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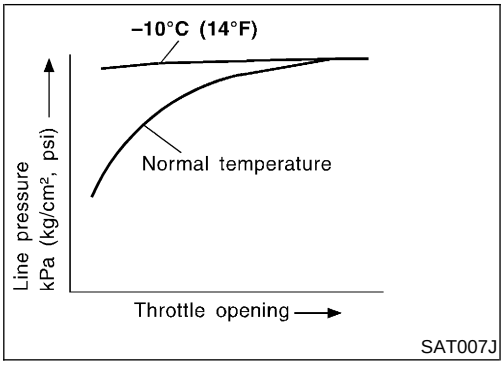
NISSAN XTERRA

MODEL WD22 SERIES

QUICK REFERENCE INDEX

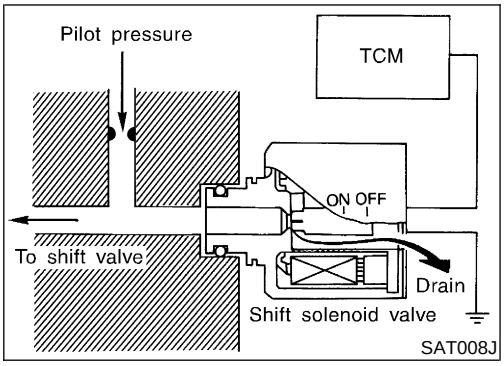


- Line pressure is increased to a maximum irrespective of the throttle opening when fluid temperature drops to −10°C (14°F). This pressure rise is adopted to prevent a delay in clutch and brake operation due to extreme drop of fluid viscosity at low temperature.

SHIFT CONTROL

NGAT0180S02

The shift is regulated entirely by electronic control to accommodate vehicle speed and varying engine operations. This is accomplished by electrical signals transmitted by the revolution sensor and throttle position sensor. This results in improved acceleration performance and fuel economy.



Control of Shift Solenoid Valves A and B

NGAT0180S0201

The TCM activates shift solenoid valves A and B according to signals from the throttle position sensor and revolution sensor to select the optimum gear position on the basis of the shift schedule memorized in the TCM.

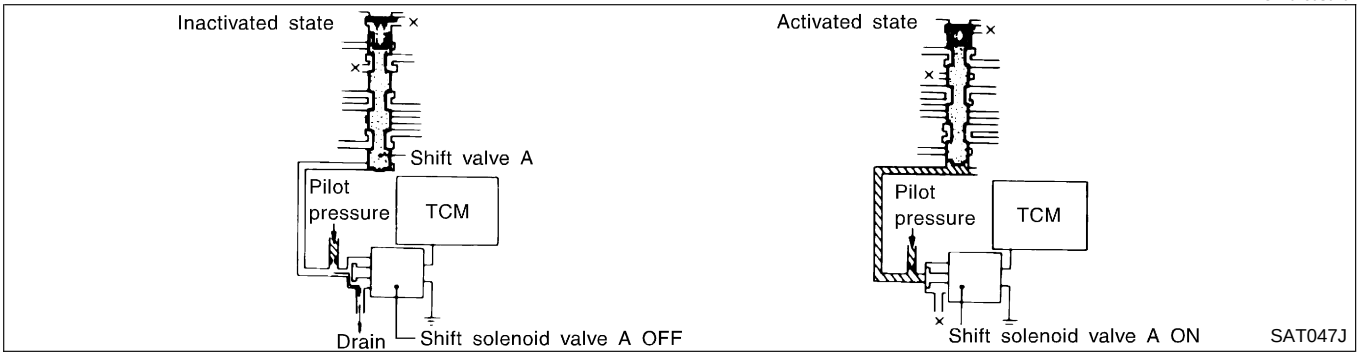
The shift solenoid valve performs simple ON-OFF operation. When set to ON, the drain circuit closes and pilot pressure is applied to the shift valve.

[Relation between shift solenoid valves A and B and gear positions]

Shift solenoid valve	Gear position				
	D_1, 2_1, 1_1	D_2, 2_2, 1_2	D_3	D_4 (OD)	N-P
A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)	ON (Closed)
B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)

Control of Shift Valves A and B

NGAT0180S0202



(VG33ER)

Symptom Chart (Cont'd)

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				VG33E only	VG33ER only
NOT USED	Vehicle runs in N position. AT-219	ON vehicle	1. Manual control linkage adjustment	AT-270	
		OFF vehicle	2. Forward clutch	AT-312	
			3. Reverse clutch	AT-306	
			4. Overrun clutch	AT-312	
	Vehicle braked when shifting into R position.	ON vehicle	1. Fluid level	AT-62	
			2. Manual control linkage adjustment	AT-270	
			3. Line pressure test	AT-65	
			4. Line pressure solenoid valve	AT-164	
			5. Control valve assembly	AT-267	
		OFF vehicle	6. High clutch	AT-310	
			7. Brake band	AT-325	
			8. Forward clutch	AT-312	
			9. Overrun clutch	AT-312	
	Excessive creep.	ON vehicle	1. Engine idling rpm	***EC-648***	***EC-1220***
	Engine stops when shifting lever into R, D, 2 and 1.	ON vehicle	1. Engine idling rpm	***EC-648***	***EC-1220***
			2. Torque converter clutch solenoid valve	AT-152	
			3. Control valve assembly	AT-267	
		OFF vehicle	4. Torque converter	AT-278	
	Vehicle braked by gear change from D_1 to D_2.	ON vehicle	1. Fluid level	AT-62	
		OFF vehicle	2. Reverse clutch	AT-306	
			3. Low & reverse brake	AT-316	
			4. High clutch	AT-310	
			5. Low one-way clutch	AT-320	
	Vehicle braked by gear change from D_2 to D_3.	ON vehicle	1. Fluid level	AT-62	
		OFF vehicle	2. Brake band	AT-325	
	Vehicle braked by gear change from D_3 to D_4.	ON vehicle	1. Fluid level	AT-62	
		OFF vehicle	2. Overrun clutch	AT-312	
			3. Forward one-way clutch	AT-322	
			4. Reverse clutch	AT-306	

a 1st trip DTC other than P0731 is shown, refer to applicable "TROUBLE DIAGNOSIS FOR DTC".

6) Stop vehicle.
7) Follow the instruction displayed. (Check for normal shifting referring to the table below.)

Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists	1 → 2 → 3 → 4
Malfunction for P0731 exists.	2 → 2 → 3 → 3
	4 → 3 → 3 → 4

8) Make sure that "OK" is displayed. (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
Refer to "DIAGNOSTIC PROCEDURE", AT-129.
Refer to "Shift Schedule", AT-348.

With GST

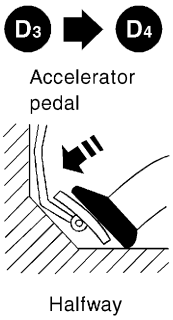
Follow the procedure "With CONSULT-II".

Diagnostic Procedure

=NGAT0055

1	CHECK SHIFT UP (D_3 TO D_4)

During “Cruise test − Part 1”, AT-74.
Does A/T shift from D_3 to D_4 at the specified speed?



SAT988H

Yes or No

Yes	▶	Check for proper lock-up. GO TO 10.
No	▶	GO TO 2.

2	CHECK LINE PRESSURE

Perform line pressure test. Refer to AT-65.

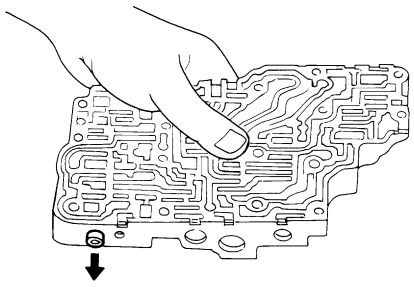
OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 6.

3	CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to “Control Valve Assembly”, AT-293.
2. Check to ensure that:

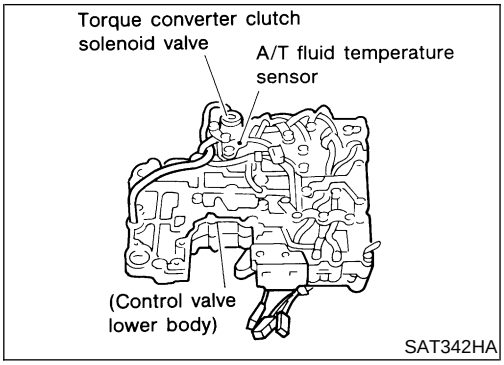
- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.

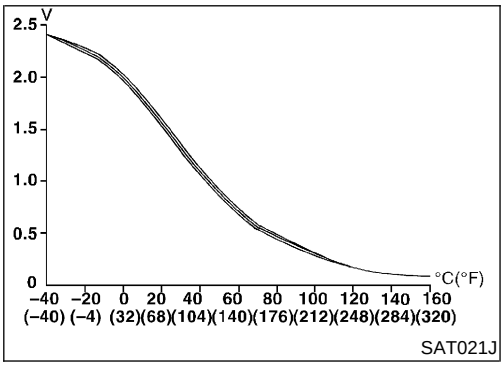


SAT367H

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair control valve.





Description

NGAT0172

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

NGAT0172S02

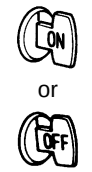
Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approx.)	
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	1.5V ↓ 0.5V	2.5 kΩ ↓ 0.3 kΩ

TCM TERMINALS AND REFERENCE VALUE

NGAT0172S03

Remarks: Specification data are reference values.

Terminal No.	Wire color	Item	Condition		Judgement standard (Approx.)
10	W/R	Power source		When turning ignition switch to ON.	Battery voltage
				When turning ignition switch to OFF.	0V
19	W/R	Power source (same as No. 10)		Same as No. 10	
28	R/Y	Power source (Memory back-up)		When turning ignition switch to OFF.	Battery voltage
				When turning ignition switch to ON.	Battery voltage
42	BR	Throttle position sensor (Ground)		—	0V
47	R/B	A/T fluid temperature sensor		When ATF temperature is 20°C (68°F).	1.5V
				When ATF temperature is 80°C (176°F).	0.5V

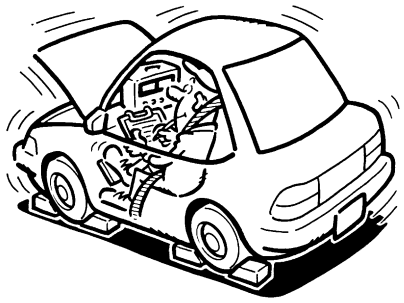
7. Vehicle Does Not Creep Forward In D, 2 Or 1 Position

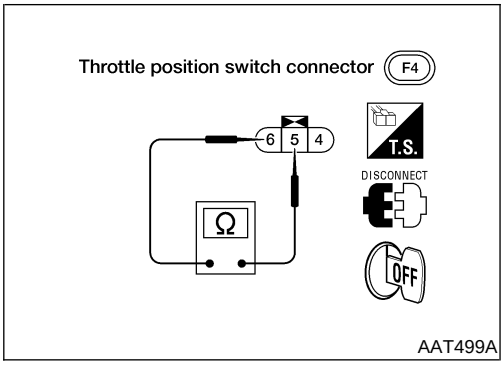
=NGAT0079

SYMPTOM:

Vehicle does not creep forward when selecting D, 2 or 1 position.

1	CHECK A/T FLUID LEVEL	
Check A/T fluid level again.  SAT638A **OK or NG**		
OK	▶	GO TO 2.
NG	▶	Refill ATF.

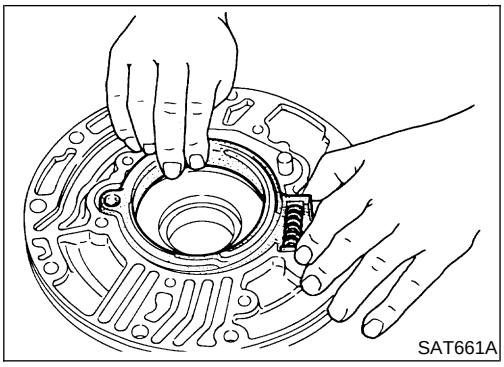
2	CHECK STALL TEST	
Check stall revolution with selector lever in D position. Refer to “Stall Test”, AT-62.  SAT493G **OK or NG**		
OK	▶	GO TO 3.
NG	▶	GO TO 6.



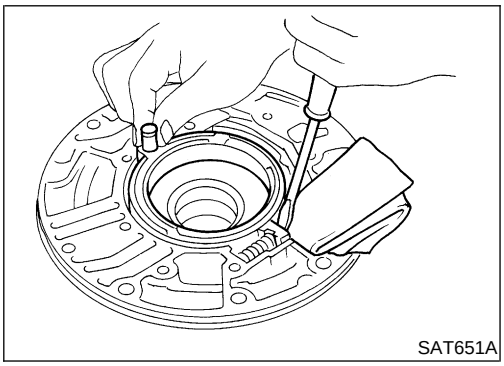
Wide Open Throttle Position Switch

- Check continuity between terminals 5 and 6.

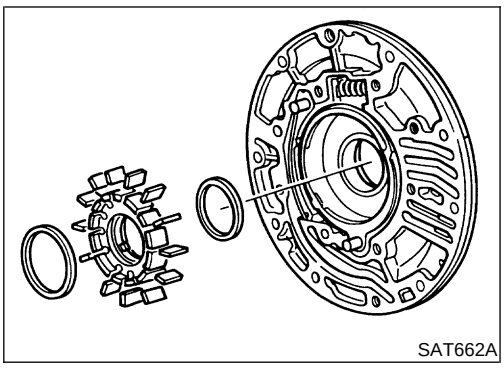
Accelerator pedal condition	Continuity
Released	No
Depressed	Yes


SAT661A

d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.

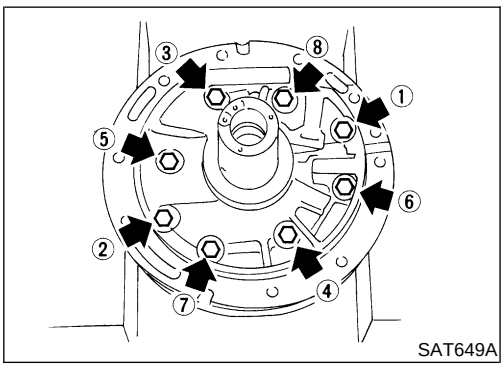

SAT651A

e. While pushing on cam ring install pivot pin.


SAT662A

3. Install rotor, vanes and vane rings.

- **Pay attention to direction of rotor.**

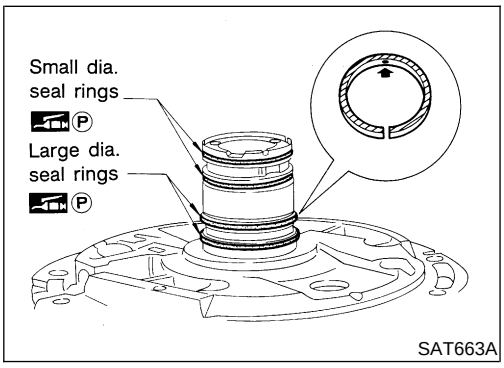


SAT649A

4. Install oil pump housing and oil pump cover.

a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.

b. Tighten bolts in a criss-cross pattern.



SAT663A

5. Install new seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.

- **Seal rings come in two different diameters. Check fit carefully in each groove.**

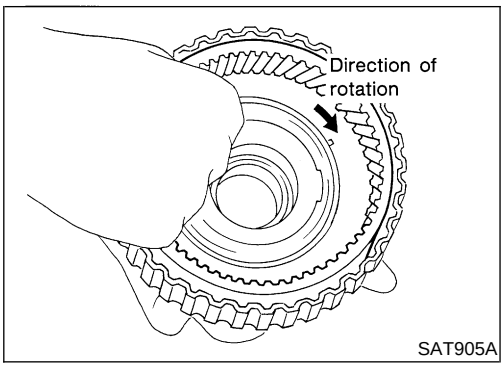
  Small dia. seal ring:

  No mark

  Large dia. seal ring:

  Yellow mark in area shown by arrow

- **Do not spread gap of seal ring excessively while installing. It may deform ring.**

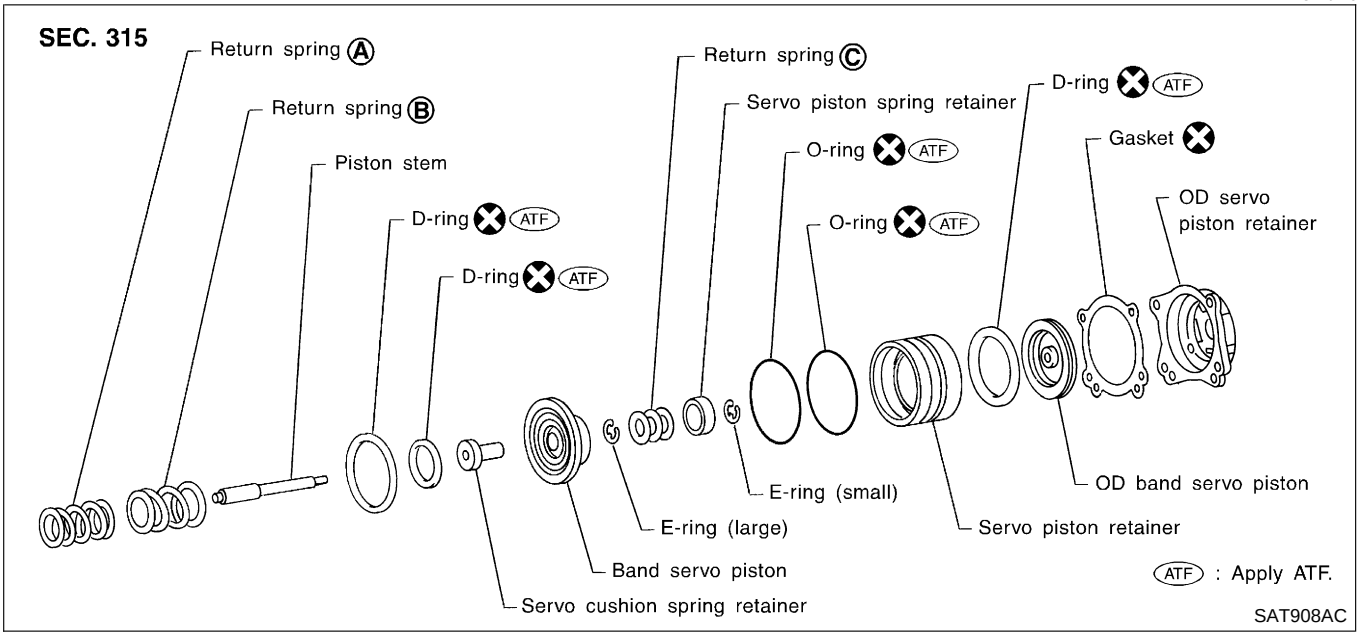


8. After installing, check to assure that forward clutch hub rotates clockwise.

Band Servo Piston Assembly

COMPONENTS

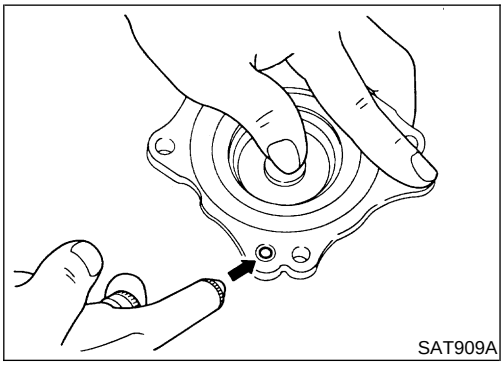
NGAT0148



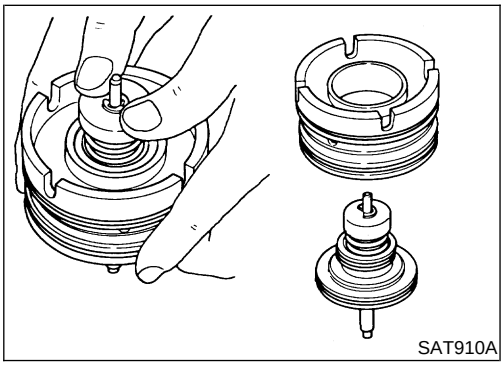
DISASSEMBLY

NGAT0149

1. Block one oil hole in OD servo piston retainer and the center hole in OD band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove OD band servo piston from retainer.
3. Remove D-ring from OD band servo piston.



4. Remove band servo piston assembly from servo piston retainer by pushing it forward.



Noise, Vibration and Harshness (NVH) Troubleshooting

=NGAX0004

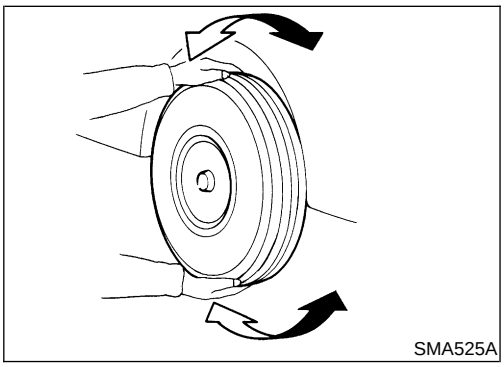
NVH TROUBLESHOOTING CHART

NGAX0004S01

Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

Reference page			—	AX-21	—	AX-8, 31	—	AX-5, 30	NVH, ***PD-4***	NVH, ***PD-4***	Refer to DRIVE SHAFT in this chart.	Refer to AXLE in this chart.	NVH, ***SU-3***	NVH, ***SU-3***	NVH, ***SU-3***	NVH, ***BR-5***	NVH, ***ST-5***
Possible cause and SUSPECTED PARTS			Excessive joint angle	Joint sliding resistance	Imbalance	Improper installation, looseness	Parts interference	Wheel bearing damage	PROPELLER SHAFT	DIFFERENTIAL	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES	STEERING
Symptom	DRIVE SHAFT	Noise, Vibration	×	×					×	×		×	×	×	×	×	×
		Shake	×		×				×			×	×	×	×	×	×
	AXLE	Noise				×	×		×	×	×		×	×	×	×	×
		Shake				×	×		×		×		×	×	×	×	×
		Vibration				×	×		×		×		×	×			×
		Shimmy				×	×						×	×	×	×	×
		Judder				×							×	×	×	×	×
		Poor quality ride or handling				×	×	×					×	×	×		

×: Applicable


SMA525A

On-vehicle Service

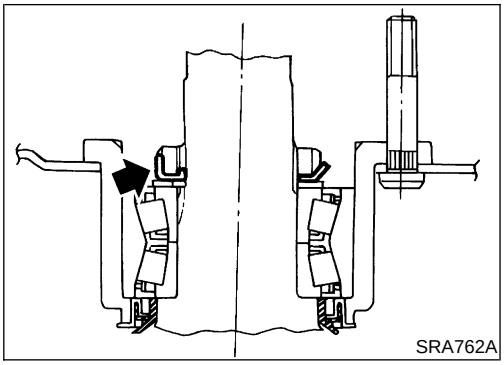
FRONT AXLE PARTS

NGAX0005

Check front axle parts for excessive play, cracks, wear and other damage.

- Shake each front wheel to check for excessive play.
  If looseness is noted, adjust wheel bearing end play, then check ball joint end play.
- Make sure that the cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

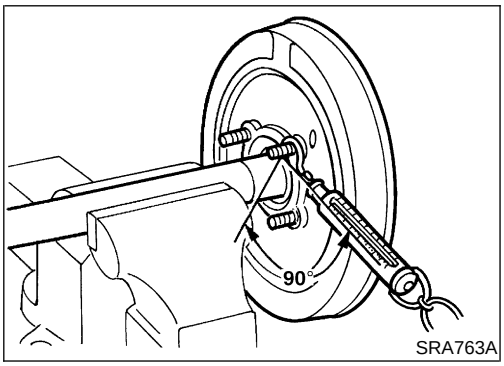
: Refer to *SU-11*, “Components”.


SRA762A

4. Install plain washer and a new wheel bearing lock washer.
5. Tighten wheel bearing lock nut to specified torque.

: 147 - 196 N·m (15 - 20 kg-m, 108 - 145 ft-lb)

Fit wheel bearing lock washer lip in wheel bearing lock nut groove correctly by tightening lock nut. Be sure to bend it up.



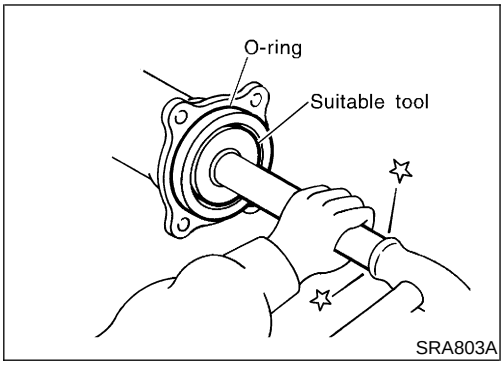
SRA763A

6. Check wheel bearing preload.

a. Turn bearing cage (with respect to axle shaft) two or three times. It must turn smoothly.

b. Attach spring gauge to bearing cage bolt (as shown at left) and pull it at a speed of 10 rpm to measure preload.

Spring gauge indication:
6.9 - 48.1 N (0.7 - 4.9 kg, 1.5 - 10.8 lb)

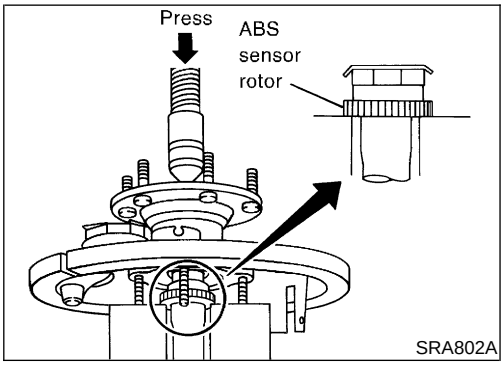


SRA803A

7. Install new oil seal to rear axle housing using a suitable tool.

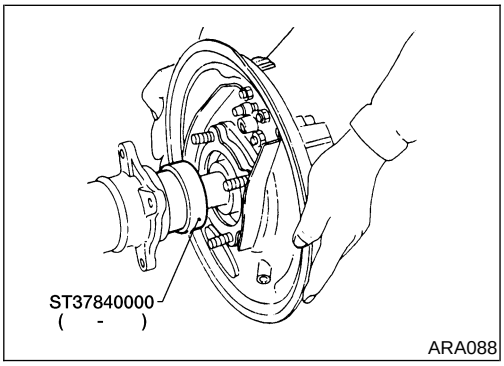
After installing new oil seal, coat sealing lip with multi-purpose grease.

8. Install new O-ring to rear axle housing.



SRA802A

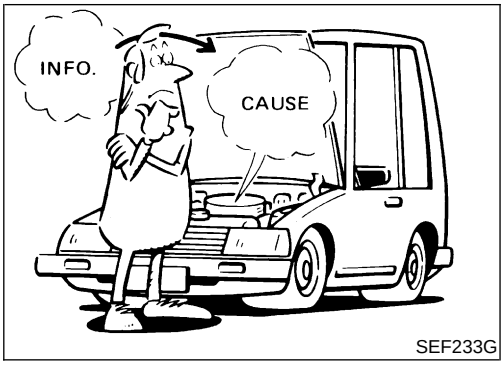
9. Press ABS sensor rotor onto axle shaft until it contacts wheel bearing lock nut. Always replace sensor rotor with new one.



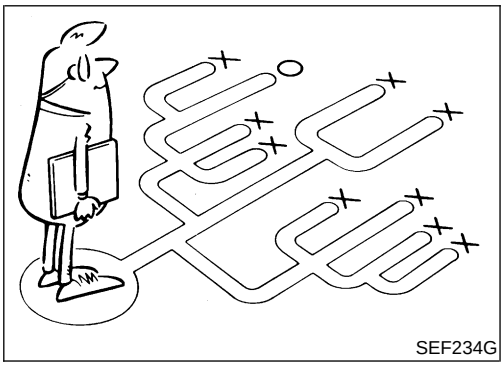
ARA088

10. Position axle shafts in rear axle housing with Tool as a guide.

Be careful not to damage oil seal.



SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

NGBR0100

INTRODUCTION

NGBR0100S01

The ABS system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives the actuators. It is essential that both kinds of signals are proper and stable. It is also important to check for conventional problems: such as air leaks in booster lines, lack of brake fluid, or other problems with the brake system.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems, so a road test should be performed.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information on such problems; especially intermittent ones. By talking to the customer, find out what symptoms are present and under what conditions they occur. Start your diagnosis by looking for “conventional” problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

Also check related Service bulletins for information.

3	CHECK G SENSOR

1. Turn ignition switch OFF.
2. Remove G sensor from bracket.
3. Reconnect harness connector to G sensor and hold sensor in same attitude/position as when installed in vehicle.

● Check voltage between G sensor connector M69 terminal 1 (G/OR) and ground for the following tests.

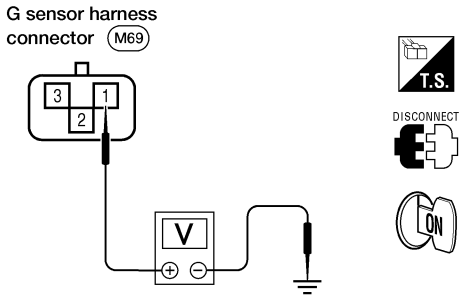
There should be approx. 2.5V.

4. Turn sensor 90° with connector point up.

● There should be approx. 3.7V.

5. Turn sensor 180° with connector pointing down.

● There should be approx. 1.3V.



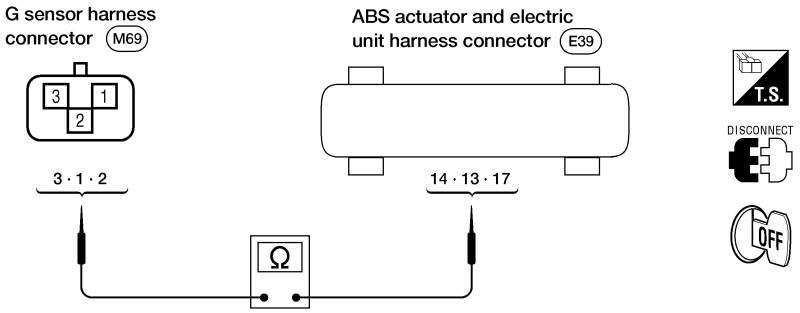
ABR897

Were the voltage readings correct for steps 3, 4 and 5?

Yes	▶	GO TO 4.
No	▶	Replace G Sensor.

4	CHECK G SENSOR CIRCUIT

1. Disconnect ABS actuator and electric unit connector.
2. Check continuity from G sensor connector M69 terminal 3 (B/P) to ABS actuator and electric unit connector E39 terminal 14 (B/P).
3. Check continuity from G sensor connector M69 terminal 1 (G/OR) to ABS actuator and electric unit connector E39 terminal 13 (G/OR).
4. Check continuity from G sensor connector M69 terminal 2 (G/B) to ABS actuator and electric unit connector E39 terminal 17 (G/B).



ABR898

Does continuity exist?

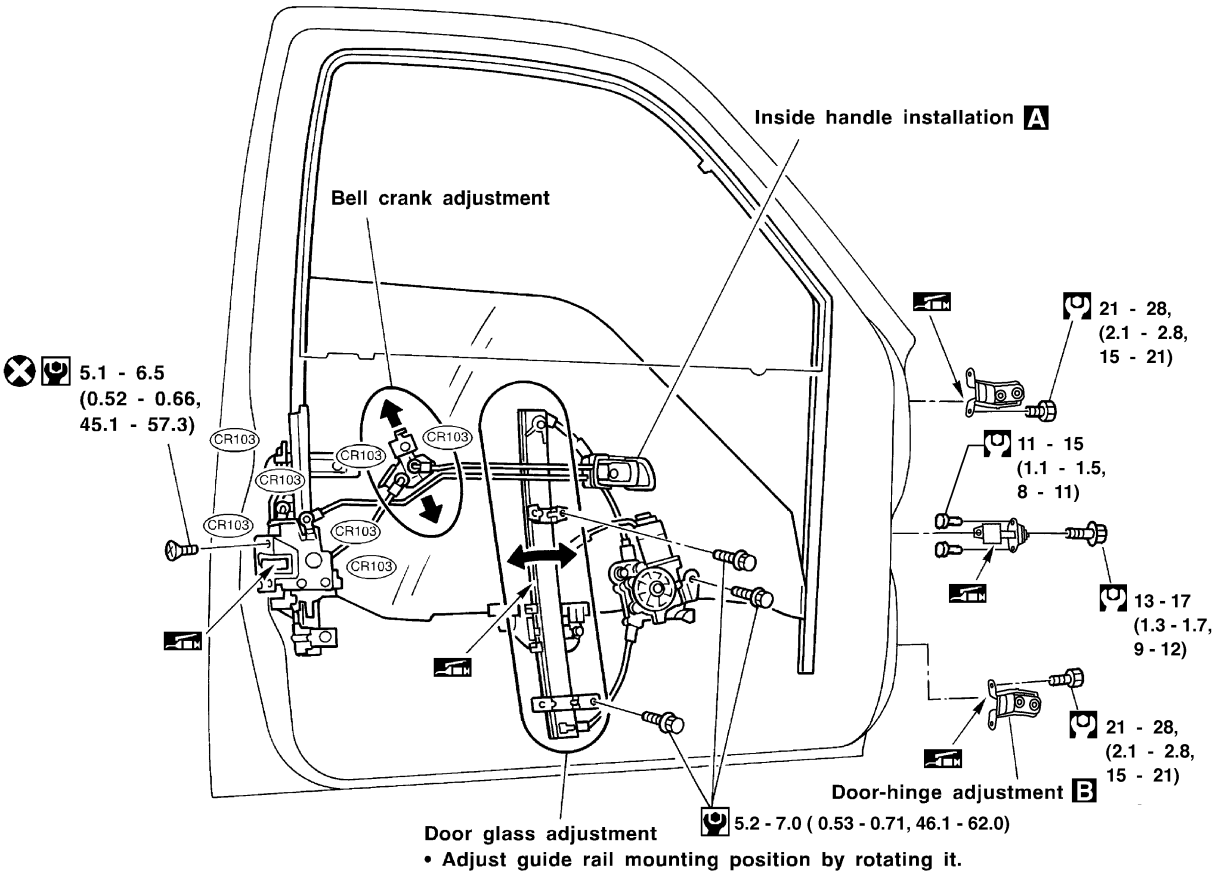
Yes	▶	Replace ABS actuator and electric unit.
No	▶	Repair harness or connector.

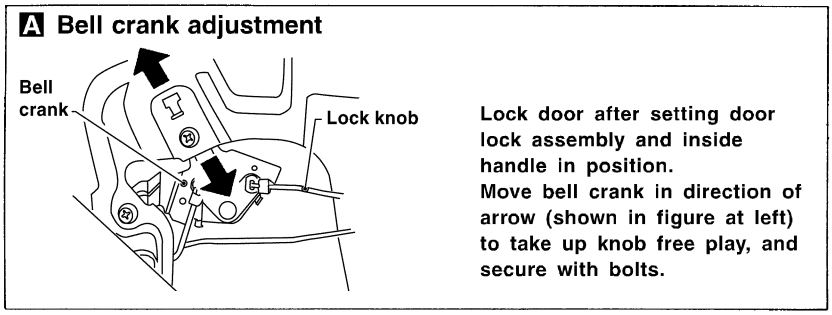
Overhaul

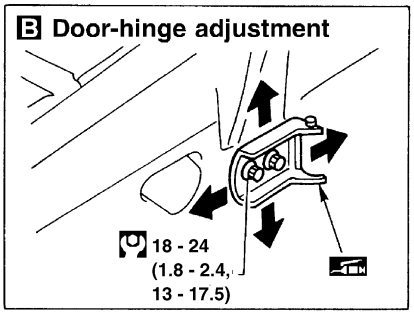
NGBT0006

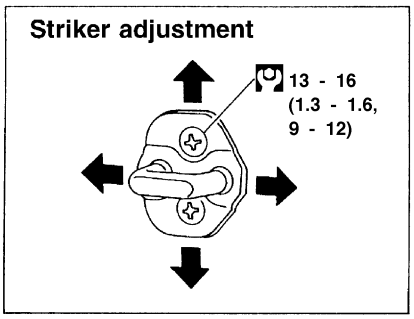
- For removal of door trim, refer to “Removal and Installation”, BT-27.
- After adjusting door or door lock, check door lock operation.

SEC. 800•803•805









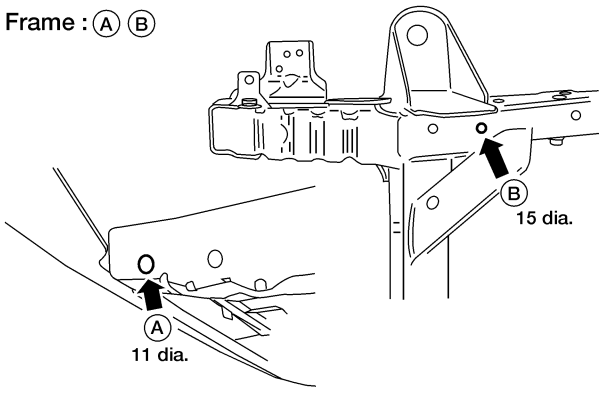
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
: Apply multi-purpose grease

WBT171

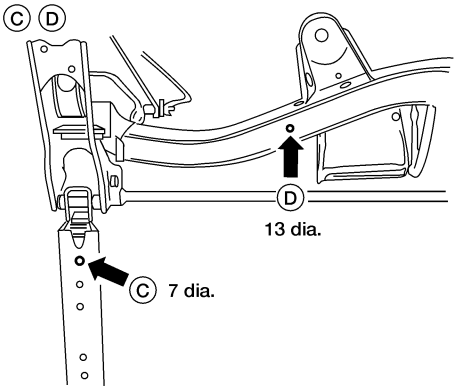
Measurement Points

NGBT0022S0206

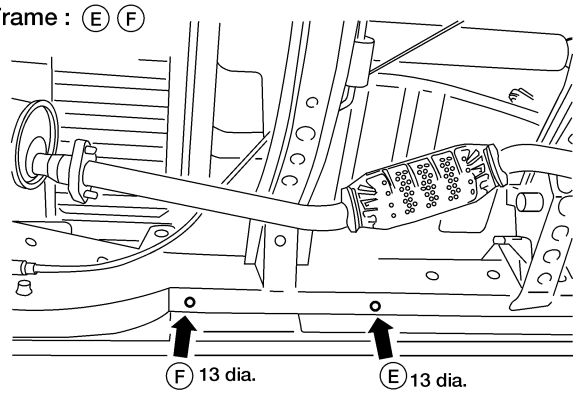
Frame : Ⓐ Ⓑ



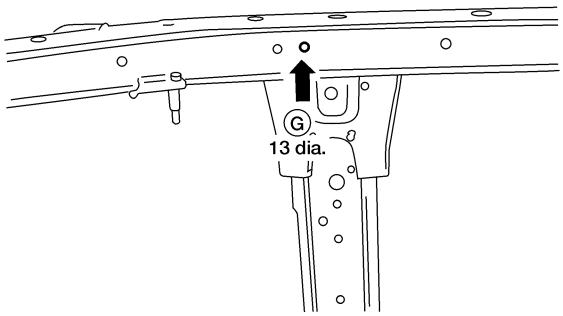
Frame : Ⓒ Ⓓ



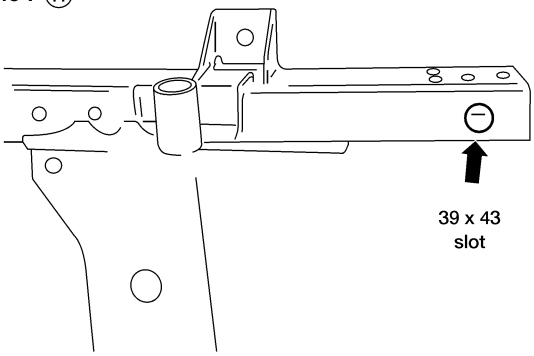
Frame : Ⓔ Ⓕ



Bump rubber mount : Ⓖ



Frame : Ⓗ



Coordinates:

Ⓐ, ⓐ X: 360 Y: -700 Z: 260	Ⓔ, ⓔ X: 515 Y: 1340 Z: 145
Ⓑ, ⓑ X: 338 Y: -409 Z: 246.2	Ⓕ, ⓕ X: 510 Y: 1720 Z: 145
Ⓒ, ⓒ X: 200 Y: -129 Z: RH 105 LH 97	Ⓖ, ⓖ X: 510 Y: 2560 Z: 398
Ⓓ, ⓓ X: 434 Y: 550 Z: 145.4	Ⓗ, ⓗ X: 505 Y: 3530 Z: 360

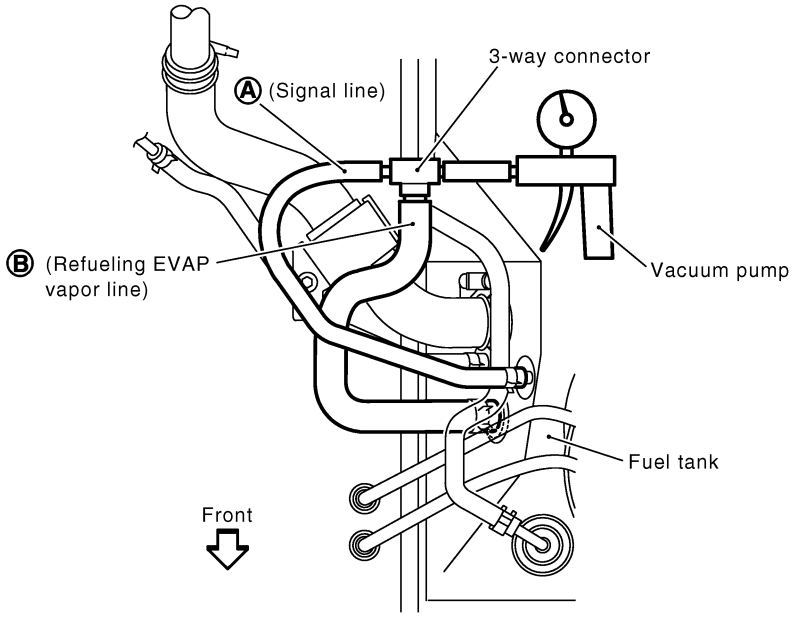
ABM437

CONTENTS (Cont'd)

7	CHECK REFUELING EVAP VAPOR CUT VALVE

Without CONSULT-II

1. Remove fuel tank. Refer to ***FE-4***, "FUEL SYSTEM".
2. Drain fuel from the tank as follows:
a. Remove fuel gauge retainer.
b. Drain fuel from the tank using a hand pump into a fuel container.
3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end B), and check that the air flows freely into the tank.
4. Check EVAP vapor cut valve for being stuck to open as follows.
a. Connect vacuum pump to hose ends A and B using a suitable 3-way connector.
b. Remove fuel gauge retainer with fuel gauge unit.
   Always replace O-ring with new one.
c. Put fuel tank upside down.
d. Apply vacuum pressure to both hose ends A and B [−13.3 kPa (−100 mmHg, −3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



SEF707Z

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace refueling EVAP vapor cut valve with fuel tank.

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time required, for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

− Sea level
− Flat road
− Ambient air temperature: 20 - 30°C (68 - 86°F)
− Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals 59 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals 59 and ground is lower than 1.4V).**
- **The engine is started at the tank fuel temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 60 and ground is less than 4.1V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:

- The driving pattern outlined in *2 must be repeated at least 3 times.

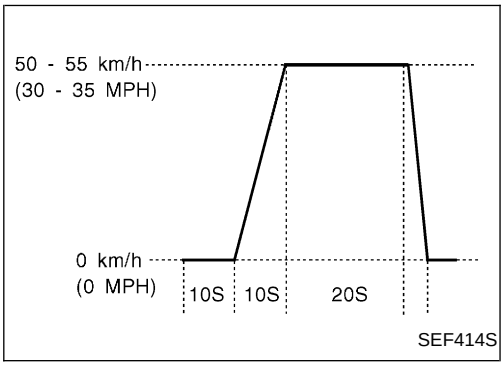
Pattern 4:

- Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Operate the vehicle in the following driving pattern.

1) Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
2) Repeat driving pattern shown below at least 10 times.
   - **During acceleration, hold the accelerator pedal as steady as possible.**
3) Repeat steps 1 and 2 until the EGR system SRT is set.



*3: Checking the vehicle speed with GST is advised.

Suggested upshift speeds for M/T models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

6	CHECK IGNITION TIMING

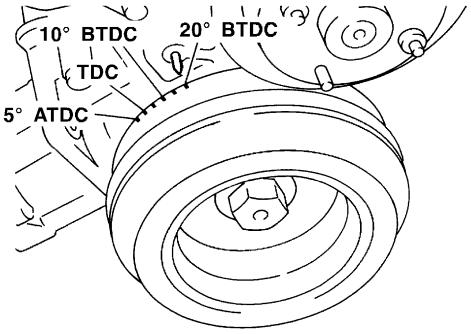
With CONSULT-II

1. Warm up engine to normal operating temperature.
2. Select "IGNITION TIMING ADJ" in "WORK SUPPORT" mode.
3. Touch "START".

IGNITION TIMING ADJ
IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START. AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.

PEF546N

4. Check ignition timing at idle using timing light.

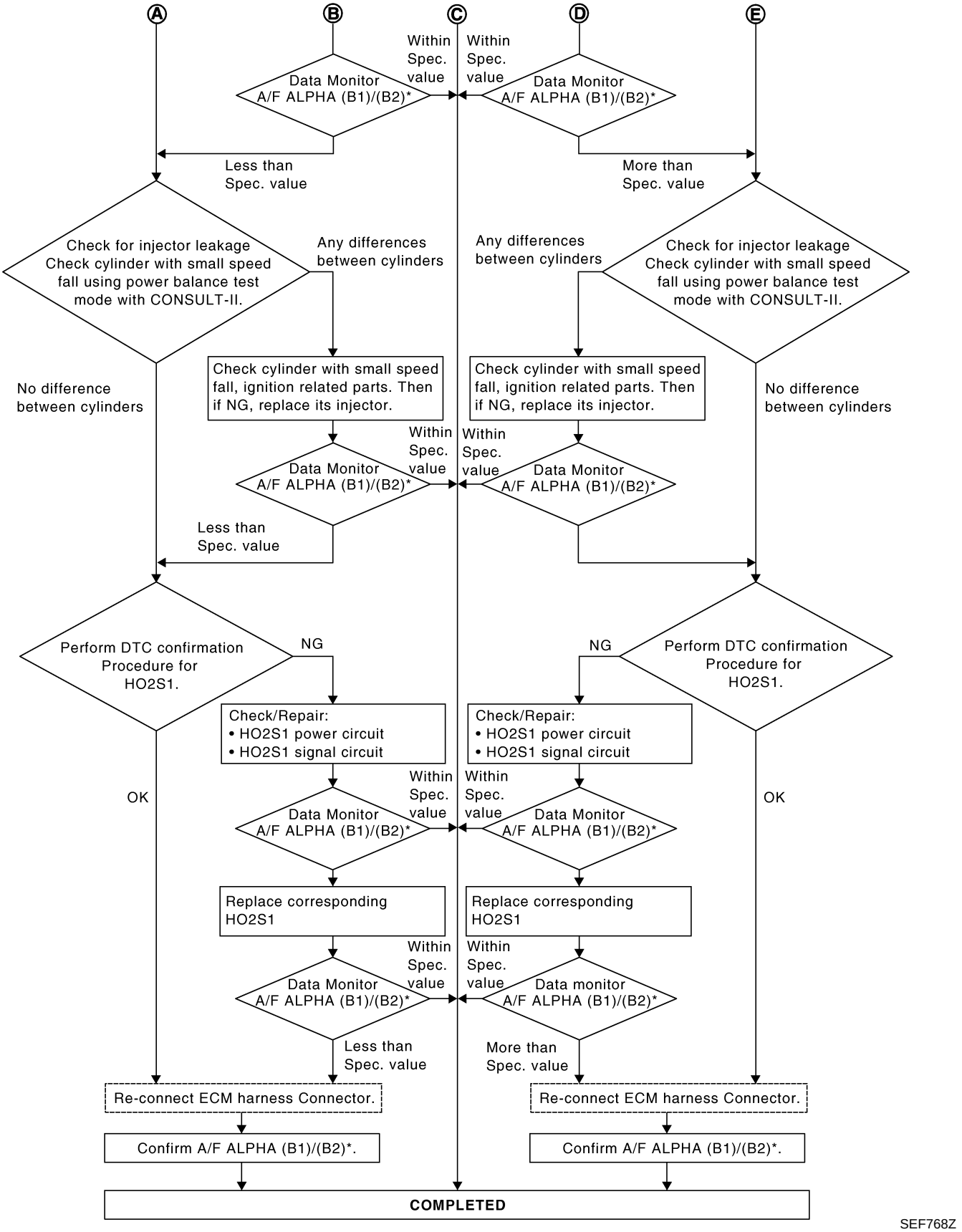


SEF320V

Ignition timing:
MT: 20°±2° BTDC

OK or NG

OK	▶	GO TO 7.
NG	▶	1. Adjust ignition timing by turning distributor. Refer to "Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment", EC-59. 2. GO TO 7.


Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED

SEF768Z

DTC Confirmation Procedure

=NGEC0068

Perform "PROCEDURE FOR MALFUNCTION A" first. If the 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

3

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm

SEF058Y

PROCEDURE FOR MALFUNCTION A

NGEC0068S01

With CONSULT-II

1) Turn ignition switch ON.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-183.

With GST

Follow the procedure "With CONSULT-II".

5

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h

SEF176Y

PROCEDURE FOR MALFUNCTION B

NGEC0068S02

CAUTION:
Always drive vehicle at a safe speed.

TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

With CONSULT-II

1) Wait until engine coolant temperature is less than 90°C (194°F).

a) Turn ignition switch ON.
b) Select "DATA MONITOR" mode with CONSULT-II.
c) Check the engine coolant temperature.
d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.

- Perform the following steps before engine coolant temperature is above 90°C (194°F).

2) Turn ignition switch ON.
3) Select "DATA MONITOR" mode with CONSULT-II.
4) Start engine.
5) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-183.

With GST

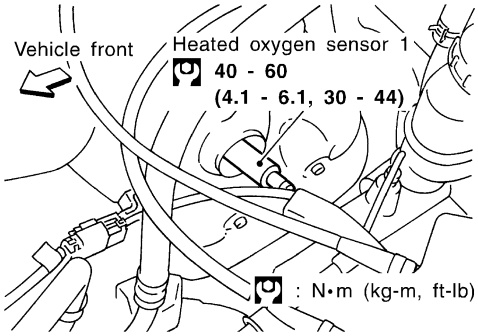
Follow the procedure "With CONSULT-II".

Diagnostic Procedure

NGEC0134

1	RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch OFF.
2. Loosen and retighten heated oxygen sensor 1.



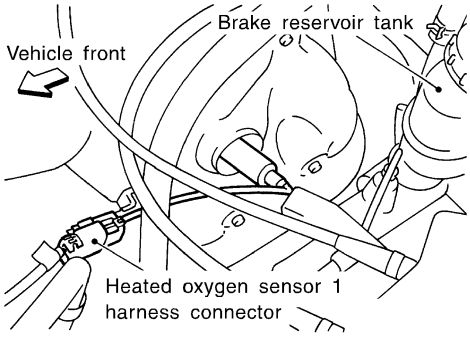
SEF332VB

Tightening torque:
40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

	▶	GO TO 2.

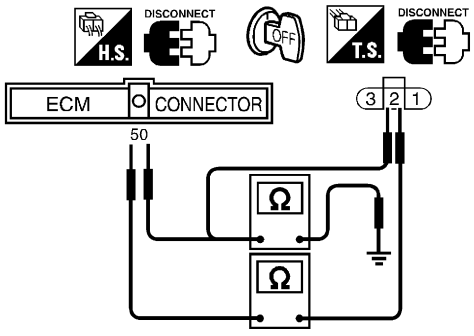
2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect heated oxygen sensor 1 harness connector and ECM harness connector.



SEF331VB

2. Check harness continuity between ECM terminal 50 and terminal 2.



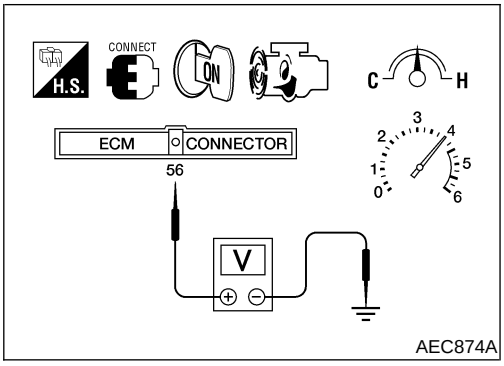
SEF141V

Continuity should exist.

3. Check harness continuity between ECM terminal 50 (or terminal 2) and ground.
Continuity should not exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.



Overall Function Check

=NGEC0167

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

CAUTION:

Always drive vehicle at a safe speed.

Without CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 56 (Heated oxygen sensor 2 signal) and engine ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should change at more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should change at more than 0.06V for 1 second during this procedure.
6) If NG, go to “Diagnostic Procedure”, EC-249.

systems for leaks by listening for noise or visually inspecting the components.

3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform "OVERALL FUNCTION CHECK".

Main 11 Causes of Overheating

NGEC1495

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	50 - 50% coolant mixture	See ***MA-13***, "RECOMMENDED FLUIDS AND LUBRICANTS".
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See ***MA-17***, "Changing Engine Coolant".
	4	• Radiator cap	• Pressure tester	78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi) 59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See ***LC-11***, "System Check".
ON*2	5	• Coolant leaks	• Visual	No leaks	See ***LC-11***, "System Check".
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	See ***LC-13***, "Thermostat" and ***LC-14***, "Radiator".
OFF	7	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	8	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	See ***MA-17***, "Changing Engine Coolant".
OFF*4	9	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	See ***MA-16***, "ENGINE MAINTENANCE".
OFF	10	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See ***EM-31***, "Inspection".
	11	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	See ***EM-45***, "Inspection".

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

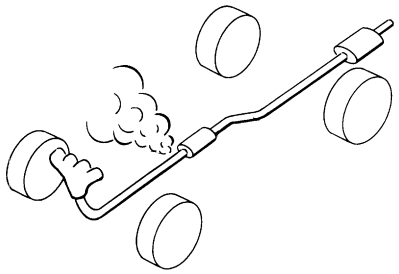
For more information, refer to ***LC-17***, "OVERHEATING CAUSE ANALYSIS".

Diagnostic Procedure

NGEC0232

1	CHECK EXHAUST SYSTEM

1. Start engine.
2. Check exhaust pipes and muffler for leaks.



SEF099P

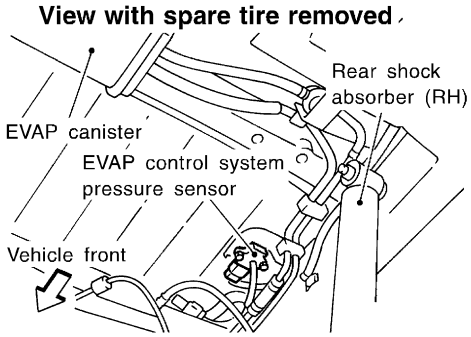
OK or NG

OK (With CONSULT-II)	▶	GO TO 2.
OK (Without CONSULT-II)	▶	GO TO 3.
NG	▶	Repair or replace exhaust system.

Diagnostic Procedure (Cont'd)

9	CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



SEF341V

2. Check connectors for water.
   Water should not exist.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace EVAP control system pressure sensor.

10	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR AND CIRCUIT

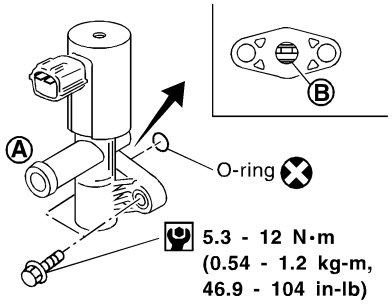
Refer to "DTC Confirmation Procedure" for DTC P0452, P0453, EC-382.

OK or NG

OK (With CONSULT-II)	▶	GO TO 11.
OK (Without CONSULT-II)	▶	GO TO 12.
NG	▶	Replace EVAP control system pressure sensor.

11	CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



SEF337X

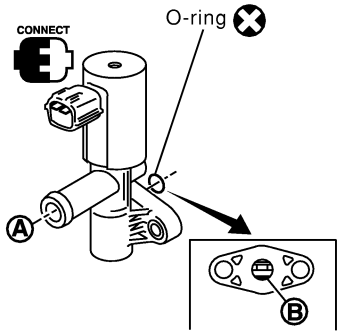
OK or NG

OK	▶	GO TO 12.
NG	▶	Replace EVAP canister vent control valve.

8	CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-II

1. Reconnect harness connectors disconnected.
2. Turn ignition switch "ON".
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time.



ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 (B1)	XXX V
THRTL POS SEN	XXX V

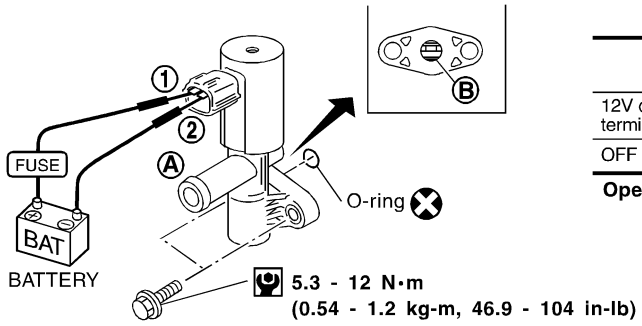
Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF803Y

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.



Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	CHECK EVAP CANISTER VENT CONTROL VALVE-III

1. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
2. Perform Test No. 8 again.

OK or NG

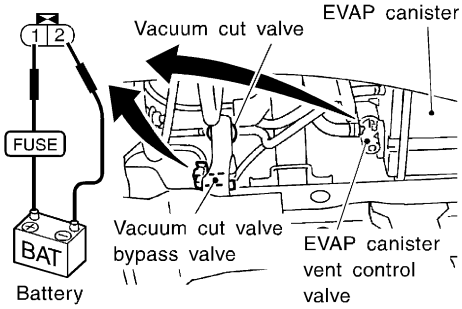
OK	▶	GO TO 10.
NG	▶	Replace EVAP canister vent control valve.

10	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-150.	
▶	**INSPECTION END**

7	CHECK FOR EVAP LEAK

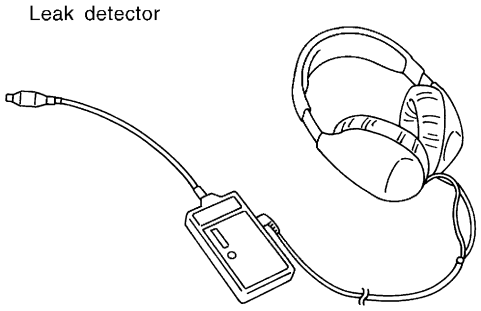
Without CONSULT-II

1. Turn ignition switch "OFF".
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)



SEF503V

3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)
4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**
5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-43.



SEF200U

OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or replace.

6	CHECK CLOSED THROTTLE POSITION SWITCH

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and turn ignition switch ON.
3. Select "DATA MONITOR" mode with CONSULT-II.
4. Check indication of "CLSD THL/P SW" under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
CLSD THL/P SW	ON

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

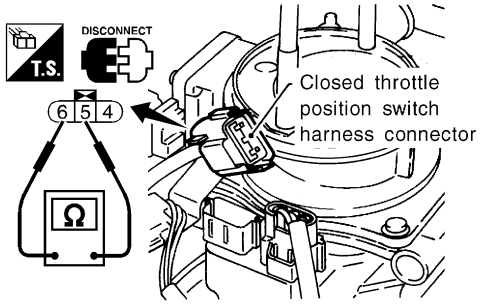
SEF721Z

NOTE:
Measurement must be made with closed throttle position switch installed in vehicle.
If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-112.

5. If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect throttle position switch harness connector.
4. Check continuity between terminals 5 and 6 under the following conditions.



SEF159S

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

MTBL0299

NOTE:
Continuity measurement must be made with closed throttle position switch installed in vehicle.
If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-112.

5. If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

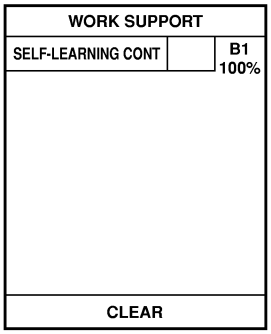
OK or NG

OK	▶	GO TO 7.
NG	▶	Replace throttle position switch.

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".

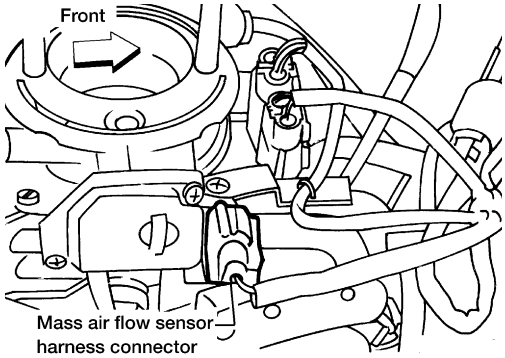


SEF215Z

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.



AEC131A

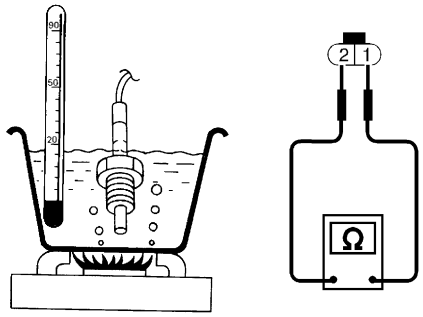
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-86.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171. Refer to EC-255.
No	▶	GO TO 3.

9	CHECK EGR TEMPERATURE SENSOR

Check resistance change and resistance value.

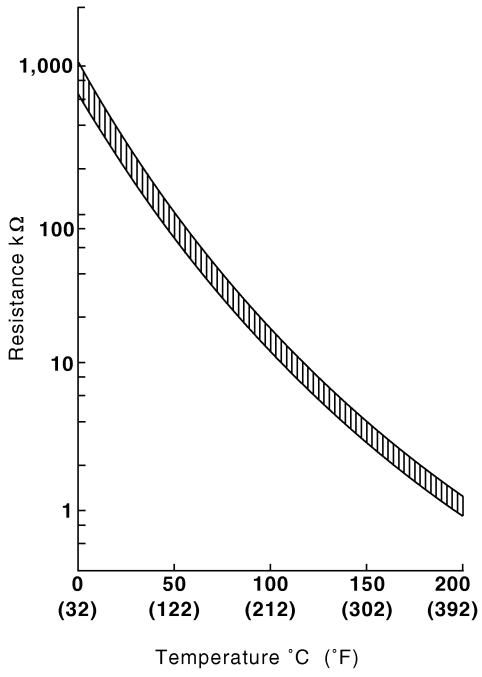


SEF643Q

<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

MTBL0549



SEF068XB

OK or NG

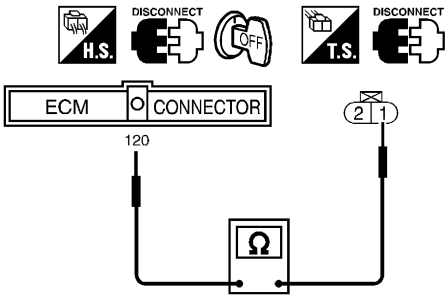
OK	▶	GO TO 10.
NG	▶	Replace EGR temperature sensor.

10	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-150.	
▶	**INSPECTION END**

Diagnostic Procedure (Cont'd)

5	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 120 and terminal 1.



SEF253V

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

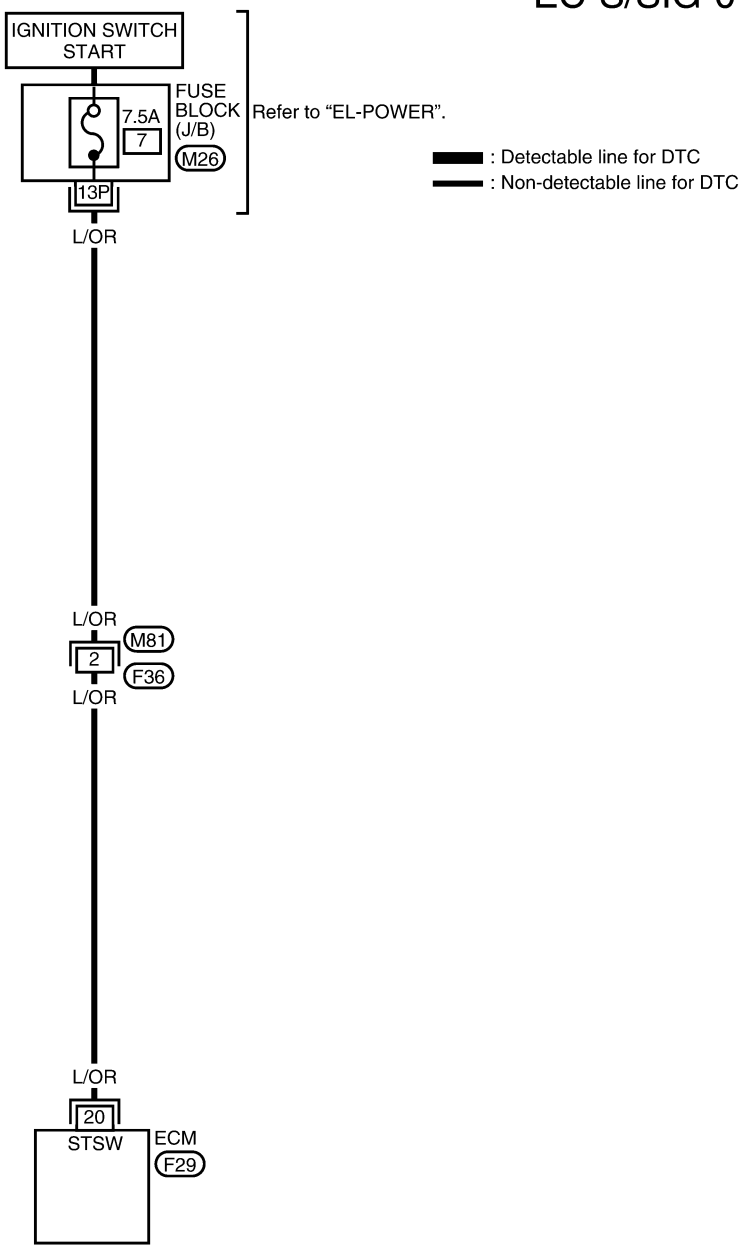
Check the following.
- Harness connectors M81, F36
- Harness connectors M67, B101
- Harness connectors B113, C3
- Harness for open or short between vacuum cut valve bypass valve and ECM

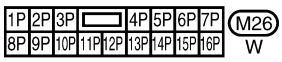
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

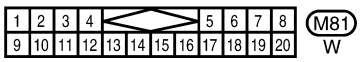
Wiring Diagram

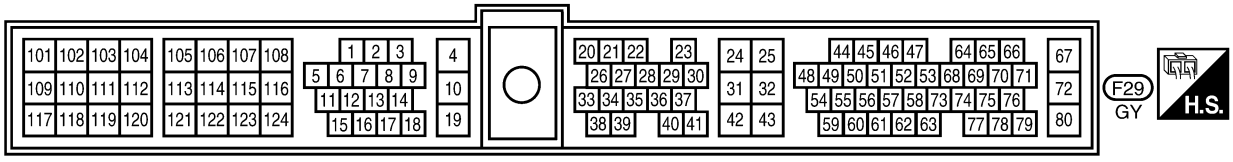
NGEC0440

EC-S/SIG-01









LEC982

Engine Fuel & Emission Control System

NGEC0525

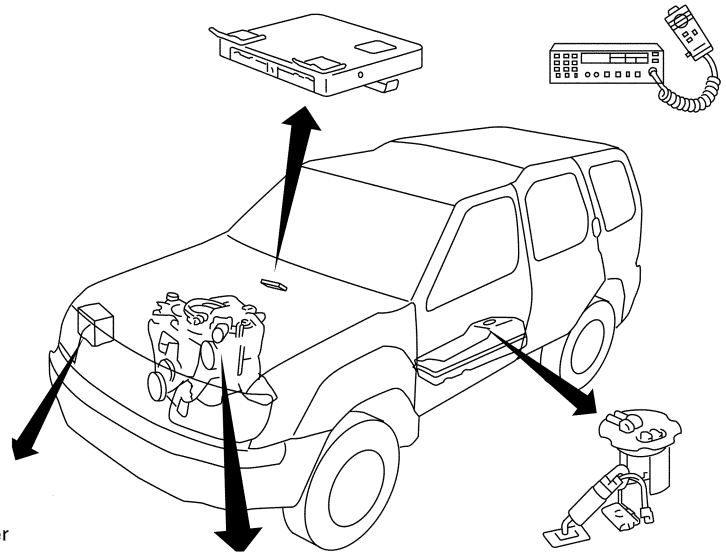
WIRELESS EQUIPMENT

- When installing CB ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.

1) Keep the antenna as far away as possible from the electronic control units.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.

ECM

- Do not disassemble ECM.
- Do not turn on board diagnostic test mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value.
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.



BATTERY

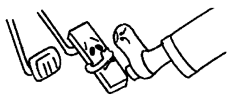
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

WHEN STARTING

- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

ECM PARTS HANDLING

- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor or crankshaft position sensor (OBD).



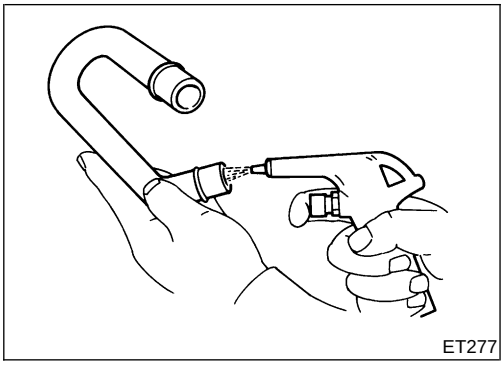
FUEL PUMP

- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque. (Refer to MA section.)

ECM HARNESS HANDLING

- Securely connect ECM harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in.) away from adjacent harnesses to prevent an ECM system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

AEC045B



PCV Valve Ventilation Hose

NGEC0543S02

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

Malfunction Indicator Lamp (MIL) (Cont'd)

On Board Diagnostic System Function

=NGEC0553S01

The on board diagnostic system has the following two functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL circuit. (See EC-1171.)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip. ● Coolant overtemperature enrichment protection ● "Misfire (Possible three way catalyst damage)" ● "Closed loop control" ● Fail-safe mode

Diagnostic Test Mode I — Bulb Check

NGEC0553S03

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to "WARNING LAMPS", ***EL-94*** or see EC-1171.

Diagnostic Test Mode I — Malfunction Warning

NGEC0553S04

MIL	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

OBD System Operation Chart

NGEC0554

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

NGEC0554S01

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to "Two Trip Detection Logic" on EC-660.
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in "OK" for the 2nd trip.

SUMMARY CHART

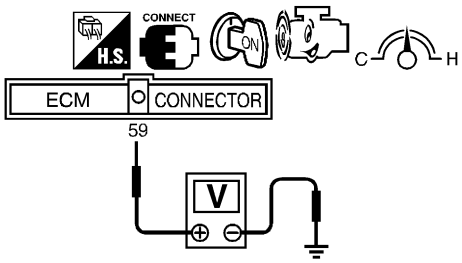
NGEC0554S02

Items	Fuel Injection System	Misfire	Other
MIL (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)

15	CHECK FI CAM FUNCTION

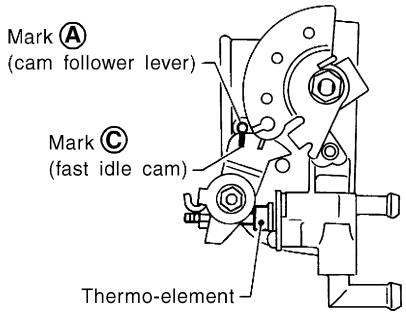
No Tools

1. Set the voltmeter between ECM terminal 59 (Engine coolant temperature sensor signal) and ground.
2. Start engine and warm it up.



SEF119W

3. When the voltage is between 1.10 to 1.36V, check the following.
- The center of mark **A** is aligned with mark **C**.
- The cam follower lever's roller is not touching the fast idle cam.



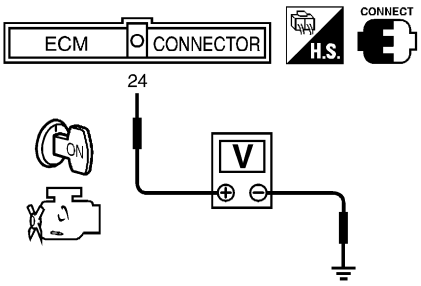
SEF971R

OK or NG

OK	▶	GO TO 16.
NG	▶	1. Check FI cam. Refer to "Fast Idle Cam (FIC)", EC-646. 2. GO TO 16.

2	CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF and then ON.
2. Check voltage between ECM terminal 24 and ground with CONSULT-II or tester.



SEF674U

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E43, M65
- Harness connectors M58, F28
- Fuse block (J/B) connector E49
- 10A fuse
- Harness for open or short between ECM and fuse

	▶	Repair harness or connectors.

4	CHECK ECM GROUND CIRCUIT-I FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 10, 19, 25, 32, 116, 124 and engine ground.
   Refer to WIRING DIAGRAM.
   Continuity should exist.
4. Also check harness for short to power.

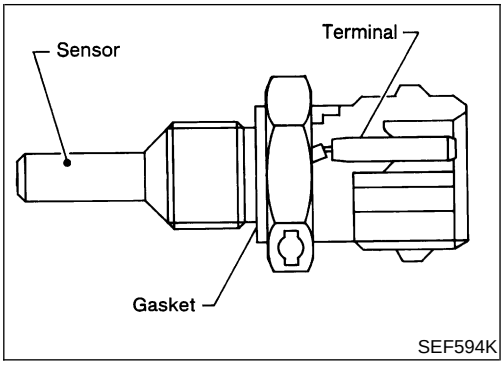
OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 5.

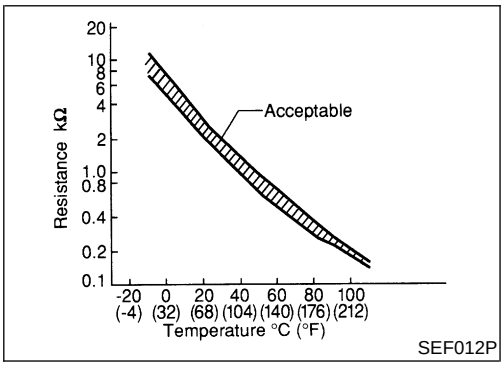
5	DETECT MALFUNCTIONING PART

Check the following.
- Joint connector-2 (if equipped)
- Harness for open between ECM and engine ground

	▶	Repair open circuit or short to power in harness or connectors.



SEF594K



SEF012P

Component Description

NGEC0590

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
−10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 59 (Engine coolant temperature sensor) and 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 the ECM terminals, such as the ground.

On Board Diagnosis Logic

NGEC0591

Malfunction is detected when an excessively high (P0118) or low (P0117) voltage from the sensor is sent to ECM.

POSSIBLE CAUSE

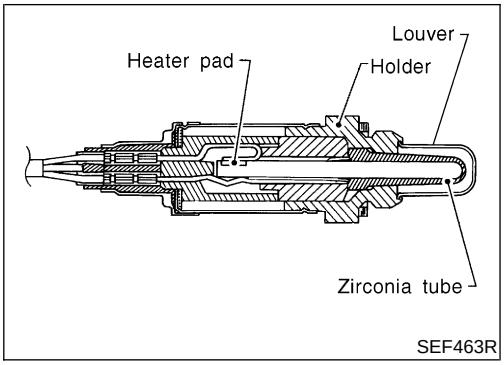
NGEC0591S01

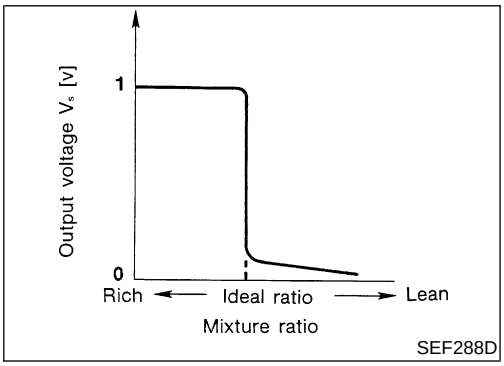
- Harness or connectors
  (The sensor circuit is open or shorted.)
- Engine coolant temperature sensor

FAIL-SAFE MODE

NGEC0591S02

When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.





Component Description

NGEC0629

The heated oxygen sensor 1 is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

CONSULT-II Reference Value in Data Monitor Mode

NGEC0630

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

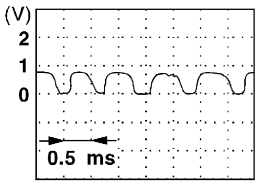
ECM Terminals and Reference Value

NGEC0631

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

CAUTION:

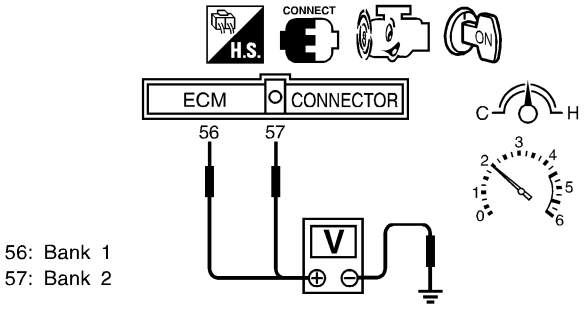
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than the ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	B	Heated oxygen sensor 1 (Bank 1)	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF002V
51	G	Heated oxygen sensor 1 (Bank 2)		

7	CHECK HEATED OXYGEN SENSOR 2

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 56 (bank 1 signal) or 57 (bank 2 signal) and engine ground.
4. Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator pedal as soon as possible)



56: Bank 1
57: Bank 2

The voltage should be above 0.62V at least once during this procedure.

SEF797ZB

5. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "O/D" OFF (A/T).
   The voltage should be below 0.48V at least once during this procedure.

CAUTION:

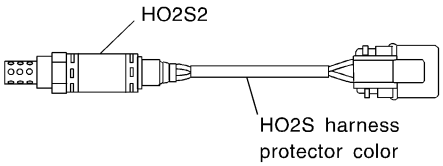
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2

1. Stop vehicle and turn ignitioin switch OFF.
2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (bank 1): White or Gray
HO2S2 (bank 2): Red or Red/Brown

SEF372ZA

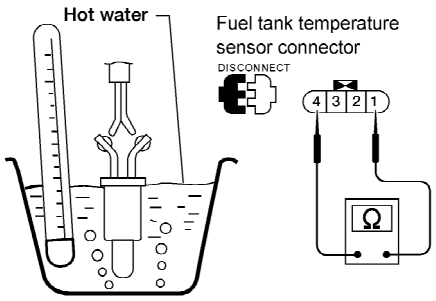
CAUTION:

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

	▶	Replace malfunctioning heated oxygen sensor 2.

5	CHECK FUEL TANK TEMPERATURE SENSOR

Check resistance by heating with hot water or heat gun as shown in the figure.



AEC052B

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

MTBL0234

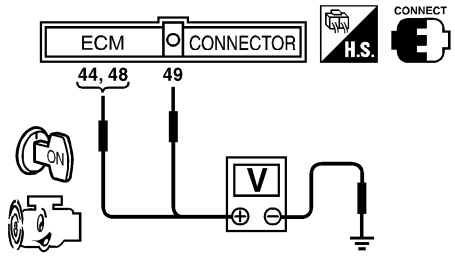
OK or NG

OK	▶	GO TO 6.
NG	▶	Replace fuel tank temperature sensor.

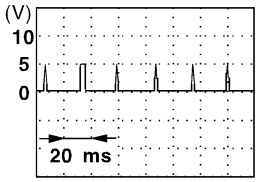
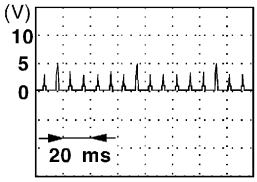
6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-739.	
▶	**INSPECTION END**

7	CHECK CAMSHAFT POSITION SENSOR

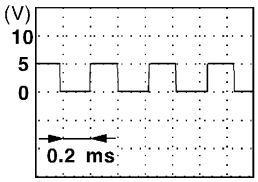
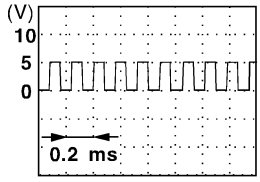
1. Install any parts removed.
2. Start engine.
3. Check voltage between ECM terminals 44, 48 and ground, ECM terminal 49 and ground with DC range.



Terminal 44 or 48 and engine ground

Condition	Idle	2,000 rpm
Voltage	0.3 - 0.5V	0.3 - 0.5V
Pulse signal		

Terminal 49 and engine ground

Condition	Idle	2,000 rpm
Voltage	Approximately 2.5V	Approximately 2.5V
Pulse signal		

AEC072B

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace distributor assembly with camshaft position sensor.

8	CHECK CMPS SHIELD CIRCUIT FOR OPEN AND SHORT (IF EQUIPPED)

1. Turn ignition switch OFF.
2. Disconnect joint connector-1.
3. Check the following.

- Continuity between joint connector terminal 1 and ground
- Joint connector

(Refer to ***EL-250***, "HARNESS LAYOUT".)

Continuity should exist.

4. Also check harness for short to power.
5. Then reconnect joint connector-1.

OK or NG

OK	▶	GO TO 9.
NG	▶	Repair open circuit or short to power in harness or connectors.

9	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-739.	
▶	**INSPECTION END**

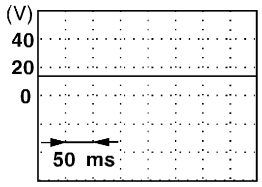
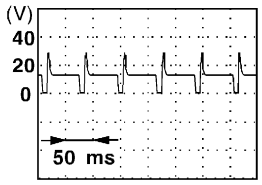
ECM Terminals and Reference Value

NGEC0749

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

CAUTION:

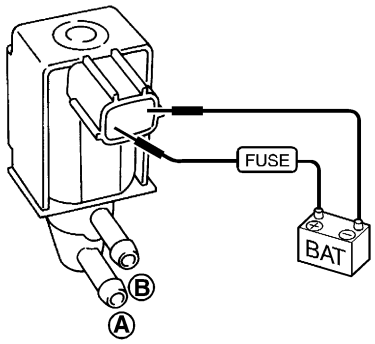
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than the ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	OR/B	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch OFF]** ● For a few seconds after turning ignition switch OFF	0 - 1.5V
			[Ignition switch OFF] ● A few seconds passed after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
5	R/Y	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF994U
			[Engine is running] ● Engine speed is 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14V)  SEF995U
67	B/P	Power supply for ECM	**[Ignition switch ON]**	BATTERY VOLTAGE (11 - 14V)
72	B/P			
117	B/P	Current return	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)

15	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Without CONSULT-II

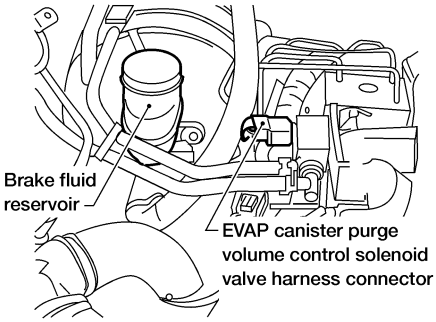
Check air passage continuity.



SEF661U

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

MTBL0242



AEC652A

OK or NG

OK	▶	GO TO 16.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

Description

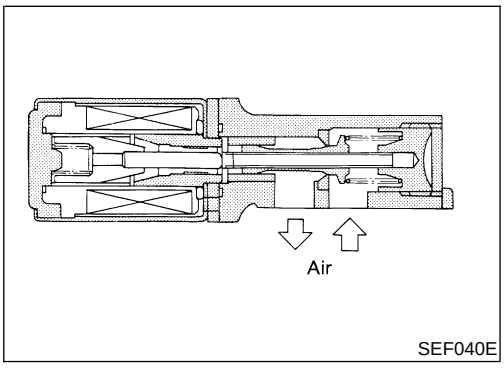
NGEC0775

SYSTEM DESCRIPTION

NGEC0775S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Idle air control	IACV-AAC valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Park/neutral position (PNP) switch	Park/neutral position		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		
Ambient air temperature switch	Ambient air temperature		
Intake air temperature sensor	Intake air temperature		
Absolute pressure sensor	Ambient barometic pressure		

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which bypasses the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner and power steering).



SEF040E

COMPONENT DESCRIPTION

NGEC0775S02

IACV-AAC Valve

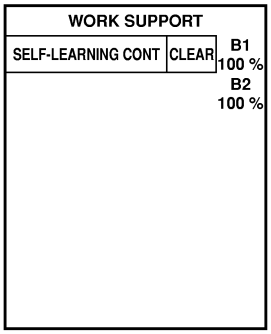
NGEC0775S0201

The IACV-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

3	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching "CLEAR".



SEF968Y

4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?

Without CONSULT-II

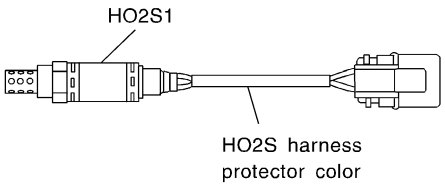
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-673.
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-862.
No	▶	GO TO 4.

4	CHECK HO2S 1 CONNECTOR FOR WATER

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 harness protector color.



HO2S1 (bank 1): Black
HO2S1 (bank 2): Blue

SEF505YB

3. Disconnect heated oxygen sensor 1 harness connector.
4. Check connectors for water.
   Water should not exist.

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair or replace harness or connectors.

On Board Diagnosis Logic

NGEC0820

Malfunction is detected when a chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.

POSSIBLE CAUSE

NGEC0820S01

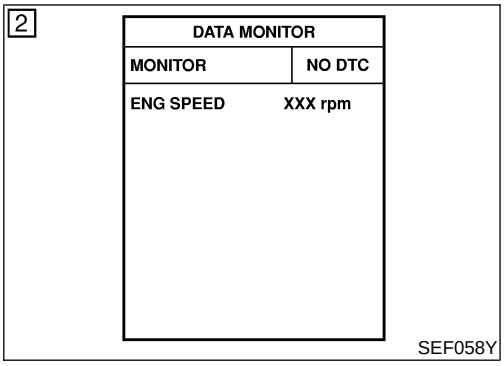
- Harness or connectors
- Crankshaft position sensor (OBD)
- Drive plate/Flywheel

DTC Confirmation Procedure

NGEC0821

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.



With CONSULT-II

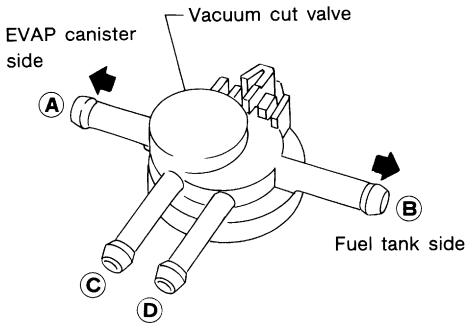
1) Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 2 minutes at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-1074.

With GST

Follow the procedure “With CONSULT-II”.

4	CHECK VACUUM CUT VALVE

Check vacuum cut valve as follows:



SEF379Q

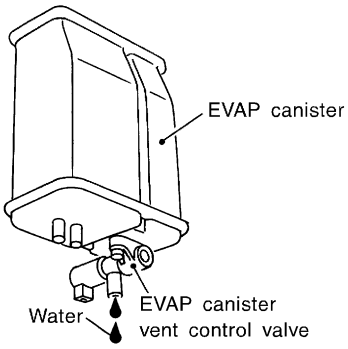
1. Plug port **C** and **D** with fingers.
2. Apply vacuum to port **A** and check that there is no suction from port **B**.
3. Apply vacuum to port **B** and check that there is suction from port **A**.
4. Blow air in port **B** and check that there is a resistance to flow out of port **A**.
5. Open port **C** and **D**.
6. Blow air in port **A** check that air flows freely out of port **C**.
7. Blow air in port **B** check that air flows freely out of port **D**.

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace vacuum cut valve.

5	CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



SEF596U

OK or NG

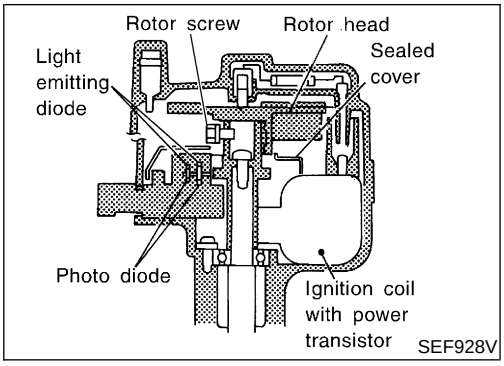
OK	▶	GO TO 6.
NG	▶	GO TO 8.

6	CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace the EVAP canister.



Component Description

NGEC0812

IGNITION COIL & POWER TRANSISTOR

NGEC0812S01

The power transistor switches on and off the ignition coil primary circuit according to the ECM signal. As the primary circuit is turned on and off, the proper high voltage is induced in the secondary circuit. The distributor is not repairable except for the distributor cap and rotor head.

NOTE:

The rotor screw which secures the distributor rotor head to the distributor shaft must be torqued properly.

: 3.6±0.3 N·m (37±3 kg-cm, 32±3 in-lb)

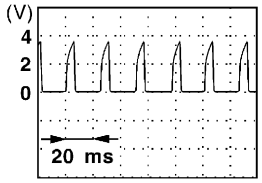
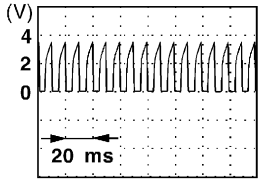
ECM Terminals and Reference Value

NGEC0813

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

CAUTION:

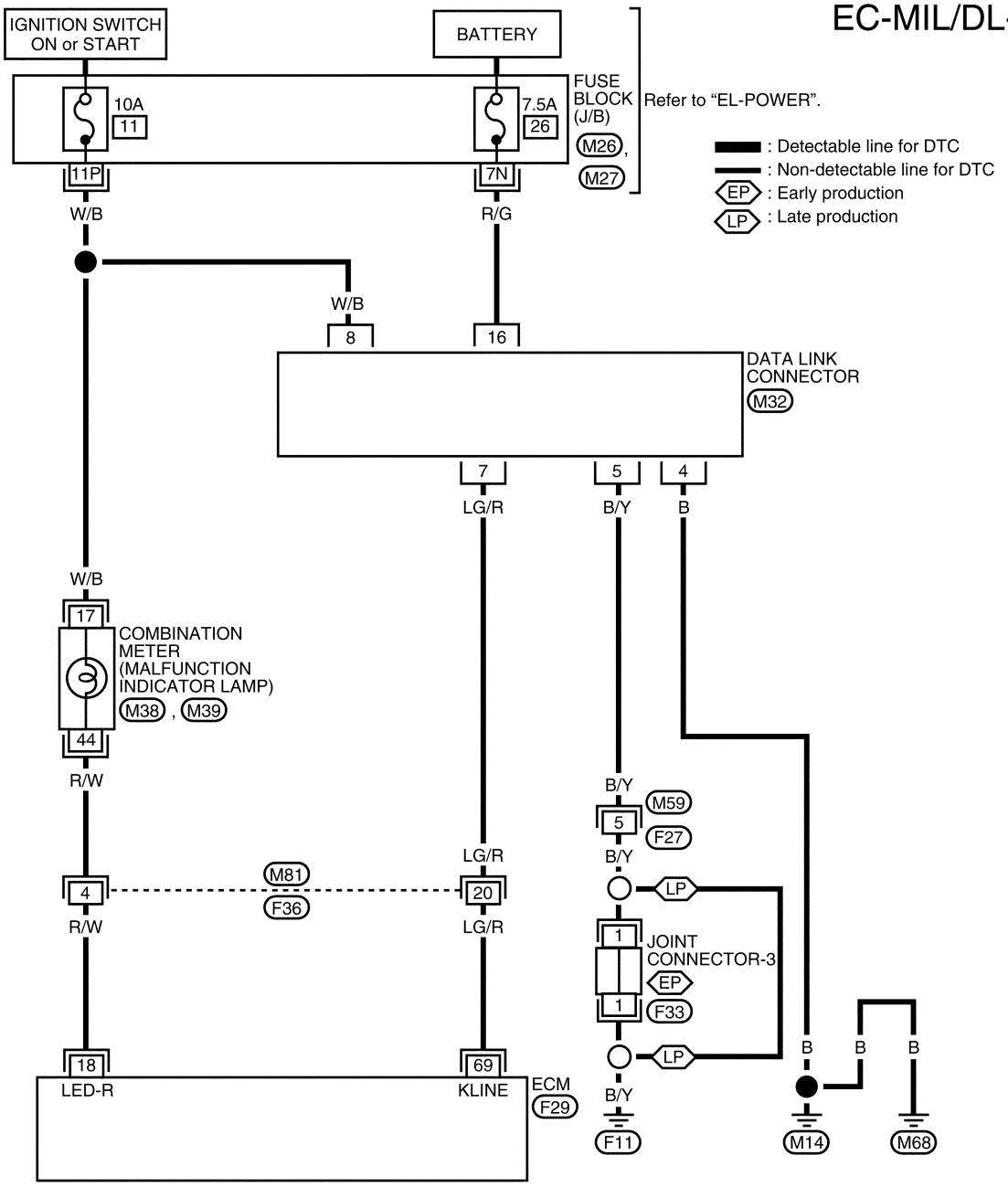
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than the ECM terminals, such as the ground.

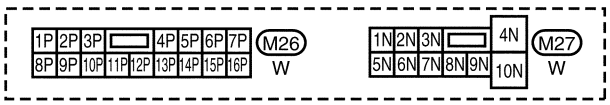
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	PU/W	Ignition signal	**[Engine is running]** ● Idle speed	Approximately 0.7V  SEF988U
			[Engine is running] ● Engine speed is 2,000 rpm	1.1 - 1.5V  SEF989U

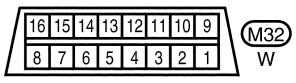
Wiring Diagram

NGEC0933

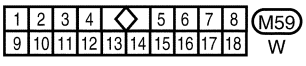
EC-MIL/DL-01

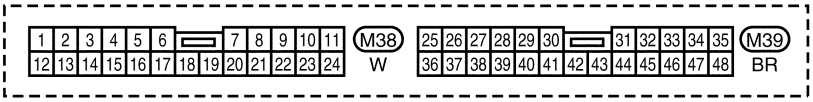


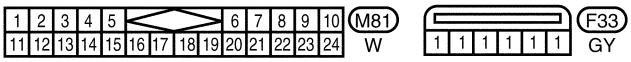




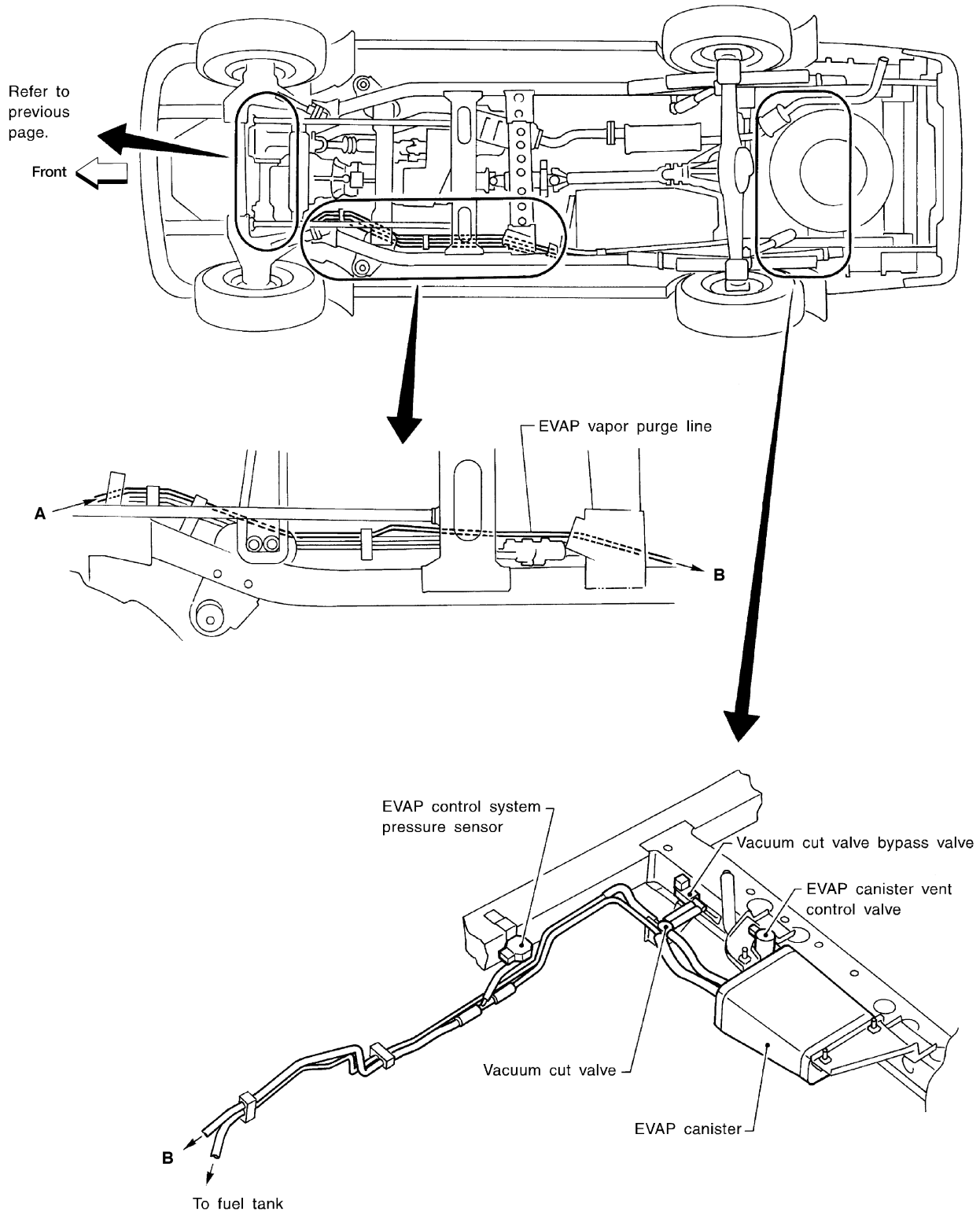
Refer to the following.
F29 - ELECTRICAL UNITS



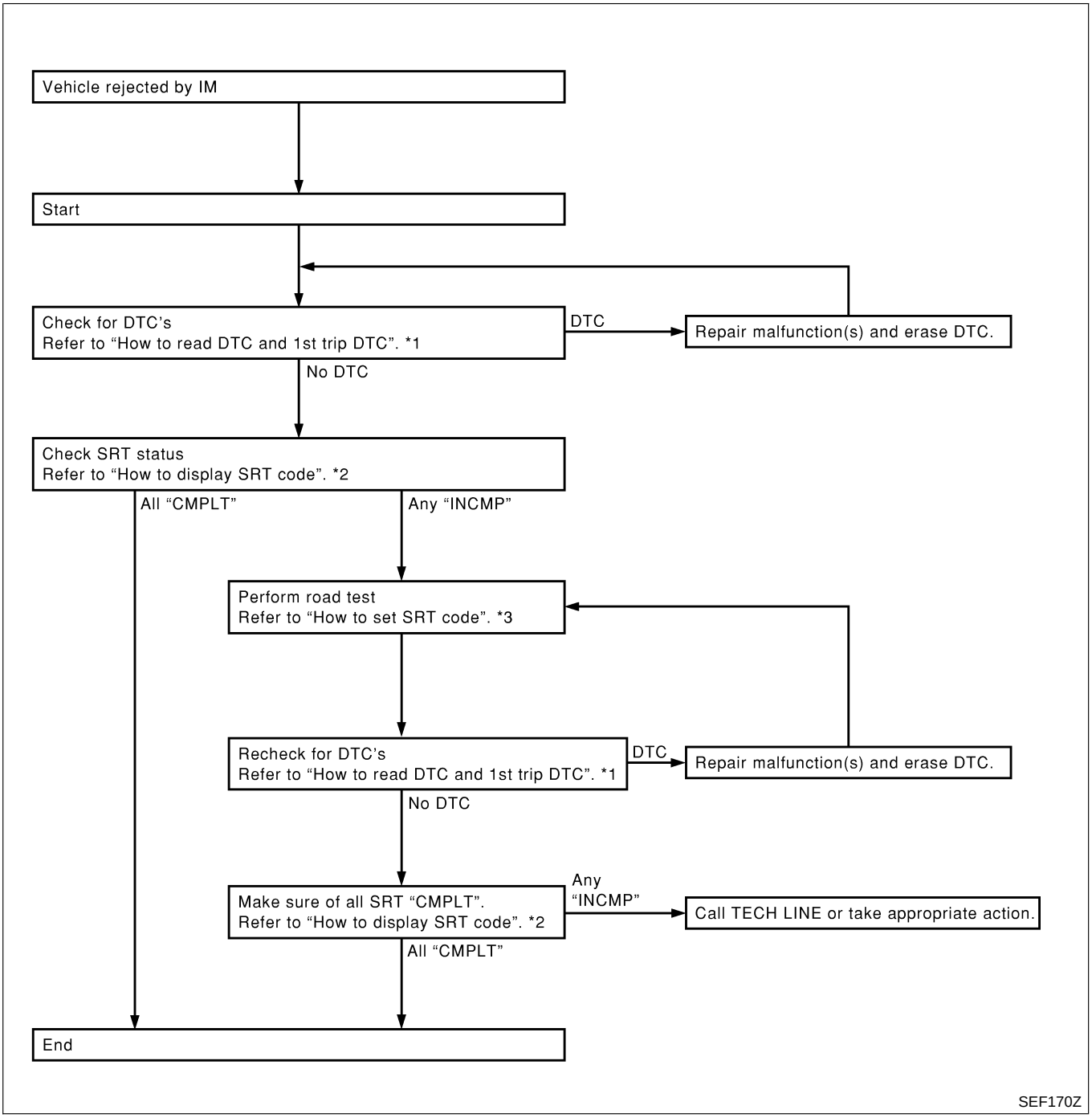




WEC183A


Refer to previous page.
Front
EVAP vapor purge line
A
B
EVAP control system pressure sensor
Vacuum cut valve bypass valve
EVAP canister vent control valve
Vacuum cut valve
EVAP canister
B
To fuel tank

AEC886A



*1 EC-1233 *2 EC-1237 *3 EC-1238

How to Display SRT Code

NGEC1083S0304

1. **With CONSULT-II**
   Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.
   For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.
2. **With GST**
   Selecting Mode 1 with GST (Generic Scan Tool)

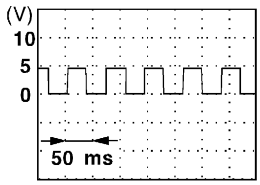
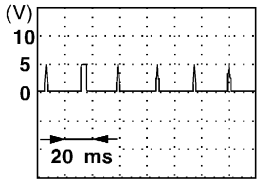
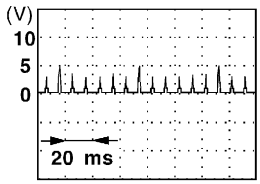
A sample of CONSULT-II display for SRT code is shown below.
"INCMP" means the self-diagnosis is incomplete and SRT is not set. "CMPLT" means the self-diagnosis is complete and SRT is set.

Worksheet Sample

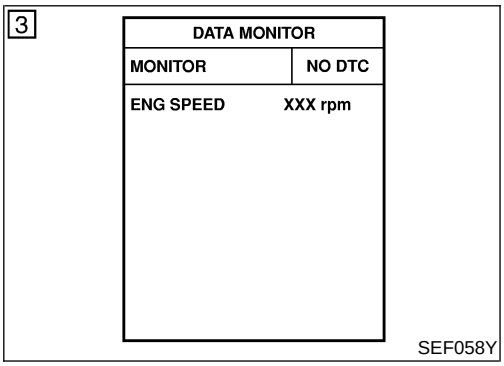
NGEC1088S0101

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Inpossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid ˚F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
29	G/B	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle. ● In 2nd gear position ● Vehicle speed is 40 km/h (25 MPH)	2 - 3V  SEF996U
32	B/Y	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
33	W/G	A/T signal No. 4	**[Engine is running]** ● Idle speed	Approximately 0 - 1.0V
34	R/Y	A/T signal No. 5	**[Engine is running]** ● Idle speed	Approximately 8V
35	G/R	A/T signal No. 3	**[Engine is running]** ● Idle speed	Approximately 0 - 1.0V
39	GY/R	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned	Approximately 0V
			[Engine is running] ● Steering wheel is not being turned	Approximately 5V
42	B/W	Sensors' power supply	**[Ignition switch ON]**	Approximately 5V
43	BR	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
44	PU	Camshaft position sensor (Reference signal)	**[Engine is running]** ● Idle speed	0.3 - 0.5V  SEF997U
			[Engine is running] ● Engine speed is 2,000 rpm	0.3 - 0.5V  SEF998U
46	OR/B	Fuel level sensor	**[Ignition switch ON]**	Approximately 0 - 4.8V Output voltage varies with fuel level.

With GST
Follow the procedure "With CONSULT-II".



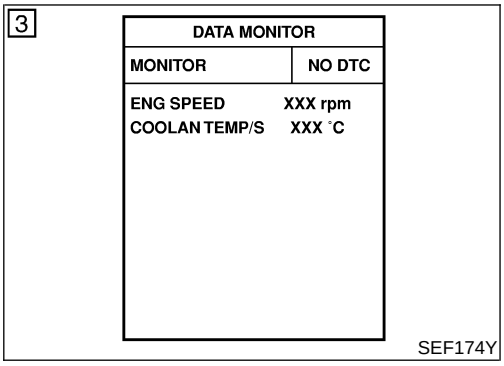
PROCEDURE FOR MALFUNCTION B

NGEC1110S02

With CONSULT-II

1) Turn ignition switch ON.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and wait 5 seconds at most.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-1339.

With GST
Follow the procedure "With CONSULT-II".



PROCEDURE FOR MALFUNCTION C

NGEC1110S03

NOTE:
If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch ON) instead of running engine at idle speed.

With CONSULT-II

1) Turn ignition switch ON.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Run engine for at least 10 seconds at idle speed.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-1339.

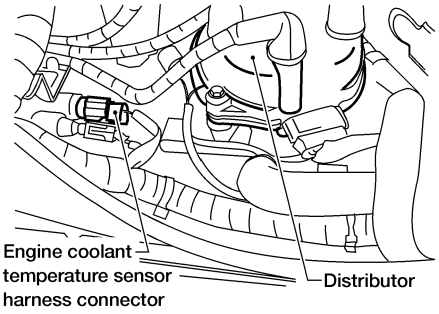
With GST
Follow the procedure "With CONSULT-II".

Diagnostic Procedure

NGEC1139

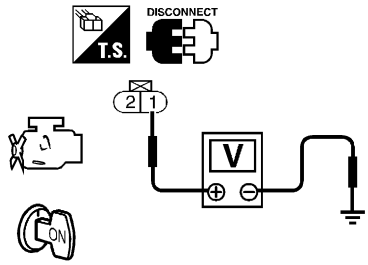
1	CHECK ECTS POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.



AEC643A

3. Turn ignition switch ON.
4. Check voltage between ECTS terminal 1 and ground with CONSULT-II or tester.



SEF206W

Voltage: Approximately 5V

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F38, F102
- Harness for open or short between ECM and engine coolant temperature sensor

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

3	CHECK ECTS GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ECTS terminal 2 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

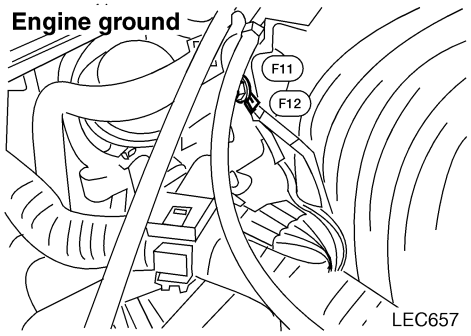
OK	▶	GO TO 5.
NG	▶	GO TO 4.

Diagnostic Procedure

NGEC1147

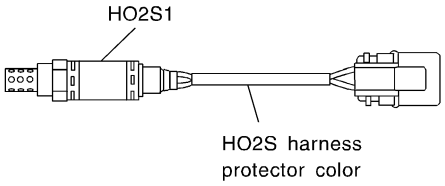
1	INSPECTION START

1. Turn ignition switch OFF.
2. Loosen and retighten engine ground screws.



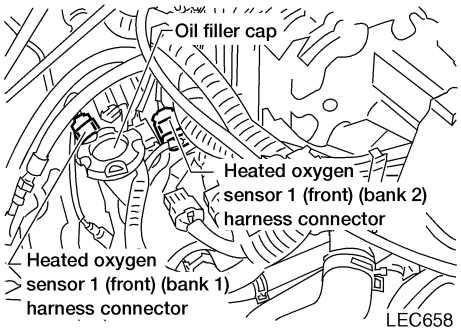
LEC657

3. Make sure HO2S 1 harness protector color, and disconnect corresponding heated oxygen sensor 1 harness connector.



HO2S1 (bank 1): Black
HO2S1 (bank 2): Blue

SEF505YB

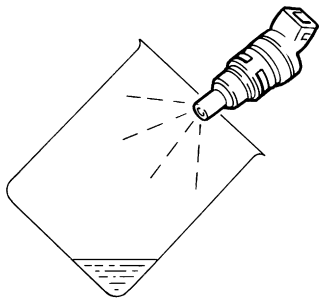


LEC658

▶	GO TO 2.

9	CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch OFF.
3. Disconnect injector harness connectors on left bank (for DTC P0171), right bank (for DTC P0174).
4. Remove injector gallery assembly. Refer to EC-1218.
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors on right bank (for DTC P0171), left bank (for DTC P0174) should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.



SEF595Q

Fuel should be sprayed evenly for each injector.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1312.

▶ **INSPECTION END**

Diagnostic Procedure (Cont'd)

12	CHECK HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT-II, and select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
3. Hold engine speed at 2,000 rpm under no load during the following steps.
4. Touch "RECORD" on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S2 (B2)	XXX V

SEF967Y

5. Check the following.

- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown left:

Bank 1

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

Bank 2

cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L	R-L	R-L	R-L	R-L

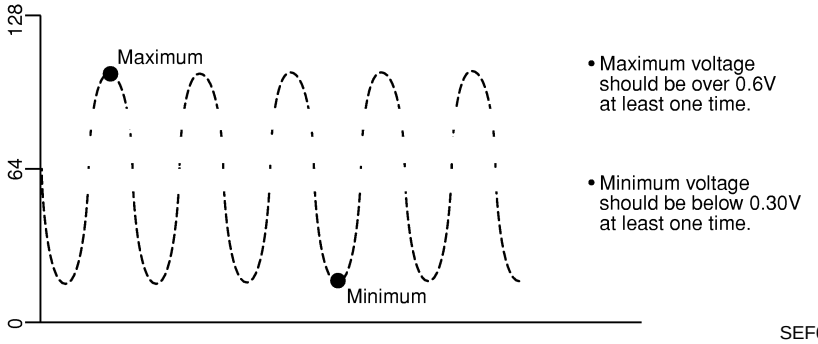
R means HO2S1 MNTR (B1)/(B2) indicates RICH

L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace heated oxygen sensor 1.

10	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to "DTC Confirmation Procedure" for DTC P0452, P0453, EC-1533.

OK or NG

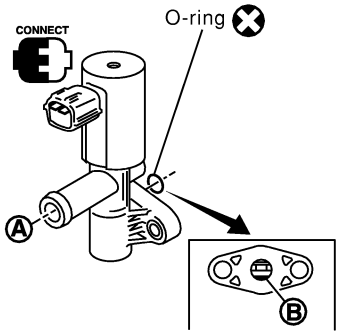
OK	▶	GO TO 11.
NG	▶	Replace EVAP control system pressure sensor.

11	CHECK EVAP CANISTER VENT CONTROL VALVE

Check air passage continuity.

With CONSULT-II

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 (B1)	XXX V
HO2S1 (B2)	XXX V
THRTL POS SEN	XXX V

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

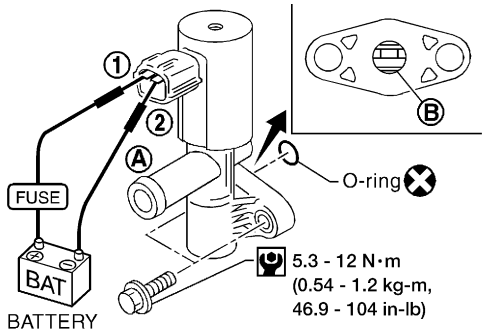
Without CONSULT-II

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes

MTBL0240

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If portion **B** is rusted, replace control valve.



AEC783A

Make sure new O-ring is installed properly.

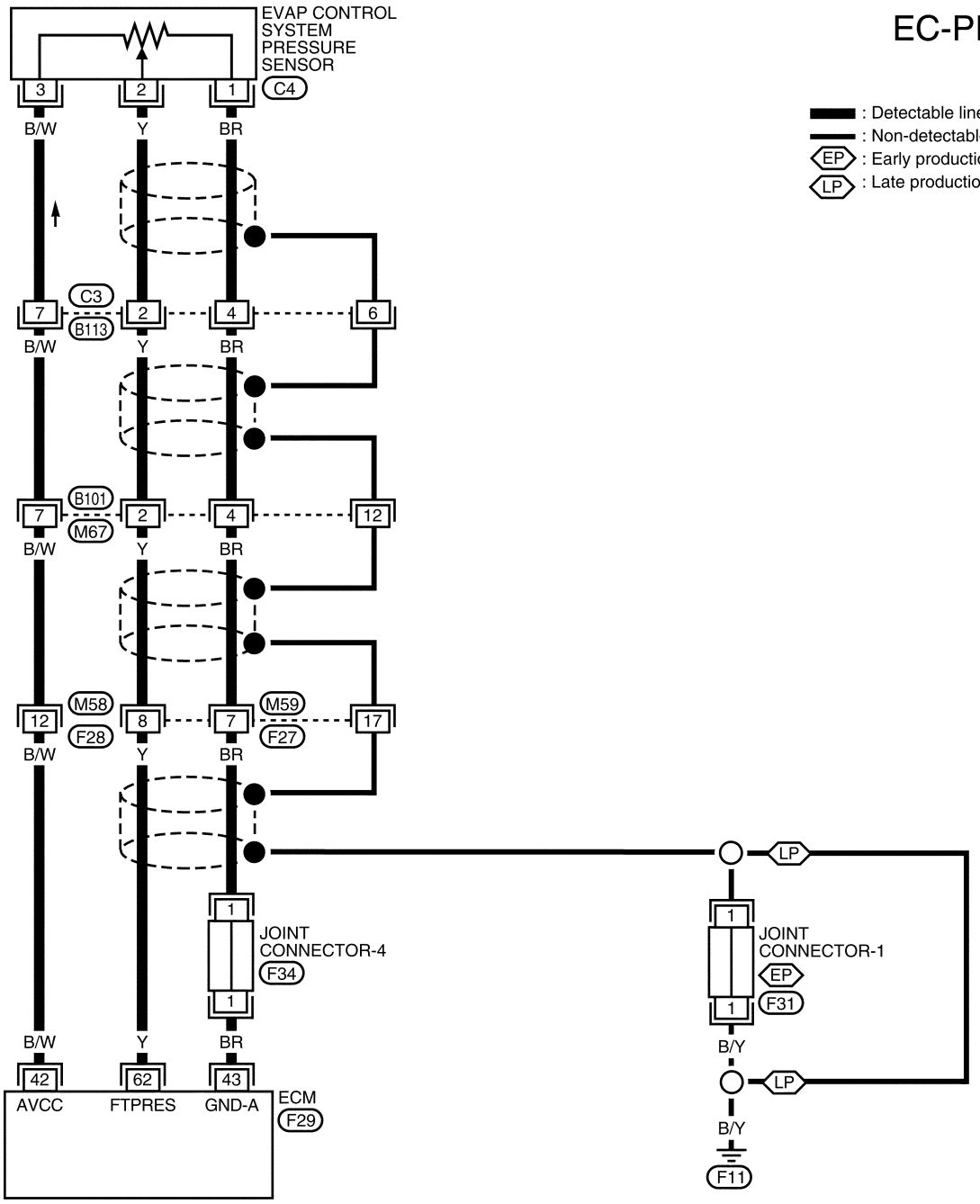
OK or NG

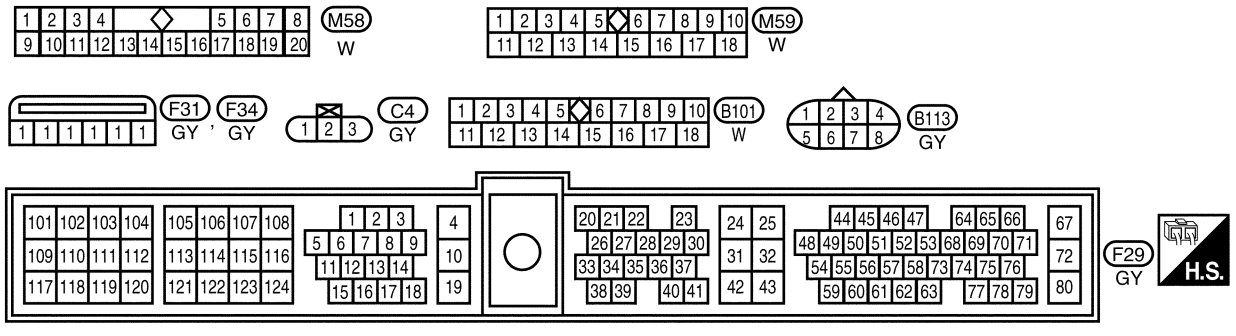
OK (With CONSULT-II)	▶	GO TO 12.
OK (Without CONSULT-II)	▶	GO TO 13.
NG	▶	Replace EVAP canister vent control valve.

Wiring Diagram

NGEC1292

EC-PRE/SE-01



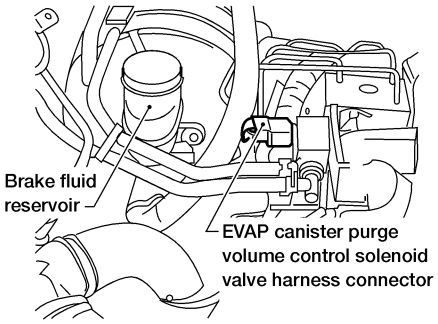


WEC181A

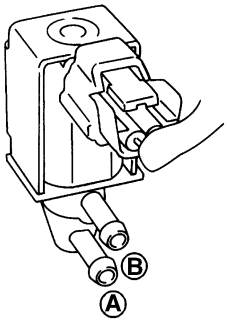
17 **CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE**

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



WEC547

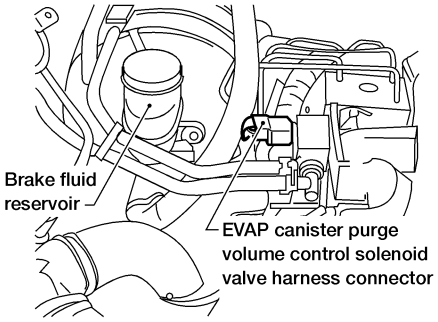


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

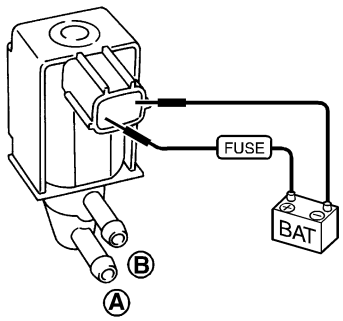
SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



WEC547

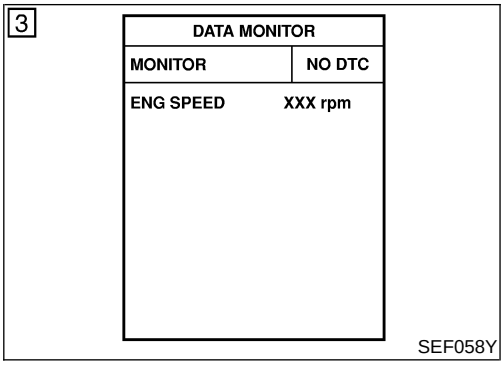


Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace EVAP canister purge volume control solenoid valve.



DTC Confirmation Procedure

=NGEC1337

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch ON.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine, and rev engine more than 1,000 rpm once, then let it idle for more than 40 seconds.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-1602.

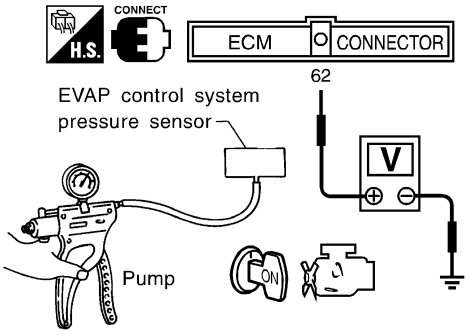
9	CHECK HO2S2 SHIELD CIRCUIT FOR OPEN AND SHORT (IF EQUIPPED)	
1. Turn ignition switch OFF. 2. Disconnect joint connector-3. 3. Check the following. ● Continuity between joint connector terminal 1 and ground ● Joint connector (Refer to ***EL-250***, "HARNESS LAYOUT".) **Continuity should exist.** 4. Also check harness for short to power. 5. Then reconnect joint connector-3.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	Repair open circuit or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1312.	
▶	**INSPECTION END**

Diagnostic Procedure (Cont'd)

7	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch ON.
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
5. Check input voltage between ECM terminal 62 and ground.



Applied vacuum	Voltage V
Not applied	1.8 - 4.8
–26.7 kPa (–200 mmHg, –7.87 inHg)	1.0 to 1.4V lower than above value

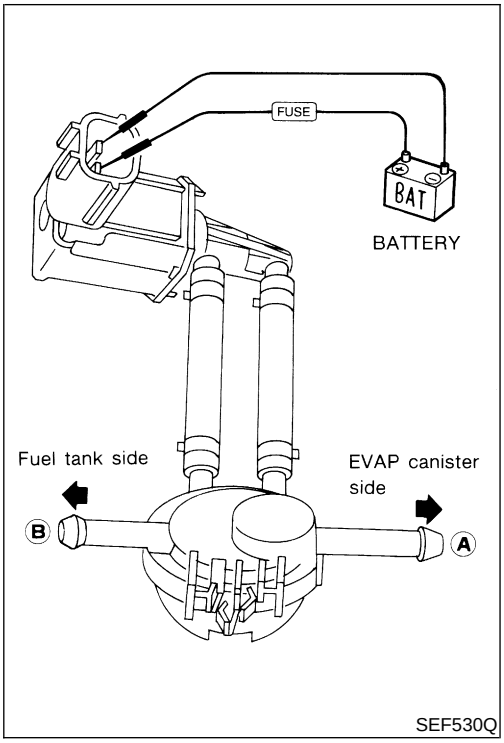
SEC649C

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below −93.3 kPa (−700 mmHg, −27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**
- **Discard and EVAP control system pressure sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

OK or NG

OK (with CONSULT-II)	▶	GO TO 8.
OK (without CONSULT-II)	▶	GO TO 9.
NG	▶	Replace EVAP control system pressure sensor.



Overall Function Check

NGEC1424

Use this procedure to check the overall function of vacuum cut valve bypass valve. During this check, the 1st trip DTC might not be confirmed.

Without CONSULT-II

1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
2) Apply vacuum to port **A** and check that there is no suction from port **B**.
3) Apply vacuum to port **B** and check that there is suction from port **A**.
4) Blow air in port **B** and check that there is a resistance to flow out of port **A**.
5) Supply battery voltage to the terminal.
6) Blow air in port **A** and check that air flows freely out of port **B**.
7) Blow air in port **B** and check that air flows freely out of port **A**.
8) If NG, go to “Diagnostic Procedure”, EC-1701.

Diagnostic Procedure (Cont'd)

4	CHECK STARTING SYSTEM	
Turn ignition switch OFF, then turn it to START. **Does starter motor operate?**		
	Yes or No	
Yes	▶	GO TO 5.
No	▶	Refer to "STARTING SYSTEM", ***SC-10***.

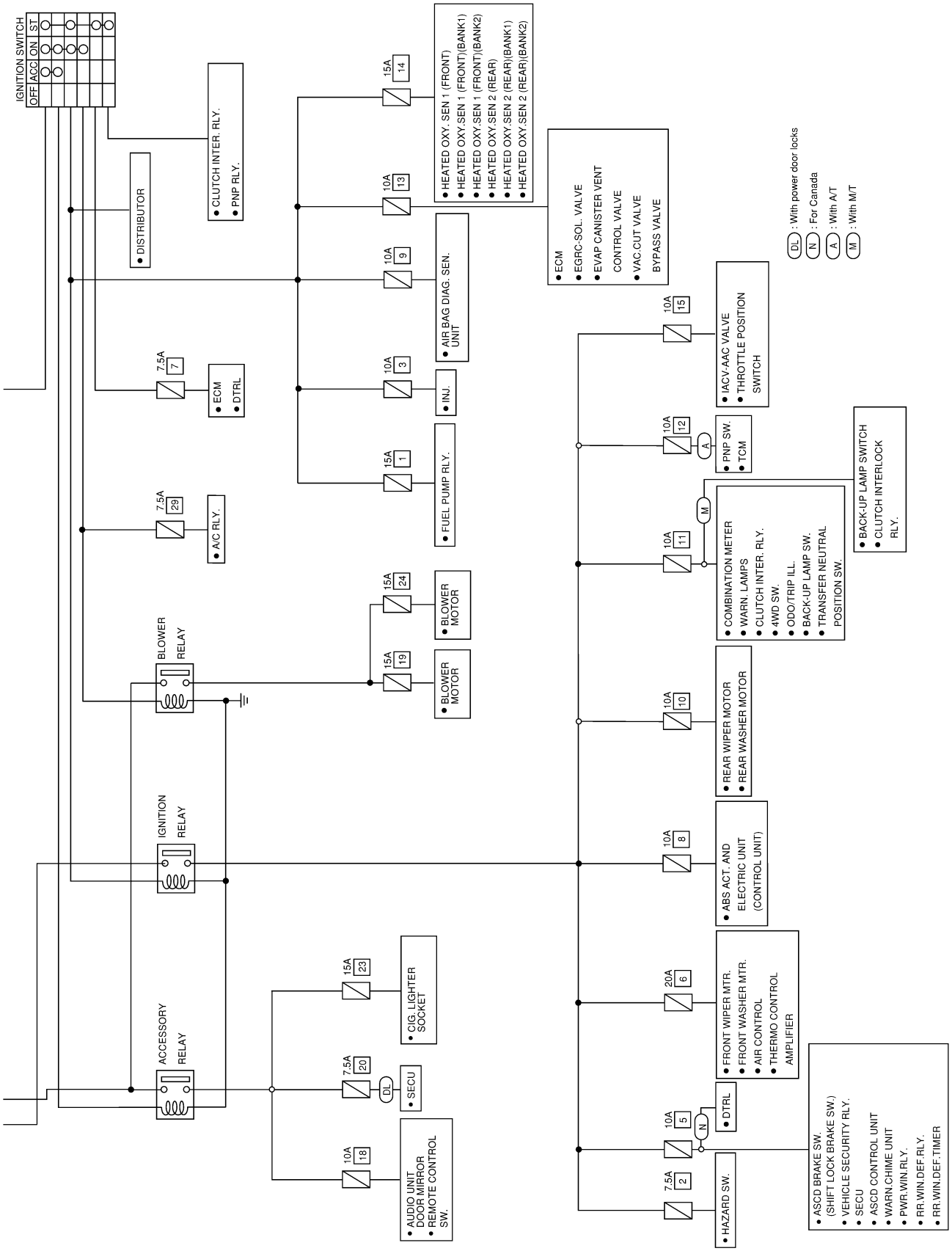
5	CHECK FUSE	
1. Turn ignition switch OFF. 2. Disconnect 7.5A fuse. 3. Check if 7.5A fuse is OK.		
	OK or NG	
OK	▶	GO TO 6.
NG	▶	Replace 7.5A fuse.

6	CHECK START SIGNAL INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 20 and fuse block. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power.		
	OK or NG	
OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors M81, F36 ● Harness for open or short between ECM and fuse		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-1312.		
	▶	**INSPECTION END**

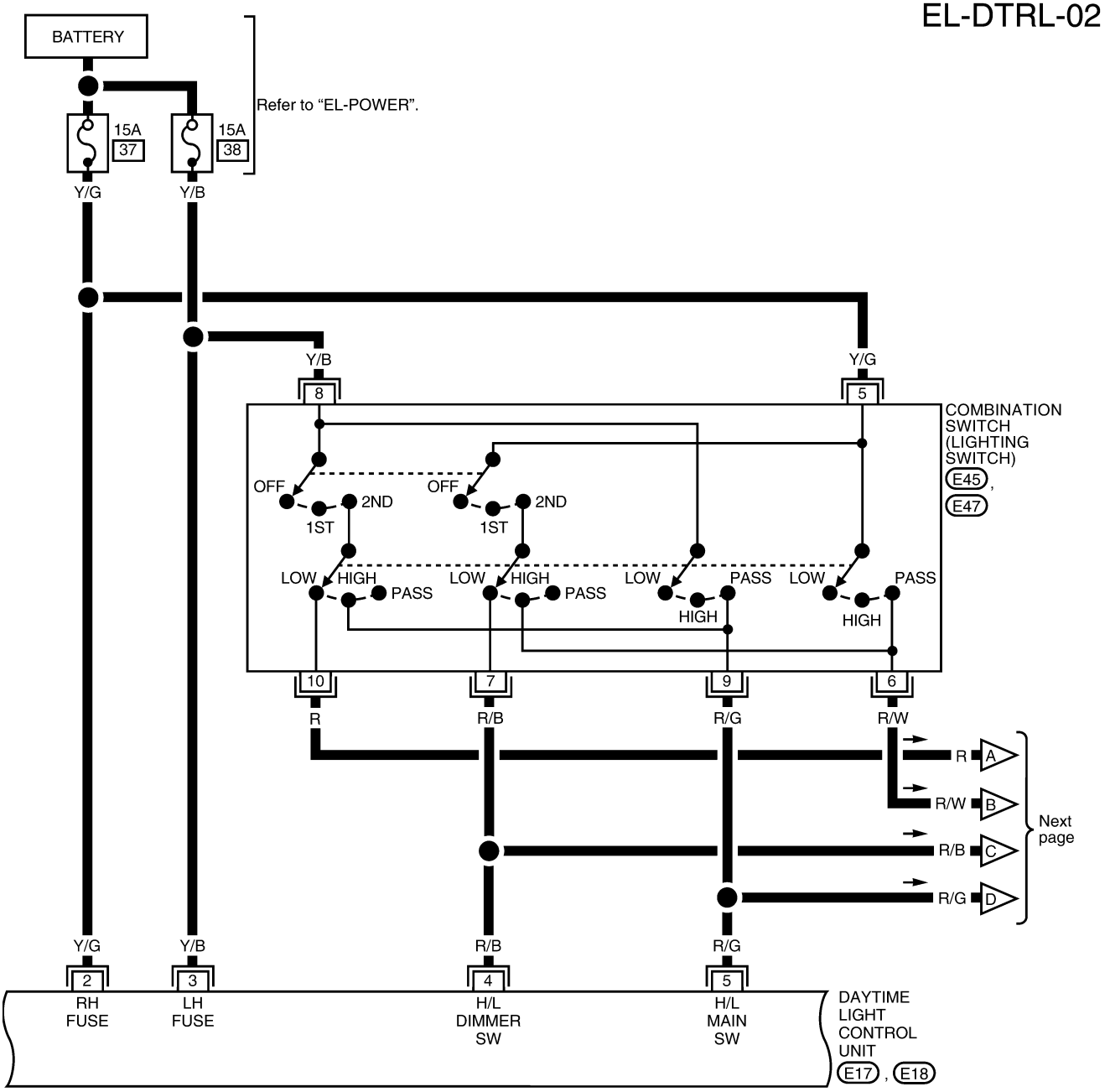
Circuit Diagram (Cont'd)

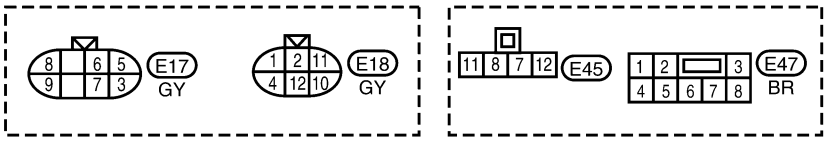


WEL108B

Wiring Diagram — DTRL — (Cont'd)

EL-DTRL-02





LEL658A

WATER TEMPERATURE GAUGE

NGEL0042S01

The water temperature gauge indicates the engine coolant temperature. The reading on the gauge is based on the resistance of the thermal transmitter.
The water temperature gauge is regulated by a variable ground signal supplied

- to combination meter terminal 46
- through thermal transmitter terminal 1.

As the temperature of the coolant increases, the resistance of the thermal transmitter decreases and the needle on the gauge moves from C to H.

TACHOMETER

NGEL0042S02

The tachometer indicates engine speed in revolutions per minute (rpm).
The tachometer is regulated by a signal

- to combination meter terminal 48 for the tachometer
- from ECM terminal 3.

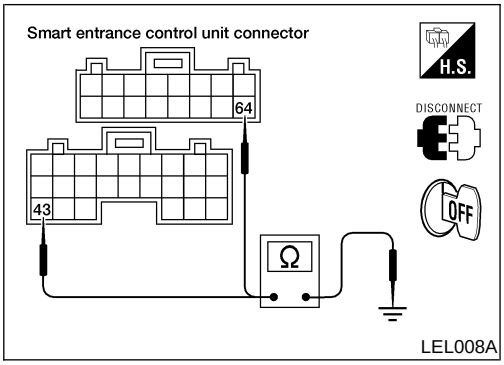
SPEEDOMETER

NGEL0042S04

The vehicle speed sensor provides a voltage signal to the combination meter for the speedometer.
The voltage is supplied

- to combination meter terminals 34 and 35 for the speedometer
- from vehicle speed sensor terminals 1 and 2.

The unified meter control unit converts the voltage to the vehicle speed and displays it on the speedometer.



- **Models with power door locks**

Terminals			Continuity
(+)		(−)	
Connector	Terminal (wire color)		
M111	43 (B)	Ground	Yes
M112	64 (B)	Ground	

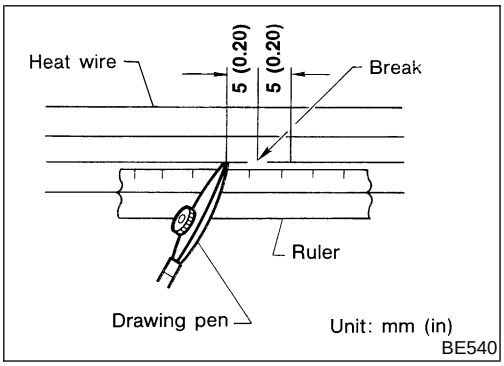
Filament Repair

NGEL0078

REPAIR EQUIPMENT

NGEL0078S01

1) Conductive silver composition (Dupont No. 4817 or equivalent)
2) Ruler 30 cm (11.8 in) long
3) Drawing pen
4) Heat gun
5) Alcohol
6) Cloth



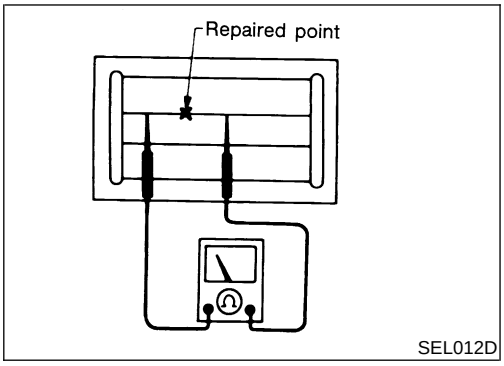
REPAIRING PROCEDURE

NGEL0078S02

1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

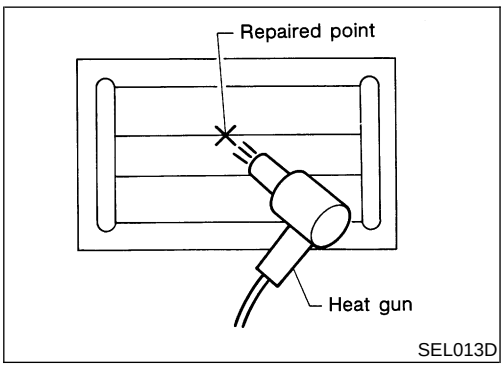
Shake silver composition container before use.

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.



4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.



5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

System Description

NGEL0102

Power is supplied at all times
- from 40A fusible link (letter **f**, located in the fuse and fusible link box)
- to circuit breaker terminal +
- through circuit breaker terminal –
- to power window relay terminal 3
- through 7.5A fuse [No. 28, located in the fuse block (J/B)]
- to smart entrance control unit terminal 49

With the ignition switch in the ON or START position, power is supplied
- through 10A fuse [No. 5, located in the fuse block (J/B)]
- to smart entrance control unit terminal 27
- through smart entrance control unit terminal 46
- to power window relay terminal 2.

Ground is supplied
- to power window relay terminal 1
- through body grounds M14 and M68.

The power window relay is energized and power is supplied
- through power window relay terminal 5
- to main power window and door lock/unlock switch terminal 2
- to front power window switch RH terminal 4
- to rear power window switch LH terminal 2
- to rear power window switch RH terminal 2

Ground is supplied
- to main power window and door lock/unlock switch terminal 10
- through body grounds M14 and M68.

When the ignition switch is turned to the OFF position from the ON or START position, the power windows will still operate for approximately 45 seconds, unless either front door is opened.

MANUAL OPERATION

NGEL0102S01

NOTE:
Numbers in parentheses are terminal numbers which apply with switch pressed in the UP and DOWN positions respectively.

Front Door LH

NGEL0102S0101

Power is supplied
- through main power window and door lock/unlock switch terminal (12, 16)
- to front power window motor LH terminal (UP, DN).

Ground is supplied
- to front power window motor LH terminal (DN, UP)
- through main power window and door lock/unlock switch terminal (16, 12).

Then, the motor raises or lowers the window until the switch is released or the window is fully closed or open.

Front Door RH

NGEL0102S0102

MAIN POWER WINDOW AND DOOR LOCK/UNLOCK SWITCH OPERATION
With front RH switch pressed, power is supplied
- through main power window and door lock/unlock switch (14, 13)
- to front power window switch RH (5, 2).

The following description is the same as the front power window switch RH description.
FRONT POWER WINDOW SWITCH RH OPERATION
Power is supplied
- through front power window switch RH (6, 3)
- to front power window motor RH (UP, DN).

Ground is supplied
- to front power window motor RH (DN, UP)

Trouble Diagnoses

=NGEL0115

SYMPTOM CHART

NGEL0115S01

NOTE:

- Always check keyfob battery before replacing keyfob
- Use Remote Keyless Entry Tester J-43241 (follow instructions on tester) to check operation of keyfob before replacing keyfob.

Symptom	Diagnoses/service procedure	Reference page (EL-)
All functions of remote keyless entry system do not operate.	1. Keyfob battery check	210
	2. Keyfob check (use Remote Keyless Entry Tester J-43241).	—
	3. Power supply and ground circuit check	211
	4. Replace keyfob. Refer to ID Code Entry Procedure.	218
The new ID of keyfob cannot be entered.	1. Keyfob battery check	210
	2. Keyfob check (use Remote Keyless Entry Tester J-43241).	—
	3. Power supply and ground circuit check	211
	4. Key switch (inserted) check	214
	5. Door switch check	213
	6. Replace keyfob. Refer to ID Code Entry Procedure.	218
Door lock or unlock does not function (If the power door lock system does not operate manually, check power door lock system. Refer to “Trouble Diagnoses”, EL-195.).	1. Key switch (inserted) check	214
	2. Keyfob check (use Remote Keyless Entry Tester J-43241).	—
	3. Door switch check	213
	4. Replace keyfob. Refer to ID Code Entry Procedure.	218
Hazard indicator does not flash twice when pressing lock button of keyfob.	1. Hazard reminder check	216
	2. Keyfob check (use Remote Keyless Entry Tester J-43241).	—
	3. Replace keyfob. Refer to ID Code Entry Procedure.	218
Room lamp does not activate properly.	1. Room lamp operation check	216
	2. Door switch check	213
Panic alarm (horn and headlamps) does not activate when panic alarm button is pressed continuously for more than 1.5 seconds.	1. Vehicle security operation check. Refer to “PRELIMINARY CHECK”.	229
	2. Keyfob check (use Remote Keyless Entry Tester J-43241).	—
	3. Replace keyfob. Refer to ID Code Entry Procedure.	218

NOTE:

The panic alarm functions of the remote keyless entry system do not activate when the key switch is in INSERTED position (key is in ignition key cylinder).

When performing a door locking operation using the main power window and door lock/unlock switch, the door lock/unlock switch RH, the front door LH lock knob, or a keyfob, all the doors will lock and then the front door LH will immediately unlock if:

- **the key switch is in INSERTED position (key is in ignition key cylinder), and**
- **either front door switch LH or RH is in OPEN position (door is open).**

Description

NGEL0124

The following systems are controlled by the smart entrance control unit.

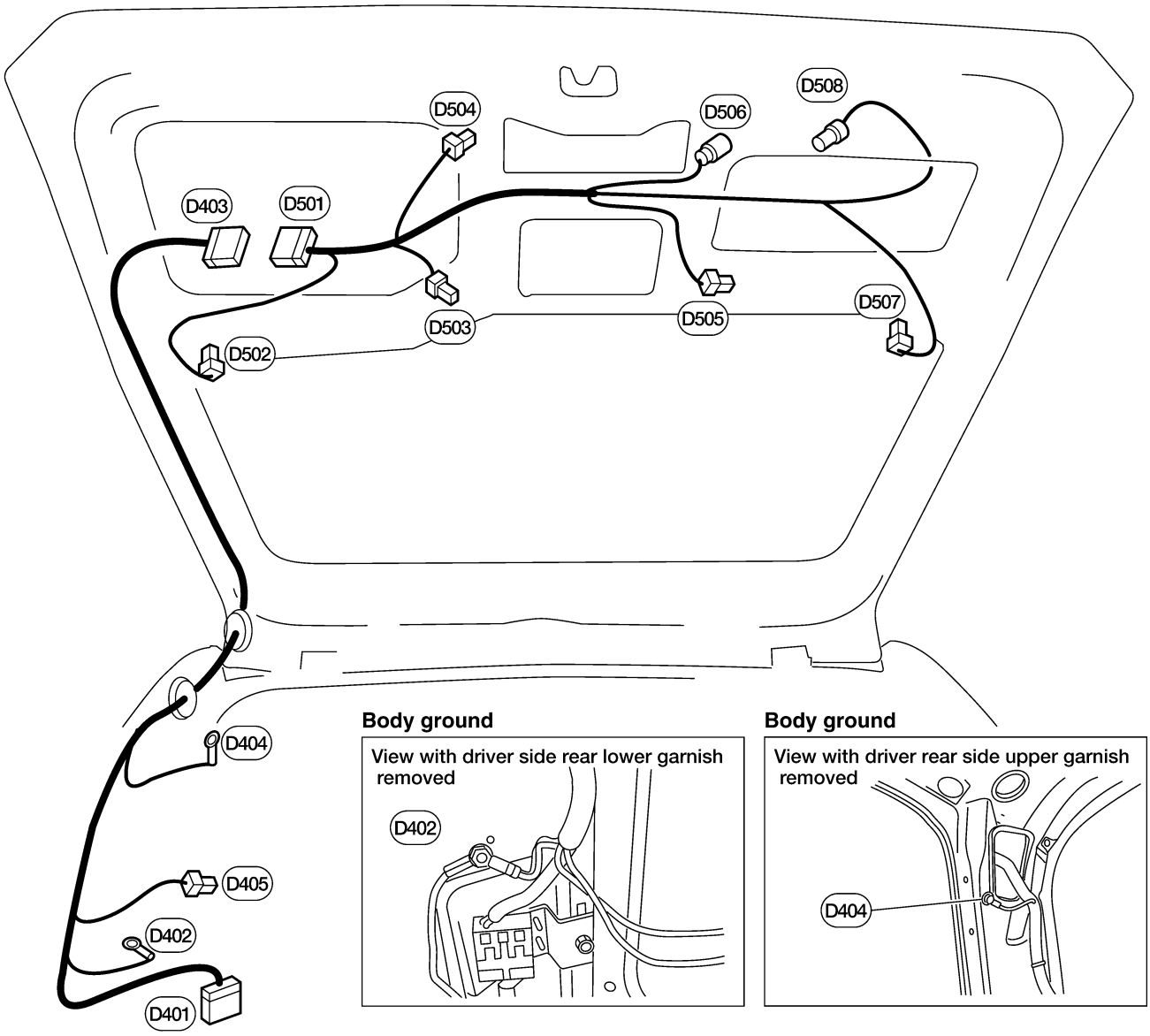
- Warning chime
- Rear window defogger timer
- Power window
- Power door lock
- Remote keyless entry
- Vehicle security
- Room lamp

For detailed description and wiring diagrams, refer to the relevant pages for the each system.
The control unit receives data from the switches and sensors to control their corresponding system relays and actuators.

System	Input	Output
Warning chime	Key switch (Insert) Ignition switch (ON) Lighting switch (1st) Seat belt buckle switch Front door switch LH	Warning chime
Rear window defogger timer	Ignition switch (ON or START) Rear window defogger switch	Rear window defogger relay
Power window	Ignition switch (ON) Door switches	Power window relay
Power door lock	Door lock/unlock switch Key switch (insert) Door switches Door key cylinder switches	Door lock actuator
Remote keyless entry	Key switch (Insert) Ignition switch (ACC) Door switches Antenna (keyfob signal) Door lock/unlock switches	Horn relay Vehicle security lamp relay Door lock actuator Room lamp
Vehicle security	Ignition switch (ACC, ON) Door switches Hood switch Door lock/unlock switches Door key cylinder switch (lock/unlock)	Horn relay Vehicle security lamp relay Vehicle security relay (Starter interrupt) Security indicator lamp
Room lamp	Door switches Ignition switch Key switch (insert)	Room lamp

Back Door Harness

NGEL0199



Back Door No. 2 Harness

- (D401) W/18 or W/12 : To (B11)
- (D402) — : Body ground
- (D403) W/18 or W/12 : To (D501)
- (D404) — : Body ground
- (D405) B/2 : Rear power socket

Back Door Harness

- (D501) W/18 or W/12 : To (D403)
- (D502) B/1 : Rear window defogger (+)
- (D503) W/2 : High mounted stop lamp
- (D504) B/2 : Back door switch
- (D505) W/4 : Rear wiper motor (with rear wiper)
- (D506) BR/3 : Back door key cylinder switch (with power door locks)
- (D507) B/1 : Rear window defogger (-)
- (D508) GY/4 : Back door lock actuator (with power door locks)

WEL655A

Removal

NGEM0058

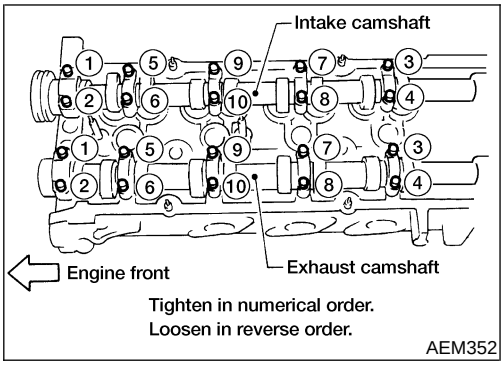
CAUTION:

- **When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.**
- **Apply new engine oil to threads and seat surfaces when installing cylinder head, camshaft sprocket, crankshaft pulley, and camshaft bracket.**
- **Attach tags to valve lifters so as not to mix them up.**

- **Before removing camshaft and idler sprockets, apply paint marks to them for retiming.**

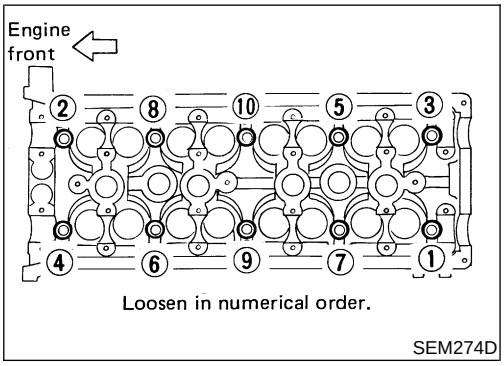
1) Remove upper timing chain and idler sprocket.

- **Refer to "UPPER TIMING CHAIN", EM-20 and "IDLER SPROCKET", EM-21.**
- **For retiming during cylinder head removal/installation, apply paint marks to camshaft sprockets, upper timing chain, lower timing chain, and idler sprocket.**



2) Remove camshaft brackets and camshafts.

- **Mark these parts' original positions for reassembly.**



3) Remove cylinder head bolts in numerical order.

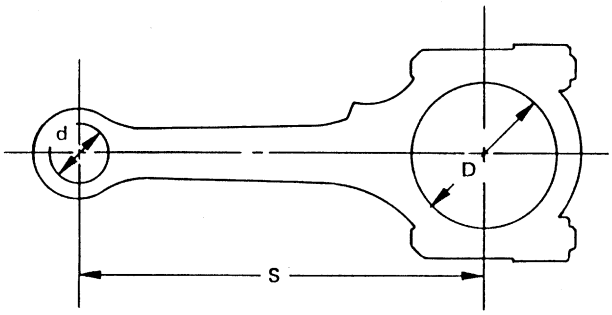
- **Removing bolts in incorrect order could result in a warped or cracked cylinder head.**
- **Loosen cylinder head bolts in two or three steps.**

4) Remove cylinder head and cylinder head gasket.

Connecting Rod

NGEM0075

Unit: mm (in)



SEM570A

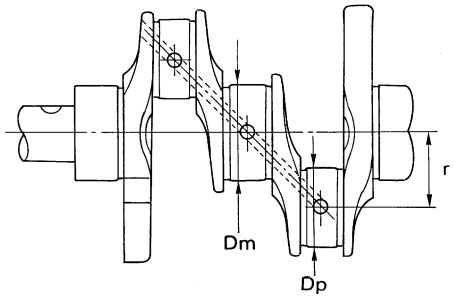
	Standard	Limit
Center distance (S)	164.95 - 165.05 (6.4941 - 6.4980)	—
Bend [per 100 mm (3.94 in)]	—	0.15 (0.0059)
Torsion [per 100 mm (3.94 in)]	—	0.30 (0.0118)
Connecting rod small end inner diameter (d)*	23.970 - 24.000 (0.9437 - 0.9449)	—
Piston pin bushing inner diameter	21.000 - 21.012 (0.8268 - 0.8272)	—
Connecting rod big end inner diameter (D)*	53.000 - 53.013 (2.0866 - 2.0871)	—
Side clearance	0.2 - 0.4 (0.008 - 0.016)	0.6 (0.024)

* Without bearing

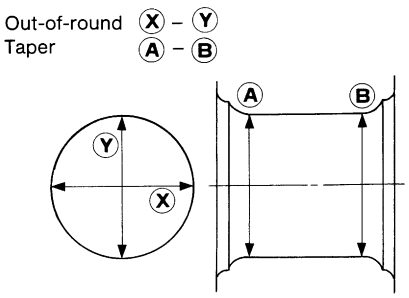
Crankshaft

NGEM0076

Unit: mm (in)

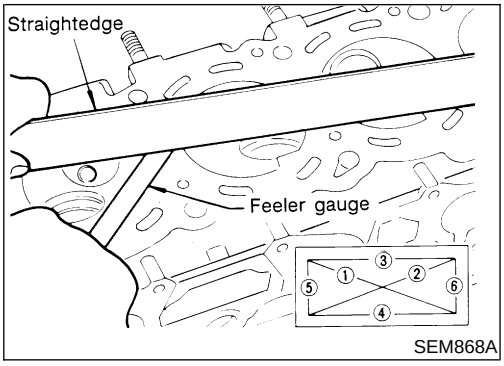


SEM394



EM715

Main journal diameter (Dm)	Grade No. 0	59.967 - 59.975 (2.3609 - 2.3612)	
	Grade No. 1	59.959 - 59.967 (2.3606 - 2.3609)	
	Grade No. 2	59.951 - 59.959 (2.3603 - 2.3606)	
Pin journal diameter (Dp)	Grade No. 0	49.968 - 49.974 (1.9672 - 1.9675)	
	Grade No. 1	49.962 - 49.968 (1.9670 - 1.9672)	
	Grade No. 2	49.956 - 49.962 (1.9668 - 1.9670)	
Center distance (r)		47.95 - 48.05 (1.8878 - 1.8917)	
		Standard	Limit
Taper of journal and pin [A - B]	Journal	—	0.01 (0.0004)
	Pin	—	0.005 (0.0002)



Inspection

NGEM0017

CYLINDER HEAD DISTORTION

NGEM0017S01

Head surface flatness:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, resurface it or replace it.

Resurfacing limit:

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

Amount of cylinder head resurfacing is “A”.

Amount of cylinder block resurfacing is “B”.

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

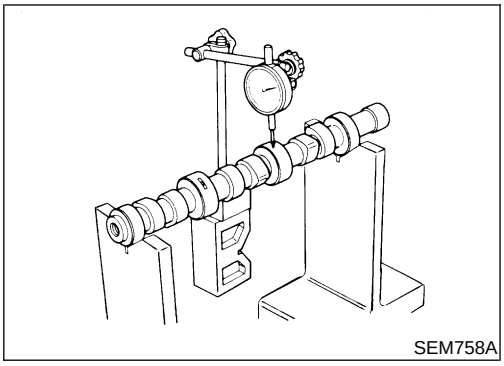
Nominal cylinder head height:

106.8 - 107.2 mm (4.205 - 4.220 in)

CAMSHAFT VISUAL CHECK

NGEM0017S02

Check camshaft for scratches, seizure and wear.



CAMSHAFT RUNOUT

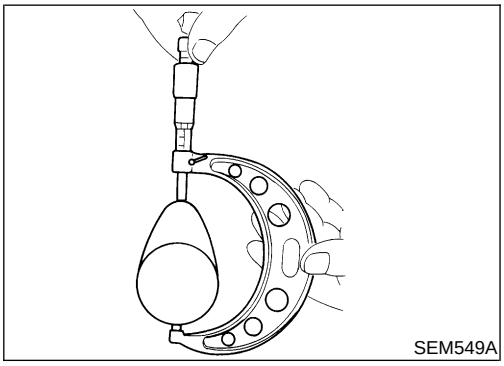
NGEM0017S03

1. Measure camshaft runout at the center journal.

Runout (Total indicator reading):

Limit 0.1 mm (0.004 in)

2. If it exceeds the limit, replace camshaft.



CAMSHAFT CAM HEIGHT

NGEM0017S04

1. Measure camshaft cam height.

Standard cam height:

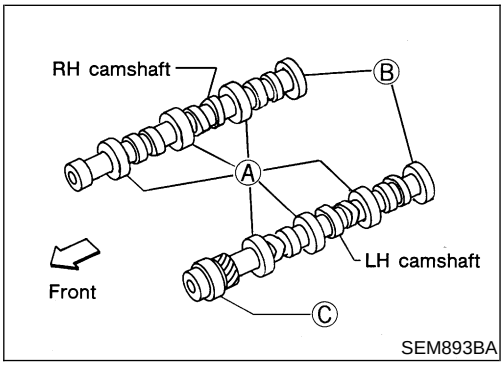
Intake and exhaust:

38.943 - 39.133 mm (1.5332 - 1.5407 in)

Cam wear limit:

0.15 mm (0.0059 in)

2. If wear is beyond the limit, replace camshaft.



CAMSHAFT JOURNAL CLEARANCE

NGEM0017S05

1. Measure outer diameter of camshaft journal.

Standard outer diameter:

A 46.920 - 46.940 mm (1.8472 - 1.8480 in)

B 42.420 - 42.440 mm (1.6701 - 1.6709 in)

C 47.920 - 47.940 mm (1.8866 - 1.8874 in)

VALVE SPRING

NGEM0028S02

Free height	Outer	51.2 mm (2.016 in)
	Inner	44.1 mm (1.736 in)
	Single	50.47 mm (1.987 in)
Pressure	Outer	523.7 N (53.4 kg, 117.7 lb) at 30.0 mm (1.181 in)
	Inner	255.0 N (26.0 kg, 57.3 lb) at 25.0 mm (0.984 in)
	Single	770 - 837 N (78.5 - 85.4 kg, 173.1 - 188.2 lb) at 30.0 mm (1.181 in)
Out-of-square	Outer	2.2 mm (0.087 in)
	Inner	1.9 mm (0.075 in)
	Single	2.0 mm (0.079 in)

HYDRAULIC VALVE LIFTER

NGEM0028S03

Unit: mm (in)

Lifter outside diameter	15.947 - 15.957 (0.6278 - 0.6282)
Lifter guide inside diameter	16.000 - 16.013 (0.6299 - 0.6304)
Clearance between lifter and lifter guide	0.043 - 0.066 (0.0017 - 0.0026)

VALVE GUIDE

NGEM0028S04

Unit: mm (in)

			Standard	Service
Valve guide	Outer diameter	Intake	11.023 - 11.034 (0.4340 - 0.4344)	11.223 - 11.234 (0.4418 - 0.4423)
		Exhaust	12.023 - 12.034 (0.4733 - 0.4738)	12.223 - 12.234 (0.4812 - 0.4817)
	Inner diameter (Finished size)	Intake	7.000 - 7.018 (0.2756 - 0.2763)	
		Exhaust	8.000 - 8.011 (0.3150 - 0.3154)	
Cylinder head valve guide hole diameter		Intake	10.975 - 10.996 (0.4321 - 0.4329)	11.175 - 11.196 (0.4400 - 0.4408)
		Exhaust	11.975 - 11.996 (0.4715 - 0.4723)	12.175 - 12.196 (0.4793 - 0.4802)
Interference fit of valve guide		Intake	0.027 - 0.059 (0.0011 - 0.0023)	
		Exhaust		
			Standard	Max. tolerance
Stem to guide clearance		Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.10 (0.0039)
		Exhaust	0.030 - 0.049 (0.0012 - 0.0019)	
Valve deflection limit			—	0.20 (0.0079)

ROCKER SHAFT AND ROCKER ARM

NGEM0028S05

Unit: mm (in)

Rocker shaft	Outer diameter	17.979 - 18.000 (0.7078 - 0.7087)
Rocker arm	Inner diameter	18.007 - 18.028 (0.7089 - 0.7098)
Clearance between rocker arm and rocker shaft		0.007 - 0.049 (0.0003 - 0.0019)

QUICK REFERENCE CHART: XTERRA [ ] 2002

EQUIPPED WITH VG33E ENGINE

ENGINE TUNE-UP DATA

Engine model		VG33E		
Firing order		1-2-3-4-5-6		
Idle speed rpm				
MT (in neutral)		750° ± 50		
A/T (in "P" or "N" position)		750° ± 50		
Ignition timing (degree B.T.D.C. at idle speed)		10° ± 2°		
CO% at idle		Idle mixture screw is preset and sealed at factory		
Spark plug		NGK (Double Platinum Tipped)		
Type	Hot	PFR4G-11		
	Standard	PFR5G-11		
	Cold	PFR6G-11		
Gap	mm (in)	1.1 (0.043)		
Drive belt deflection (Cold)	mm (in)	Used belt		
		Limit	Deflection after adjustment	Deflection of new belt
Generator		11 (0.43)	7 - 8 (0.24 - 0.31)	6 - 7 (0.24 - 0.28)
Air conditioner compressor		18 (0.71)	12 - 13 (0.47 - 0.51)	10.5 - 11.5 (0.413 - 0.453)
Power steering oil pump		15 (0.59)	9.5 - 10.5 (0.374 - 0.413)	8 - 9 (0.31 - 0.35)
Drive belt tension	N (kg, lb)	Used belt		
		Limit	Tension after adjustment	Tension of new belt
Generator		226 (23, 51)	554.1-642.4 (56.5-65.5, 124.6-144.4)	671.8-760.0 (68.5-77.5, 151.0-170.9)
Air conditioner compressor		196 (20, 44)	495.3-583.5 (50.5-59.5, 111.4-131.2)	603.1-691.4 (61.5-70.5, 135.6-155.5)
Power steering oil pump		275 (28, 62)	554.1-642.4 (56.5-65.5, 124.6-144.4)	671.8-760.0 (68.5-77.5, 151.0-170.9)
Applied pressed force	N (kg, lb)	98 (10, 22)		
Radiator cap relief pressure kPa (kg/cm², psi)		78 - 98 (0.8 - 1.0, 11 - 14)		
Cooling system leakage testing pressure kPa (kg/cm², psi)		157 (1.6, 23)		
Compression pressure kPa (kg/cm², psi)/rpm	Standard	1,196 (12.2, 173)/300		
	Minimum	883 (9.0, 128)/300		
Tightening torque		N·m	kg-m	ft-lb
Spark plug		20 - 29	2.0 - 3.0	14 - 22
Oil pan drain plug		29 - 39	3.0 - 4.0	22 - 29

FRONT WHEEL ALIGNMENT (Unladen*1)

			2WD		4WD	
Camber		Minimum	0°03' (0.05°)		0°06' (0.10°)	
		Nominal	0°33' (0.55°)		0°36' (0.60°)	
		Maximum	1°03' (1.05°)		1°06' (1.10°)	
	Degree minute (Decimal degree)	Left and right difference	45' (0.75°) or less		45' (0.75°) or less	
Caster		Minimum	2°04' (2.07°)		1°40' (1.67°)	
		Nominal	2°34' (2.57°)		2°10' (2.17°)	
		Maximum	3°04' (3.07°)		2°40' (2.67°)	
	Degree minute (Decimal degree)	Left and right difference	45' (0.75°) or less		45' (0.75°) or less	
Kingpin inclination		Minimum	10°23' (10.38°)		10°18' (10.30°)	
		Nominal	10°53' (10.88°)		10°48' (10.80°)	
	Degree minute (Decimal degree)	Maximum	11°23' (11.38°)		11°18' (11.30°)	
Total toe-in	Distance (A - B) mm (in)	Minimum	3 (0.12)		3 (0.12)	
		Nominal	4 (0.16)		4 (0.16)	
		Maximum	5 (0.20)		5 (0.20)	
	Angle (left plus right)	Minimum	15' (0.25°)		15' (0.25°)	
	Degree minute (Decimal degree)	Nominal	20' (0.33°)		20' (0.33°)	
		Maximum	25' (0.42°)		25' (0.42°)	
Wheel turning angle	Inside		Except P265/70R15	P265/70R15	Except P265/70R15	P265/70R15
		Minimum	32°48' (32.80°)	30°48' (30.80°)	33°06' (33.10°)	31°00' (31.00°)
		Nominal	34°48' (34.80°)	32°48' (32.80°)	35°06' (35.10°)	33°00' (33.00°)
	Degree minute (Decimal degree)	Maximum	34°48' (34.80°)	32°48' (32.80°)	35°06' (35.10°)	33°00' (33.00°)
Full turn *2	Outside	Minimum	31°00' (31.00°)	28°42' (28.70°)	31°12' (31.20°)	29°00' (29.00°)
		Nominal	33°00' (33.00°)	30°42' (30.70°)	33°12' (33.20°)	31°00' (31.00°)
	Degree minute (Decimal degree)	Maximum	33°00' (33.00°)	30°42' (30.70°)	33°12' (33.20°)	31°00' (31.00°)°

*1 Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
*2 Wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

BRAKE

Unit: mm (in)

Disc brake	
Pad minimum thickness	2.0 (0.079)
Rotor repair limit Runout	0.07 (0.0028)
Minimum thickness	26.0 (1.024)
Drum brake	
Lining minimum thickness	1.5 (0.059)
Drum repair limit Maximum inner diameter	296.5 (11.67)
Parking brake	
Number of notches*2	5 - 6

*1 At pulling force: 196 N (20 kg, 44 lb)

FRONT WHEEL BEARING

	Model			
Item	2WD		4WD	
Lock nut tightening torque N • m (kg•m, ft-lb)	34 - 39 (3.5 - 4.0, 25 - 29)		—	
Preload (At hub bolt) N (kg, lb)	New seal	9.8 - 28.4 (1.0 - 2.9, 2.2 - 6.4)	Wheel bearing Tightening torque N • m(kg•m, ft-lb)	78 - 98 (8-10, 58 - 72)
			Retightening torque after loosening wheel bearing lock nut N•m (kg•m, ft-lb)	0.5 - 1.5 (0.05 - 0.15, 0.4 - 1.1)
			Axial end play mm (in)	0(0)
	Used seal	9.8 - 23.5 (1.0 - 2.4, 2.2 - 5.3)	Turning angle degree	15° - 30°
			Wheel bearing preload at wheel hub bolt N (kg, lb)	7.06 - 20.99 (0.72 - 2.14, 1.59 - 4.72)

REFILL CAPACITIES

Unit			Liter	US measure
Fuel tank			73.5	19.4 gal
Coolant (with reservoir)		AT & MT	10.95	11-5/8 qt
Engine		With oil filter	3.3	3-1/2 qt
		Without oil filter	3.0	3-1/8 qt
	Dry engine	(engine overhaul)	3.8	4 qt
Transmission	M/T	2WD	2.8	5-7/8 pt
		4WD	5.1	10-3/4 pt
	A/T	2WD	8.3	8-3/4 qt
		4WD	8.5	9 qt
Transfer		4WD	2.2	2-3/8 qt
Final drive	Rear	H233B	2.8	5-7/8 pt
	Front	R200A	1.75	3-3/4 pt
Manual steering system			0.62	1-3/8 pt
Power steering system			1.0 - 1.1	33.8 - 37.2 fl oz
Air conditioning system		Lubricant	0.2	6.8 fl oz
		Refrigerant *	0.6 - 0.7 kg	1.32 - 1.54 lb

*R-134a

HOW TO FOLLOW TROUBLE DIAGNOSES

NOTICE:
Trouble diagnoses indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1) **Before performing trouble diagnoses, read the “Preliminary Check”, the “Symptom Chart” or the “Work Flow”.**
2) **After repairs, re-check that the problem has been completely eliminated.**
3) **Refer to Component Parts and Harness Connector Location for the Systems described in each section for identification/location of components and harness connectors.**
4) **Refer to the Circuit Diagram for quick pinpoint check.**
   If you need to check circuit continuity between harness connectors in more detail, such as when a sub-harness is used, refer to Wiring Diagram in each individual section and Harness Layout for identification of harness connectors.
5) **When checking circuit continuity, ignition switch should be “OFF”.**
6) **Before checking voltage at connectors, check battery voltage.**
7) **After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.**

Wiring Diagrams and Trouble Diagnosis

NGHA0066

When you read wiring diagrams, refer to the following:

- Refer to ***GI-10***, “HOW TO READ WIRING DIAGRAMS”.
- Refer to ***EL-10***, “POWER SUPPLY ROUTING”.

When you perform trouble diagnosis, refer to the following:

- Refer to ***GI-33***, “How to Follow Test Groups in Trouble Diagnoses”.
- Refer to ***GI-22***, “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”.

MAGNET CLUTCH CIRCUIT

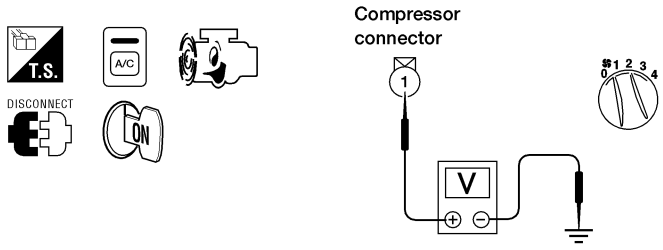
=NGHA0091

SYMPTOM:

- **Magnet clutch does not engage when A/C switch and fan switch are ON.**

1	CHECK A/C COMPRESSOR POWER SUPPLY CIRCUIT

1. Disconnect A/C compressor harness connector F15–2.
2. Press the A/C switch ON.
3. Does approx. 12 volts exist between A/C compressor connector F15–2 terminal 1 (B) and ground?



Battery voltage should exist.

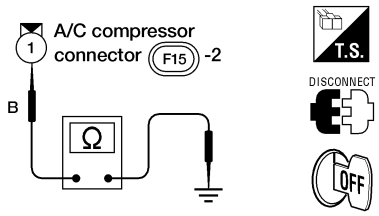
WHA232

Yes or No

Yes	▶	GO TO 2.
No	▶	GO TO 3.

2	CHECK A/C COMPRESSOR GROUND

Check continuity between A/C compressor connector F15–2 terminal 1 and ground.



AHA466A

Continuity should exist.

OK or NG

OK	▶	Refer to "TROUBLE DIAGNOSIS PROCEDURE FOR MAGNET CLUTCH", HA-43.
NG	▶	• Check thermal protector. Refer to "Thermal Protector", HA-51. • Check magnet clutch coil. If NG, replace magnet clutch. Refer to "MAGNET CLUTCH MOUNTING", HA-72.

Refrigerant Lines

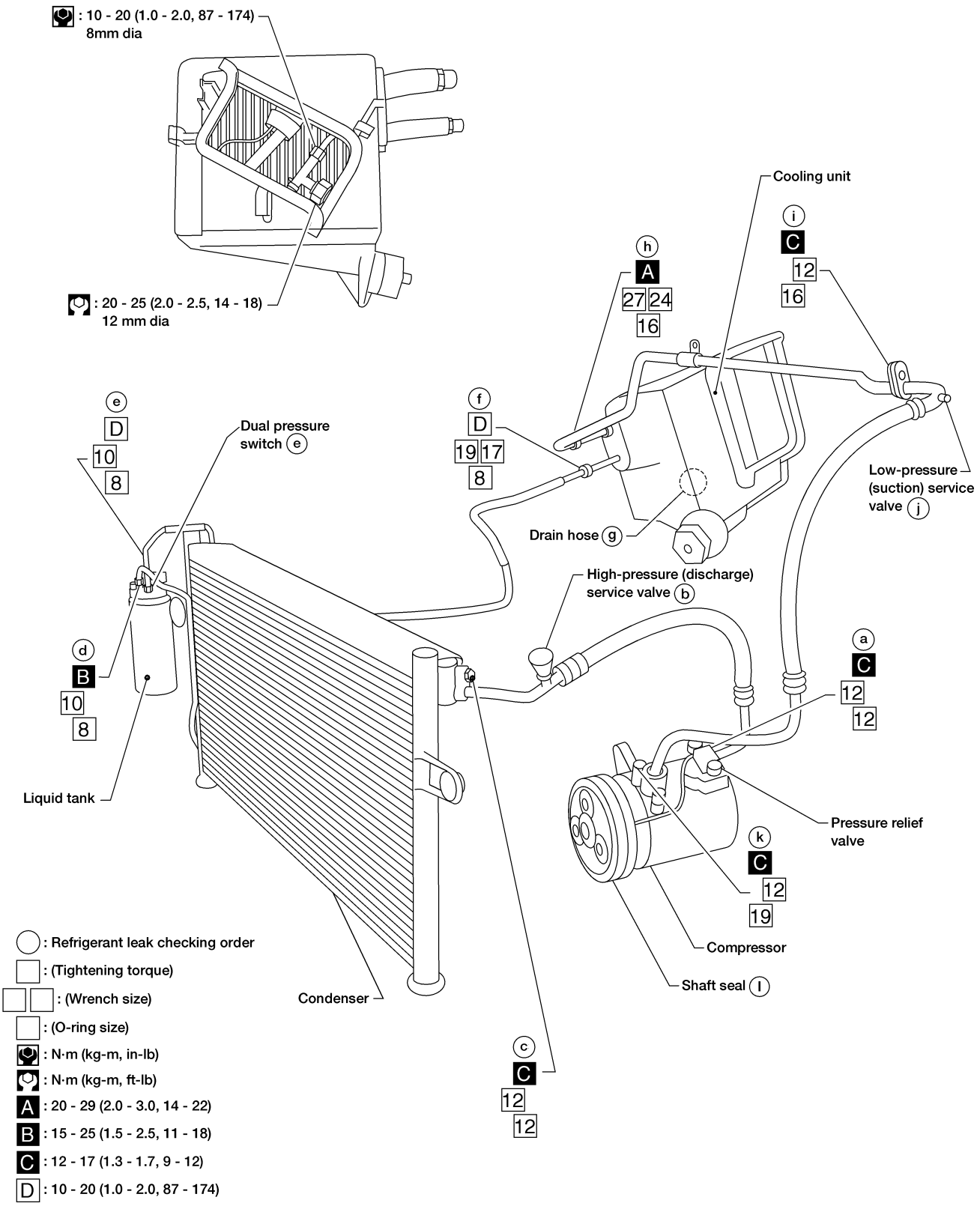
REMOVAL AND INSTALLATION

KA24DE Models

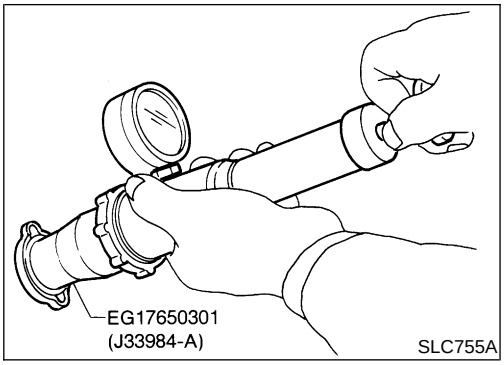
NGHA0101

NGHA0101S02

SEC. 271 • 274 • 276



LHA240



CHECKING RADIATOR CAP

NGLC0112S04

To check radiator cap, apply pressure to radiator cap with a radiator cap tester.

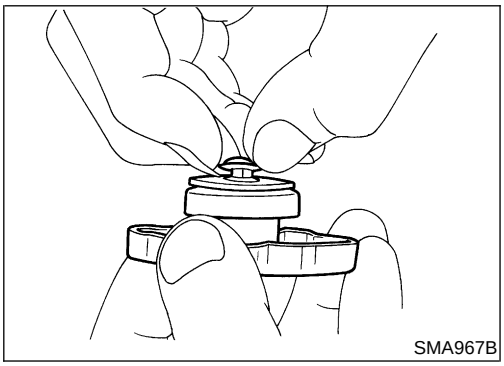
Radiator cap relief pressure:

Standard

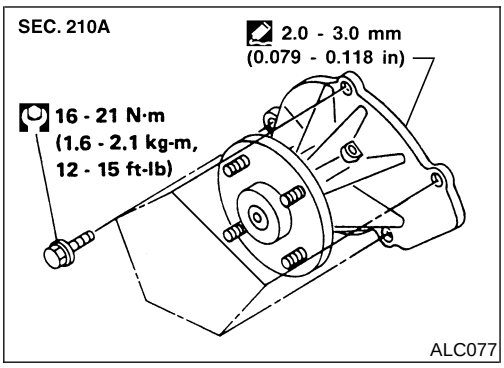
78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi)

Limit

59 kPa (0.6 kg/cm^2, 9 psi)



Pull the negative pressure valve to open it.
Check that it closes completely when released.



Water Pump

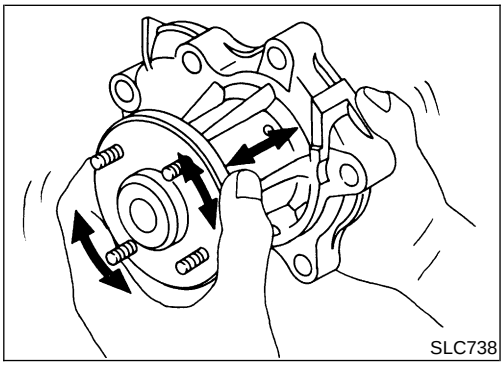
REMOVAL

NGLC0113

CAUTION:

- **When removing water pump assembly, be careful not to get coolant on drive belts.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **After installing water pump, connect hose and clamp securely. Check for leaks using radiator cap tester.**

1. Drain coolant from engine.
   Refer to ***MA-17***, "Changing Engine Coolant".
2. Remove fan coupling with fan.
3. Remove power steering pump drive belt, generator drive belt and A/C compressor drive belt.
4. Remove water pump.



INSPECTION

NGLC0114

- Check body assembly for rust or corrosion.
- Check for rough operation due to excessive end play.

Abbreviations: R = Replace. I = Inspect. Correct or replace if necessary. L = Lubricate. [ ]: At the mileage intervals only.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL																Reference Section - Page or - Content Title
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	3.75 (6) 3	7.5 (12) 6	11.25 (18) 9	15 (24) 12	18.75 (30) 15	22.5 (36) 18	26.25 (42) 21	30 (48) 24	33.75 (54) 27	37.5 (60) 30	41.25 (66) 33	45 (72) 36	48.75 (78) 39	52.5 (84) 42	56.25 (90) 45	60 (96) 48	
Brake lines & cables					I				I				I				I	MA-43
Brake pads, rotors, drums & linings			I		I		I		I		I		I		I		I	MA-43, 44
Automatic transmission fluid	NOTE (1)				I				I				I				I	MA-39, 40
Transfer fluid & differential gear oil (exc. LSD)	NOTE (2)				I				I				I				I	MA-40, 41
Limited slip differential (LSD) gear oil	NOTE (2)				I				R				I				R	MA-42
Manual transmission gear oil	NOTE (1)				I				I				I				I	MA-38
Steering gear, linkage, axle & suspension parts			I		I		I		I		I		I		I		I	MA-45
Tire rotation	NOTE (3)																	MA-43
Drive shaft boots and propeller shaft (4x4)			I		I		I		I		I		I		I		I	MA-46
Propeller shaft (4x4)	NOTE (4)		L		L		L		L		L		L		L		L	MA-41
Front wheel bearing grease	4x2								I								I	MA-45
Front wheel bearing grease and free-running hub grease	4x4	NOTE (5)				I				R				I				R	MA-45
Exhaust system			I		I		I		I		I		I		I		I	MA-38
In-cabin microfilter					R				R				R				R	***HA-83***

NOTE:

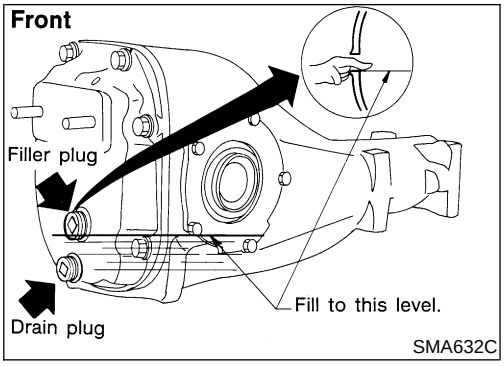
(1) If towing a trailer, using a camper or a car-top carrier, or driving on rough or muddy roads, change (not just inspect) oil at every 30,000 miles (48,000 km) or 24 months.

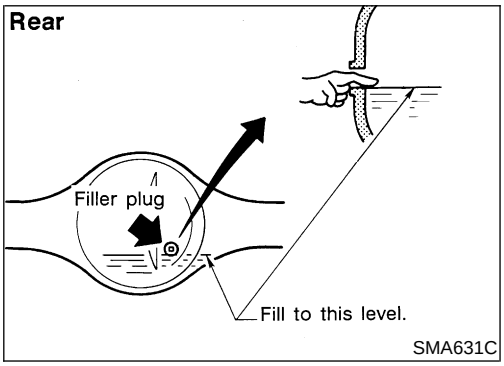
(2) If towing a trailer, using a camper or a car-top carrier, or driving on rough or muddy roads, change (not just inspect) oil (exc. LSD) at every 30,000 miles (48,000 km) or 24 months, and change LSD gear oil every 15,000 miles (24,000 km) or 12 months.

(3) Refer to "Tire rotation" under the "General maintenance" heading in this section.

(4) The propeller shaft should be re-greased after being immersed in water.

NGMA0004S0102





Changing Differential Gear Oil

NGMA0037

1. Drain oil from drain plug and refill with new gear oil.
2. Check oil level.

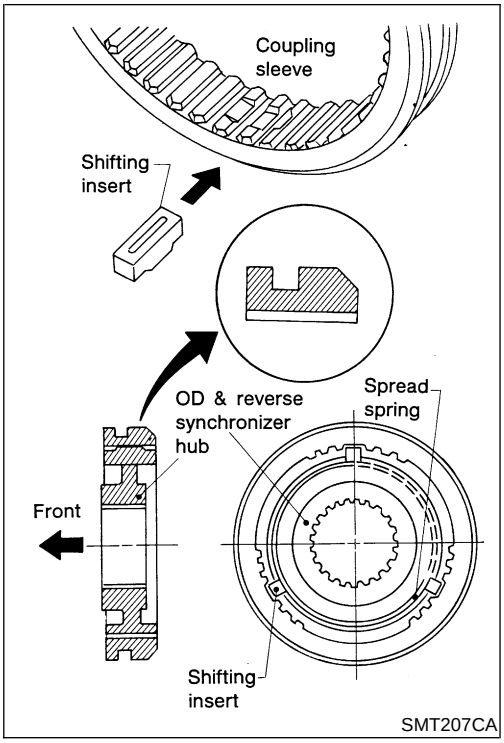
Oil grade and viscosity:
See “RECOMMENDED FLUIDS AND LUBRICANTS”, MA-13, 14.
Oil capacity:
Front — R200A
1.75ℓ (3-3/4 US pt, 3-1/8 Imp pt)
Rear — H233B
2.8ℓ (5-7/8 US pt, 4-7/8 Imp pt)
Rear — C200
1.3ℓ (2-3/4 US pt, 2-1/4 Imp pt)
Filler plug:
Front — R200A
: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)
Rear — H233B
: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)
Rear — C200
: 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)
Drain plug:
Front — R200A
: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)
Rear — H233B
: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)
Rear — C200
: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)

LIMITED-SLIP DIFFERENTIAL GEAR

NGMA0037S01

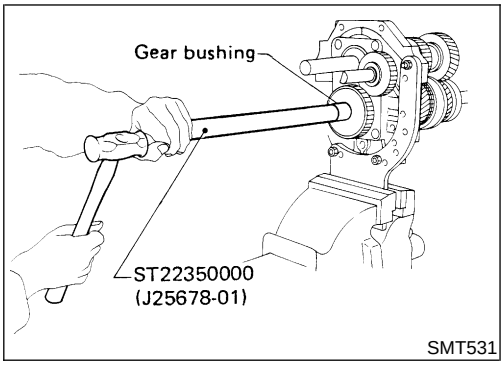
- Use only approved limited-slip differential gear oil.
- Limited-slip differential identification.

1. Lift both rear wheels off the ground.
2. Turn one rear wheel by hand.
3. If both rear wheels turn in the same direction simultaneously, vehicle is equipped with limited-slip differential.



c. Install bushing, reverse main gear and overdrive and reverse synchronizer to mainshaft.

- **Pay attention to the direction of synchronizer hub.**

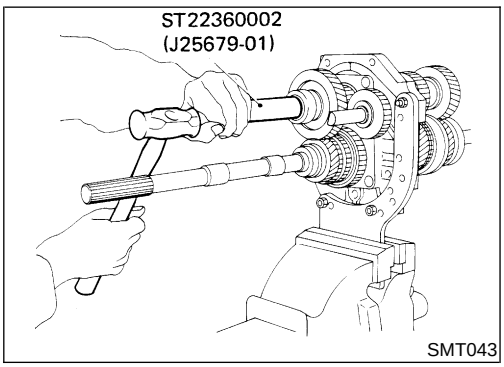


d. Install overdrive gear bushing to mainshaft using Tool.
e. Install overdrive main gear and needle bearing to mainshaft.
f. Install spacer, reverse counter gear and overdrive counter gear to counter/gear.

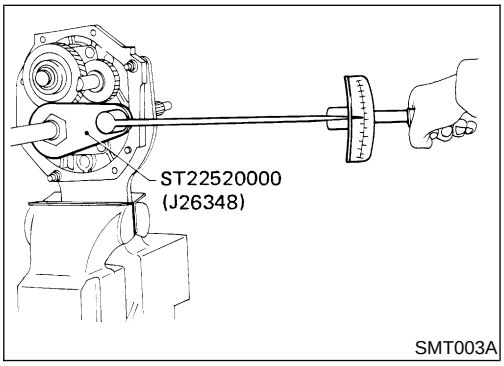
- **OD main gear and OD counter gear should be handled as a matched set.**

g. Install washer, roller bearing, steel roller and thrust washer.
h. Tighten mainshaft lock nut temporarily.

- **Always use new lock nut.**



i. Install counter/gear rear end bearing using Tool.

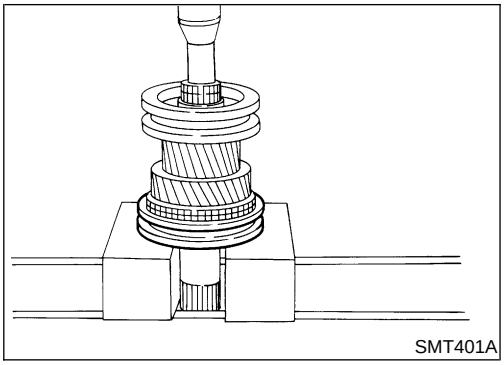


8. Mesh 2nd and reverse gears, then tighten mainshaft lock nut using Tool.

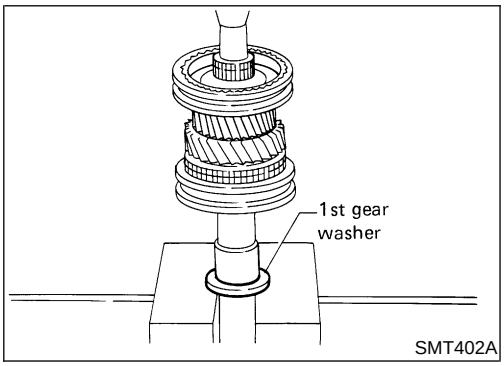
- **Always use new lock nut.**

Mainshaft lock nut:

: 137 - 167 N·m (14.0 - 17.0 kg-m, 101 - 123 ft-lb)

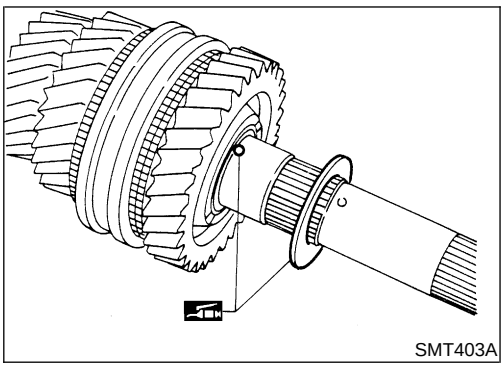

SMT401A

f. Press on 1st and 2nd synchronizer assembly together with 2nd main gear and 2nd gear needle bearing.



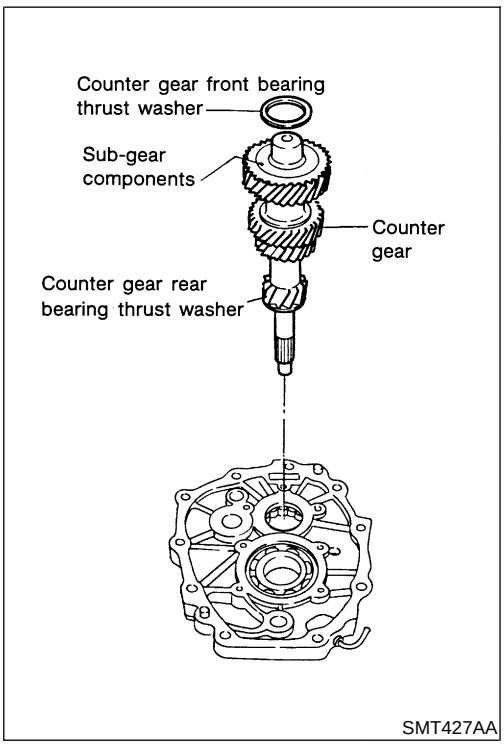
SMT402A

g. Press on 1st gear bushing using 1st gear washer.
h. Install 1st main gear and needle bearing.


SMT403A

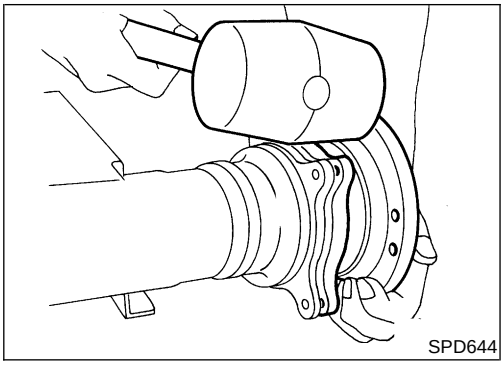
i. Install steel ball and 1st gear washer.

- **Apply multi-purpose grease to steel ball and 1st gear washer before installing.**

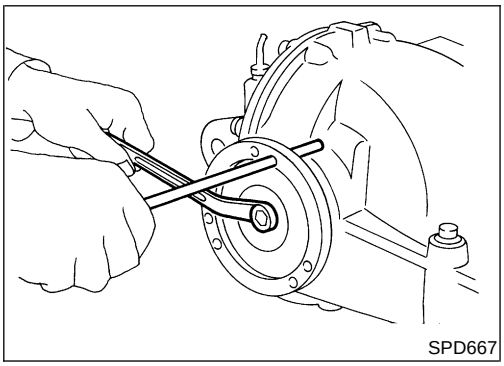


SMT427AA

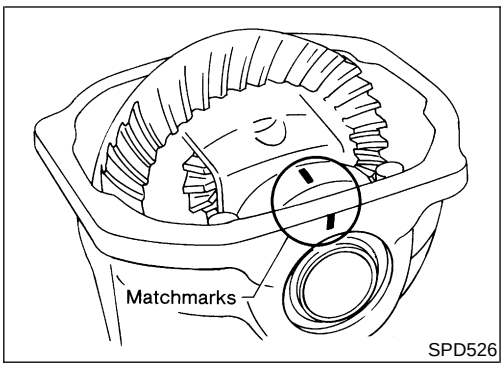
5. Select proper counter gear front bearing thrust washer when replacing transmission case, counter gear, counter gear rear thrust bearing or sub-gear components.
a. Install counter gear with sub-gear components, counter gear front and rear bearing thrust washer on adapter plate.
b. Remove counter gear front bearing thrust washer from transmission case.
c. Place adapter plate and counter gear assembly in transmission case (case inverted).


SPD644

2. Remove differential side shaft assembly.


SPD667

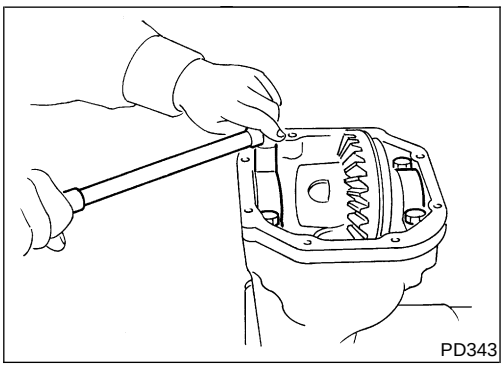
3. Remove differential side flange.



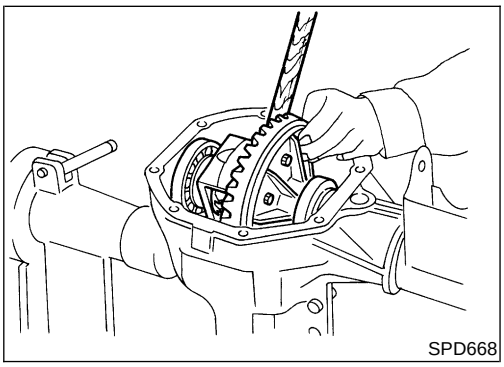
SPD526

4. Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

Bearing caps are line-bored during manufacture and should be put back in their original places.

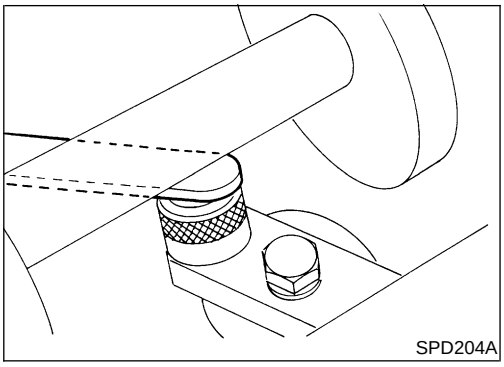

PD343

5. Remove side bearing caps.

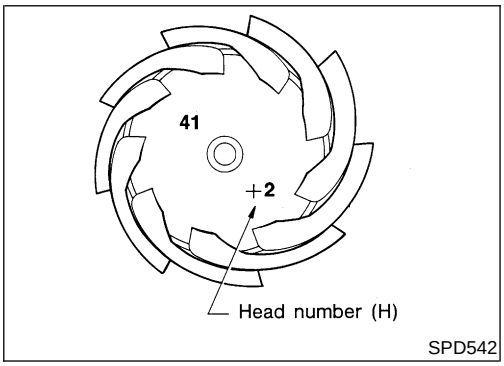

SPD668

6. Remove differential case assembly with a pry bar.

Adjustment (Cont'd)


SPD204A

12. Select the correct standard pinion height adjusting washer thickness. Select by using a standard gauge of 3 mm (0.12 in) and J34309-101 feeler gauge. Measure the distance between the J34309-11 pinion height adapter including the standard gauge and the arbor.
13. Write down the exact measurement (the value of feeler gauge).



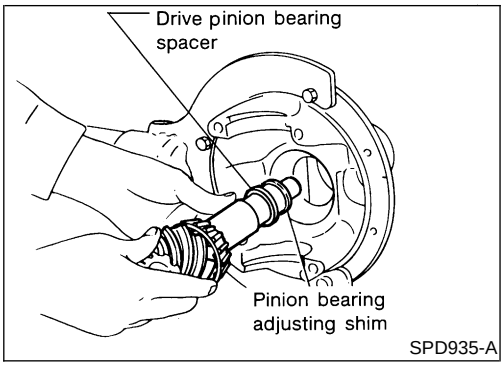
SPD542

14. Correct the pinion height washer size by referring to the "pinion head number".
There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set. This number should be the same as the number on the ring gear. The second number is the "pinion head height number". It refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.

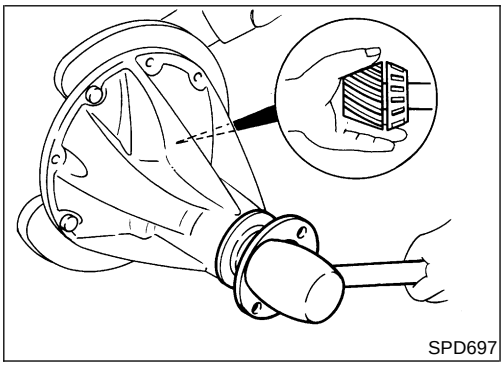
Use the following chart to determine the correct pinion height washer:

Pinion head height number	Add or remove from the standard pinion height washer thickness measurement
−6	Add 0.06 mm (0.0024 in)
−5	Add 0.05 mm (0.0020 in)
−4	Add 0.04 mm (0.0016 in)
−3	Add 0.03 mm (0.0012 in)
−2	Add 0.02 mm (0.0008 in)
−1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

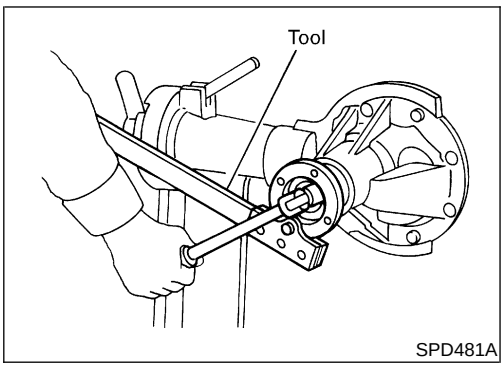
15. Select the correct pinion height washer.
Drive pinion height adjusting washer:
Refer to "Drive Pinion Height Adjustment", PD-63.



6. Install drive pinion bearing spacer, pinion bearing adjusting shim and drive pinion in gear carrier.



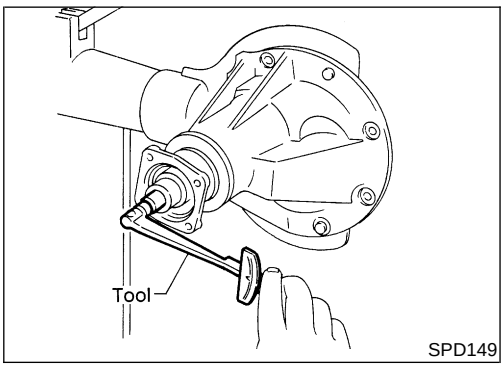
7. Install ABS sensor and sensor rotor (2WD models).
8. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer until fully seated.



9. Tighten pinion nut 127 - 249 N·m (13.0 - 30.0 kg-m, 94 - 217 ft-lb) until total preload of 1.2 - 2.2 N·m (12 - 22 kg-m, 10 - 19 ft-in) is obtained.

The threaded portion of drive pinion and pinion nut should be free from oil or grease.

Tool number: KV38108300 (J44195)



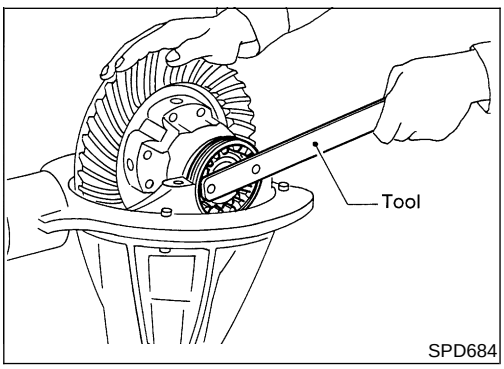
10. Turn drive pinion in both directions several times, and measure pinion bearing preload.

Tool number: ST3127S000 (J25765-A)
Pinion bearing preload (With front oil seal):
1.4 - 1.7 N·m (14 - 17 kg-cm, 12 - 15 in-lb)
Pinion bearing preload (Without front oil seal):
1.2 - 1.5 N·m (12 - 15 kg-cm, 10 - 13 in-lb)

If preload is out of specification, adjust the thickness of spacer and shim combination by replacing shim and spacer with thinner one.

- Start from the combination of thickest spacer and shim.
- Combine each spacer and shim thickness one by one until the correct specification are achieved.

Drive pinion bearing preload adjusting spacer and shim:
Refer to "Drive Pinion Preload Adjustment", PD-91.



11. Install differential case assembly with side bearing outer races into gear carrier.
12. Position side bearing adjusters on gear carrier with threads properly engaged; screw in adjusters lightly at this stage of assembly.

Tool number: ST32580000 (J34312)

Trouble Diagnoses Introduction

=NGRS0055

CAUTION:

- **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 harness connectors.**
- **Do not attempt to repair, splice or modify the SRS wiring harness. If the harness is damaged, replace it with a new one.**
- **Keep ground portion clean.**

DIAGNOSIS FUNCTION

NGRS0055S01

The SRS self-diagnosis results can be read by using “AIR BAG” warning lamp and/or CONSULT-II. The reading of these results is accomplished using one of two modes — “User mode” and “Diagnosis mode”.
The User mode is exclusively prepared for the customer (driver). This mode warns the driver of a system malfunction through the operation of the “AIR BAG” warning lamp.
The Diagnosis mode allows the technician to locate and inspect the malfunctioning part.
The mode applications for the “AIR BAG” warning lamp and CONSULT-II are as follows:

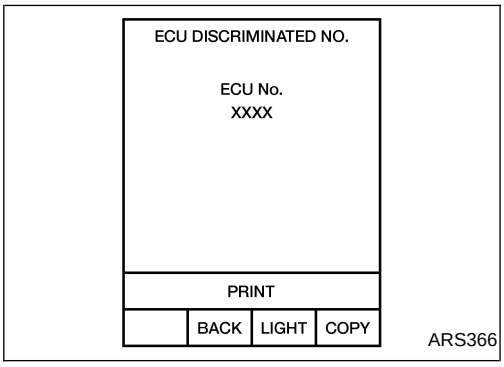
	User mode	Diagnosis mode	Display type
“AIR BAG” warning lamp	X	X	ON-OFF operation
CONSULT-II	—	X	Monitoring

NOTE:
Seat belt pre-tensioner malfunction is indicated by “AIR BAG” warning lamp.

DIAGNOSIS MODE FOR CONSULT-II

NGRS0055S02

- “SELF-DIAG [CURRENT]”
  A current Self-diagnosis result (also indicated by the number of warning lamp flashes in the Diagnosis mode) is displayed on the CONSULT-II screen in real time. This refers to a malfunctioning part requiring repairs.
- “SELF-DIAG [PAST]”
  Diagnosis results previously stored in the memory are displayed on the CONSULT-II screen. The stored results are not erased until memory erasing is executed.
- “TROUBLE DIAG RECORD”
  With TROUBLE DIAG RECORD, diagnosis results previously erased by a reset operation can be displayed on the CONSULT-II screen.
- “ECU DISCRIMINATED NO.”
  The diagnosis sensor unit for each vehicle model is assigned with its own, individual classification number. This number will be displayed on the CONSULT-II screen, as shown. When replacing the diagnosis sensor unit, refer to the part number for the compatibility. After installation, replacement with a correct unit can be checked by confirming this classification number on the CONSULT-II screen.

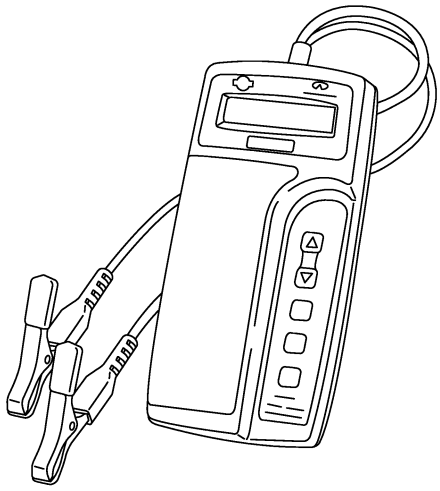


ARS366

ECU Part No.	ECU Discriminated No.
28556 8Z800	F60E

Special Service Tool

NGSC0018

Tool number Tool name	Description
J-44373 Model 620 Battery/Starting/Charging system tester	 SEL403X

MALFUNCTION INDICATOR

=NGSC0021S06

The IC regulator warning function activates to illuminate "CHARGE" warning lamp, if any of the following symptoms occur while generator is operating:

- Excessive voltage is produced.
- No voltage is produced.

Noise, Vibration and Harshness (NVH) Troubleshooting

=NGSU0004

NVH TROUBLESHOOTING CHART

NGSU0004S01

Use the chart below to help you find the cause of the symptom. Repair or replace parts as necessary.

Symptom			Improper installation, looseness	Shock absorber deformation, damage or deflection	Bushing or mounting deterioration	Parts interference	Spring fatigue	Suspension looseness	Incorrect wheel alignment	Stabilizer bar fatigue	Out-of-round	Imbalance	Incorrect air pressure	Uneven tire wear	Deformation or damage	Non-uniformity	Incorrect tire size	PROPELLER SHAFT	DIFFERENTIAL	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES	STEERING
Reference page			SU-4, 21	SU-12, 24	SU-11, 24	—	SU-11, 24	SU-11, 24	SU-6	SU-14	SU-6	—	—	—	—	—	—	***PD-4***, NVH	***PD-16***, ***PD-66***, ***PD-42***, NVH	***AX-4***, NVH	***AX-4***, NVH	Refer to SUSPENSION in this chart.	Refer to TIRES in this chart.	Refer to ROAD WHEEL in this chart.	***BR-5***, NVH	***ST-5***, NVH
Symptom	SUSPENSION	Noise	×	×	×	×	×	×										×	×	×	×		×	×	×	×
		Shake	×	×	×	×		×										×		×	×		×	×	×	×
		Vibration	×	×	×	×	×											×		×	×		×			×
		Shimmy	×	×	×	×			×												×		×	×	×	×
		Judder	×	×	×																×		×	×	×	×
		Poor quality ride or handling	×	×	×	×	×		×	×											×		×	×		
	TIRES	Noise	×								×	×	×	×	×	×		×	×	×	×	×		×	×	×
		Shake	×								×	×	×	×	×		×	×		×	×	×		×	×	×
		Vibration											×				×	×		×	×	×				×
		Shimmy	×								×	×	×	×	×	×	×				×	×		×	×	×
		Judder	×								×	×	×	×	×		×				×	×		×	×	×
		Poor quality ride or handling	×								×	×	×	×	×		×				×	×		×		
	ROAD WHEEL	Noise	×								×	×			×			×	×	×	×	×	×		×	×
		Shake	×								×	×			×			×		×	×	×	×		×	×
		Shimmy, Judder	×								×	×			×						×	×	×		×	×
		Poor quality ride or handling	×								×	×			×						×	×	×			

x: Applicable