

REPLACEMENT OF CONNECTING ROD BUSHING (SMALL END)

NEEM0024S10

1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

2. After driving in small end bushing, ream the bushing so that clearance between connecting rod bushing and piston pin is the specified value.

Clearance between connecting rod bushing and piston pin:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

FLYWHEEL/DRIVE PLATE RUNOUT

NEEM0024S11

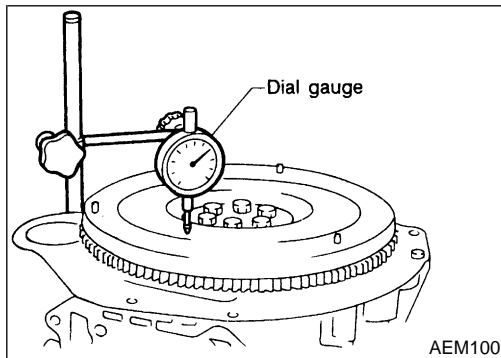
Runout (Total indicator reading):

Flywheel (M/T model)

Less than 0.15 mm (0.0059 in)

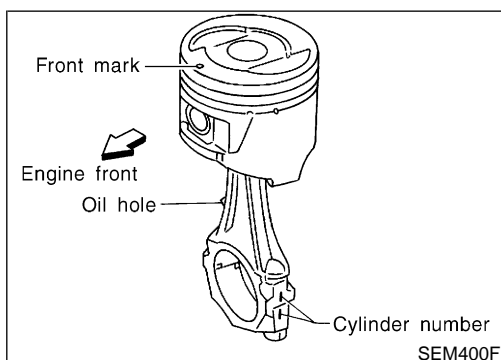
Drive plate (A/T model)

Less than 0.15 mm (0.0059 in)



CAUTION:

- Be careful not to damage the ring gear teeth.
- Check the drive plate for deformation or cracks.
- Do not allow any magnetic materials to contact the ring gear teeth.
- Do not surface flywheel or drive plate. Replace as necessary.



Assembly PISTON

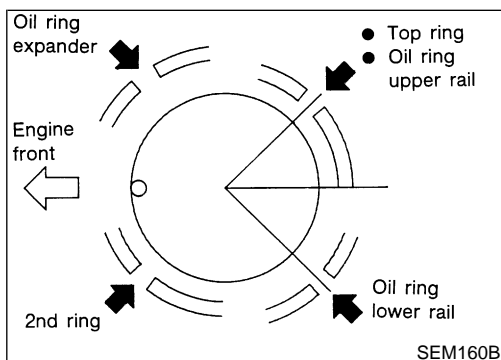
NEEM0025

NEEM0025S01

1. Install new snap ring on one side of piston pin hole.
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod swings smoothly.**

3. Set piston rings as shown.

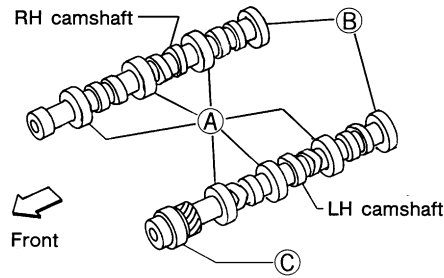


SERVICE DATA AND SPECIFICATIONS (SDS)

VG33E AND VG33ER
Camshaft and Camshaft Bearing

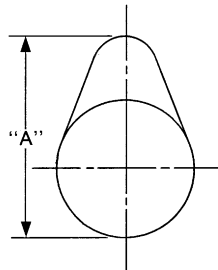
Camshaft and Camshaft Bearing

NEEM0030
Unit: mm (in)



SEM893BA

	Standard	Max. tolerance
Camshaft journal to bearing clearance	0.060 - 0.105 (0.0024 - 0.0041)	0.15 (0.0059)
Inner diameter of camshaft bearing	A: 47.000 - 47.025 (1.8504 - 1.8514)	—
	B: 42.500 - 42.525 (1.6732 - 1.6742)	—
	C: 48.000 - 48.025 (1.8898 - 1.8907)	—
Outer diameter of camshaft journal	A: 46.920 - 46.940 (1.8472 - 1.8480)	—
	B: 42.420 - 42.440 (1.6701 - 1.6709)	—
	C: 47.920 - 47.940 (1.8866 - 1.8874)	—
Camshaft runout [TIR*]	Less than 0.04 (0.0016)	0.1 (0.004)
Camshaft end play	0.03 - 0.06 (0.0012 - 0.0024)	—



EM671

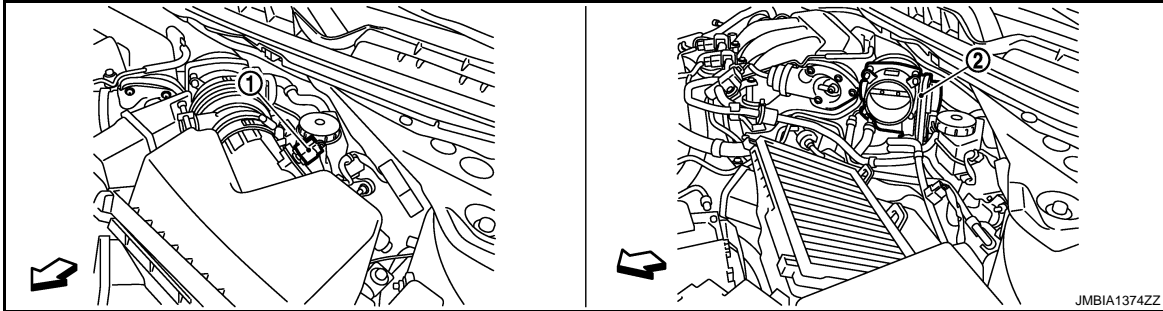
Cam height "A"	Intake	38.943 - 39.133 (1.5332 - 1.5407)
	Exhaust	38.943 - 39.133 (1.5332 - 1.5407)
Wear limit of cam height		0.15 (0.0059)

*Total indicator reading

AIR CONDITIONING CUT CONTROL

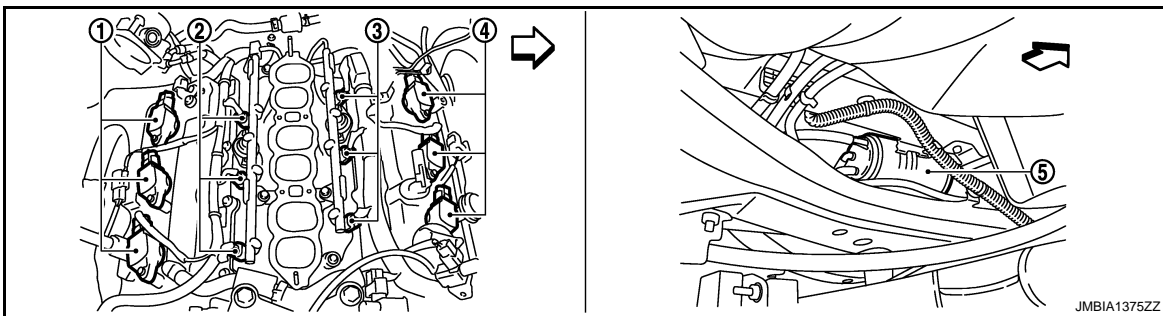
< FUNCTION DIAGNOSIS >

[VQ25DE, VQ35DE]



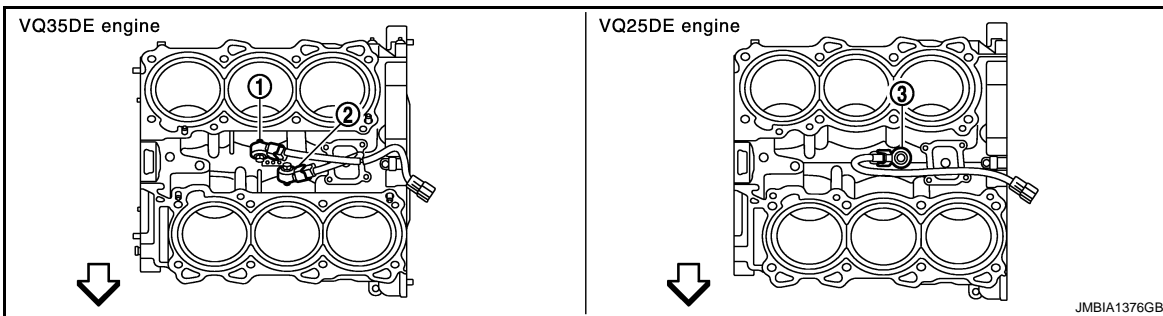
- 1. Mass air flow sensor (with intake air temperature sensor)
- 2. Electric throttle control actuator

← : Vehicle front



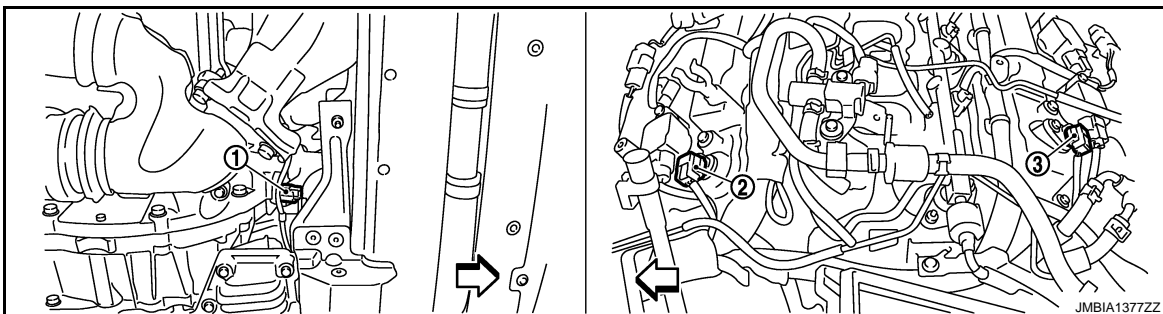
- 1. Ignition coil (with power transistor and spark plug (bank 1))
- 2. Fuel injector (bank 1)
- 3. Fuel injector (bank 2)
- 4. Ignition coil (with power transistor and spark plug (bank 2))
- 5. EVAP canister

← : Vehicle front



- 1. Knock sensor (bank 1)
- 2. Knock sensor (bank 2)
- 3. Knock sensor

← : Vehicle front



TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< COMPONENT DIAGNOSIS >

[VQ25DE, VQ35DE]

NOTE:

Check "A/F ALPHA-B1", "A/F ALPHA-B2" for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little.

Is the measurement value within the SP value?

YES >> GO TO 17.

NO-1 >> Less than the SP value: GO TO 2.

NO-2 >> More than the SP value: GO TO 3.

2.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 4.

NO >> More than the SP value: GO TO 19.

3.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 6.

NO-1 >> More than the SP value: GO TO 6.

NO-2 >> Less than the SP value: GO TO 25.

4.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Stop the engine.

2. Disconnect PCV hose, and then plug it.

3. Start engine.

4. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that the each indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 5.

NO >> GO TO 6.

5.CHANGE ENGINE OIL

1. Stop the engine.

2. Change engine oil.

NOTE:

This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving conditions.

>> INSPECTION END

6.CHECK FUEL PRESSURE

Check fuel pressure. (Refer to [EC-411. "Inspection".](#))

Is the inspection result normal?

YES >> GO TO 9.

NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly" and then. GO TO 8.

NO-2 >> Fuel pressure is too low: GO TO 7.

7.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly" and then GO TO 8.

NO >> Repair or replace malfunctioning part and then GO TO 8.

8.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

ECM

< ECU DIAGNOSIS >

[VQ25DE, VQ35DE]

DTC No.	Detected items	Engine operating condition in fail-safe mode
P2119	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
		(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator because of regulating the throttle opening to 20 degrees or less.
		(When ECM detects the throttle valve is stuck open:) While the vehicle is being driver, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Inspection Priority Chart

INFOID:000000003856871

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)
1	<ul style="list-style-type: none"> • U1000 U1001 CAN communication line • P0102 P0103 Mass air flow sensor • P0112 P0113 Intake air temperature sensor • P0117 P0118 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 P0345 Camshaft position sensor (PHASE) • P0500 Vehicle speed sensor • P0605 P0607 ECM • P0643 Sensor power supply • P0705 P0850 Park/Neutral position (PNP) switch • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1610 - P1615 NATS • P1700 CVT control system • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor

DESCRIPTION

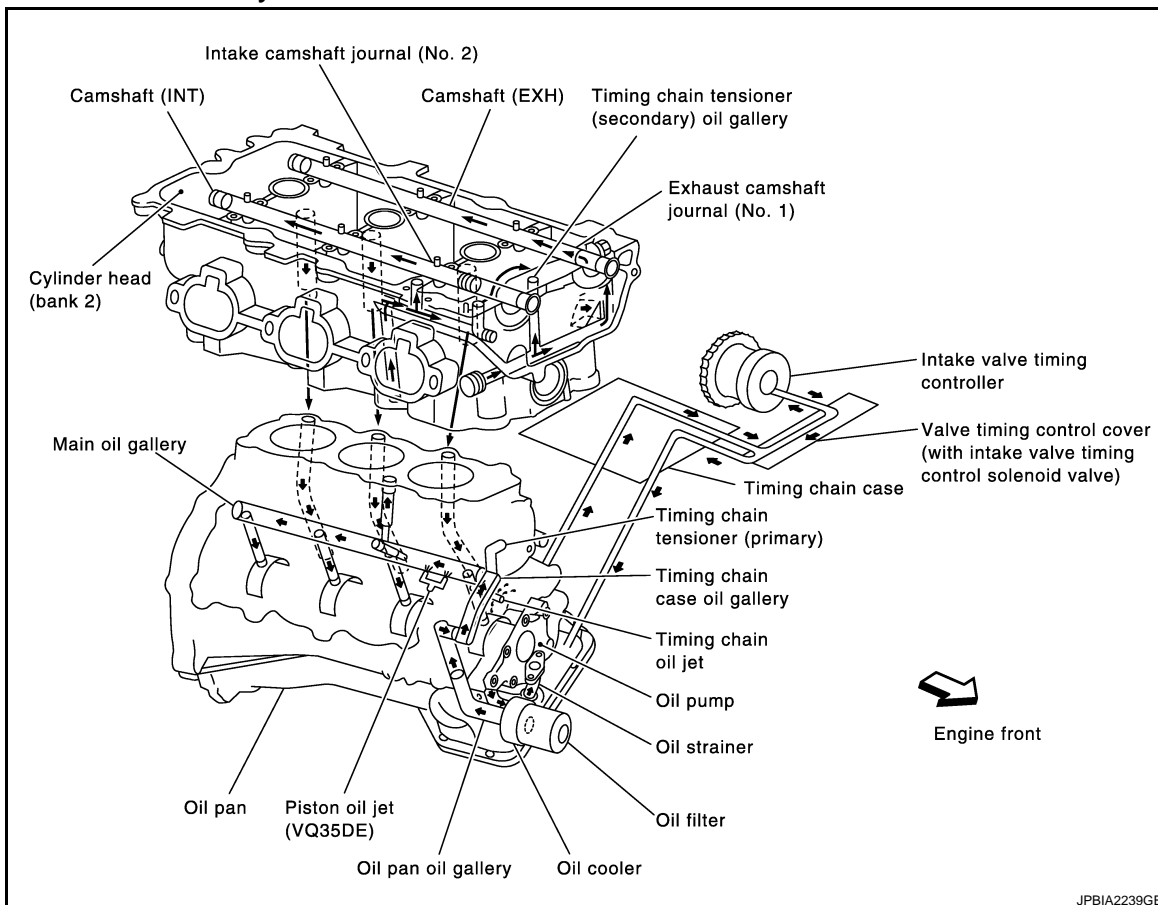
< FUNCTION DIAGNOSIS >

FUNCTION DIAGNOSIS

DESCRIPTION

Engine Lubrication System

INFOID:000000003793114

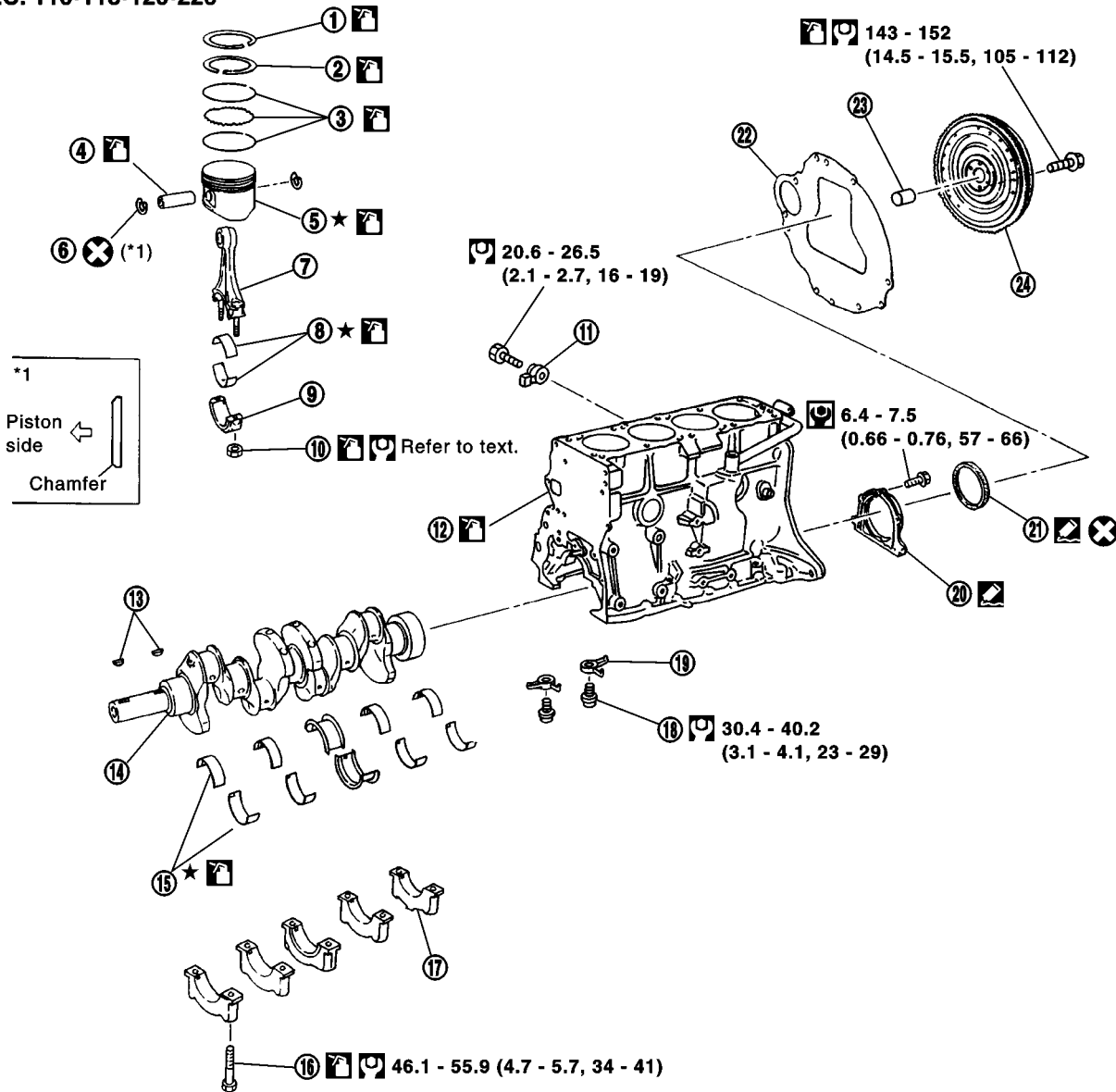


JPBIA2239GB

CYLINDER BLOCK

Disassembly and Assembly

SEC. 110•118•120•226



- ★ : Selecting parts
- : Apply new engine oil.
- : Apply genuine liquid gasket or equivalents.
- : N•m (kg-m, in-lb)
- : N•m (kg-m, ft-lb)

PBIC0475E

- | | | |
|--------------------------|---------------------------|----------------------|
| 1 Top ring | 2 Second ring | 3 Oil ring |
| 4 Piston pin | 5 Piston | 6 Snap ring |
| 7 Connecting rod | 8 Connecting rod bearing | 9 Connecting rod cap |
| 10 Connecting rod nut | 11 Knock sensor | 12 Cylinder block |
| 13 Key | 14 Crankshaft | 15 Main bearing |
| 16 Main bearing cap bolt | 17 Main bearing cap | 18 Bolt |
| 19 Oil jet | 20 Rear oil seal retainer | 21 Rear oil seal |
| 22 Rear plate | 23 Pilot bush | 24 Flywheel |

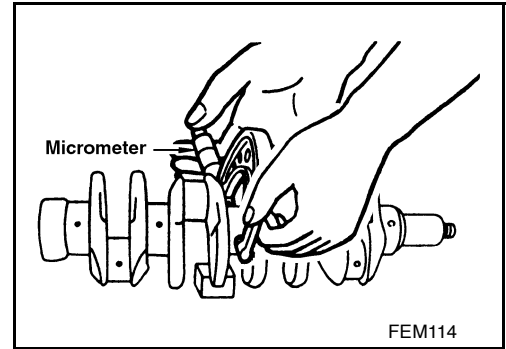
CAUTION:
Apply new engine oil to parts marked in illustration before installation.

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M

Crankshaft Journal Outer Diameter

Use micrometer to measure journal outer diameter.

Standard : 70.907 - 70.920 mm (2.7916 - 2.7921 in) dia.



Crankshaft Pin Outer Diameter

Use micrometer to measure pin outer diameter.

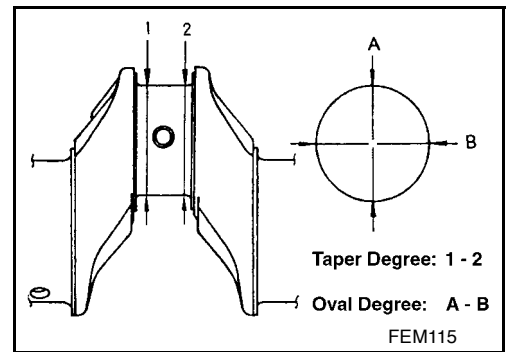
Standard : 56.913 - 56.926 mm (2.2407 - 2.2412 in) dia.

Crankshaft Out-of-Round and Taper

- Using micrometer, measure each journal and pin at 4 points shown in the figure.
- Out-of-round value is indicated by difference in dimensions between directions A and B at points 1 and 2.
- Taper value is indicated by difference in dimensions between points 1 and 2 in directions A and B.

Out-of-round limit : 0.01 mm (0.0004 in)

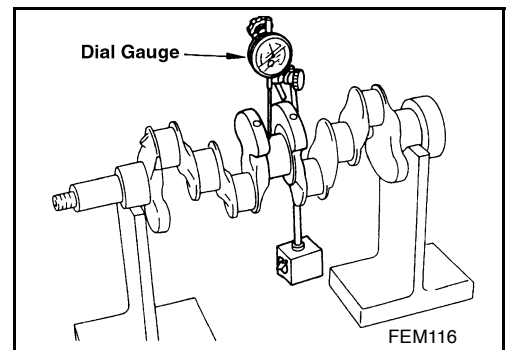
Taper limit : 0.01 mm (0.0004 in)



Crankshaft Runout

- Place V-block onto surface plate to support journals at both ends of crankshaft.
- Position dial indicator vertically onto No. 3 journal.
- Rotate crankshaft to read needle movement on dial indicator. (Total indicator reading)

Limit : 0.06 mm (0.0024 in)



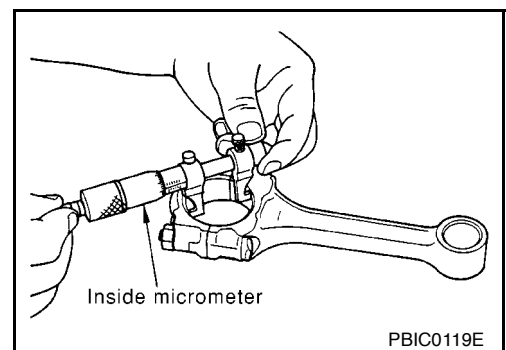
Connecting Rod Bearing Oil Clearance

Method by measurement

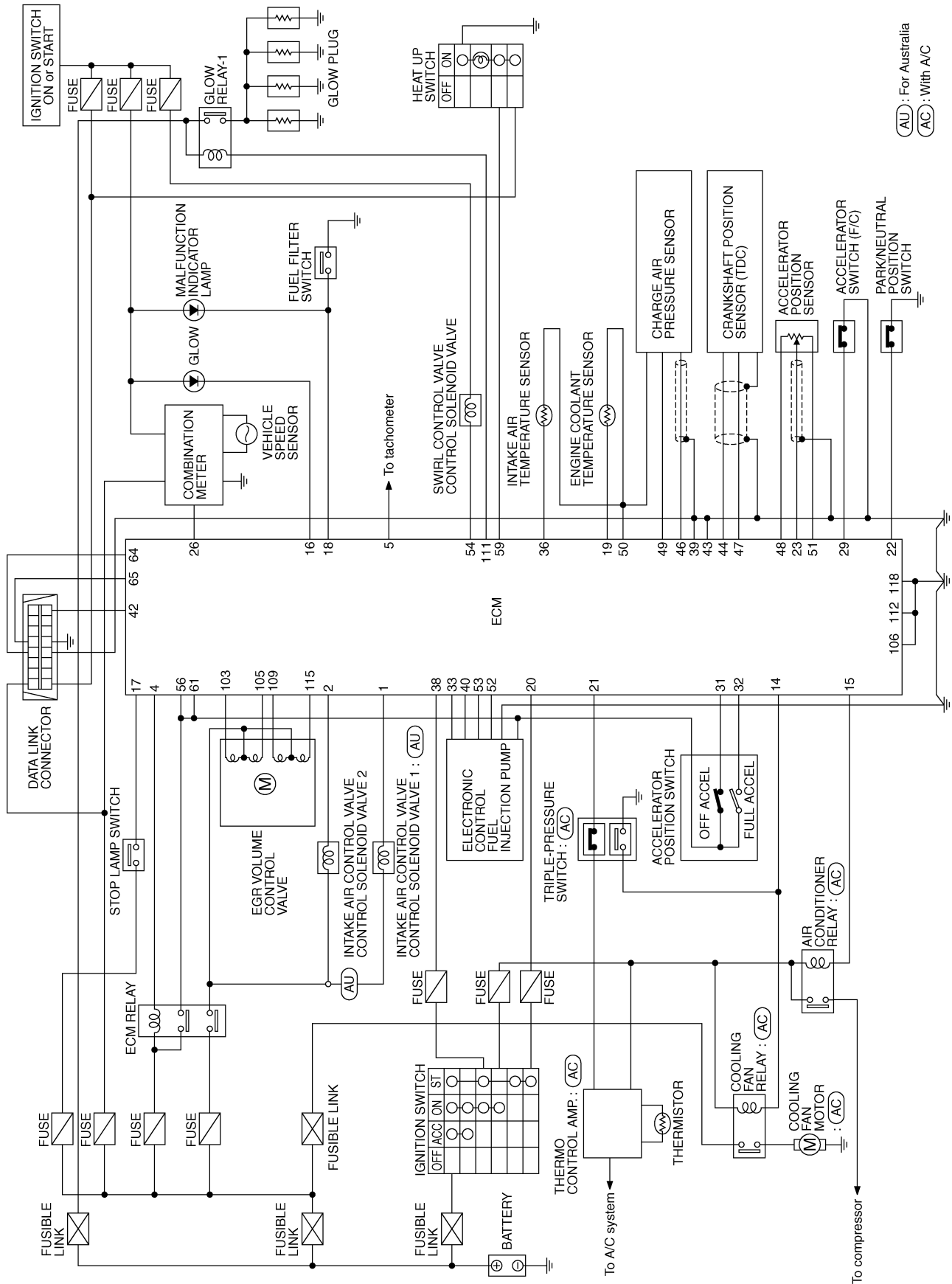
- Install connecting rod bearings to connecting rods and caps, and tighten connecting nuts to the specified torque. Use inside micrometer to measure connecting rod bearing inner diameter. (Bearing clearance) = (Connecting rod bearing inner diameter) - (Crankshaft pin outer diameter)

Standard : 0.035 - 0.077 mm (0.0014 - 0.0030 in)

- If out of specifications, check connecting rod big end inner diameter and crankshaft pin outer diameter, and select appropriate connecting rod bearing to adjust clearance to specifications. Refer to "Connecting rod bearing undersize list" on the next page.



Circuit Diagram

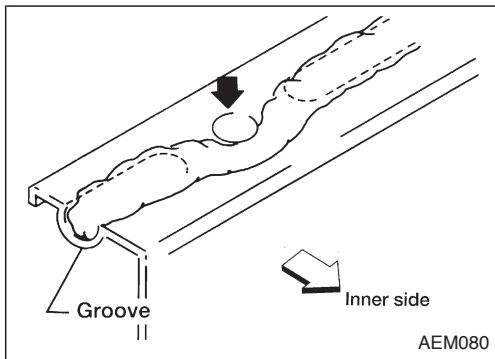
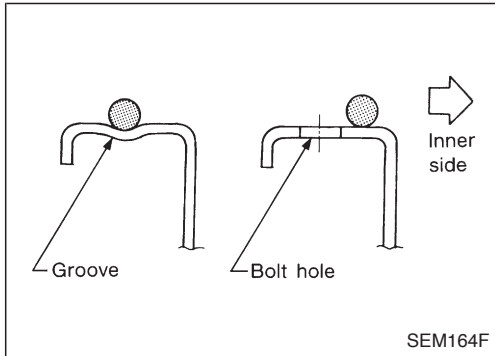


(AU) : For Australia
(AC) : With A/C

GI
MA
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LC
EC
FE
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IDX

Parts Requiring Angular Tightening

- Use an angle wrench for the final tightening of the cylinder head bolts.
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

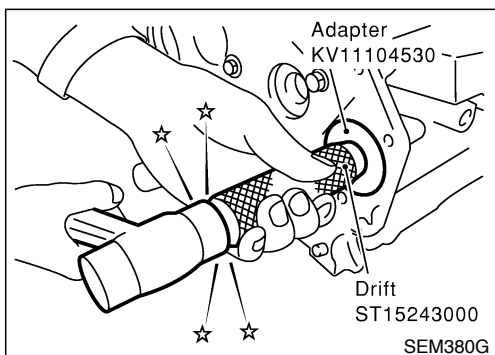
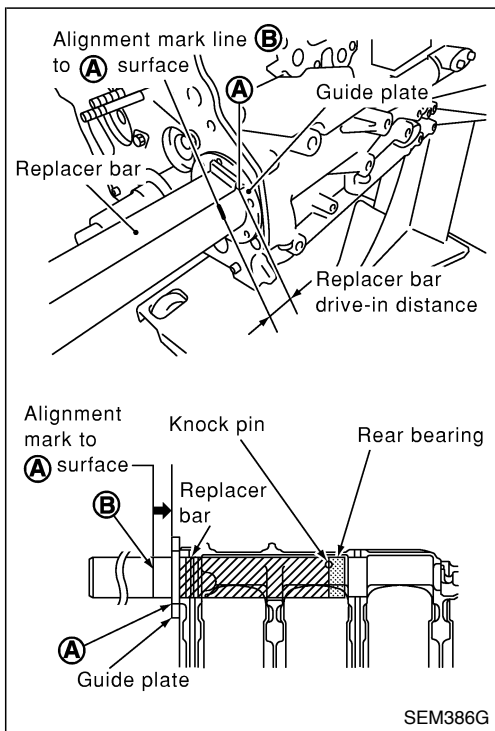
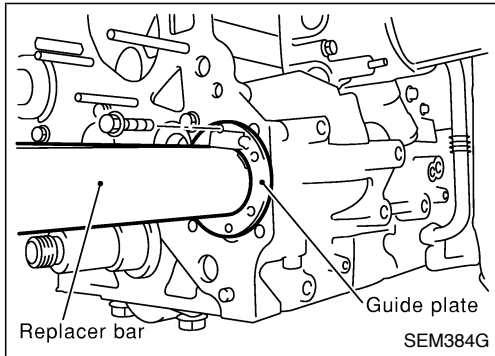
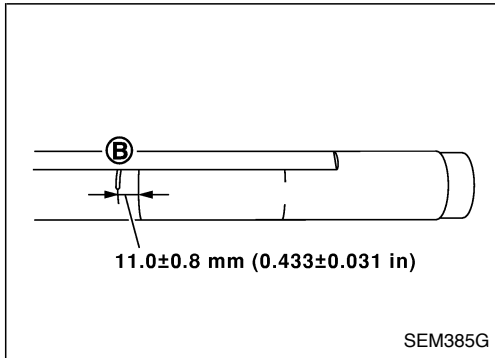


Liquid Gasket Application Procedure

1. Use a scraper to remove old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
 - Be sure liquid gasket diameter is as specified.
3. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
4. Assembly should be done within 5 minutes after coating.
5. Wait at least 30 minutes before refilling engine oil and engine coolant.

TIMING GEAR

Inspection (Cont'd)



- Make an alignment mark 11.0 ± 0.8 mm (0.433 ± 0.031 in) from the bar No. 2 engraved line with a marker pen. This alignment mark **(B)** will be the point to where the rear bearing is pushed.

- Insert the bar with the bearing installed into the cylinder block and install the guide plate (SST).
- Align the guide plate with the ZD engraving and install the bolts.

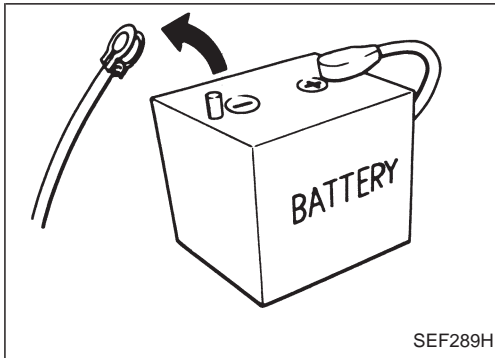
CAUTION:

Use a washer of the same thickness used on the front plate to prevent the guide plate from bending.

- Push the engraved bar alignment mark **(B)** to the same position of the guide plate tip **(A)**.
- After all the journals have been installed, make sure that all the journal and cylinder block oil holes are aligned.

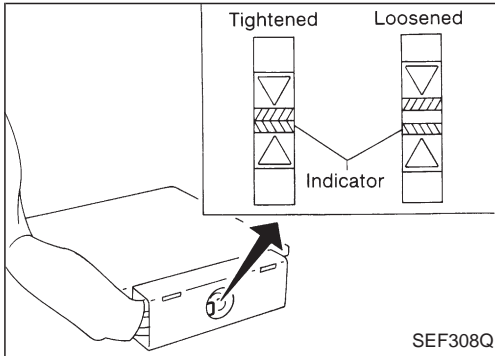
4. Install the front balancer shaft bearing.
 - Align the journal and cylinder block oil holes.
 - Use a drift (SST) to force in the tip of the journal to 8.0 ± 0.3 mm (0.315 ± 0.012 in) inside the cylinder block.
 - After installing the journal, make sure that the journal and cylinder block oil holes are aligned.

PRECAUTIONS AND PREPARATION




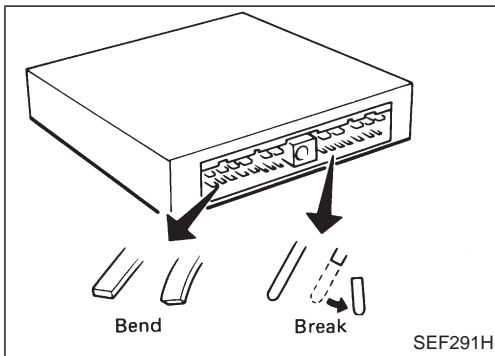
Precautions

- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.



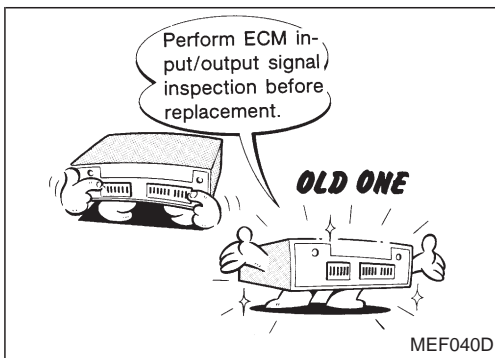
- When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.

 : 3.0 - 5.0 N·m (0.3 - 0.5 kg·m, 26 - 43 in·lb)

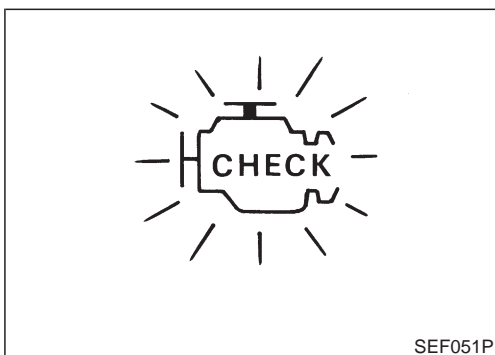


- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.



- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-54.

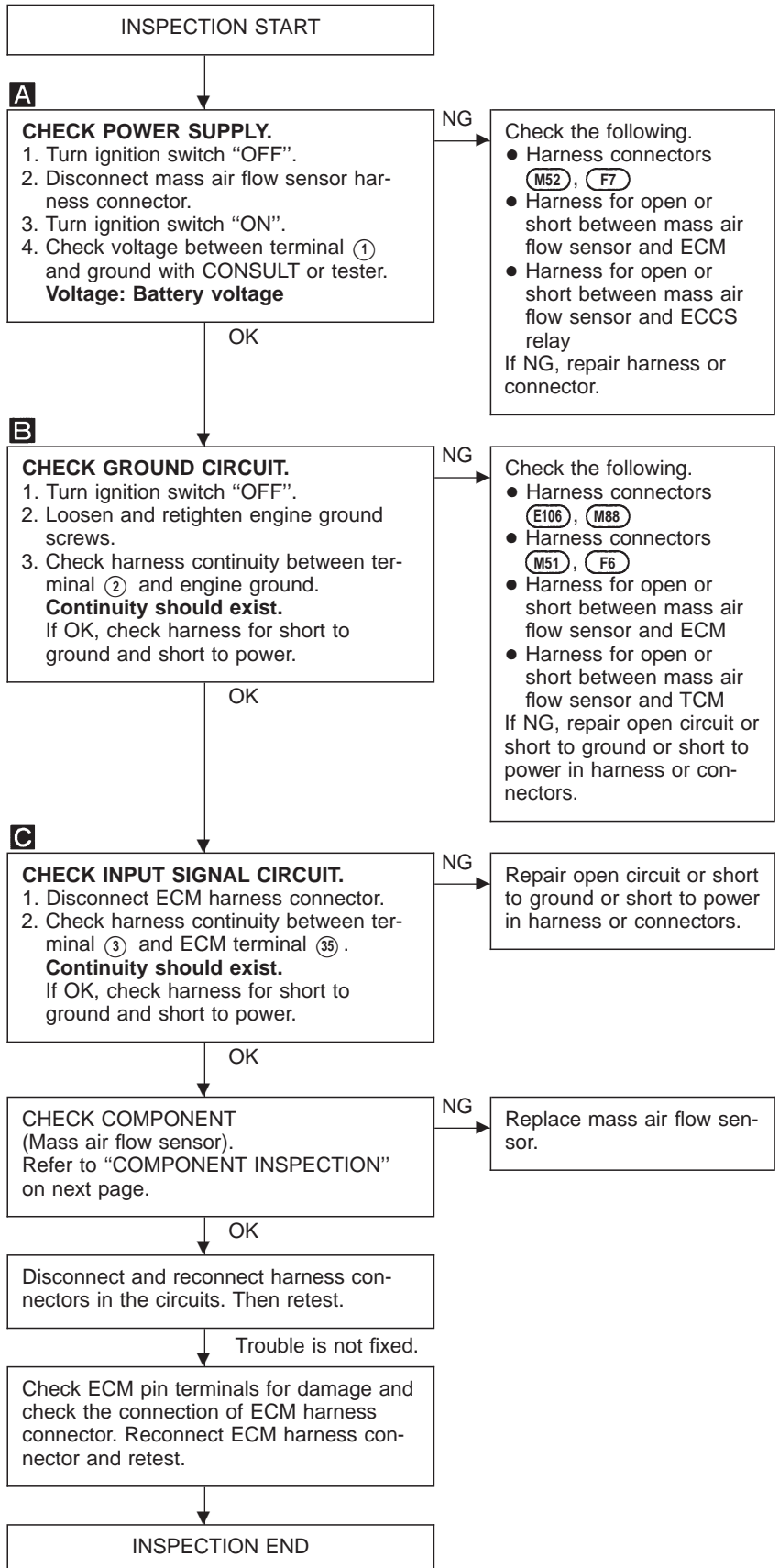
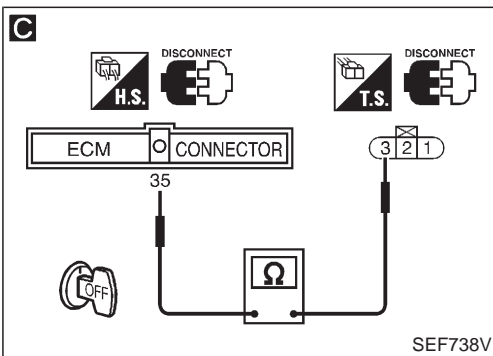
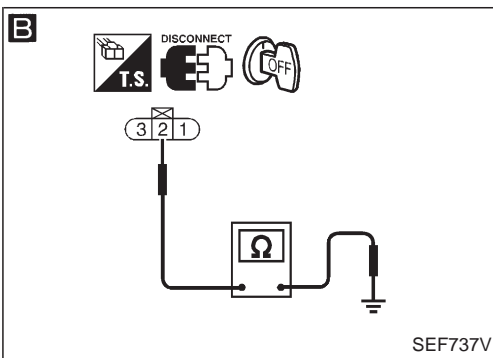
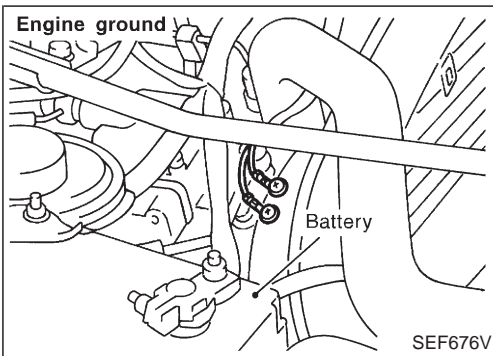
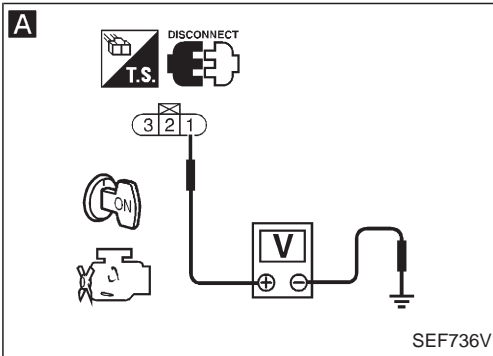
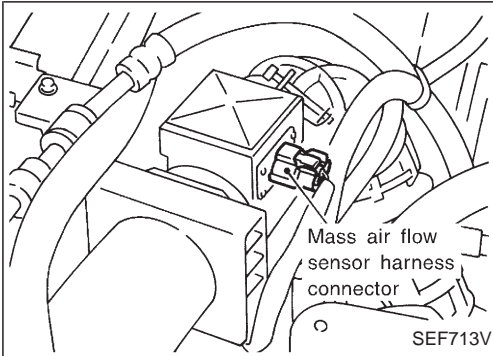


- If MIL illuminates or blinks irregularly when engine is running, water may have accumulated in fuel filter. Drain water from fuel filter. If this does not correct the problem, perform specified trouble diagnostic procedures.
- After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE". The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed. The "OVERALL FUNCTION CHECK" should be a good result if the repair is completed.

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

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

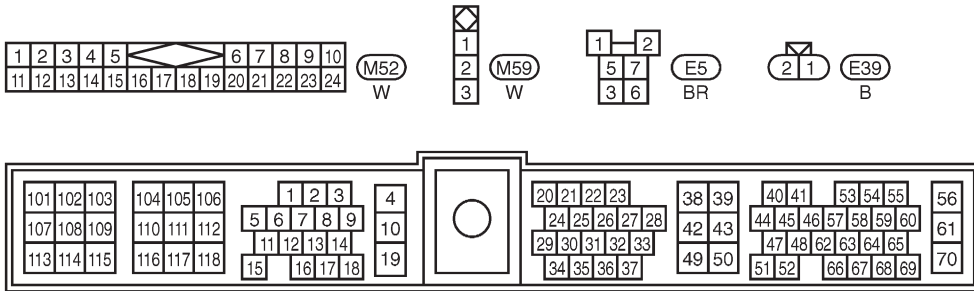
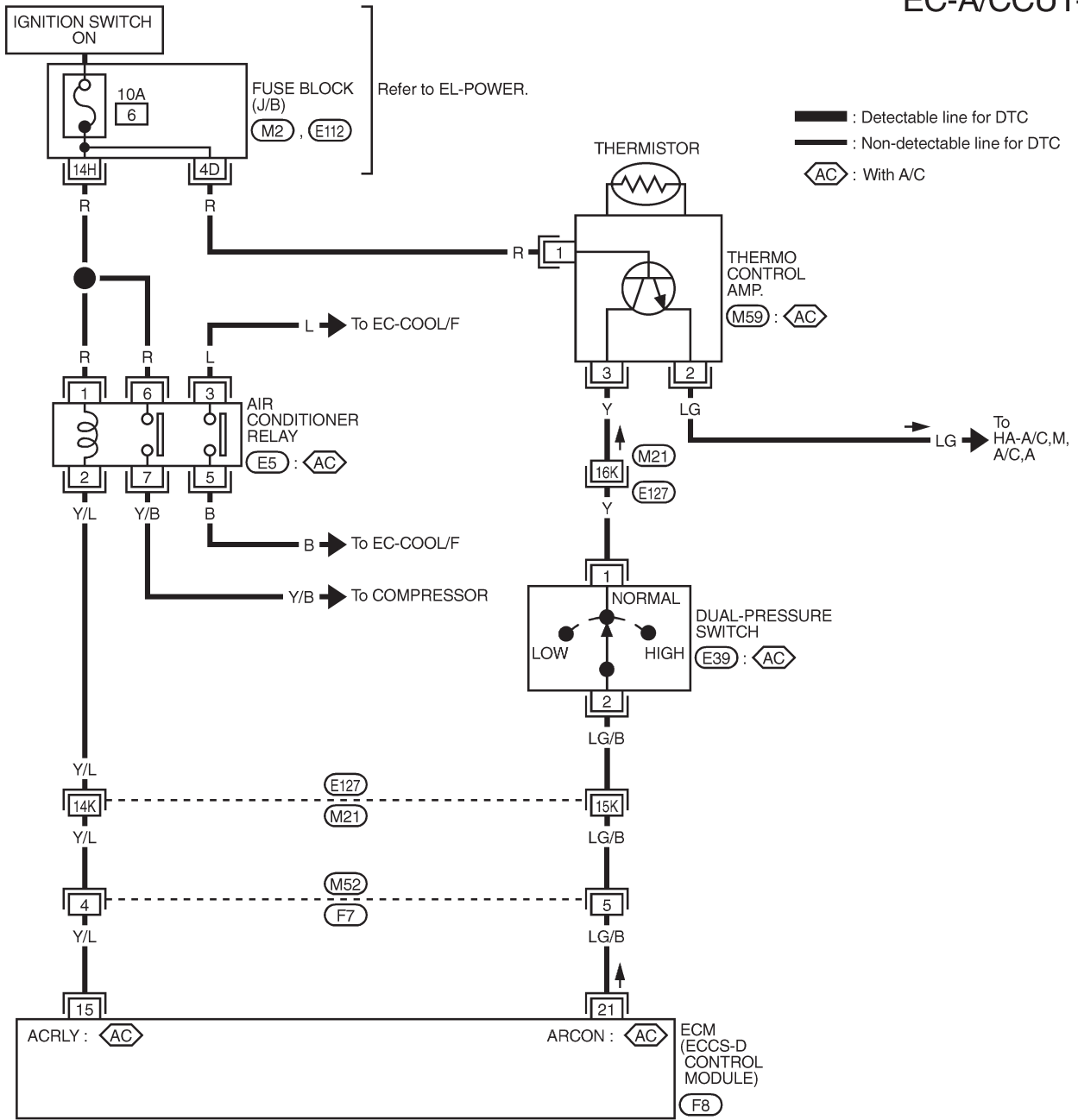
DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSES FOR NON-DETECTABLE ITEMS

Air Conditioner Control

EC-A/CCUT-01



Refer to last page (Foldout page).

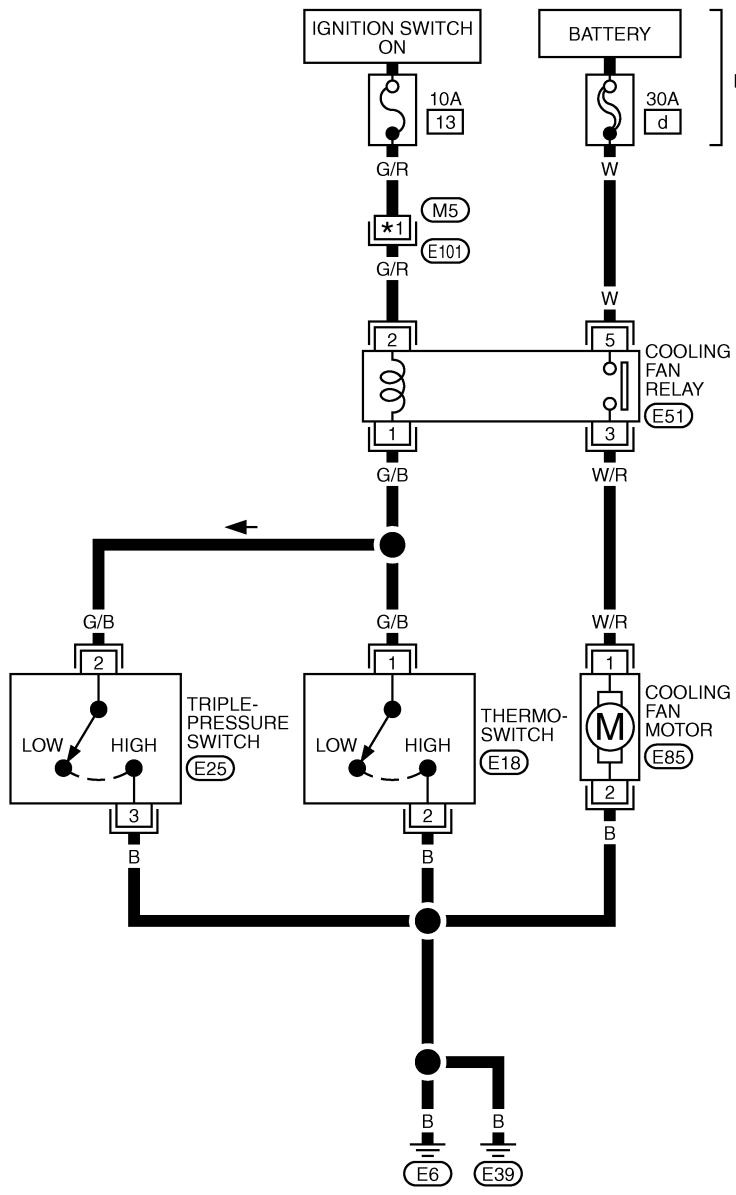
- M21, E127
- M2
- E112



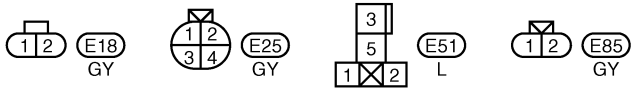
Wiring Diagram

LC-COOL/F-01

GI
MA
EM
LC
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FE
CL
MT
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PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX



Refer to EL-POWER.
 *1 12E : L
 12D : R



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