

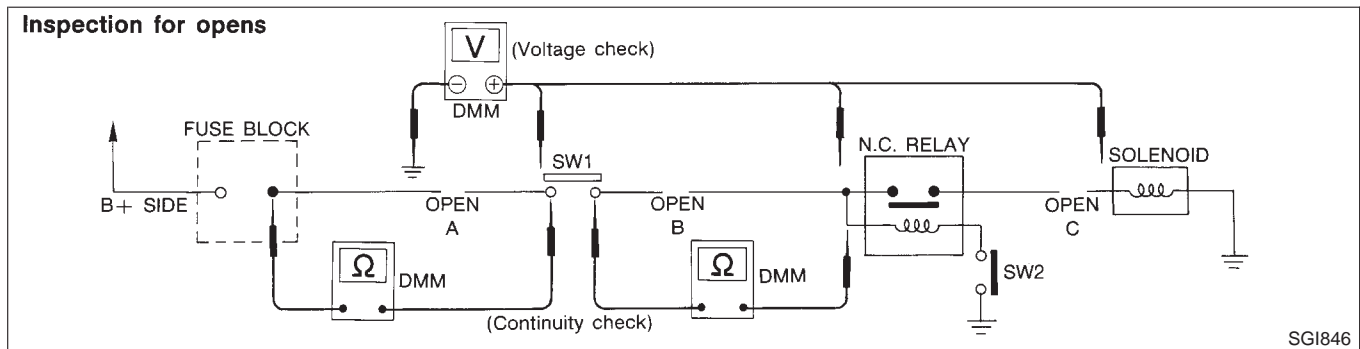
HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT

Circuit Inspection (Cont'd)

TESTING FOR "OPENS" IN THE CIRCUIT

NMGI0005S0302

Before you begin to diagnose and test the system, you should rough sketch a schematic of the system. This will help you to logically walk through the diagnosis process. Drawing the sketch will also reinforce your working knowledge of the system.



Continuity Check Method

The continuity check is used to find an open in the circuit. The Digital Multimeter (DMM) set on the resistance function will indicate an open circuit as over limit (no beep tone or no ohms symbol). Make sure to always start with the DMM at the highest resistance level.

To help in understanding the diagnosis of open circuits please refer to the schematic above.

- 1) Disconnect the battery negative cable.
- 2) Start at one end of the circuit and work your way to the other end. (At the fuse block in this example)
- 3) Connect one probe of the DMM to the fuse block terminal on the load side.
- 4) Connect the other probe to the fuse block (power) side of SW1. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point A)
- 5) Connect the probes between SW1 and the relay. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point B)
- 6) Connect the probes between the relay and the solenoid. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point C)

Any circuit can be diagnosed using the approach in the above example.

Voltage Check Method

To help in understanding the diagnosis of open circuits please refer to the previous schematic.

In any powered circuit, an open can be found by methodically checking the system for the presence of voltage. This is done by switching the DMM to the voltage function.

- 1) Connect one probe of the DMM to a known good ground.
- 2) Begin probing at one end of the circuit and work your way to the other end.
- 3) With SW1 open, probe at SW1 to check for voltage. voltage; open is further down the circuit than SW1. no voltage; open is between fuse block and SW1 (point A).
- 4) Close SW1 and probe at relay.

PRECAUTIONS

Parts Requiring Angular Tightening

Parts Requiring Angular Tightening

NMEM0001

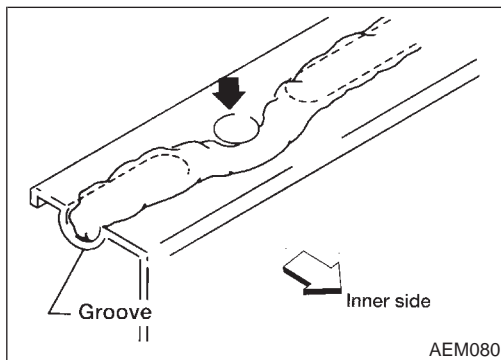
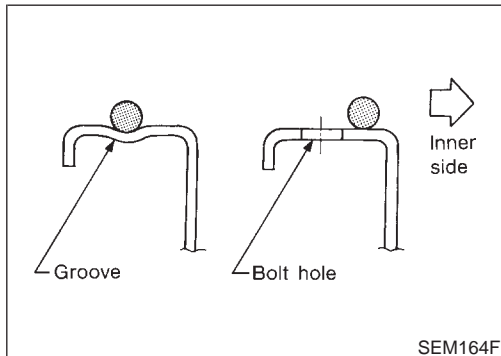
- Use an angle wrench for the final tightening of the following engine parts:
 - a) Cylinder head bolts
 - b) Main bearing cap bolts
 - c) Connecting rod cap nuts
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

GI

MA

EM

LC



Liquid Gasket Application Procedure

NMEM0002

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.)
 - For oil pan, be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).
 - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
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.

EC

FE

CL

MT

AT

PD

AX

SU

Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves

NMEM0042

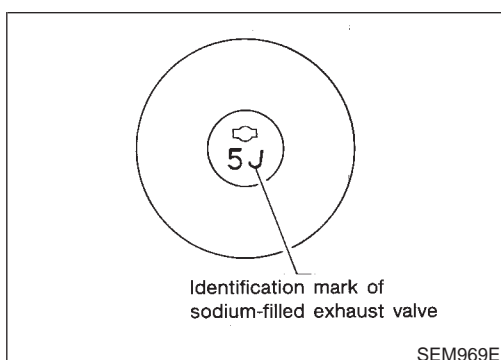
The handling and disposal of sodium-filled exhaust valves requires special care and consideration. Under conditions such as breakage with subsequent exposure to water, the sodium metal will react violently. The sodium metal, which lines the inner portion of the exhaust valve, forms sodium hydroxide. Also, it releases hydrogen gas which may result in an explosion or fire.

BR

ST

RS

BT



A sodium-filled exhaust valve is identified on the top of its stem as shown in illustration.

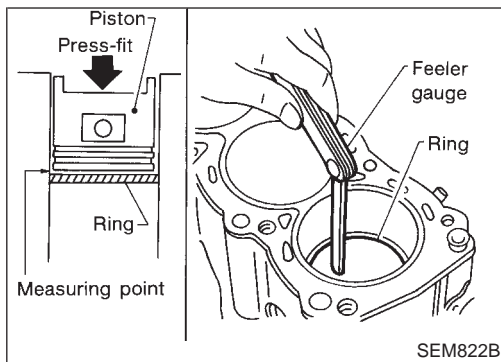
HA

SC

EL

IDX

NMEM0026S03



PISTON RING END GAP

End gap:

Top ring 0.20 - 0.30 mm (0.0079 - 0.0118 in)

2nd ring 0.35 - 0.50 mm (0.0138 - 0.0197 in)

Oil ring 0.20 - 0.60 mm (0.0079 - 0.0236 in)

Max. limit of ring gap:

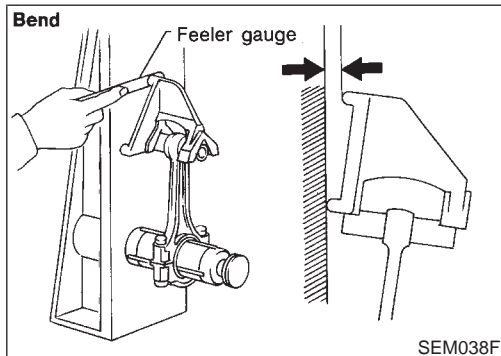
Top ring 0.39 mm (0.0154 in)

2nd ring 0.59 mm (0.0232 in)

Oil ring 0.60 mm (0.236 in)

If out of specification, replace piston ring. If gap exceeds maximum limit with a new ring, rebore cylinder and use oversized piston and piston rings. Refer to SDS, EM-90.

- When replacing the piston, check cylinder block surface for scratches or seizure. If scratches or seizure are found, hone or replace the cylinder block.



CONNECTING ROD BEND AND TORSION

NMEM0026S04

Bend:

Limit 0.15 mm (0.0059 in)

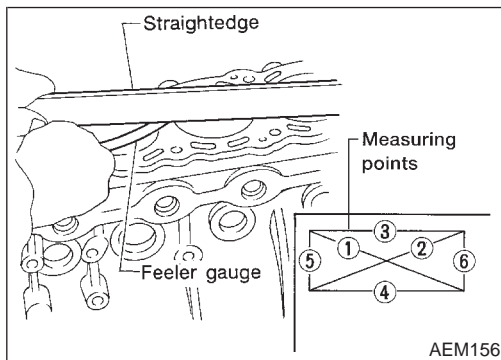
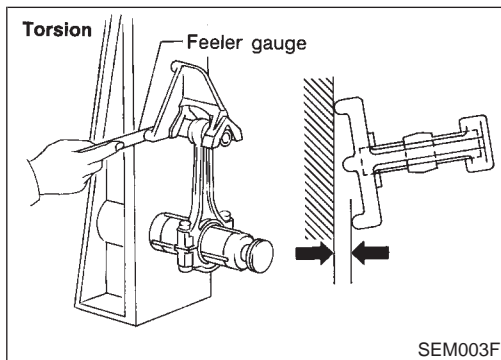
per 100 mm (3.94 in) length

Torsion:

Limit 0.30 mm (0.0118 in)

per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.



CYLINDER BLOCK DISTORTION AND WEAR

NMEM0026S05

Clean upper surface of cylinder block.

Use a reliable straightedge and feeler gauge to check the flatness of cylinder block surface. Check along six positions shown in figure.

Block surface flatness:

Standard Less than 0.03 mm (0.0012 in)

Limit 0.10 mm (0.0039 in)

If out of specification, resurface it.

The limit for cylinder block resurfacing is determined by the amount of cylinder head resurfacing.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

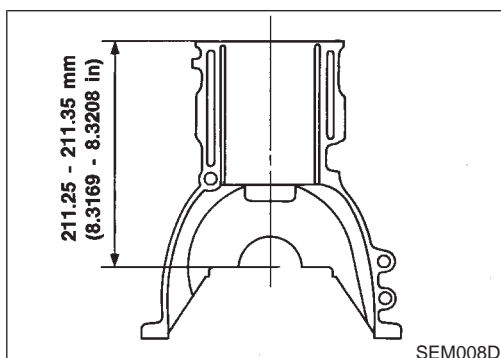
A + B = 0.2 mm (0.008 in)

Nominal cylinder block height

from crankshaft center:

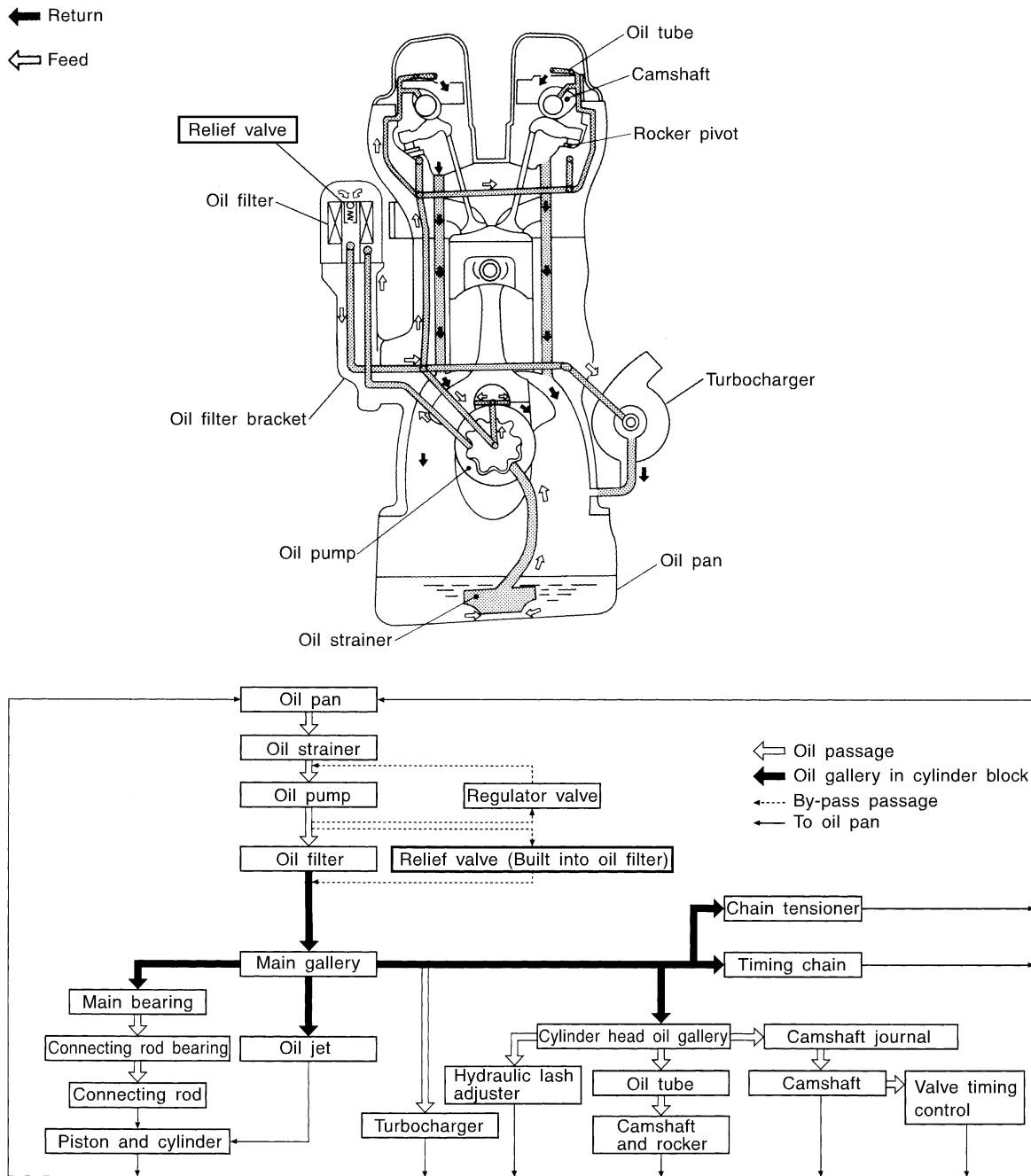
211.25 - 211.35 mm (8.3169 - 8.3208 in)

If necessary, replace cylinder block.

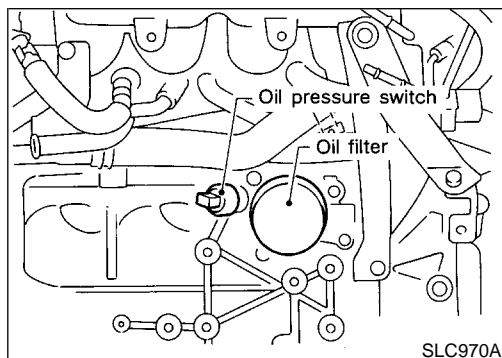


Lubrication Circuit

NMLC0003



SLC401B



Oil Pressure Check

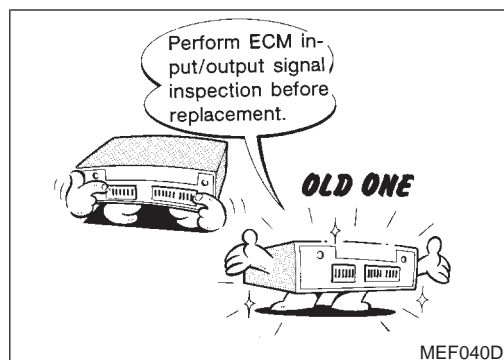
WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
 - For M/T models, put gearshift lever in Neutral "N" position. For A/T models, put selector lever in Park "P" position.
- Check oil level.
 - Remove oil pressure switch.

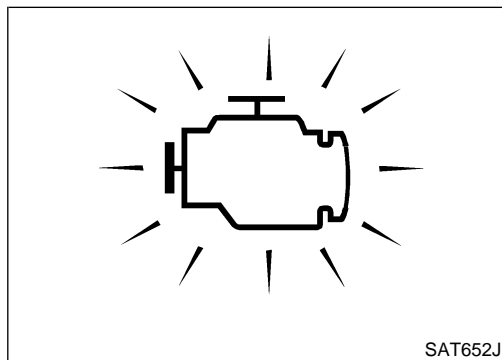
NMLC0004

PRECAUTIONS

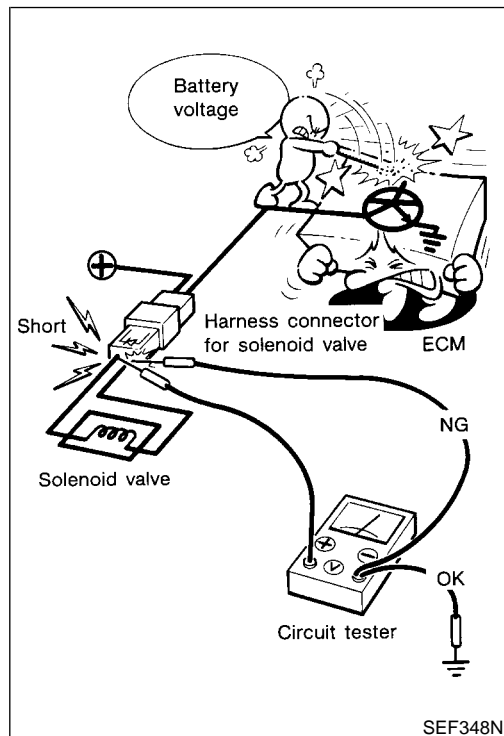
Engine Fuel & Emission Control System (Cont'd)



- 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 IAC valve-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor and crankshaft position sensor.
- Before replacing ECM, perform refer to “ECM Terminals and Reference Value” inspection and make sure ECM functions properly, EC-76.



- After performing each TROUBLE DIAGNOSIS, perform “DTC Confirmation Procedure” or “Overall Function Check”.
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.



- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
VHCL SPEED SE [km/h] or [mph]	○	○	<ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed sensor signal is displayed. 	
BATTERY VOLT [V]	○	○	<ul style="list-style-type: none"> The power supply voltage of ECM is displayed. 	
THRTL POS SEN [V]	○	○	<ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. 	
START SIGNAL [ON/OFF]	○	○	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the starter signal. 	<ul style="list-style-type: none"> After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	○	○	<ul style="list-style-type: none"> Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal. 	
AIR COND SIG [ON/OFF]	○	○	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. 	
P/N POSI SW [ON/OFF]	○	○	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal. 	
PW/ST SIGNAL [ON/OFF]	○	○	<ul style="list-style-type: none"> [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated. 	
LOAD SIGNAL [ON/OFF]	○	○	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the electrical load signal and/or lighting switch. ON ... rear defogger is operating and/or lighting switch is on. OFF ... rear defogger is not operating and lighting switch is not on. 	
INJ PULSE [msec]		○	<ul style="list-style-type: none"> Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		○	<ul style="list-style-type: none"> Indicates the ignition timing computed by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated.
IACV-AAC/V [%]		○	<ul style="list-style-type: none"> Indicates the IACV-AAC valve control value computed by ECM according to the input signals. 	
W/G CONT S/V [%]		○	<ul style="list-style-type: none"> Indicates the wastegate valve control solenoid valve control value computed by the ECM according to the input signals. 	
AIR COND RLY [ON/OFF]		○	<ul style="list-style-type: none"> The air conditioner relay control condition (determined by ECM according to the input signal) is indicated. 	
FUEL PUMP RLY [ON/OFF]		○	<ul style="list-style-type: none"> Indicates the fuel pump relay control condition determined by ECM according to the input signals. 	

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

Symptom Matrix Chart (Cont'd)

		SYMPTOM												Reference section	
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION		
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine	Cylinder head	5	5	5	5	5		5	5			5	3	EM section	
	Cylinder head gasket										4				
	Cylinder block												4		
	Piston														
	Piston ring	6	6	6	6	6		6	6			6			
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mechanism	Timing chain													FE section	
	Camshaft	5	5	5	5	5		5	5			5	3		
	Intake valve														
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5	5	5		5				MA, EM, LC section	
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5		LC section	
	Oil level (Low)/Filthy oil														
Cooling	Radiator/Hose/Radiator filler cap													EC section	
	Thermostat									5					
	Water pump														
	Water gallery	5	5	5	5	5		5	5		4	5			
	Cooling fan									5					
	Coolant level (low)/Contaminated coolant														

1 - 6: The numbers refer to the order of inspection.

DTC 0504 A/T CONTROL

System Description

System Description

These circuit lines are used to control the smooth shifting up and down of A/T during the hard acceleration/deceleration. Pulse signals are exchanged between ECM and TCM (Transmission control module). NMEC0721

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground. NMEC0722

CAUTION:

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

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	PU/W	A/T signal No. 3	[Engine is running] ● Idle speed	0 - 0.1V
44	L/W	A/T signal No. 2	[Engine is running] ● Idle speed	6 - 8V
45	L/OR	A/T signal No. 1	[Engine is running] ● Idle speed	6 - 8V

On Board Diagnosis Logic

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
0504	● ECM receives incorrect voltage from TCM (Transmission control module) continuously.	● Harness or connectors [The circuit between ECM and TCM (Transmission control module) is open or shorted.]

DATA MONITOR

MONITOR

NO DTC

CMPS-RPM (REF) XXX rpm

SEC447C

DTC Confirmation Procedure

NMEC0724

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.

TESTING CONDITION:

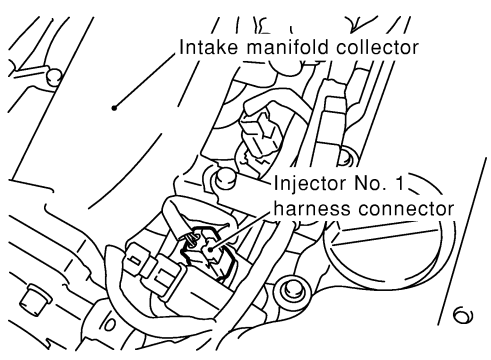
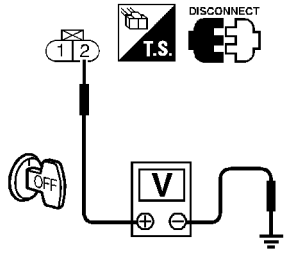
Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

④ With CONSULT-II

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine, and let it idle for at least 15 seconds.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-151.

INJECTOR

Diagnostic Procedure (Cont'd)

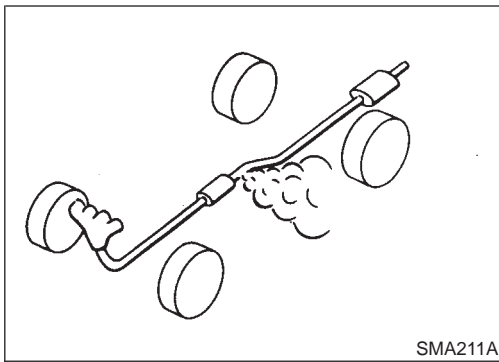
2	CHECK POWER SUPPLY	
<ol style="list-style-type: none"> 1. Stop engine. 2. Disconnect injector harness connector. 		
		
<ol style="list-style-type: none"> 3. Turn ignition switch "ON". 4. Check voltage between terminal 2 and ground with CONSULT-II or tester. 		
		
<p>Voltage: Battery voltage</p>		
<p>OK or NG</p>		
OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART	
<p>Check the following.</p> <ul style="list-style-type: none"> • 10A fuse • Harness connectors M60, F4 • Harness connectors F27, F111 • Harness for open or short between injector and fuse 		
	▶	Repair harness or connectors.

4	CHECK OUTPUT SIGNAL CIRCUIT	
<ol style="list-style-type: none"> 1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between injector harness connector terminal 1 and ECM terminals 101, 103, 110, 112. Refer to wiring diagram. 		
<p>Continuity should exist.</p>		
<ol style="list-style-type: none"> 4. Also check harness for short to ground and short to power. 		
<p>OK or NG</p>		
OK	▶	GO TO 6.
NG	▶	GO TO 5.

EXHAUST SYSTEM

Checking Exhaust System



SMA211A

Checking Exhaust System

NMFE0012

Check exhaust pipes, muffler and mounting for improper attachment, leaks, cracks, damage, chafing or deterioration.

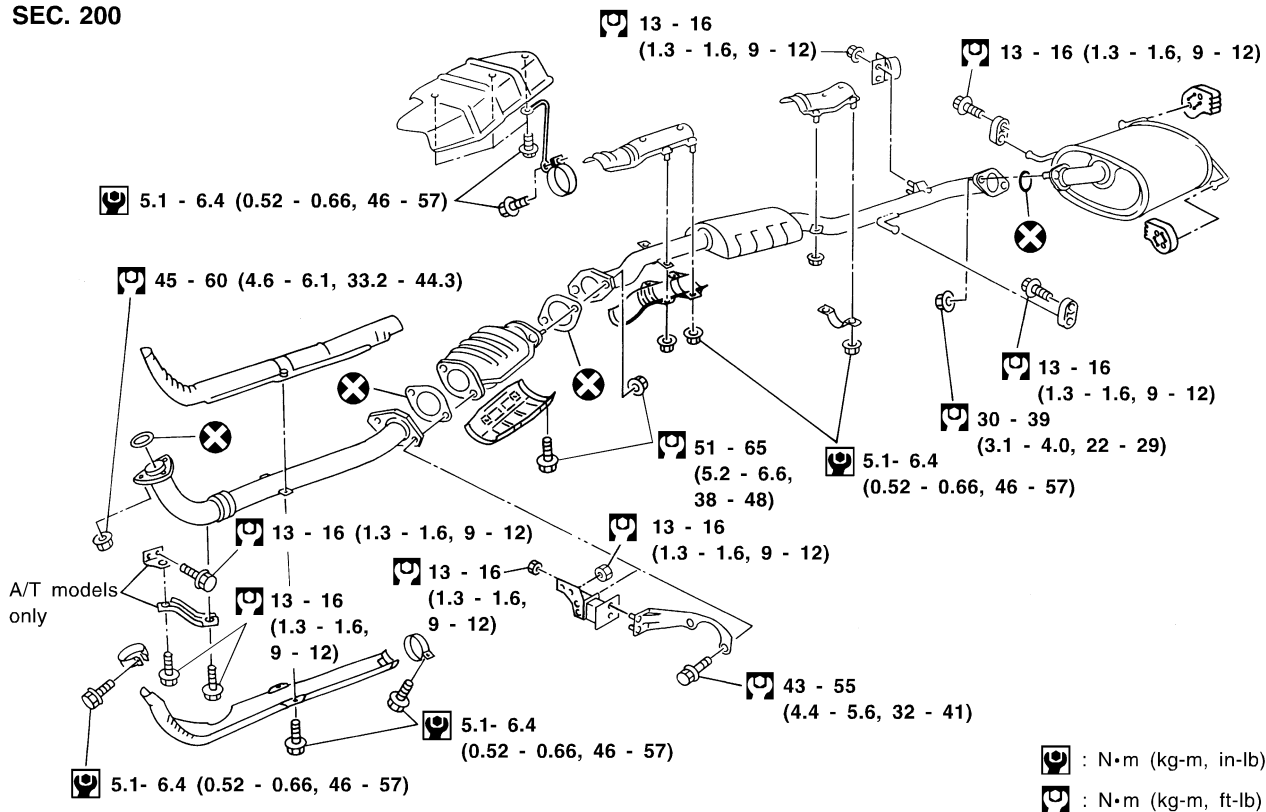
Removal and Installation

NMFE0005

CAUTION:

- Always replace exhaust gaskets with new ones when reassembling.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- Check to ensure that mounting brackets and mounting insulators are installed properly and free from undue stress. Improper installation could result in excessive noise or vibration.

SEC. 200



SFE694A

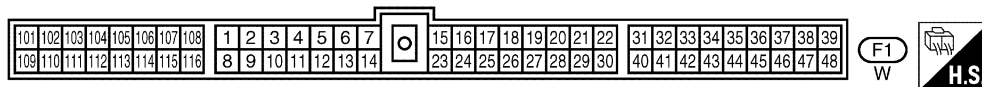
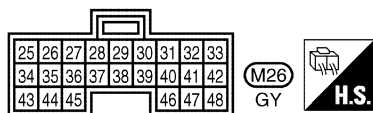
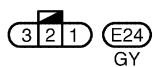
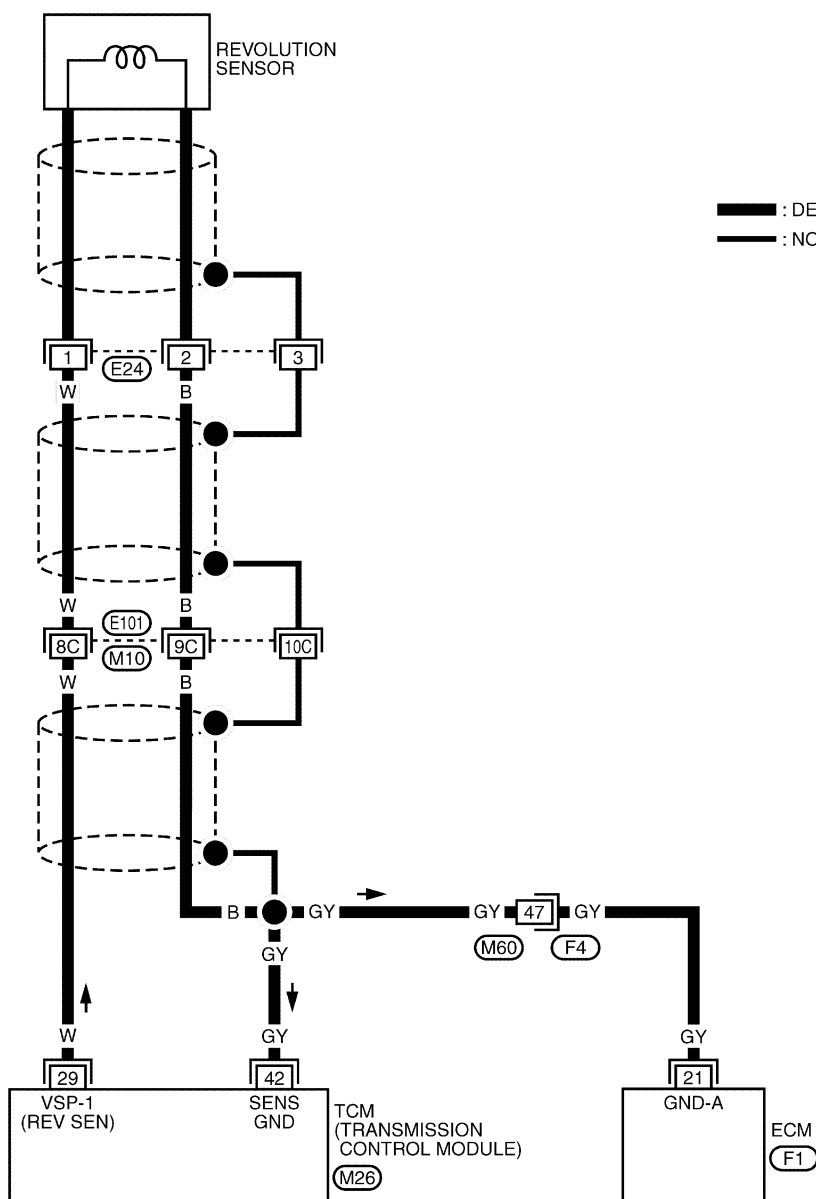
TROUBLE DIAGNOSIS FOR VHCL SPEED SEN-A/T (REVOLUTION SENSOR)

Wiring Diagram — AT — VSSA/T

Wiring Diagram — AT — VSSA/T

NMAT0188

AT-VSSA/T-01



REFER TO THE FOLLOWING.
E101, F4 -SUPER
MULTIPLE JUNCTION (SMJ)

TROUBLE DIAGNOSES FOR SYMPTOMS




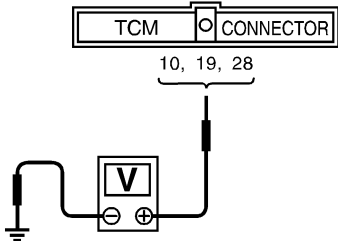
1. POWER Indicator Lamp Does Not Come On




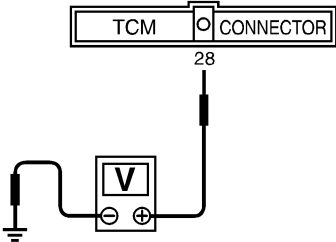
1. POWER Indicator Lamp Does Not Come On

NIMAT0073

SYMPTOM:

POWER indicator lamp does not come on for about 2 seconds when turning ignition switch to “ON”.

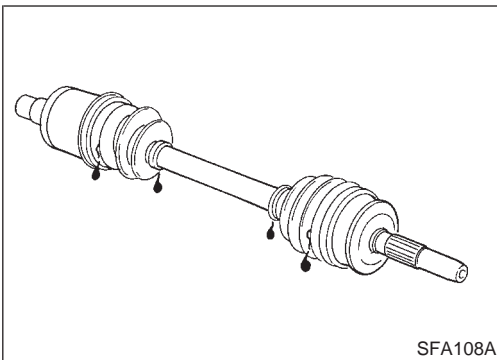
1	CHECK TCM POWER SOURCE STEP 1	
<div>1. Turn ignition switch to ON position. (Do not start engine.)</div> <div>2. Check voltage between TCM harness connector M25, M26 terminal Nos. 10 (G/OR), 19 (G/OR), 28 (R/W) and ground.</div>		
<div><div><div><div>CONNECT</div><div></div></div><div><div>H.S.</div><div></div></div><div><div>ON</div><div></div></div></div><div><div>TCM</div><div>CONNECTOR</div></div><div><div>10, 19, 28</div><div></div></div><div><div>Voltage:</div><div>Battery voltage</div></div></div> <div>SAT611J</div> <div>OK or NG</div>		
OK	▶	GO TO 2.
NG	▶	GO TO 3.

2	CHECK TCM POWER SOURCE STEP 2										
<div>1. Turn ignition switch to OFF position.</div> <div>2. Check voltage between TCM harness connector M26 terminal No. 28 (R/W) and ground.</div> <div><div><div><div>CONNECT</div><div></div></div><div><div>H.S.</div><div></div></div><div><div>OFF</div><div></div></div></div><div><div><div>TCM</div><div>○</div><div>CONNECTOR</div></div><div>28</div><div></div></div><div><div>Voltage:</div><div>Battery voltage</div></div><div>SAT612JE</div></div> <tr><td colspan="3">OK or NG</td></tr> <tr><td>OK</td><td>▶</td><td>GO TO 4.</td></tr> <tr><td>NG</td><td>▶</td><td>GO TO 3.</td></tr>			OK or NG			OK	▶	GO TO 4.	NG	▶	GO TO 3.
OK or NG											
OK	▶	GO TO 4.									
NG	▶	GO TO 3.									

3	DETECT MALFUNCTIONING ITEM	
Check the following items: <ul style="list-style-type: none">● Harness for short or open between ignition switch and TCM terminals 10, 19 and 28 (Main harness)● Ignition switch and 10A fuse [No. 12 or 28, located in the fuse block (J/B)] Refer to EL-7, "Schematic".		
OK or NG		
OK	▶	GO TO 4.
NG	▶	Repair or replace damaged parts.

REAR AXLE

On-vehicle Service (Cont'd)



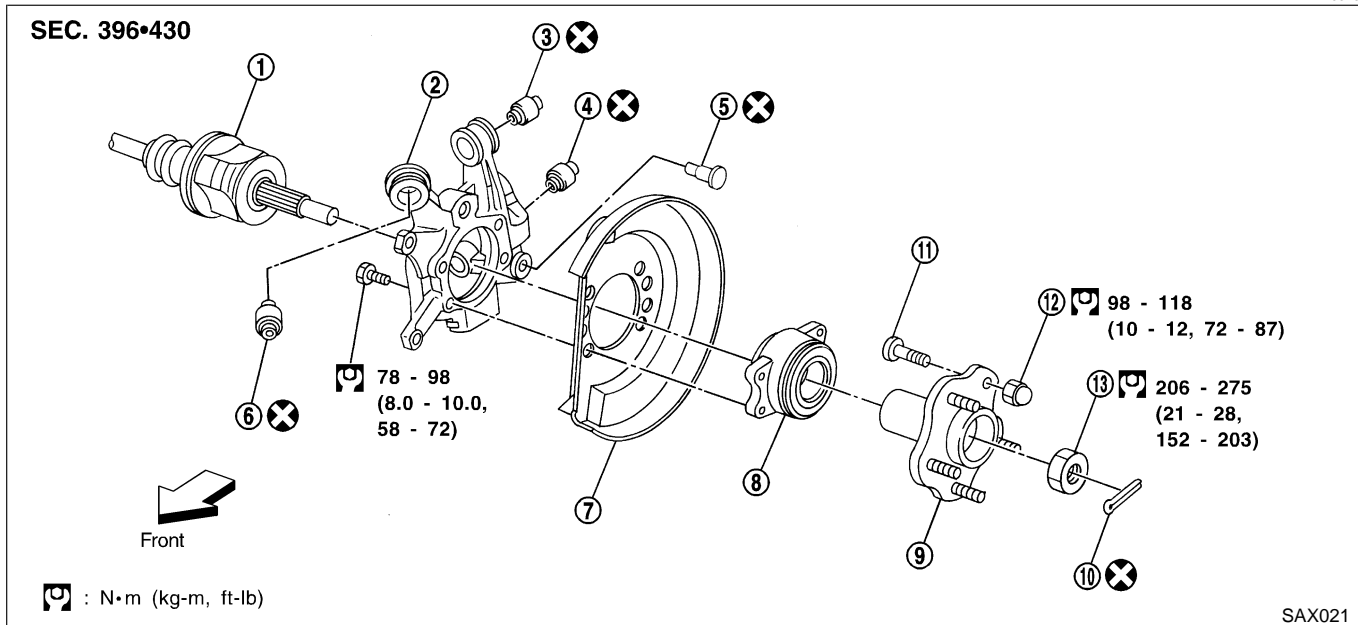
DRIVE SHAFT

Check for grease leakage or other damage.

NMAX0007

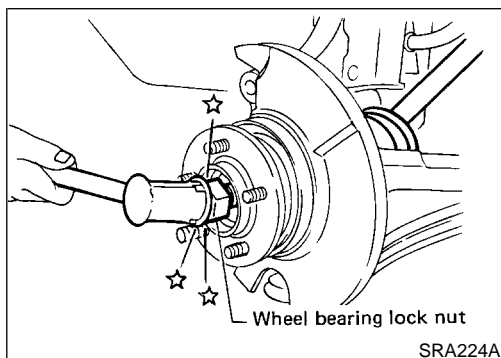
Wheel Hub and Axle Housing COMPONENTS

NMAX0028



SAX021

- | | | |
|-----------------------|------------------------------|----------------------------|
| 1. Drive shaft | 6. Bushing | 10. Cotter pin |
| 2. Axle housing | 7. Baffle plate | 11. Hub bolt |
| 3. Bushing | 8. Wheel bearing with flange | 12. Wheel nut |
| 4. Bushing | 9. Wheel hub | 13. Wheel bearing lock nut |
| 5. Shock absorber pin | | |



SRA224A

REMOVAL

1. Remove wheel bearing lock nut.
2. Separate drive shaft from axle housing by lightly tapping it. If it is hard to remove use puller.

When removing drive shaft, cover boots with shop towel to prevent them from being damaged.

NMAX0029


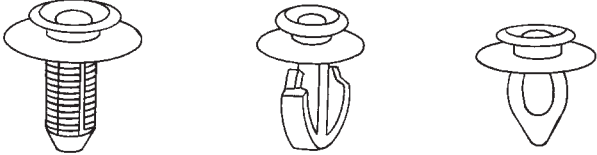


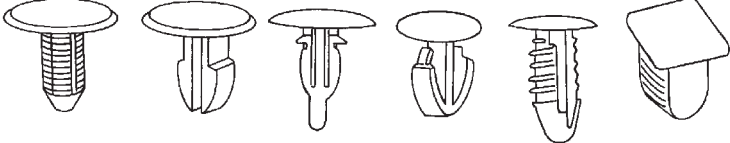
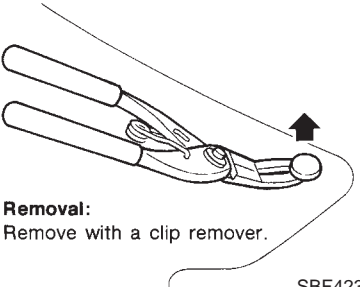

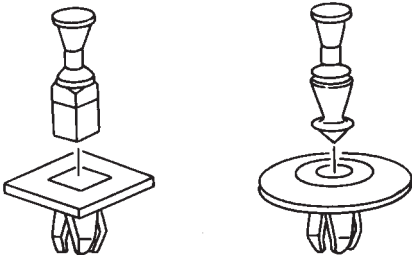
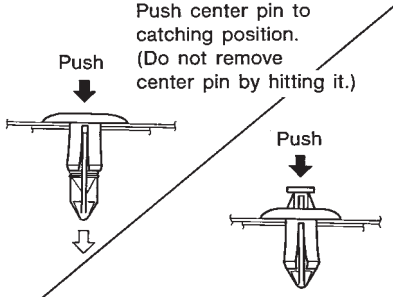

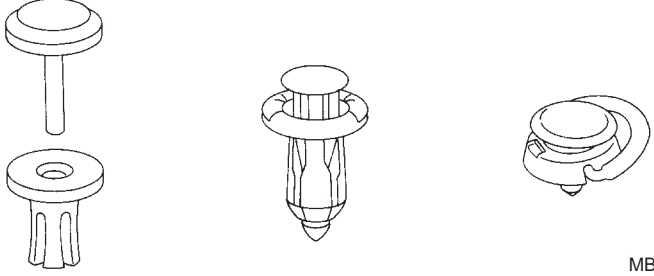
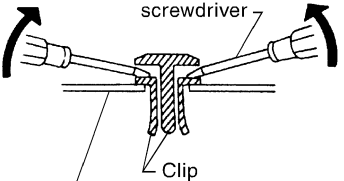

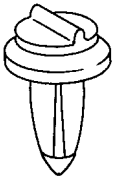
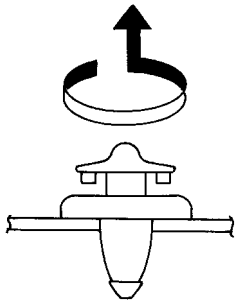
CLIP AND FASTENER

Description

Description

NMBT0003

- Clips and fasteners in BT section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

Symbol No.	Shapes	Removal & Installation
C101	  <p>SBF302H</p>	<p>Removal: Remove by bending up with flat-bladed screwdrivers or clip remover.</p>  <p>SBF367BA</p>
C103	  <p>SBT095</p>	 <p>Removal: Remove with a clip remover.</p> <p>SBF423H</p>
C203	  <p>SBF258G</p>	<p>Push center pin to catching position. (Do not remove center pin by hitting it.)</p>  <p>Installation:</p> <p>SBF708E</p>
C205	  <p>MBT080A</p>	<p>Removal: Flat-bladed screwdriver</p>  <p>Clip</p> <p>Finisher</p> <p>SBF638CA</p>
C206	  <p>MBF519B</p>	 <p>MBF520B</p>