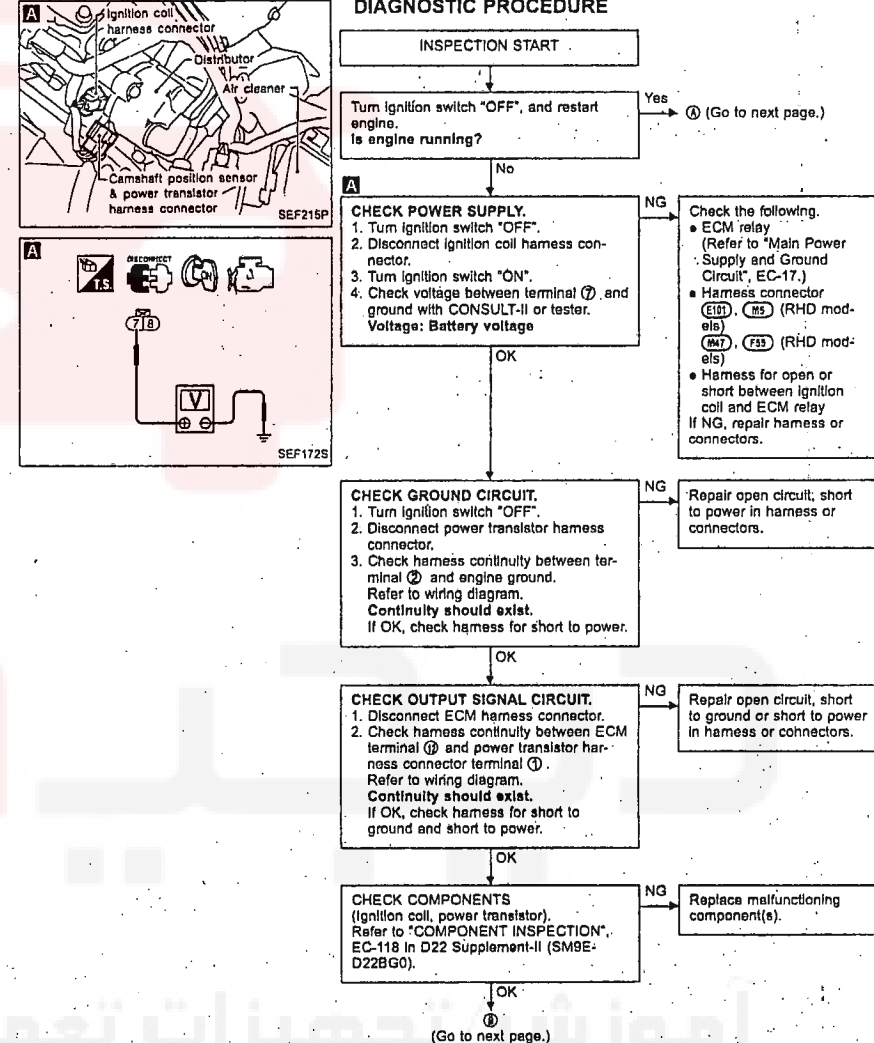


0BP-32

TRouble DIAGNOSIS FOR "IGN SIGNAL-PRIMARY"
(DTC 21)

KA24DE

Ignition signal (Cont'd)
DIAGNOSTIC PROCEDURE



0BD-31

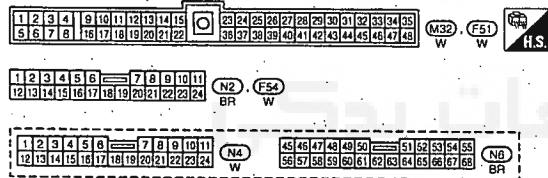
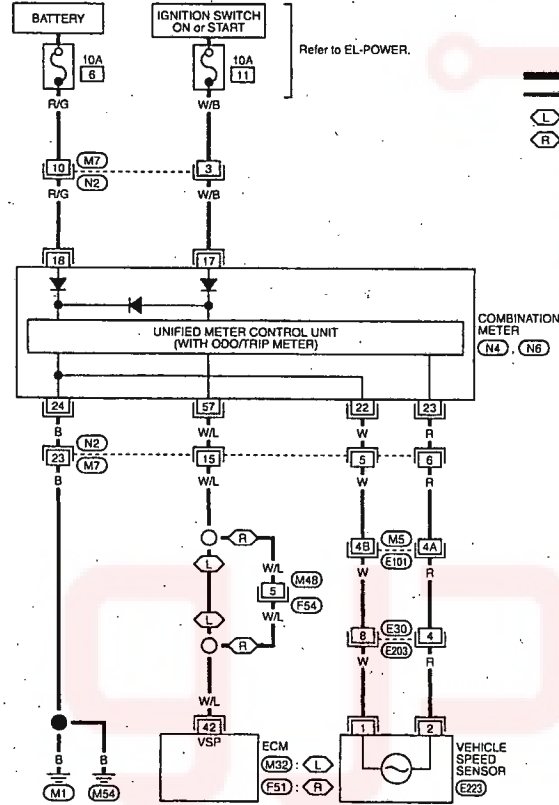
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

KA24DE

Vehicle Speed Sensor (VSS)

WITH TACHOMETER MODELS

EC-VSS-01



EC-34

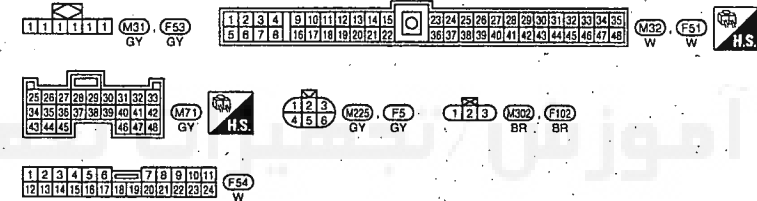
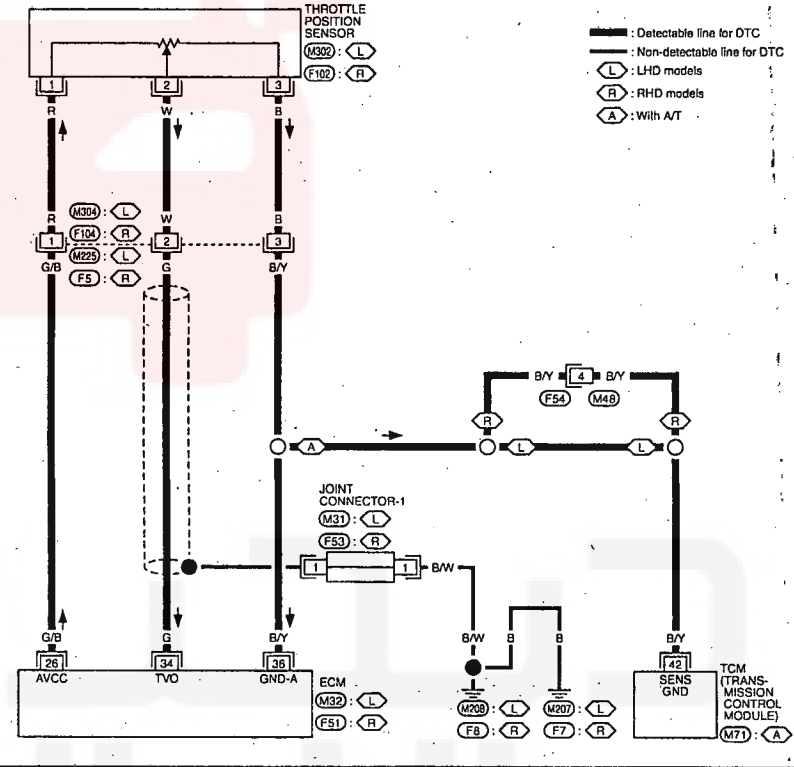
GEC190A

TROUBLE DIAGNOSIS FOR "THROTTLE POSI SEN" (DTC 43)

KA24DE

Throttle Position Sensor

EC-TPS-01



EC-33

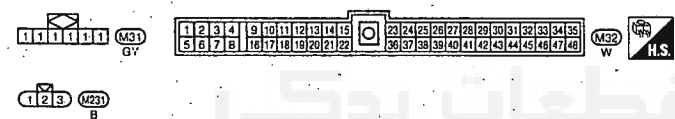
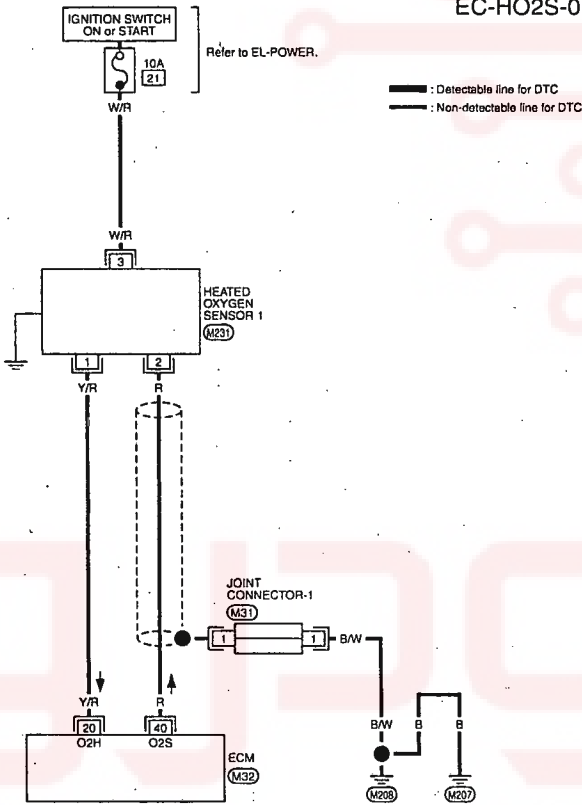
GEC189A

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS
KA24DE

Heated Oxygen Sensor (HO2S)
— Models with Three Way Catalyst —

FOR LHD MODELS

EC-HO2S-01



EC-36

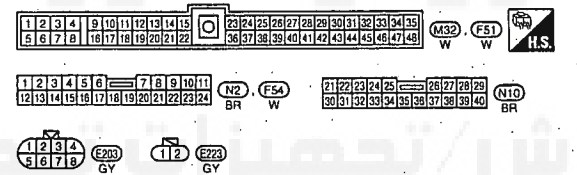
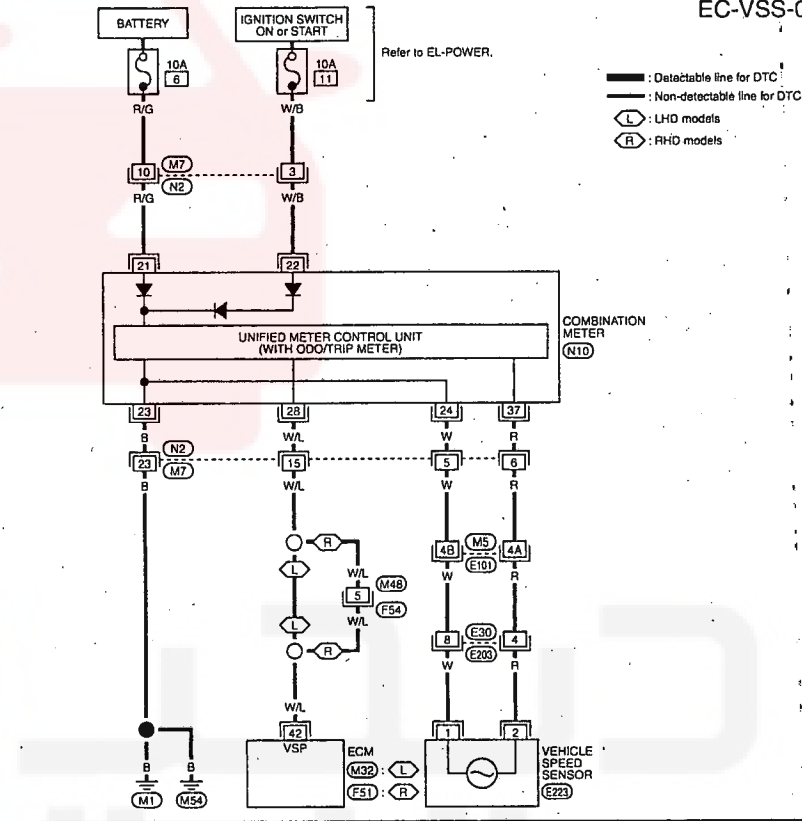
GEC192A

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS
KA24DE

Vehicle Speed Sensor (VSS) (Cont'd)

FOR WITHOUT TACHOMETER MODELS

EC-VSS-02



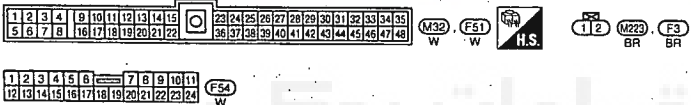
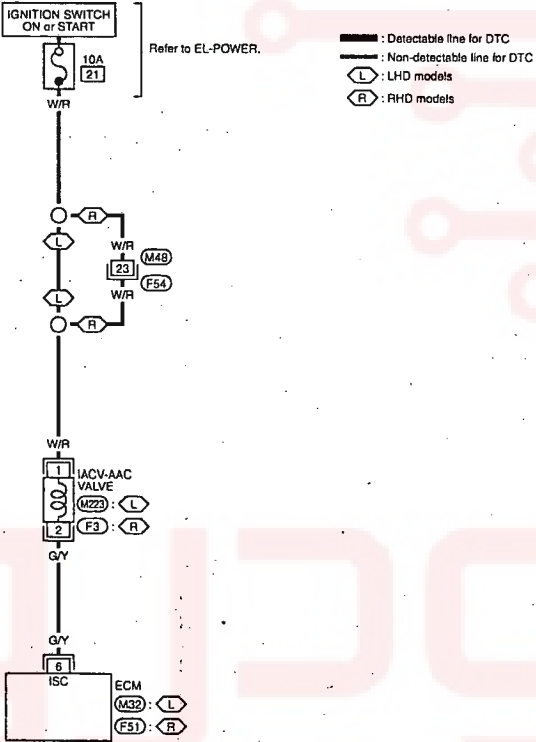
EC-35

GEC191A

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS
KA24DE

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

EC-AAC/V-01



EC-38

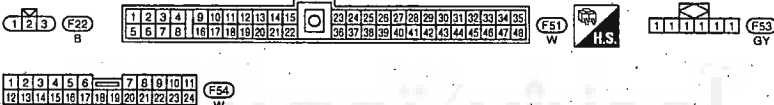
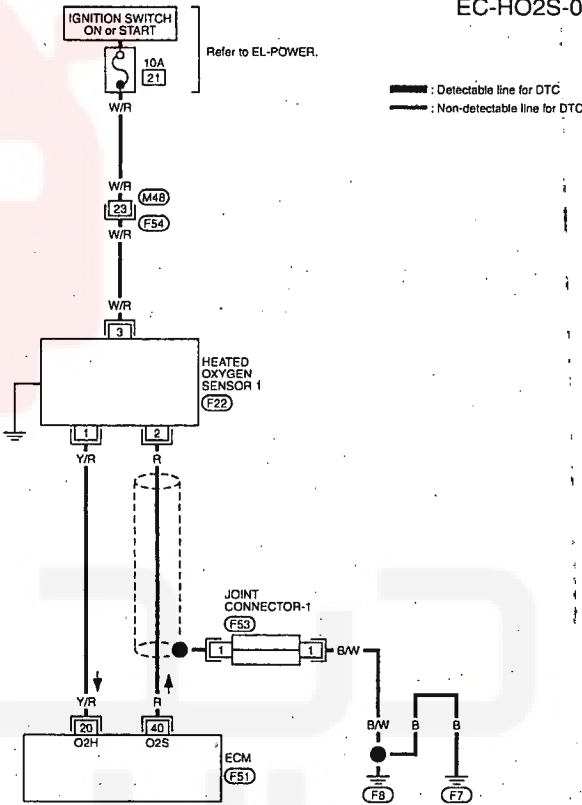
GEC194A

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS
KA24DE

Heated Oxygen Sensor (HO2S)
— Models with Three Way Catalyst — (Cont'd)

FOR RHD MODELS

EC-HO2S-02



EC-37

GEC193A

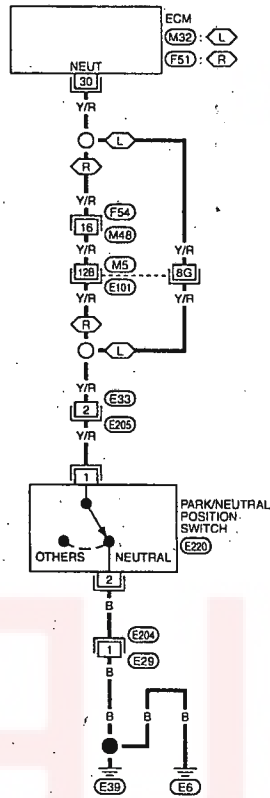
EC-40

KA24DE

TRouble DIAGNOSIS FOR NON-DETECTABLE ITEMS

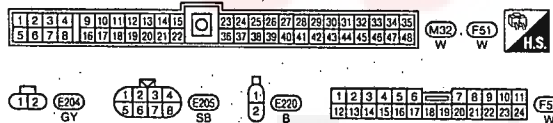
Park/Neutral Position Switch (Cont'd)

FOR M/T MODELS



EC-PNP/SW-03

— : Detectable line for DTC
 — : Non-detectable line for DTC
 L : LHD models
 R : RHD models



EC-40

GEC196A

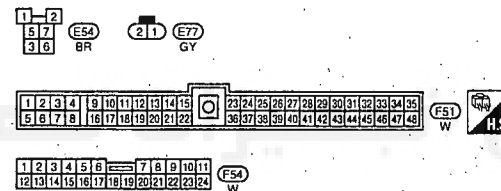
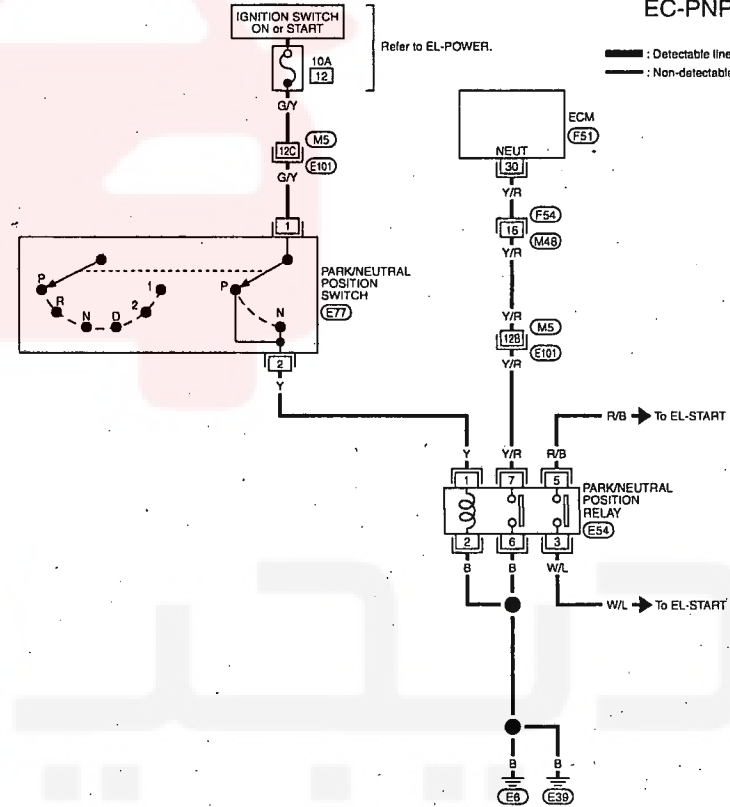
KA24DE

TRouble DIAGNOSIS FOR NON-DETECTABLE ITEMS

Park/Neutral Position Switch

FOR A/T RHD MODELS

EC-PNP/SW-02

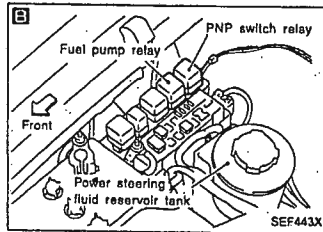


EC-39

GEC195A

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

Park/Neutral Position Switch (Cont'd)



CHECK PARK/NEUTRAL POSITION RELAY.
 1. Apply 12V direct current between relay terminals ① and ②.
 2. Check continuity between relay terminals ③ and ⑦.
 12V (① - ②) applied:
 Continuity exists.
 No voltage applied:
 No continuity

NG → Replace park/neutral position relay.

CHECK OUTPUT SIGNAL CIRCUIT
 1. Disconnect ECM harness connector.
 2. Check harness continuity between ECM terminal ③ and PNP relay terminal ⑦.
 Refer to wiring diagram.
 Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG → Check the following.
 • Harness connectors (F54, M44)
 • Harness connectors (M5, E11)
 • Harness for open or short between ECM and PNP relay
 If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK → Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.
 Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

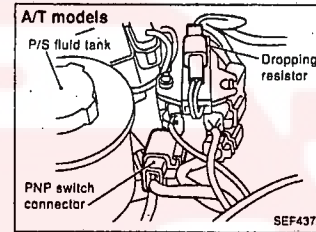
INSPECTION END

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

Park/Neutral Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE

A/T models



DATA MONITOR

MONITOR	NG DTC
P/N POSI SW	ON

SEF212Y

INSPECTION START

CHECK OVERALL FUNCTION.
 1. Turn ignition switch "ON".
 2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
 3. Check the "P/N POSI SW" signal under the following conditions.
 "P" or "N" position: ON
 Except above position: OFF
 OR
 2. Check voltage between ECM terminal ③ and ground with CONSULT-II or tester under the following conditions.
 Voltage:
 "P" or "N" position
 Approximately 0V
 Except above position
 Approximately 5V

OK → INSPECTION END

CHECK POWER SUPPLY.
 1. Turn ignition switch "OFF".
 2. Disconnect Park/Neutral position relay harness connector.
 3. Turn ignition switch "ON".
 4. Select "P" or "N" position.
 5. Check voltage between PNP relay harness connector terminal ① and ground with CONSULT or tester.
 Voltage: Battery voltage

NG → Check the following.
 • 10A fuse
 • Harness connectors (M5, E11) (A/T RHD models)
 • Harness for open or short between fuse and PNP relay
 If NG, repair harness or connectors.
 • Check component (PNP switch) (Refer to A/T section.)

CHECK GROUND CIRCUIT.
 1. Disconnect park/neutral position relay harness connector.
 2. Check harness continuity between park/neutral position relay terminal ②, PNP relay terminal ③ and body ground.
 Refer to wiring diagram.
 Continuity should exist.
 If OK, check harness for short to power.

NG → Repair open circuit, short to power in harness or connectors.

OK → (Go to next page.)

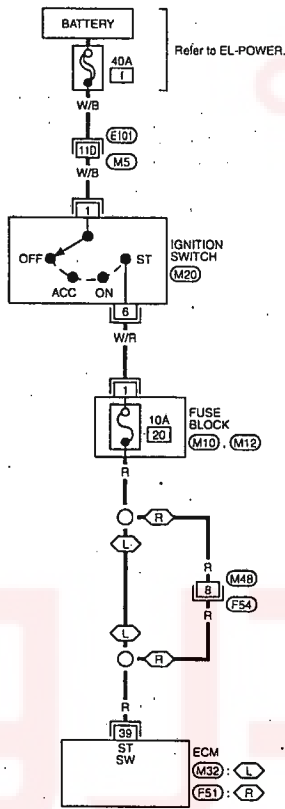
OBD-42

OBD-41

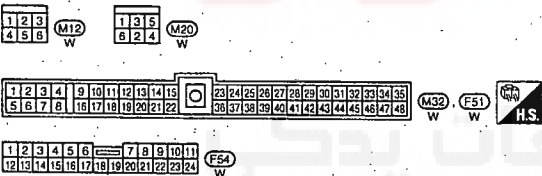
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

Start Signal

EC-S/SIG-01



— : Detectable line for DTC
— : Non-detectable line for DTC
L : LHD models
R : RHD models



Refer to last page (Foldout page).
M5, (E101)
M10

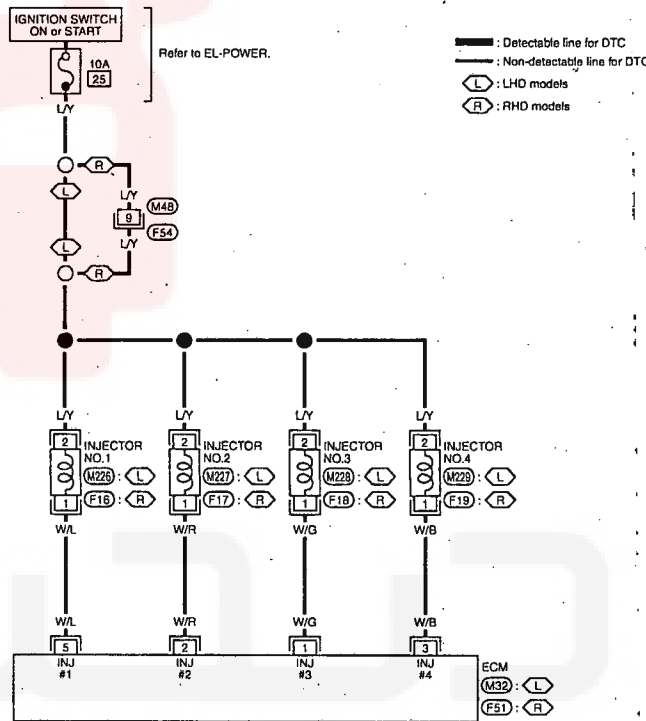
EC-44

GEC198A

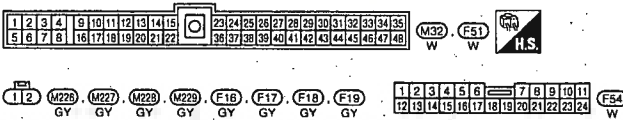
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

Injector

EC-INJECT-01

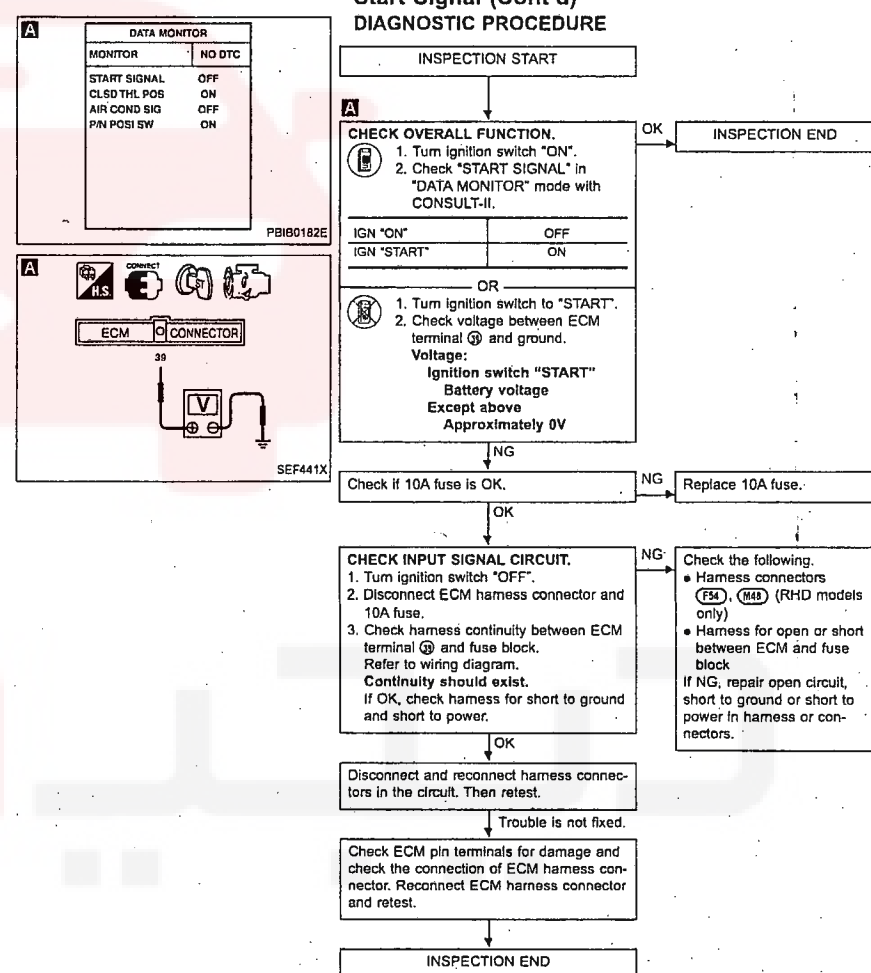


— : Detectable line for DTC
— : Non-detectable line for DTC
L : LHD models
R : RHD models



EC-43

GEC197A

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

EC-45

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

IACV-FICD Solenoid Valve

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and body ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

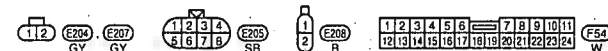
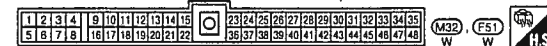
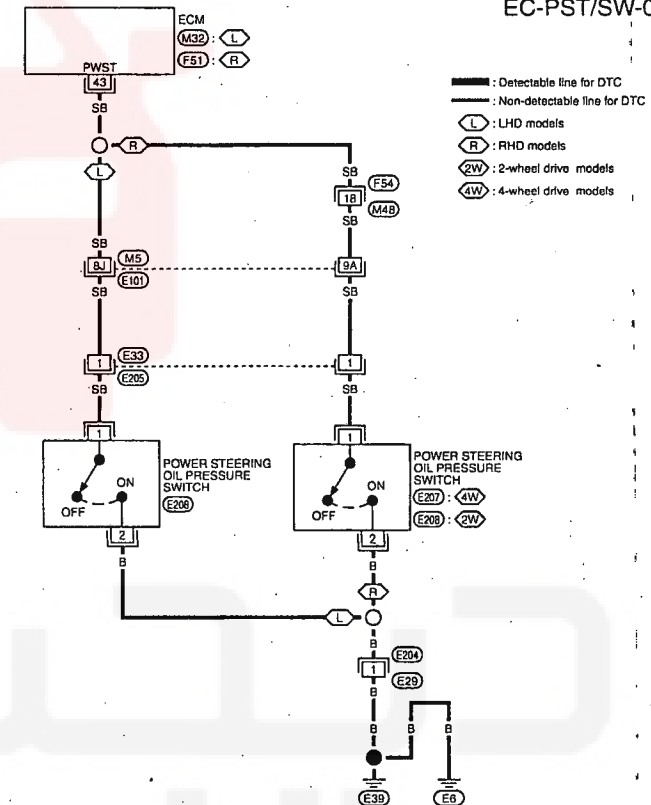
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
23	G/W	Air conditioner relay	Engine is running. Both air conditioner switch and blower switch are "ON". (Compressor operates.)	Approximately 1V
			Engine is running. Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
25	BR/W	Ambient air temperature switch	Engine is running. • Idle speed • Ambient air temperature is above 23°C (73°F) • Air conditioner is operating	0V
			Engine is running. • Idle speed • Ambient air temperature is below 23°C (73°F) • Air conditioner is operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. • Idle speed • Ambient air temperature is below 23°C (73°F) • Air conditioner is not operating	Approximately 5V
46	Y	Air conditioner switch	Engine is running. Both air conditioner switch and blower switch are "ON". (Compressor operates.)	Approximately 0V
			Engine is running. Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)

EC-48

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

Power Steering Oil Pressure Switch

EC-PST/SW-01



Refer to last page (Foldout page).

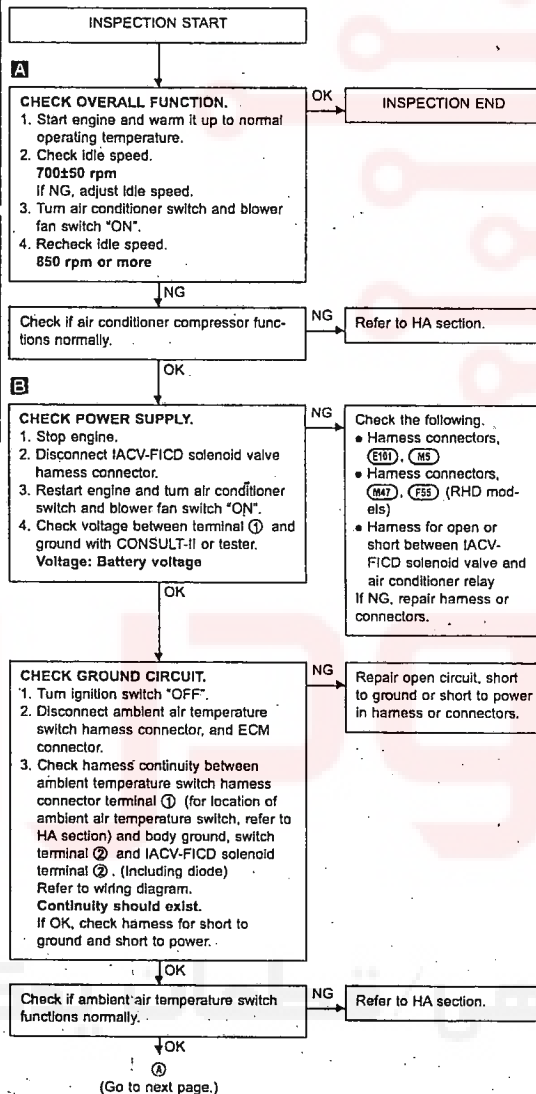
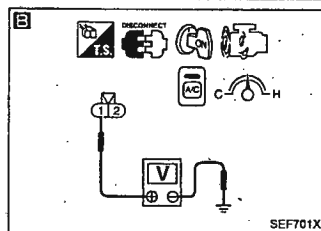
(M5, E101)

EC-47

GEC200A

KA24DE

INSPECTION START

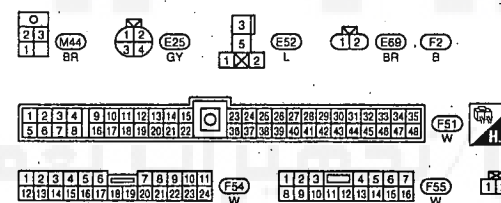
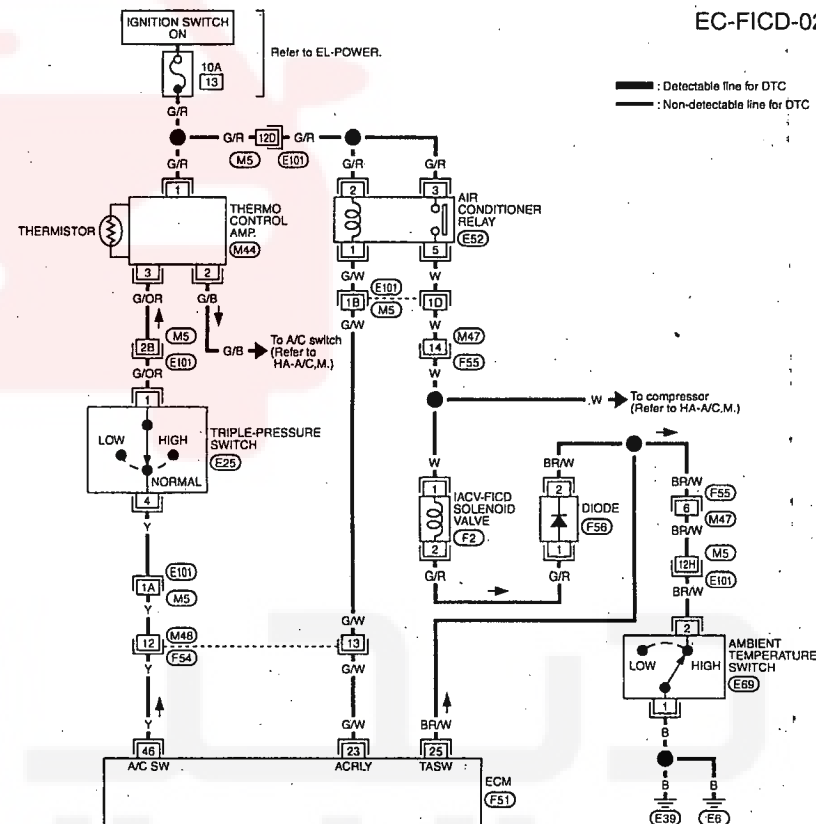


EC-50

KA24DE

EC-FICD-02

FOR RHD MODELS



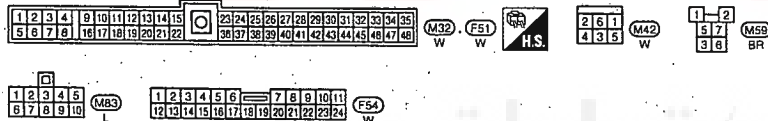
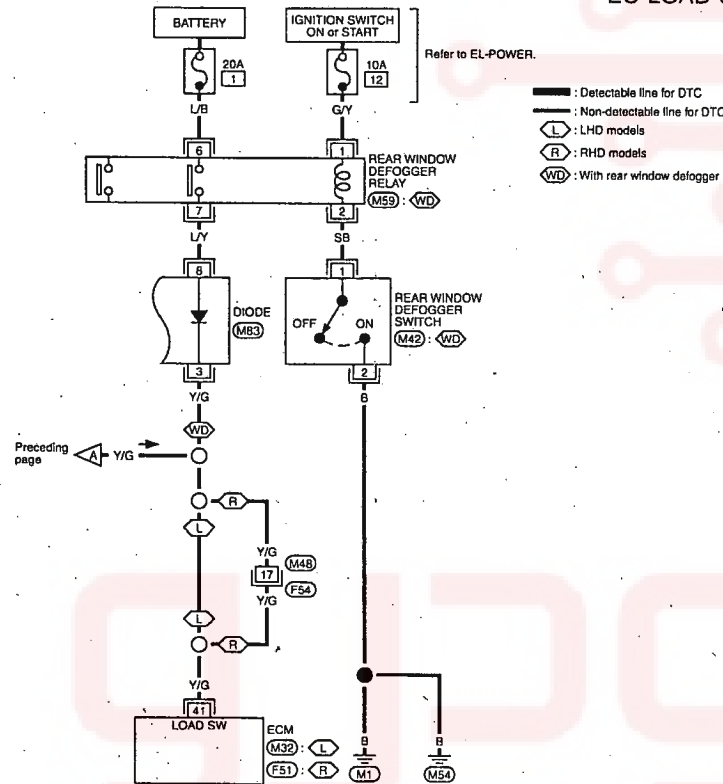
Refer to last page (Foldout page)
M5, E101

EC-49

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

Electrical Load Signal

EC-LOAD-02

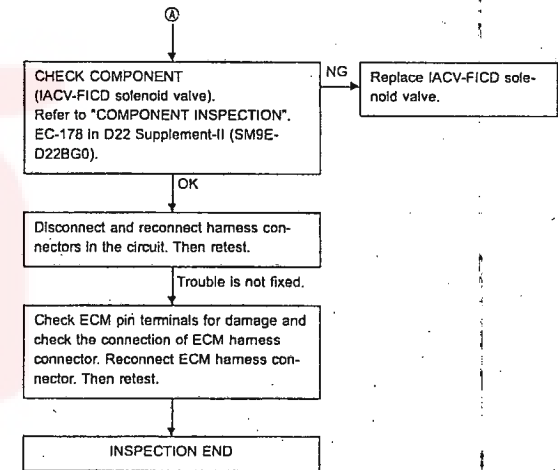


EC-52

GEC202A

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS KA24DE

IACV-FICD Solenoid Valve (Cont'd)



EC-51

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

KA24DE

FOR RHD MODELS

MIL & Data Link Connectors

EC-MIL/DL-03

IGNITION SWITCH
ON or START

Refer to EL-POWER.

10A
11

W/B

3

W/B

M7
N2

TM

OT

W/B

22

COMBINATION
METER
(MALFUNCTION
INDICATOR LAMP)

N10 N11 OT

47

OR/B

OT

TM

OR/B

N1
M6

OR/B

M48
F54

OR/B

13

LED-R

ECM
F51

W/B

17

COMBINATION
METER
(MALFUNCTION
INDICATOR LAMP)

N4 N6 TM

63

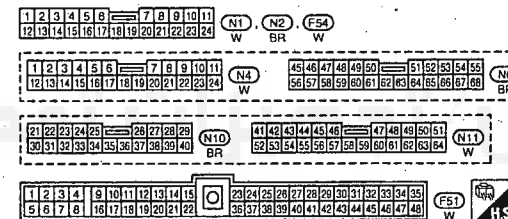
W/G

W/G

W/G

Not used

— : Detectable line for DTC
— : Non-detectable line for DTC
TM : With tachometer
OT : Without tachometer



EC-53

GEC203A