FRONT AXLE & FRONT SUSPENSION

SECTION FA

GI MA EM LC EC FE AT PD FA RA BR ST RS BT HA EL IDX

CONTENTS

Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

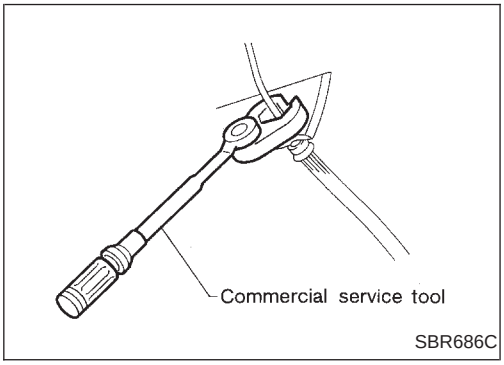
The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to INFINITI Q45 is as follows:

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), satellite sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by intentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape (except satellite sensor and side air bag module) either just before the harness connectors or for the complete harness are related to the SRS.**

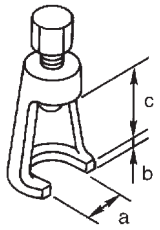
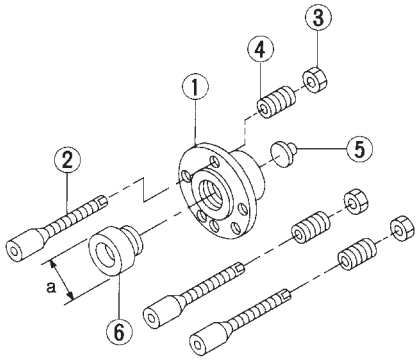
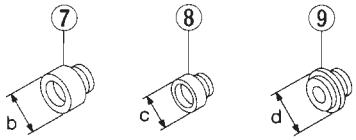
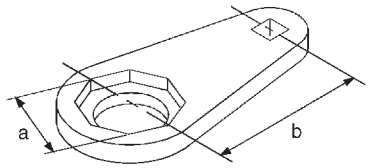
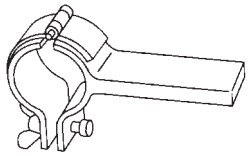


Precautions for Brake System

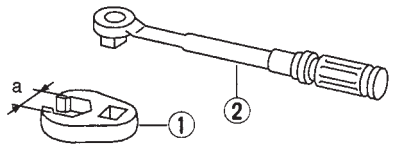
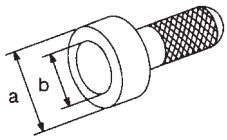
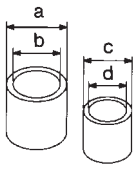
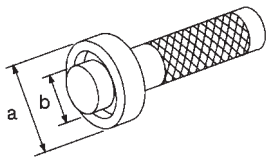
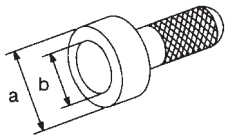
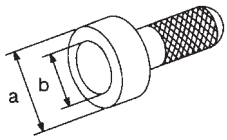
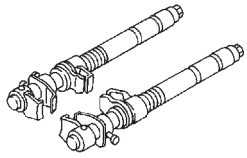
- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **After installing removed suspension parts, check wheel alignment and adjust if necessary.**
- **Use flare nut wrench when removing or installing brake tubes.**
- **Always torque brake lines when installing.**

Special Service Tools

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
ST29020001 (J24319-01) Pitman arm puller	NT694 	Removing tie-rod outer end and lower ball joint **a: 34 mm (1.34 in)** **b: 6.5 mm (0.256 in)** **c: 61.5 mm (2.421 in)**
KV991040S0 (—) C.C.K. holder KV99104010 Attachment set ① Plate ② Guide bolts ③ Nuts ④ Springs ⑤ Center plate ⑥ KV99104020 Adapter A ⑦ KV99104030 Adapter B ⑧ KV99104040 Adapter C ⑨ KV99104050 Adapter D	 NT498 	Attaching wheel alignment gauge **a: 72 mm (2.83 in) dia.** **b: 65 mm (2.56 in) dia.** **c: 57 mm (2.24 in) dia.** **d: 53.4 mm (2.102 in) dia.**
ST35490001 (J26083) Gland packing wrench	NT383 	Removing and installing gland packing **a: 58 mm (2.28 in)** **b: 100 mm (3.94 in)**
ST35652000 (—) Strut attachment	NT145 	Fixing strut assembly

Commercial Service Tools

Tool name	Description	
① Flare nut crowfoot ② Torque wrench	 NT360	Removing and installing each brake piping **a: 10 mm (0.39 in)**
Front axle grease seal drift	 NT115	Installing front axle grease seal **a: 75 mm (2.95 in) dia.** **b: 65 mm (2.56 in) dia.**
Tension rod bushing drift	 NT155	Removing and installing tension rod bushing **a: 75 mm (2.95 in) dia.** **b: 66 mm (2.60 in) dia.** **c: 62 mm (2.44 in) dia.** **d: 25 - 55 mm (0.98 - 2.17 in) dia.**
Wheel bearing drift	 NT084	Removing wheel bearing **a: 49 mm (1.93 in) dia.** **b: 41 mm (1.61 in) dia.**
Wheel bearing drift	 NT115	Installing wheel bearing **a: 66 mm (2.60 in) dia.** **b: 60 mm (2.36 in) dia.**
Cap drift	 NT115	Installing hub cap **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**
Spring compressor	 NT717	Removing and installing coil spring

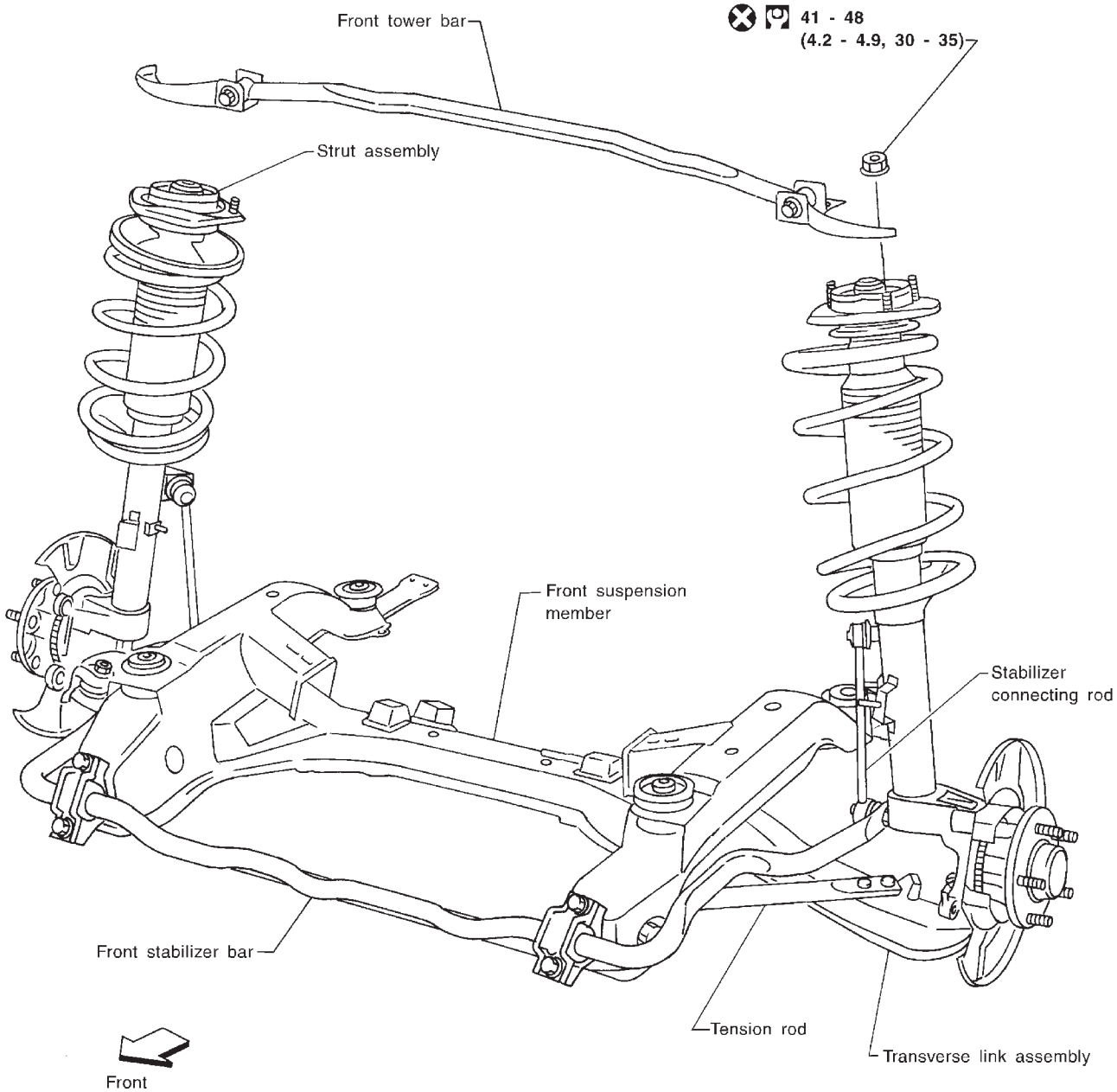
NVH Troubleshooting Chart

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

Reference page			FA-6, 17	FA-18	—	—	—	FA-17	FA-9	FA-22	FA-14	FA-10	—	—	—	—	—	—	NVH in PD section	NVH in PD section	Refer to FRONT AXLE AND FRONT SUSPENSION in this chart.	NVH in RA section	Refer to TIRES in this chart.	Refer to ROAD WHEEL in this chart.	NVH in RA section	NVH in BR section	NVH in ST section
Possible cause and SUSPECTED PARTS			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	Wheel bearing damage	Out-of-round	Imbalance	Incorrect air pressure	Uneven tire wear	Deformation or damage	Non-uniformity	Incorrect tire size	PROPELLER SHAFT	DIFFERENTIAL	FRONT AXLE AND FRONT SUSPENSION	REAR AXLE AND REAR SUSPENSION	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES	STEERING
Symptom	FRONT AXLE AND FRONT SUSPENSION	Noise	X	X	X	X	X	X											X	X		X	X	X	X	X	X
		Shake	X	X	X	X		X											X			X	X	X	X	X	X
		Vibration	X	X	X	X	X												X			X	X		X		X
		Shimmy	X	X	X	X			X													X	X	X		X	X
		Judder	X	X	X																	X	X	X		X	X
		Poor quality ride or handling	X	X	X	X	X		X	X	X											X	X	X			
	TIRES	Noise	X									X	X	X	X	X	X		X	X	X	X		X	X	X	X
		Shake	X									X	X	X	X	X		X	X		X	X		X	X	X	X
		Vibration												X				X	X		X	X			X		X
		Shimmy	X									X	X	X	X	X	X	X			X	X		X		X	X
		Judder	X									X	X	X	X	X		X			X	X		X		X	X
		Poor quality ride or handling	X									X	X	X	X	X		X			X	X		X			
	ROAD WHEEL	Noise	X									X	X			X			X	X	X	X	X		X	X	X
		Shake	X									X	X			X			X		X	X	X		X	X	X
		Shimmy, judder	X									X	X			X					X	X	X			X	X
		Poor quality ride or handling	X									X	X			X					X	X	X				

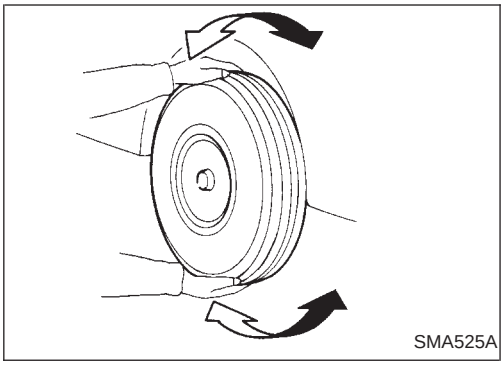
X: Applicable

SEC. 400•401



: N•m (kg-m, ft-lb)

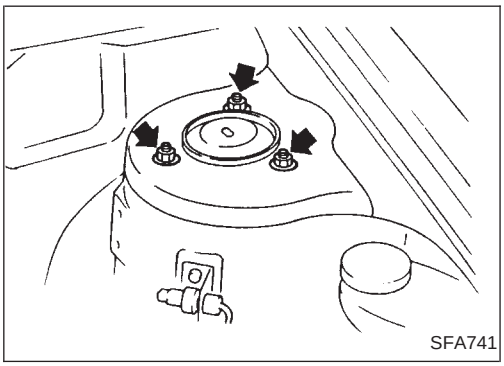
SFA792B


SMA525A

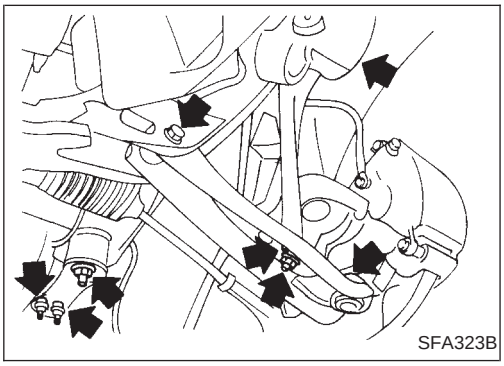
Front Axle and Front Suspension Parts

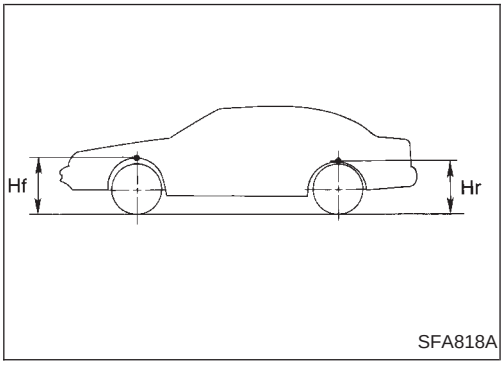
Check front axle and front suspension parts for excessive play, cracks, wear or other damage.

- Shake each front wheel to check for excessive play.


SFA741

- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.
  Tightening torque:
  Refer to FRONT SUSPENSION (FA-17).

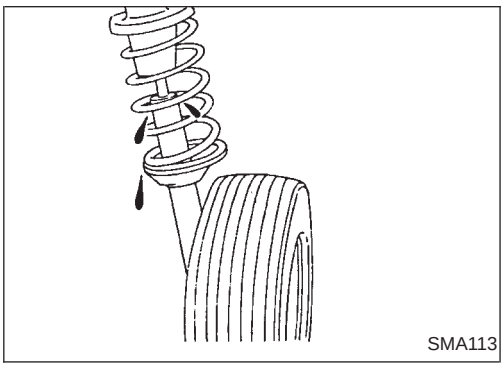

SFA323B



SFA818A

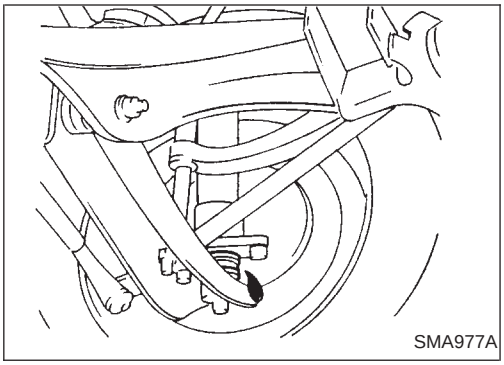
- Check spring height from top of wheelarch to ground.

a. Vehicle must be unladen*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).
   *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
b. Bounce vehicle up and down several times before measuring.
   Standard height: Refer to SDS (FA-62).
c. Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.

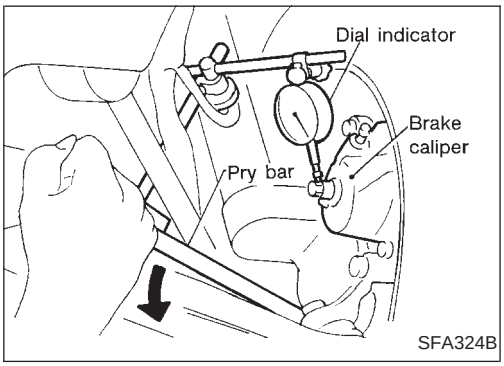

SMA113

- Check strut (Shock absorber) for oil leakage or damage.

Front Axle and Front Suspension Parts (Cont'd)


SMA977A

- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage. If ball joint dust cover is cracked or damaged, replace transverse link.



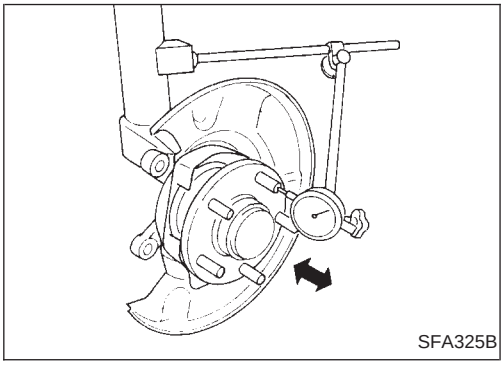
SFA324B

- Check suspension ball joint end play.

a. Jack up front of vehicle and set the stands.
b. Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
c. Make sure front wheels are straight and brake pedal is depressed.
d. Place a pry bar between transverse link and inner rim of road wheel.
e. While raising and releasing pry bar, observe maximum dial indicator value.

Vertical end play:
0 mm (0 in)

If ball joint vertical end play exists, remove transverse link and recheck the ball joint. Refer to FA-23.


SFA325B

Front Wheel Bearing

Check that wheel bearings operate smoothly, as well as axial end play and grease leakage.

Axial end play limit: 0.05 mm (0.0020 in) or less

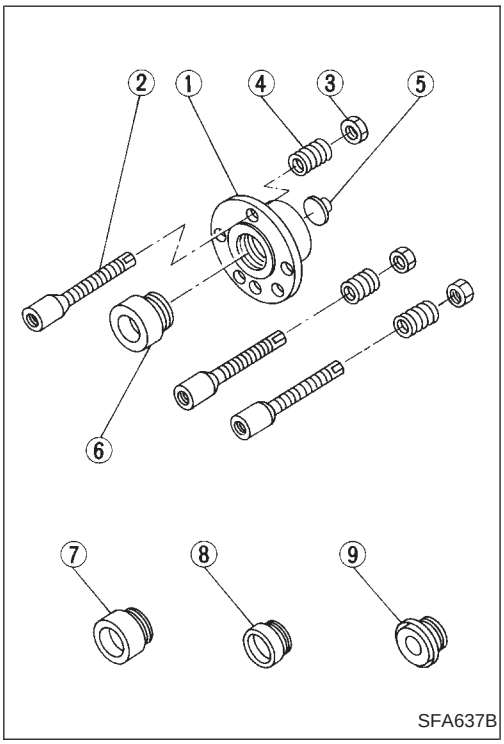
- If out of specification or wheel bearing does not turn smoothly, replace wheel bearing assembly.
  Refer to FRONT AXLE (FA-13).

Front Wheel Alignment

CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

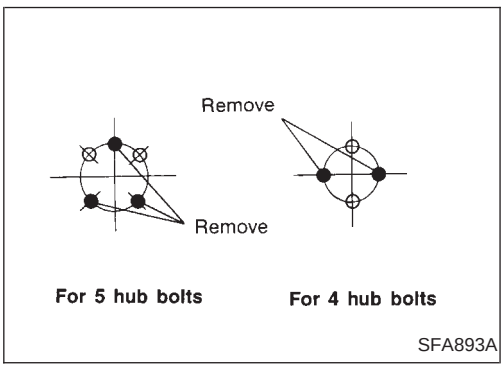
1. Set vehicle on turning radius gauge.



SFA637B

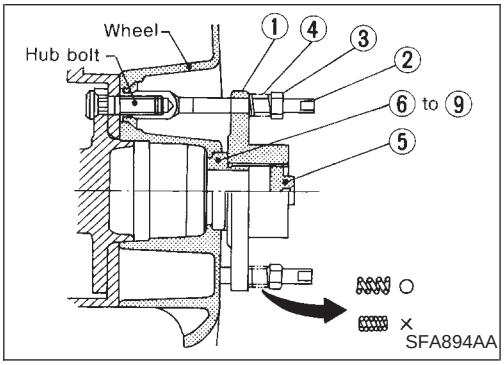
2. Mount Tool as follows.
   Tool number:
   KV991040S0 (—)
   KV99104010 ① to ⑤
   KV99104020 ⑥
   KV99104030 ⑦
   KV99104040 ⑧
   KV99104050 ⑨

a. Select adapter which corresponds with wheel or hub shape from four types ⑥ to ⑨.
b. Screw selected adapter in until it contacts plate ①.



SFA893A

c. Remove wheel nuts.



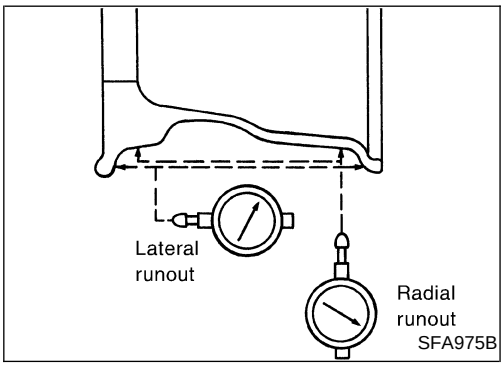
SFA894AA

d. Install guide bolts ② to where wheel nuts were removed and tighten them by hand.
e. Install plate and adapter assembly to guide bolts ②.
f. Install springs ④ onto guide bolts ②. Then tighten nuts ③ evenly until a little before springs ④ are completely compressed.
g. Install center plate ⑤.
h. Mount wheel alignment gauge on attachment plate.

Front Wheel Alignment (Cont'd)

Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



PRELIMINARY INSPECTION

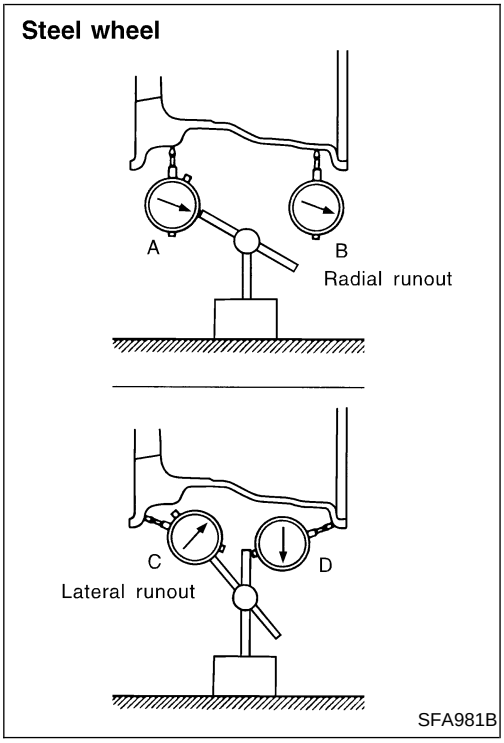
Aluminum wheel

1. Check tires for wear and improper inflation.
2. Check wheels for deformation, cracks and other damage. If deformed, remove wheel and check wheel runout.

a. Remove tire from aluminum wheel and mount on a tire balance machine.
b. Set dial indicator as shown in the illustration.

Wheel runout (Dial indicator value):
Refer to SDS.

3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly.
7. Check vehicle posture (Unladen).



Steel wheel

1. Check tires for wear and improper inflation.
2. Check wheels for deformation, cracks and other damage. If deformed, remove wheel and check wheel runout.

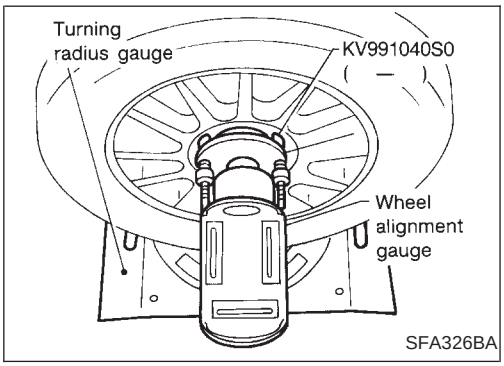
a. Remove tire from steel wheel and mount wheel on a tire balance machine.
b. Set two dial indicators as shown in the illustration.
c. Set each dial indicator to 0.
d. Rotate wheel and check dial indicators at several points around the circumference of the wheel.
e. Calculate runout at each point as shown below.
Radial runout = (A + B)/2
Lateral runout = (C + D)/2
f. Select maximum positive runout value and the maximum negative value.
Add the two values to determine total runout.
In case a positive or negative value is not available, use the maximum value (negative or positive) for total runout.
If the total runout value exceeds the limit, replace steel wheel.

Wheel runout:
Refer to SDS.

3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.

Front Wheel Alignment (Cont'd)

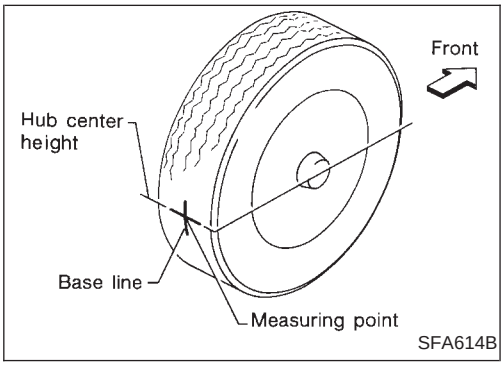
6. Check that front shock absorbers work properly.
7. Check vehicle posture (Unladen).



CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.
   Camber, Caster and Kingpin inclination:
   Refer to SDS (FA-61).
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.



TOE-IN

Measure toe-in using following procedure. If out of specification, inspect and replace any damaged or worn front suspension parts.

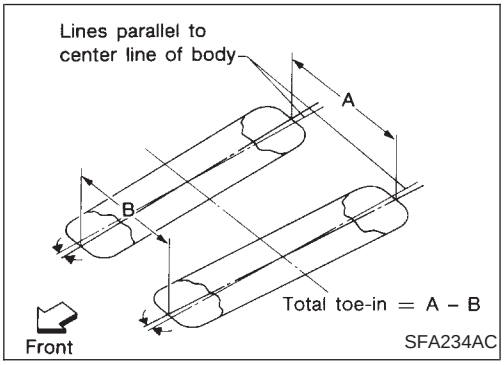
WARNING:

- **Always perform the following procedure on a flat surface.**
- **Make sure that no person is in front of the vehicle before pushing it.**

1. Bounce front of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead about 5 m (16 ft).
3. Put a mark on base line of tread (rear side) of both tires at the same height as hub center. These are measuring points.
4. Measure distance "A" (rear side).
5. Push the vehicle slowly ahead to rotate the wheels 180 degrees (1/2 turn).

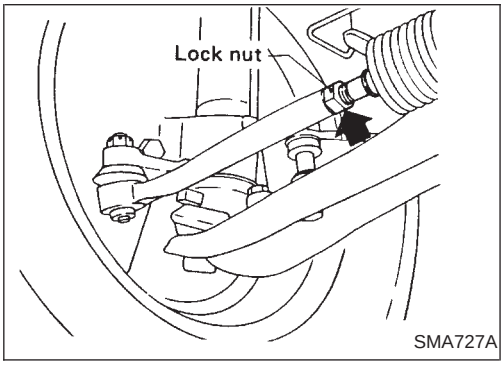
If the wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.

6. Measure distance "B" (front side).
   Total toe-in: Refer to SDS (FA-61).

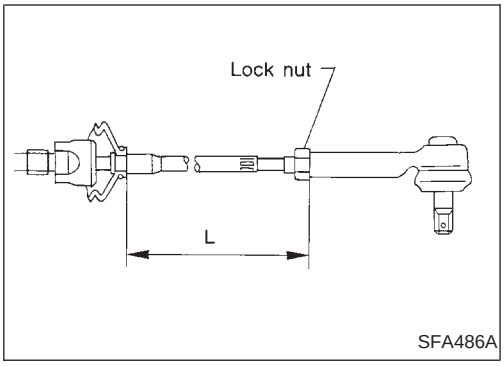


7. Adjust toe-in by varying the length of steering tie-rods.

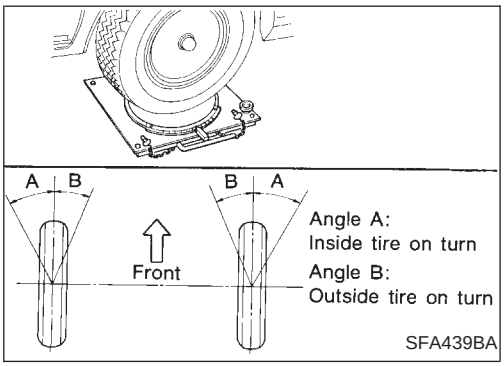
a. Loosen lock nuts.



Front Wheel Alignment (Cont'd)



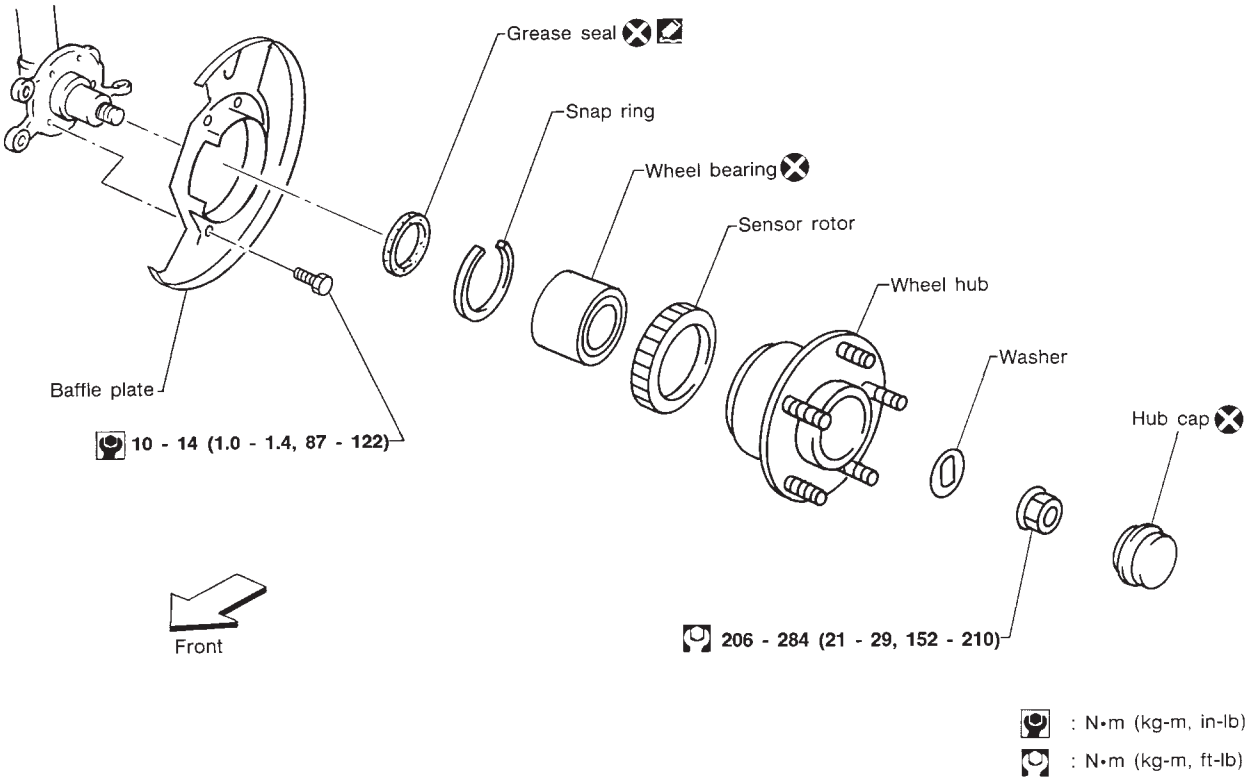
b. Adjust toe-in by screwing tie-rods in and out.
   Standard length "L":
   Refer to SDS in ST section.
c. Tighten lock nuts to specified torque.
   Lock nut tightening torque:
   Refer to POWER STEERING GEAR AND LINKAGE in ST section.

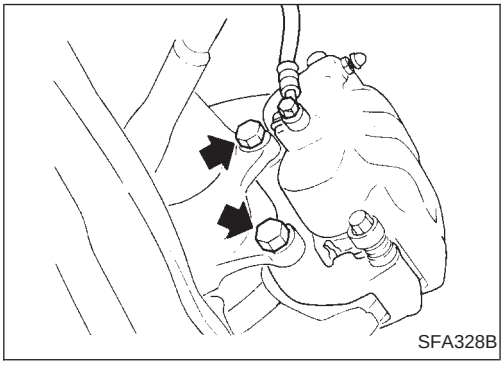


FRONT WHEEL TURNING ANGLE

1. Set wheels in straight-ahead position. Then, move vehicle forward until front wheels rest on turning radius gauge properly.
2. Rotate steering wheel all the way right and left; measure turning angle.
   Wheel turning angle (Full turn):
   Refer to SDS (FA-61).

SEC. 400





Wheel Hub and Knuckle

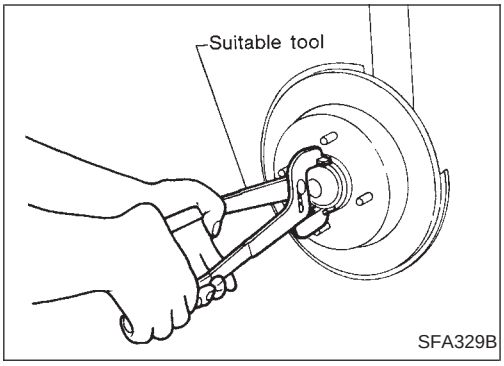
REMOVAL

- Remove brake caliper assembly and rotor.

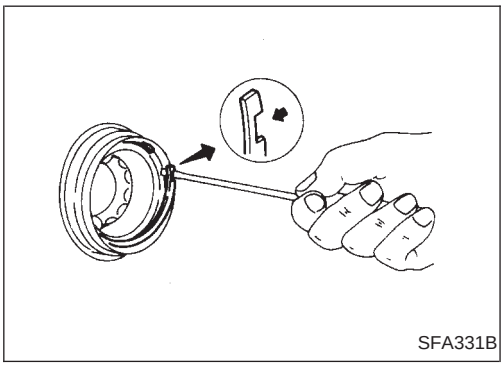
CAUTION:

- **Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Do not pull or twist brake hose.**
- **Before removing the front axle assembly, disconnect the ABS wheel sensor from the assembly. Then, move it away from the front axle assembly area. Failure to do so may result in damaging the sensor wires and the sensor will become inoperative.**

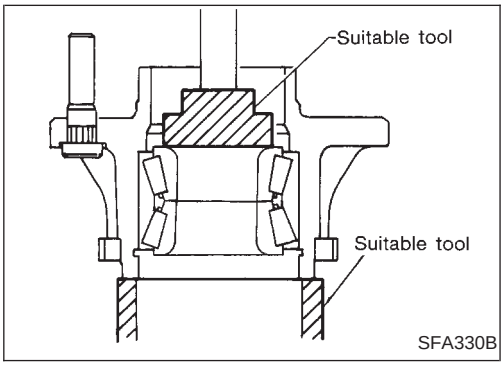
Wheel Hub and Knuckle (Cont'd)



- Remove wheel hub from spindle.



- Remove grease seal.
- Remove snap ring.



- Press out bearing and race as a set.

INSPECTION

Wheel bearing

Check wheel bearing to see that it rolls freely and is free from noise, crack, pitting, or wear, and replace if damaged.

Wheel hub

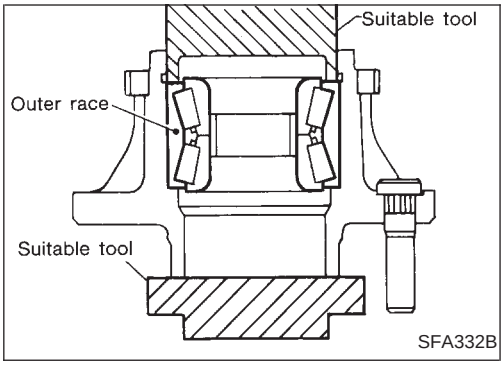
Check wheel hub for crack by a magnetic exploration or dyeing test, and replace if cracked.

Knuckle spindle

Check knuckle spindle for deformation, tapping mark, or cracks (by magnetic or dyeing test) and replace if damaged.

Wheel Hub and Knuckle (Cont'd)

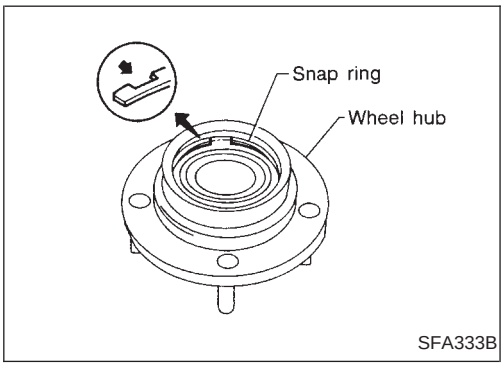
INSTALLATION



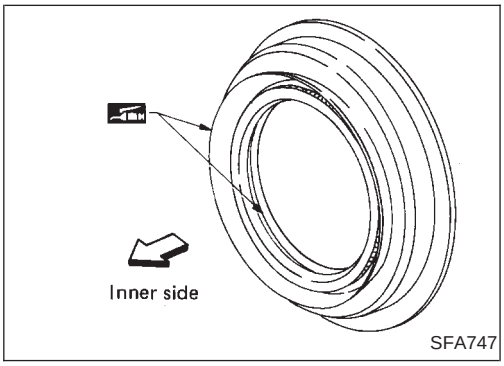
- Press new wheel bearing assembly into wheel hub.
  Maximum load P:
  29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

CAUTION:

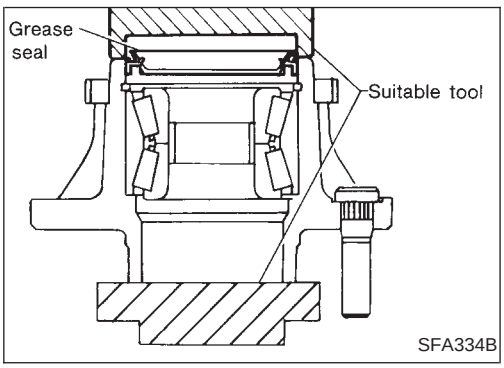
- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and wheel hub.**



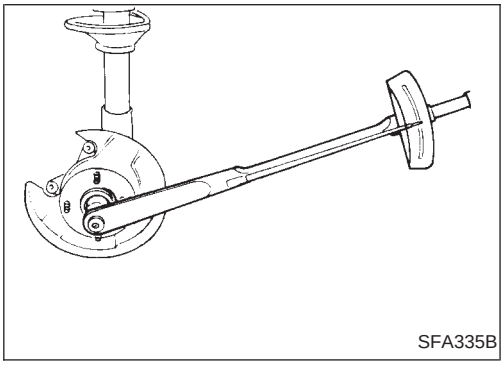
- Install snap ring.



- Pack grease seal lip with recommended multi-purpose grease.

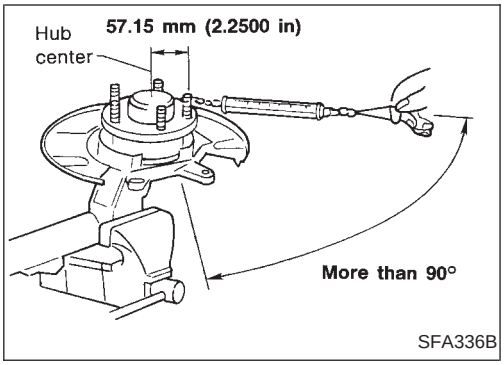


- Install grease seal.



- Install wheel hub.
- Tighten wheel bearing lock nut to the specified torque.

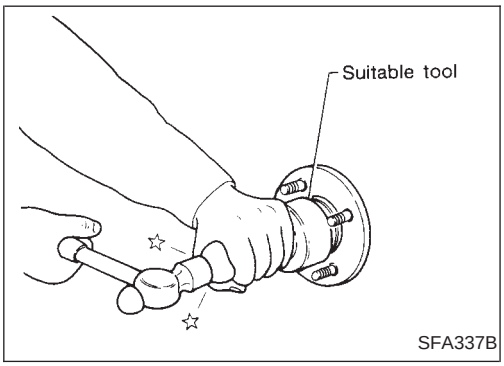
Wheel Hub and Knuckle (Cont'd)



- Turn wheel hub several times in both directions to seat wheel bearing correctly.
- Attach spring balance to wheel hub bolt (as shown at left) and pull it at a speed of 10 rpm to measure rotation torque.

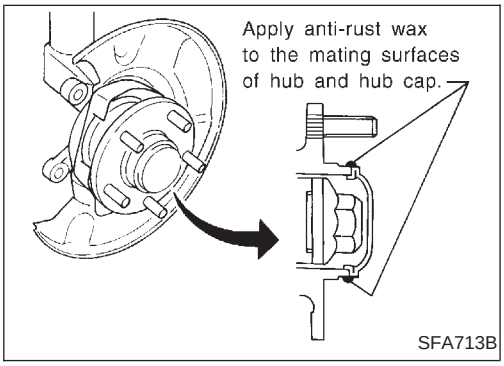
Rotation torque:
0.25 - 2.11 N·m (2.5 - 21.5 kg-cm, 2.2 - 18.7 in-lb)
Spring balance indication:
3.9 - 37.2 N (0.4 - 3.8 kg, 0.9 - 8.4 lb)

If bearing preload does not meet the specification, replace wheel bearing assembly.



- Clinch lock nut using standard screwdriver and install hub cap using a suitable tool.

Do not reuse hub cap. When installing, replace it with a new one.

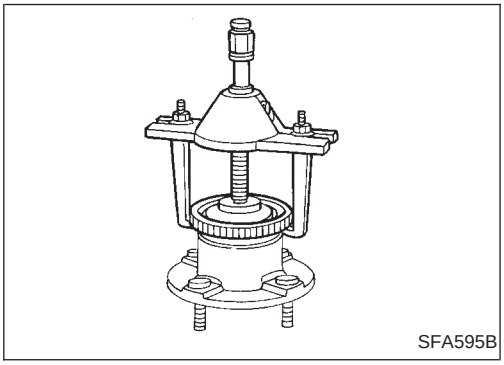


- Apply anti-rust wax to the mating surfaces of hub and hub cap.

ABS Sensor Rotor

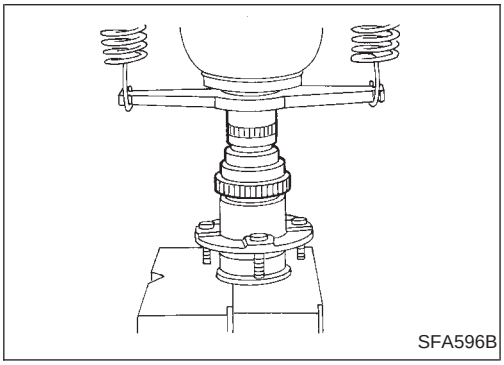
REMOVAL

Remove ABS sensor rotor.

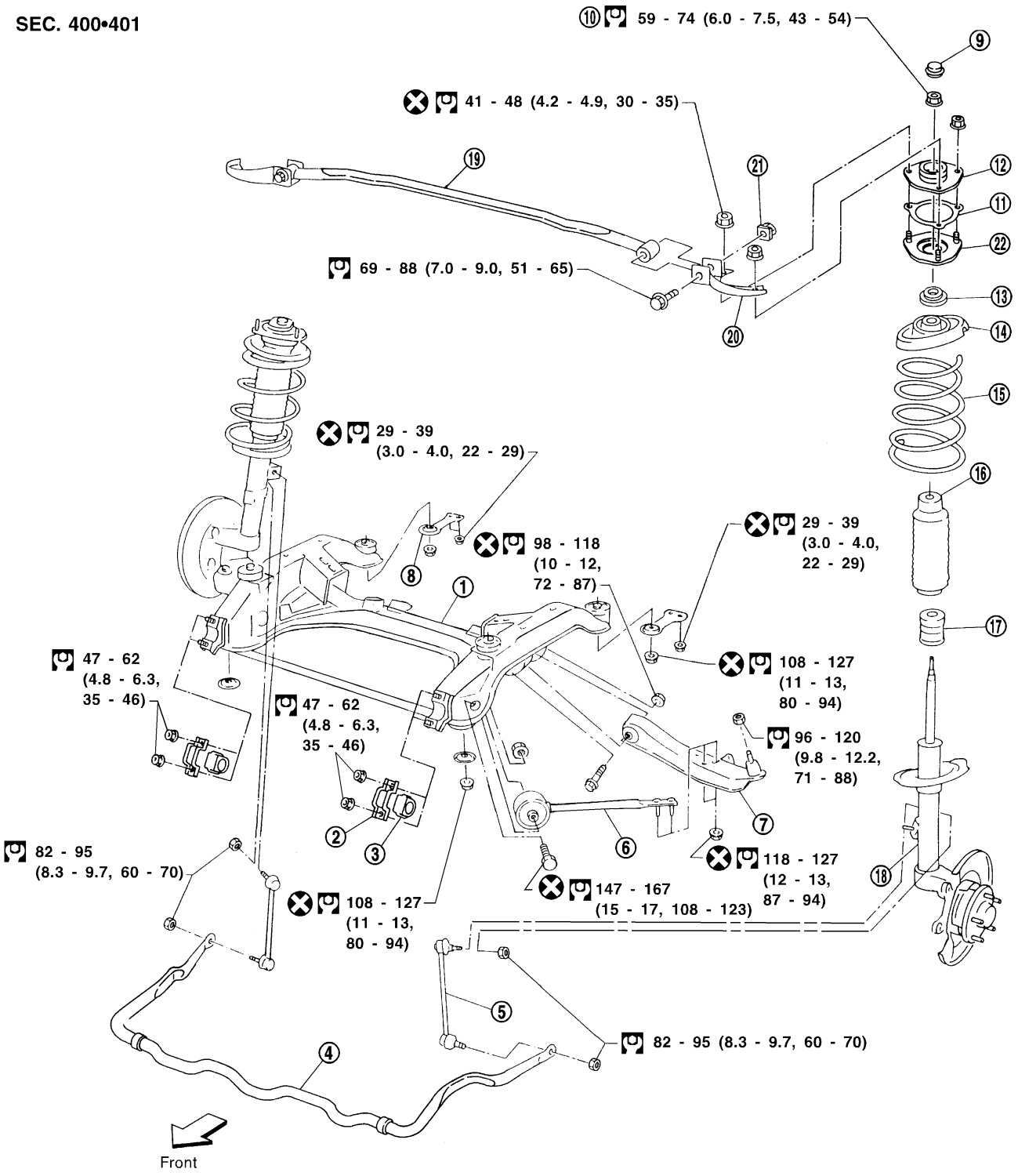


INSTALLATION

Press-fit ABS sensor rotor.



SEC. 400•401



When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

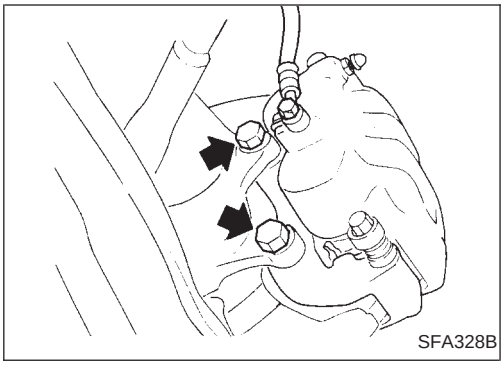
*** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**

SFA793BA

: N•m (kg-m, in-lb)

: N•m (kg-m, ft-lb)

① Front suspension member
② Stabilizer bar clamp
③ Bushing
④ Stabilizer bar
⑤ Stabilizer connecting rod
⑥ Tension rod
⑦ Transverse link
⑧ Member stay
⑨ Cap
⑩ Lock nut
⑪ Gasket
⑫ Strut mounting insulator
⑬ Strut mounting bearing
⑭ Spring upper seat
⑮ Coil spring
⑯ Dust cover
⑰ Bound bumper
⑱ Strut assembly
⑲ Front tower bar
⑳ Bracket
㉑ Plate nut
㉒ Strut mounting bracket


SFA328B

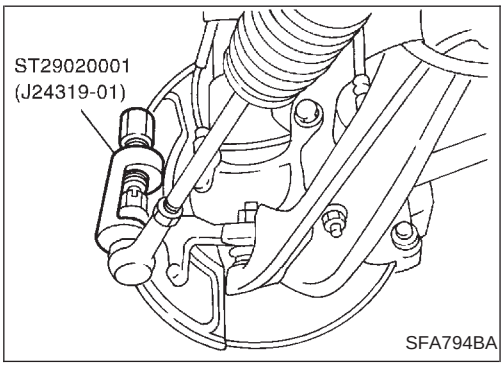
Coil Spring and Strut Assembly

NOTE:
For removal and installation procedures of active damper suspension-related parts, refer to "Removal and Installation", "ACTIVE DAMPER SUSPENSION", FA-28.

REMOVAL AND INSTALLATION

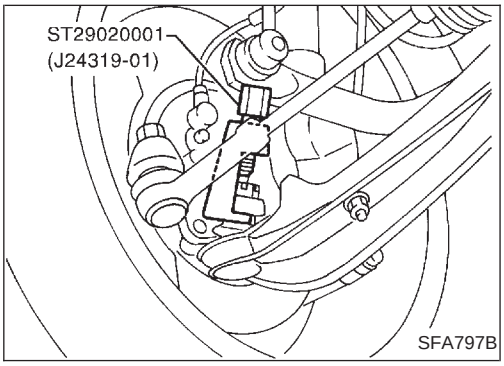
- Remove brake caliper assembly and rotor.

Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Do not pull or twist brake hose.

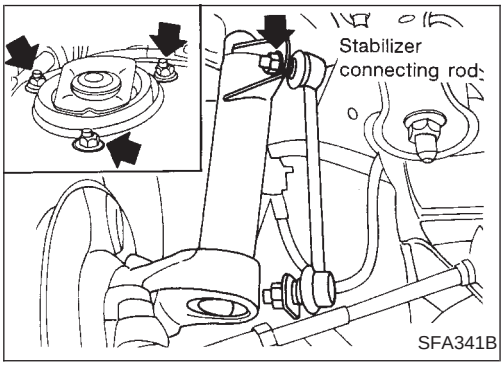


SFA794BA

- Remove tie-rod ball joint and lower ball joint with Tool.

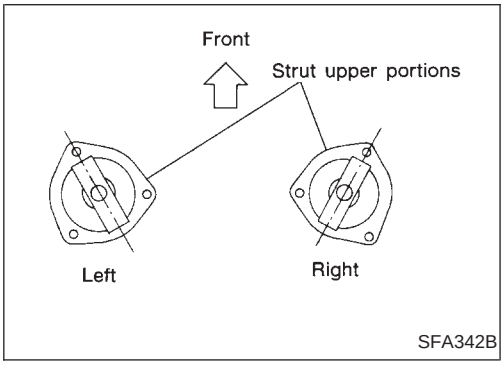


SFA797B



SFA341B

- Remove stabilizer connecting rod upper nut, separate strut assembly and stabilizer connecting rod.
- Remove strut assembly upper nuts.

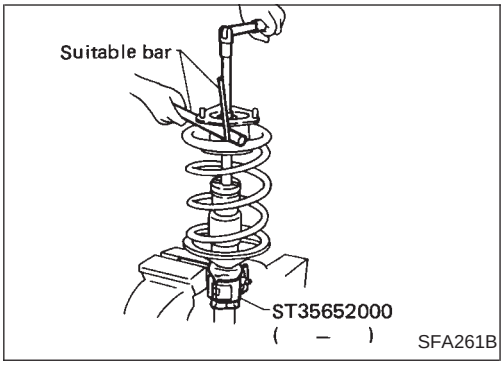


SFA342B

- To install, reverse above removal procedures.
  Installation position of upper end of strut is shown at left.

Coil Spring and Strut Assembly (Cont'd)

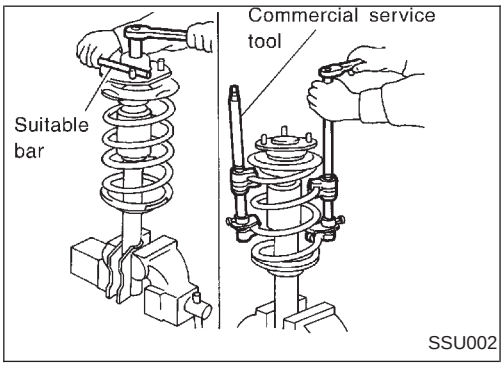
DISASSEMBLY



1. Set strut assembly on vice with attachment, then **loosen** piston rod lock nut.

WARNING:

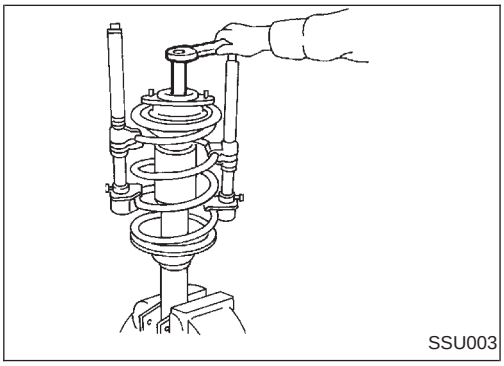
Do not remove piston rod lock nut at this time.



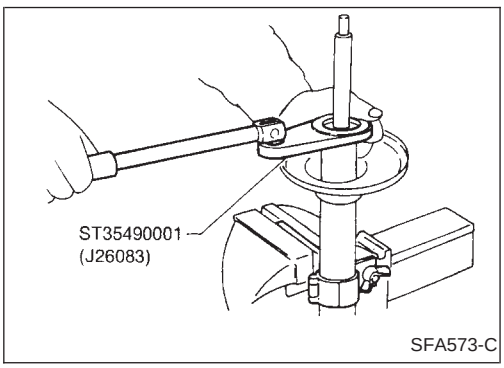
2. Compress spring with tool so as to permit turning of strut mounting insulator by hand.

WARNING:

Make sure that the pawls of the two spring compressors are firmly hooked on the spring. The spring compressors must be tightened alternately so as not to tilt the spring.



3. Remove piston rod lock nut. Then remove coil spring.



4. Remove gland packing with Tool.

- **Avoid dirt and dust getting into gland packing portion.**

5. Retract piston rod by pushing it down until it bottoms. Then, slowly withdraw piston rod from cylinder together with piston guide.

Coil Spring and Strut Assembly (Cont'd)

INSPECTION

Wash all parts, except for nonmetallic parts, clean with suitable solvent and dry with compressed air.
Blow dirt and dust off of nonmetallic parts using compressed air.

Strut assembly

- Oil oozing out around gland packing does not need strut replacement.
  If oil leakage is evident on spring seat, check piston rod gland packing and O-ring.
  If oil leakage occurs on welded portion of outer strut casing, replace strut assembly.
- If shock absorber itself is malfunctioning, replace as shock absorber kit.

Gland packing

Check gland packing for oil leakage. Replace gland packing if necessary.

Strut mounting insulator

Check cemented rubber-to-metal portion for melting or cracks. Check rubber parts for deterioration. Replace if necessary.

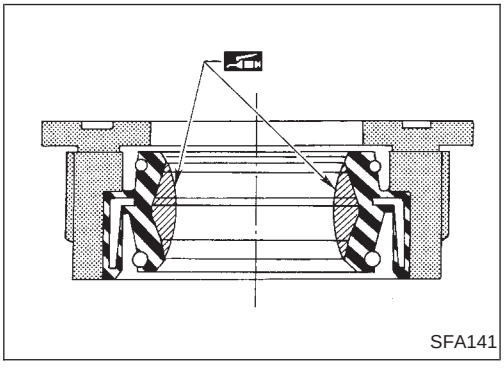
Thrust seat

Check for cracks, deformation or other damage. Replace if necessary.

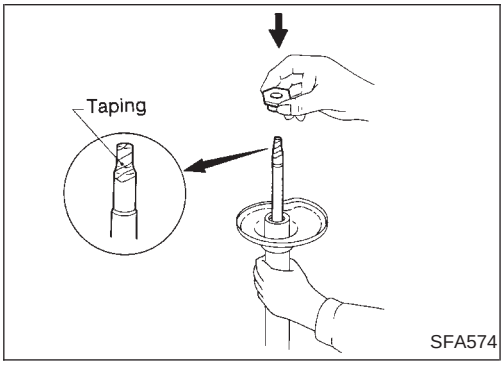
Coil spring

Check for cracks, deformation or other damage. Replace if necessary.

ASSEMBLY


SFA141

- Lubricate sealing lip of gland packing.

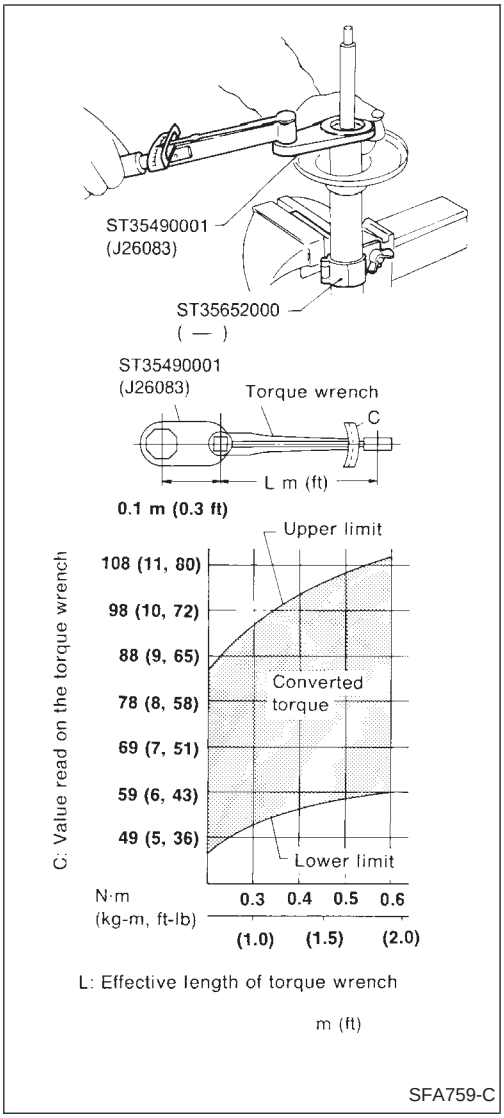


SFA574

- Install gland packing.

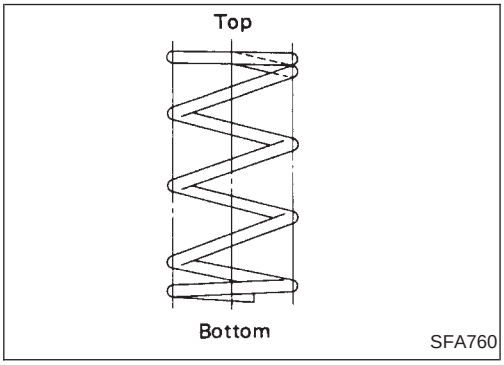
Cover piston rod with tape so as not to damage oil sealing lip.

Coil Spring and Strut Assembly (Cont'd)



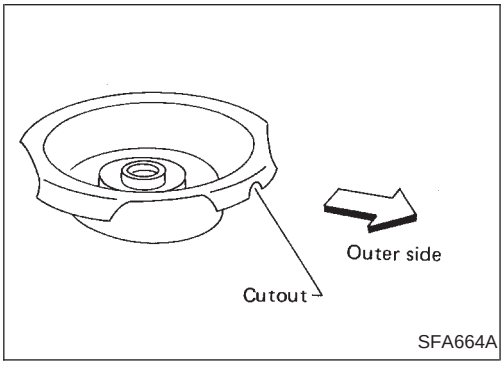
SFA759-C

- Tighten gland packing to the specified torque (refer to chart at left) with Tool.



SFA760

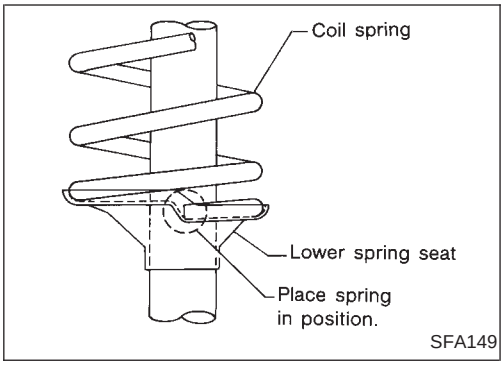
- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)



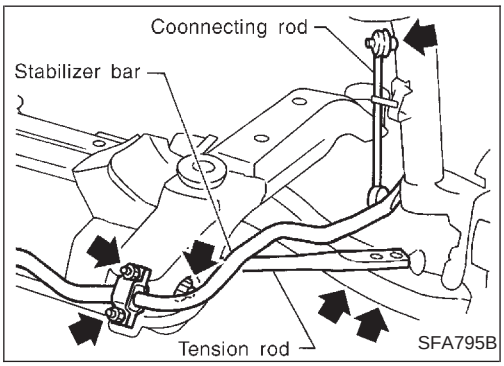
SFA664A

- Install upper spring seat with its cutout facing the outer side of vehicle.

Coil Spring and Strut Assembly (Cont'd)



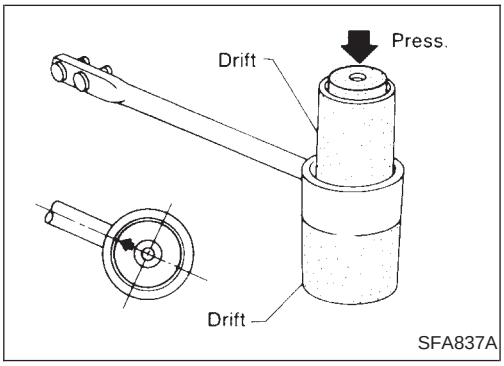
After placing spring in position on lower spring seat, release spring compressor gradually.



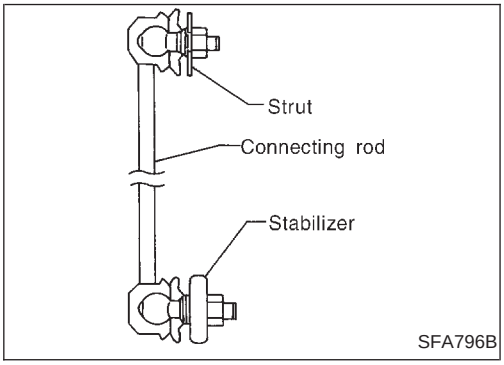
Tension Rod and Stabilizer Bar

REMOVAL AND INSTALLATION

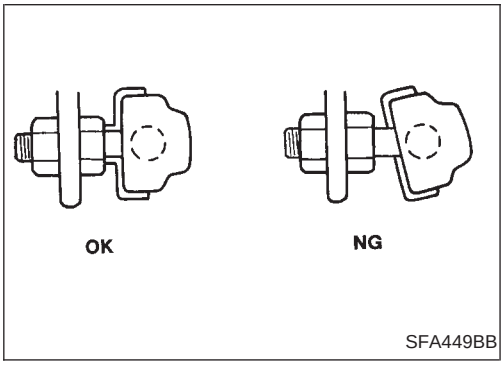
- Remove tension rod and stabilizer bar.
- Prevent stabilizer connecting rod from turning by inserting hex wrench into end of ball stud, then remove nut.

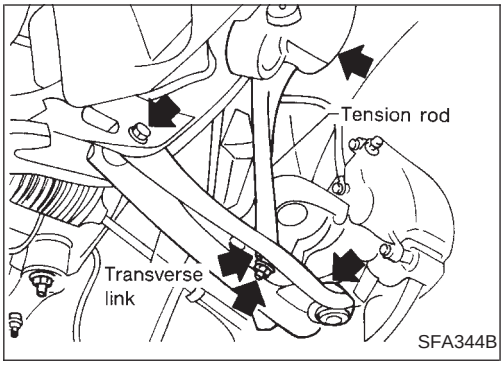


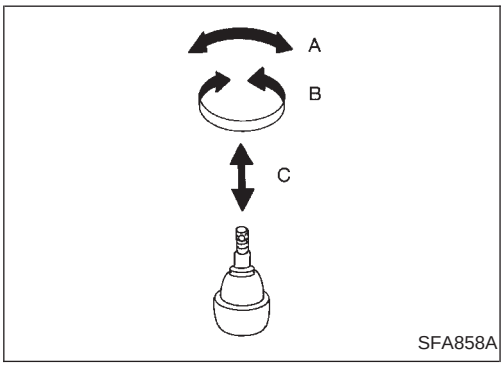
- Place a drift on lower side of tension rod bushing and another on upper side, as shown. Remove tension rod bushing by pressing it out.
- Place arrow mark on bushing facing tension rod before installing bushing.



- Install stabilizer bar with ball joint socket properly placed.







Transverse Link Assembly

REMOVAL AND INSTALLATION

- Separate suspension ball joint from knuckle arm.
- Remove tension rod and transverse link assembly.

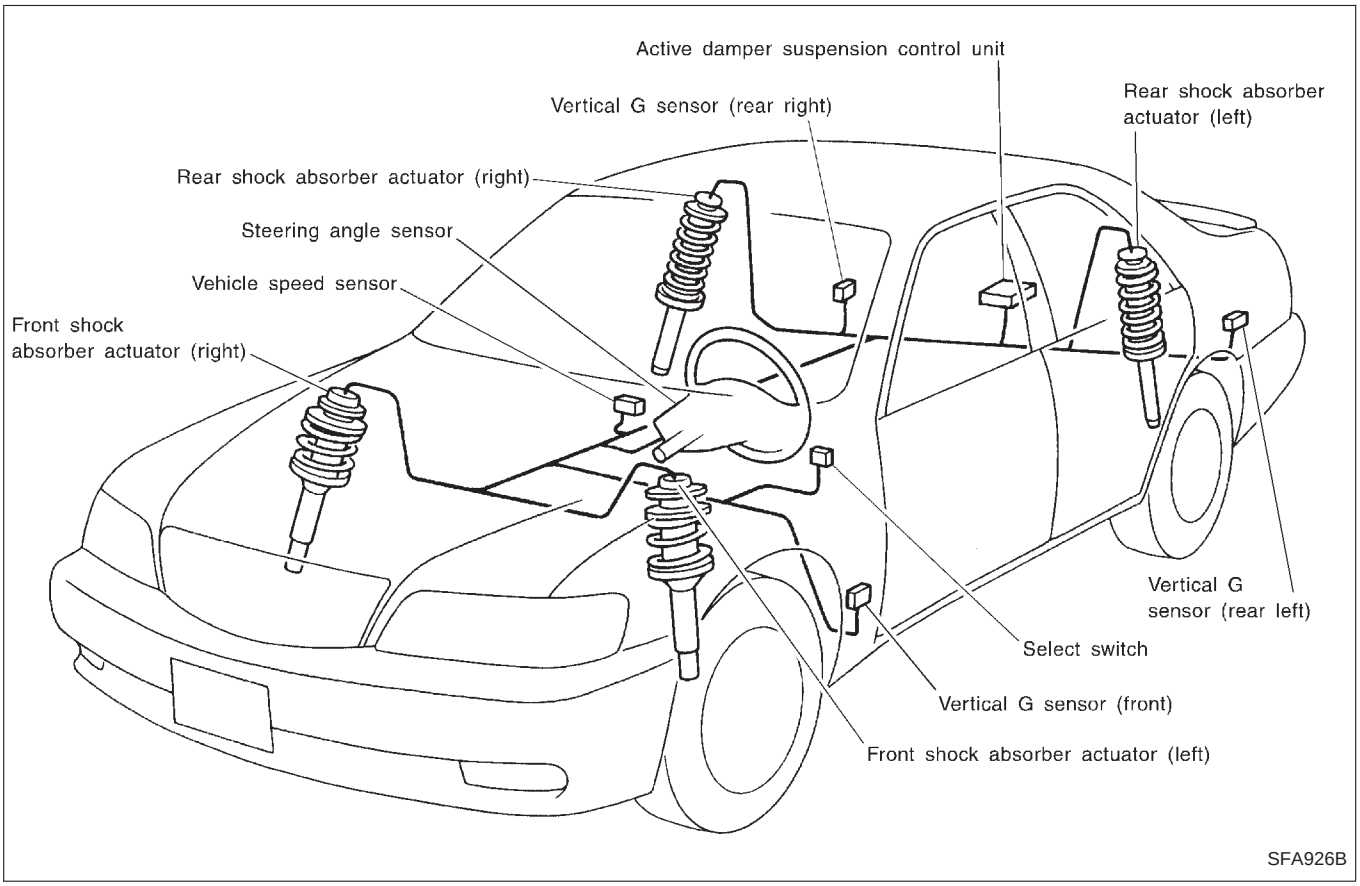
INSPECTION

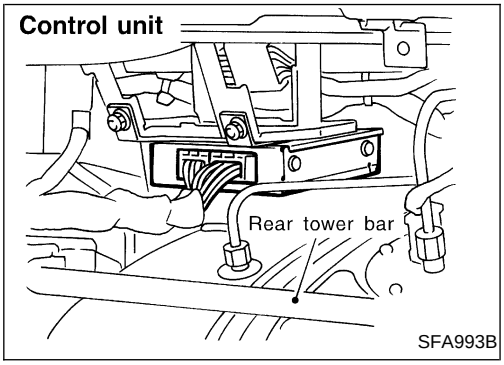
- Check tension rod, stabilizer bar and transverse link for damage, cracks, deformation; replace transverse link assembly if necessary.
- Check rubber bushing for damage, cracks and deformation; replace tension rod or transverse link assembly if necessary.
- Check ball joint for excessive play. Replace transverse link assembly if any of the following exists:
  - Ball stud is worn.
  - Joint is hard to swing.
  - Play in axial direction is excessive.

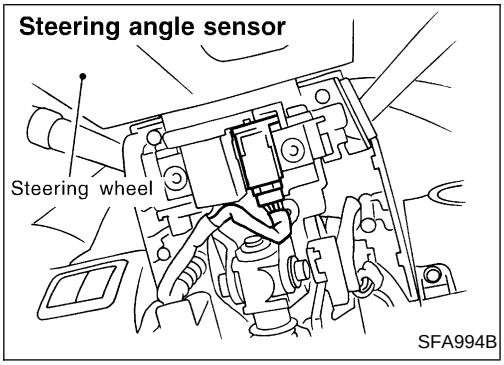
  Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

  Swinging force:
  Refer to SDS (FA-62).
  Turning torque:
  Refer to SDS (FA-62).
  Vertical end play:
  Refer to SDS (FA-62).
- Check dust cover for damage. Replace it and cover clamp if necessary.

System Components







Component Description

CONTROL UNIT

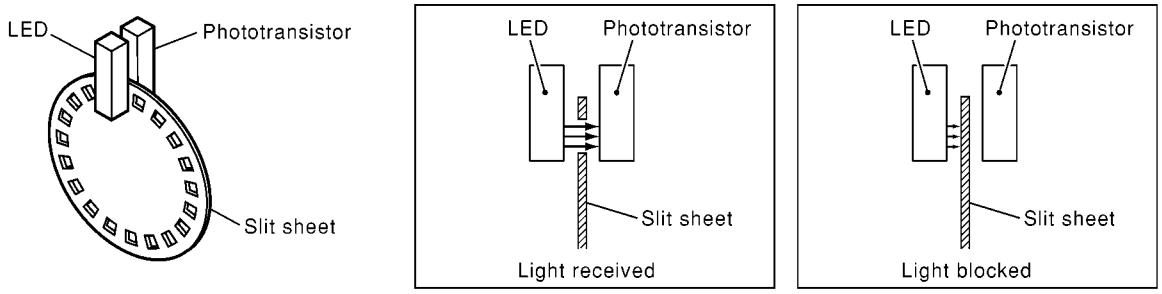
The control unit calculates the direction and the speed of the vehicle based on input signals from each sensor, and controls actuators (step motors) for optimum damping force of shock absorbers. In case of the trouble in the electric system, the control unit controls actuators (step motors) for constant damping force according to signals stored in control unit.

STEERING ANGLE SENSOR

Three optical, non-contact type sensors are used to send signals of the steering direction, neutral position, and lock angle to the control unit.

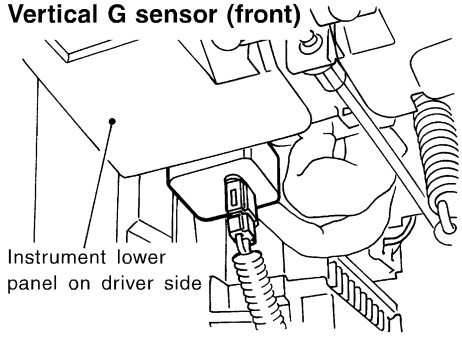
Steering angle sensors consist of LEDs, phototransistors which transform light to electric signals, and slit sheets which rotate with the steering wheel. The sensors receive light through slit sheets which rotate and shade light, turning ON/OFF the phototransistors.

Component Description (Cont'd)

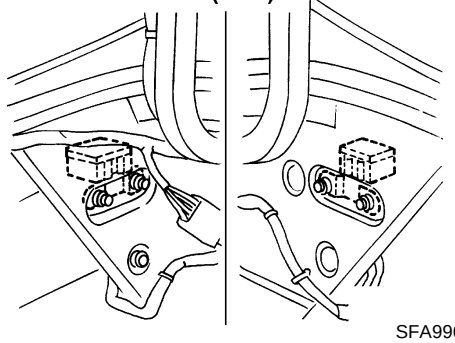


SFA995B

Vertical G sensor (front)



Vertical G sensor (rear)



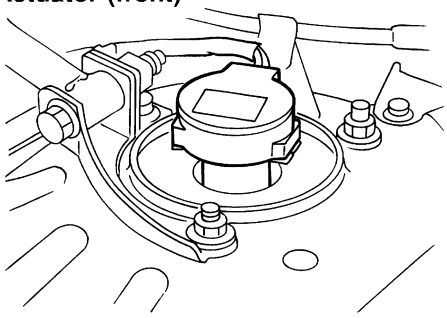
SFA996B

VERTICAL G SENSOR

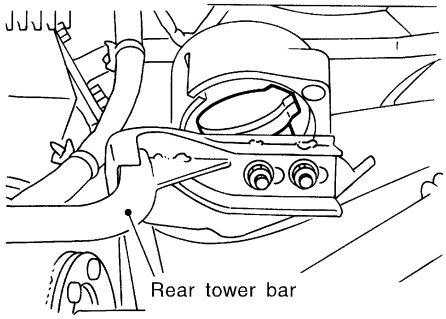
The vertical G sensor detects the up/down accelerations of the vehicle, and sends signals to the control unit.
The vertical G sensor consists of semiconductor piezo elements for the detecting element. The sensor detects accelerations as distortion amount and transforms the amount to a voltage signal through the amplification circuit.

CAUTION:
Because the sensor is susceptible to mechanical impact, be sure to handle it with care.

Actuator (front)



Actuator (rear)

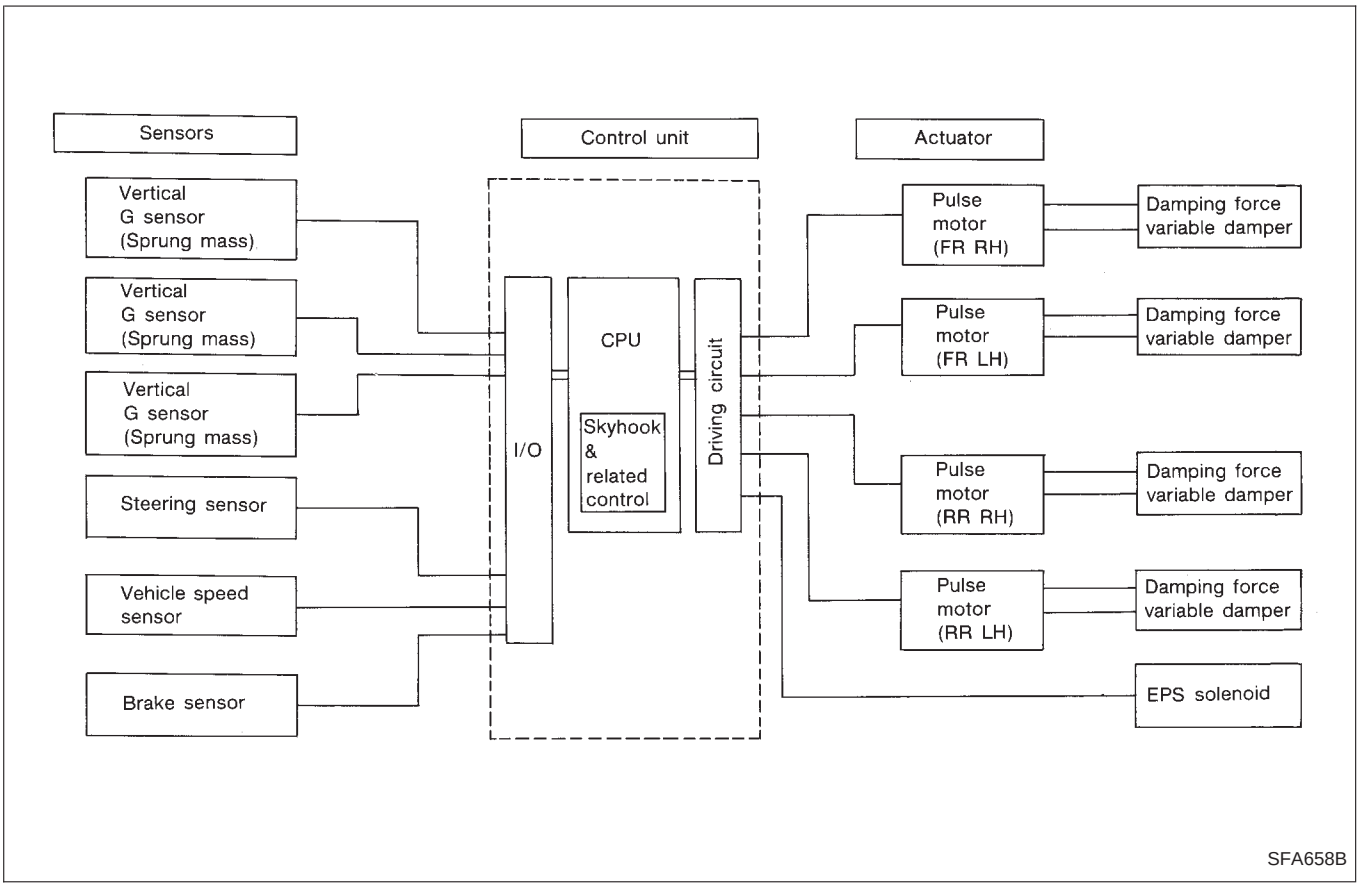


SFA997B

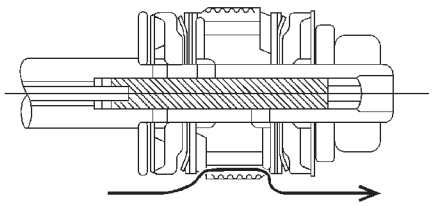
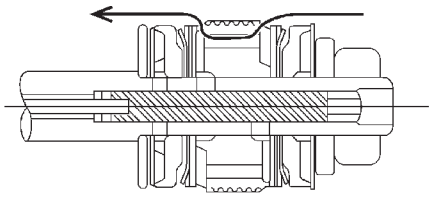
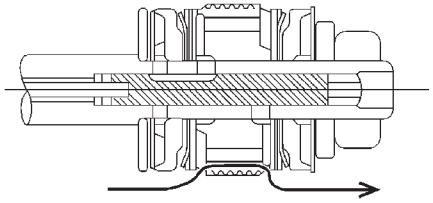
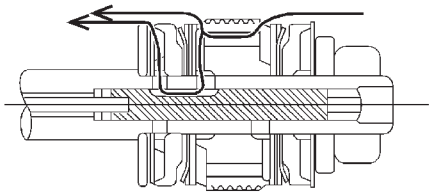
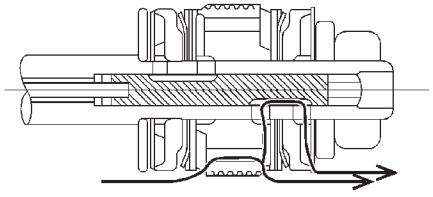
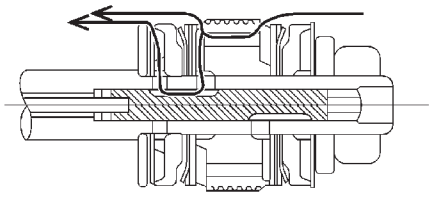
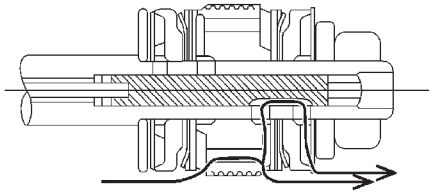
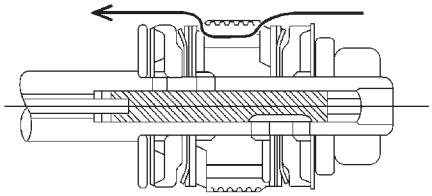
SHOCK ABSORBER ACTUATOR

Shock absorber actuators are installed on the upper part of shock absorbers to control the damping force of shock absorbers by output signals from the control unit.
The motor operating angle is about 70°. The shock absorber actuator instantly controls 140 patterns of damping force.

Active Damper Suspension Configuration

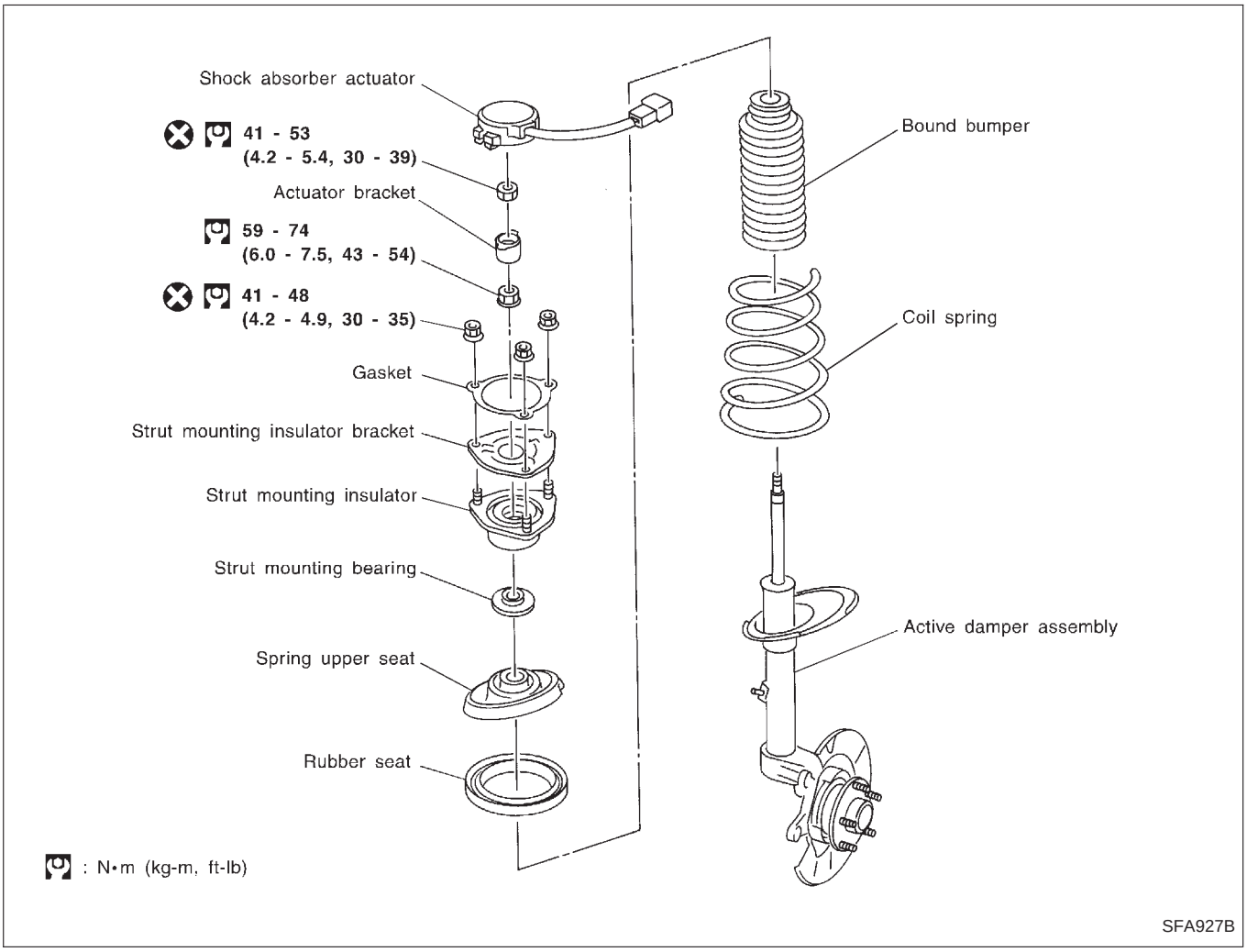


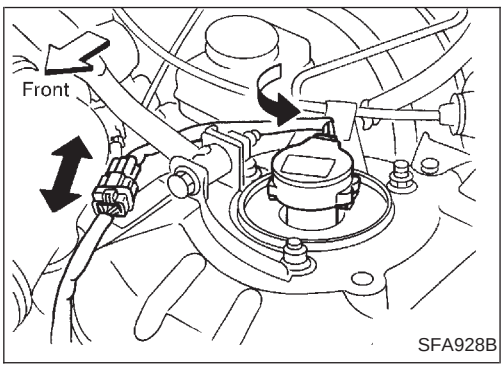
Active Damper

Tension stroke	Compression stroke
HARD	HARD
	
HARD	SOFT
	
SOFT	SOFT
	
SOFT	HARD
	

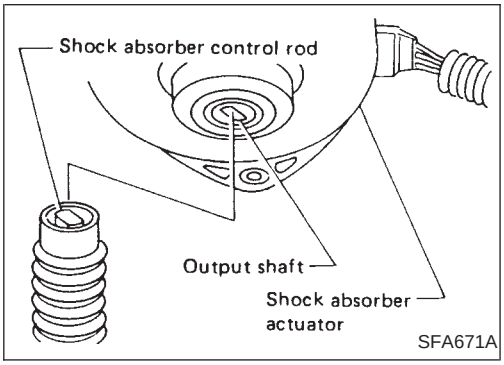
SFA972B

Removal and Installation





- Disconnect sub-harness connector.
- Turn shock absorber actuator counterclockwise, then remove from bracket.



- **Before installing actuator, ensure shock absorber control rod is aligned with actuator output shaft. Otherwise, actuator may be damaged.**
- Refer to FRONT SUSPENSION for other procedures.

INSPECTION

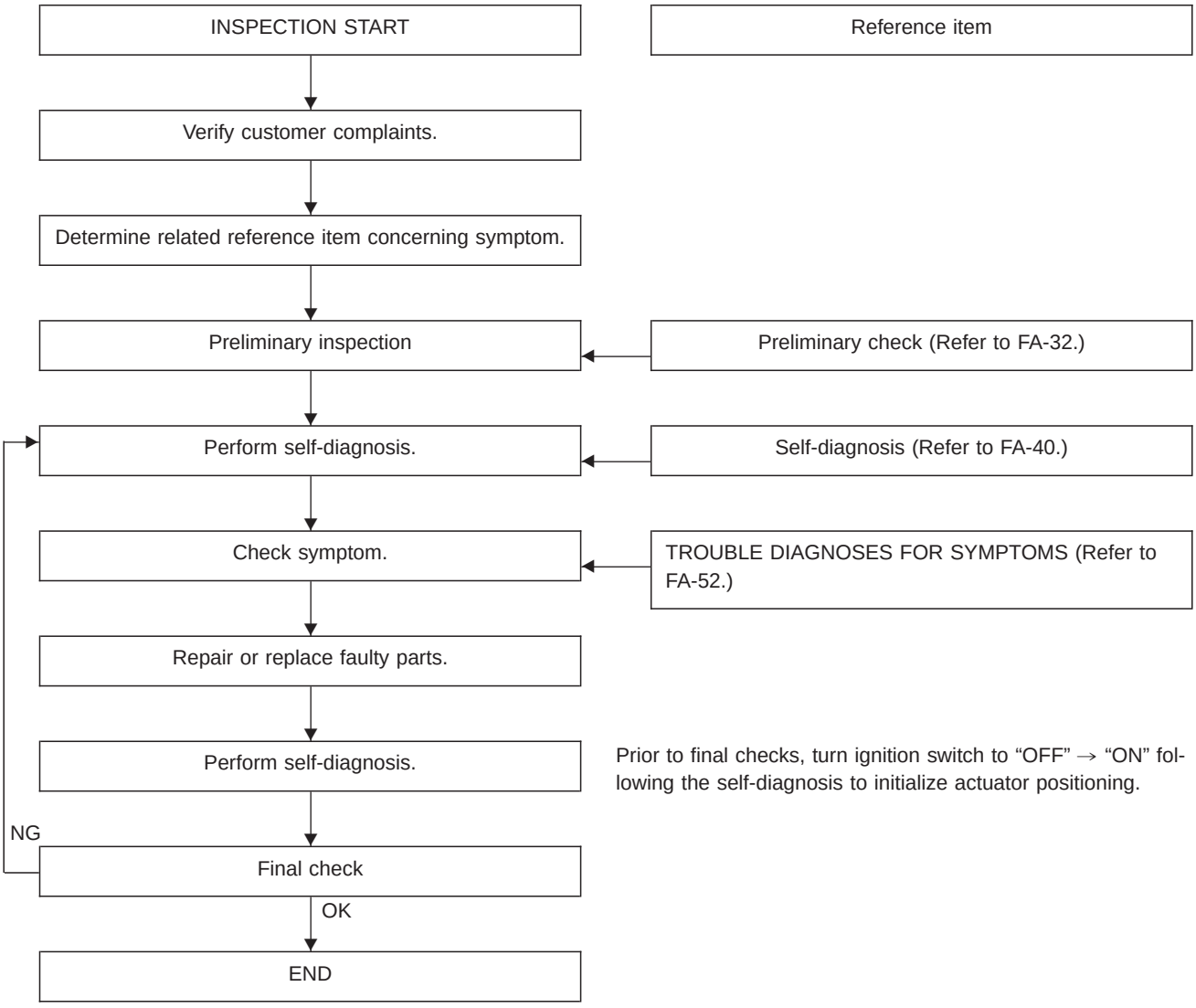
- Replace shock absorber assembly if it is damaged. Refer to FRONT SUSPENSION — Coil Spring and Strut Assembly (FA-18).

How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

- Before troubleshooting, verify customer complaints concerning his vehicle.
- If a vehicle problem is hard to reproduce, harnesses, harness connectors and/or terminals may often be faulty. Hold and shake these parts by hand to make sure they are securely connected.
- When using a circuit tester to measure voltage or resistance of each circuit, be careful not to expand connector terminals unnecessarily.

WORK FLOW



Symptom Chart

PROCEDURE				TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS				TROUBLE DIAGNOSES FOR SYMPTOMS			
SYMPTOM				Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8
Self-diagnostic results	Self-diagnosis code No.	Diagnosed part	CONSULT-II indication								
	11	Vehicle speed sensor	VHCL SPEED SE [km/h] or [mph]	○							
	12	Steering angle sensor (Steering angle signal)	STEERING ANG [°]		○						
	13	Steering angle sensor (Steering neutral signal)	NEUTRAL SIG [ON-OFF]		○						
	14	Stop lamp switch	DATA MONITOR mode “STOP LAMP SW” Brake pedal depressed: ON Brake pedal release: OFF			○					
	22	Vertical G sensor front	VERTI G SE FL [G]				○				
	23	Vertical G sensor rear right side	VERTI G SE RR [G]				○				
	24	Vertical G sensor rear left side	VERTI G SE RL [G]				○				
Indicator lamp in meter cluster does not illuminate.								○			
Hard or soft (riding comfort) feel.									○		
Heavy steering operation during stationary turns.										○	
Light steering during high-speed operation.											○

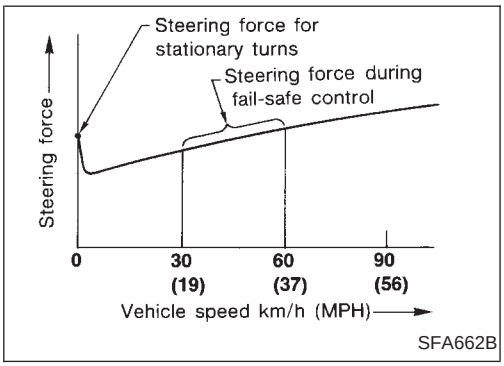
Fail-safe Remarks

FAIL-SAFE FUNCTION (Active damper suspension)

The active damper suspension electronically controls the shock absorber dampening force. If, for some reason, the dampening force falls under any of the conditions listed in the “Fail-safe items” table below, the fail-safe system will activate to maintain a constant level of shock absorber dampening force. If symptoms (such as unstable steering, unpleasant riding comfort, etc.) are pointed out, check and correct the faulty part or area using the diagnostic procedure outlined under “Diagnostic Procedure 6 (Hard or soft feel)”. Refer to FA-54.

FAIL-SAFE FUNCTION (Electric control power steering)

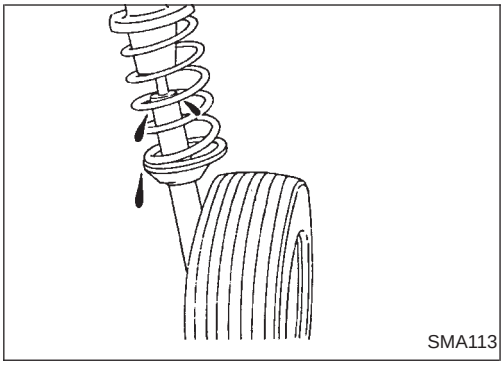
The electric control power steering (EPS) electrically controls the solenoid valve in response to vehicle speeds. If any of the conditions listed in the table below are encountered, the fail-safe system will activate so that a constant level of steering force is maintained during high-speed operation. If abnormal steering force is indicated, check and correct the problem using the diagnostic procedure outlined under “Diagnostic Procedure 7 (Heavy steering operation during stationary turns)”. Refer to FA-57.



Fail-safe items

Item	Fail-safe input conditions	Fail-safe cancel conditions	Operation during fail-safe
Vehicle speed sensor	● Vehicle speed signal cannot be entered for more than 10 seconds when the vehicle is running with the engine revolution greater than 1,500 rpm. ● Vehicle speed signal changes from a value of greater than 30 km/h (19 MPH) to a value of less than 2 km/h (1 MPH) within 1.4 seconds.	A signal corresponding to a vehicle speed of greater than 2 km/h (1 MPH) is entered.	● Shock absorber dampening force is maintained at a preset value. ● Power steering control current is maintained at approximately 0.18A.
Steering angle sensor	A steering signal of greater than 1° does not change for more than 180 seconds when vehicle speed is greater than 60 km/h (37 MPH).	A steering signal of greater than 1° is entered.	Shock absorber dampening force is maintained at a preset value.
Steering angle (neutral) signal	● Steering neutral signal is not entered (“ON”) at all while vehicle is being driven a distance of more than 10 km (6 miles). ● Steering neutral signal is not entered (“ON”) at all when steering wheel is turned at least 360° in either direction. ● Steering neutral signal is entered (“ON”) only while steering wheel is being turned at least 50° in either direction.	More than one ON-OFF signal are entered.	Shock absorber dampening force is maintained at a preset value.
Vertical G sensor	● Vertical G sensor signal corresponding to a voltage of greater than 4.5 volts does not change for 2 seconds. ● Vertical G sensor signal corresponding to a voltage of less than 0.5 volts does not change for 2 seconds.	Vertical G sensor signal corresponding to a voltage of greater than 1 volt or less than 4 volts.	When any of the vertical G sensors are determined to be faulty, shock absorber dampening force is maintained at a preset value.
Stop lamp switch	Fail-safe system does not process data. Faulty area is displayed when self-diagnosis is performed.		

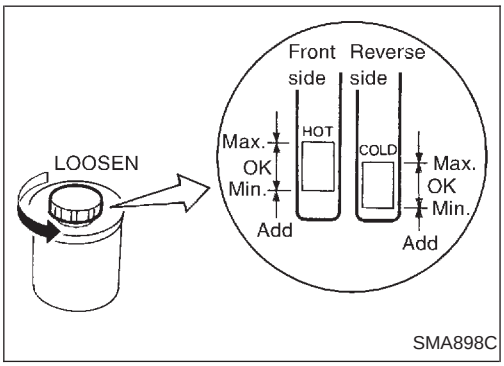
NOTE: Even after the fail-safe function is canceled, the fail-safe processed history is retained in the control unit memory.


SMA113

Preliminary Check

BASIC INSPECTION 1

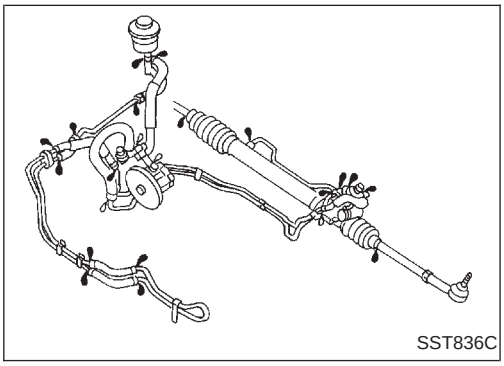
Check shock absorber for oil leakage or other damage.



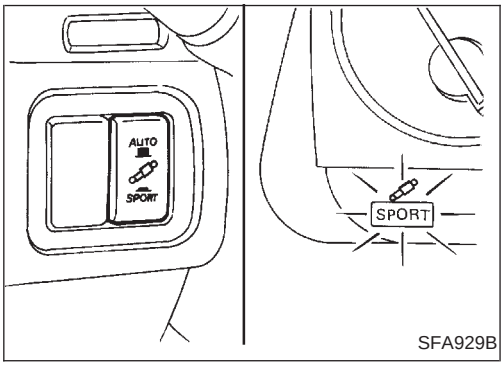
SMA898C

BASIC INSPECTION 2

Check fluid level in reservoir tank.
Use “HOT” range at fluid temperatures of 50 to 80°C (122 to 176°F) or “COLD” range at fluid temperatures of 0 to 30°C (32 to 86°F).


SST836C

Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



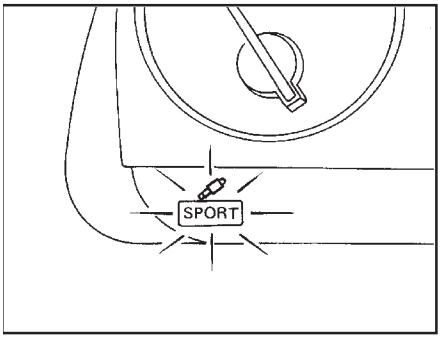
SFA929B

BASIC INSPECTION 3

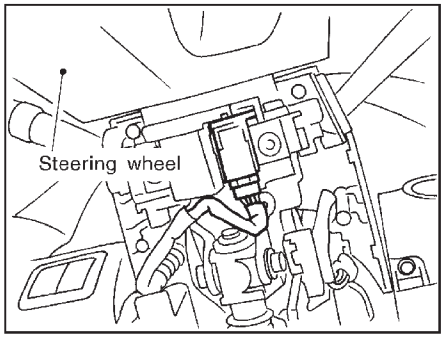
Perform self-diagnosis.
Refer to “Self-diagnosis”, FA-40.

Component Parts and Harness Connector Locations

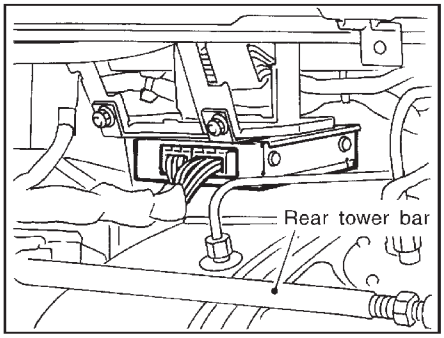
Indicator lamp (SPORT)

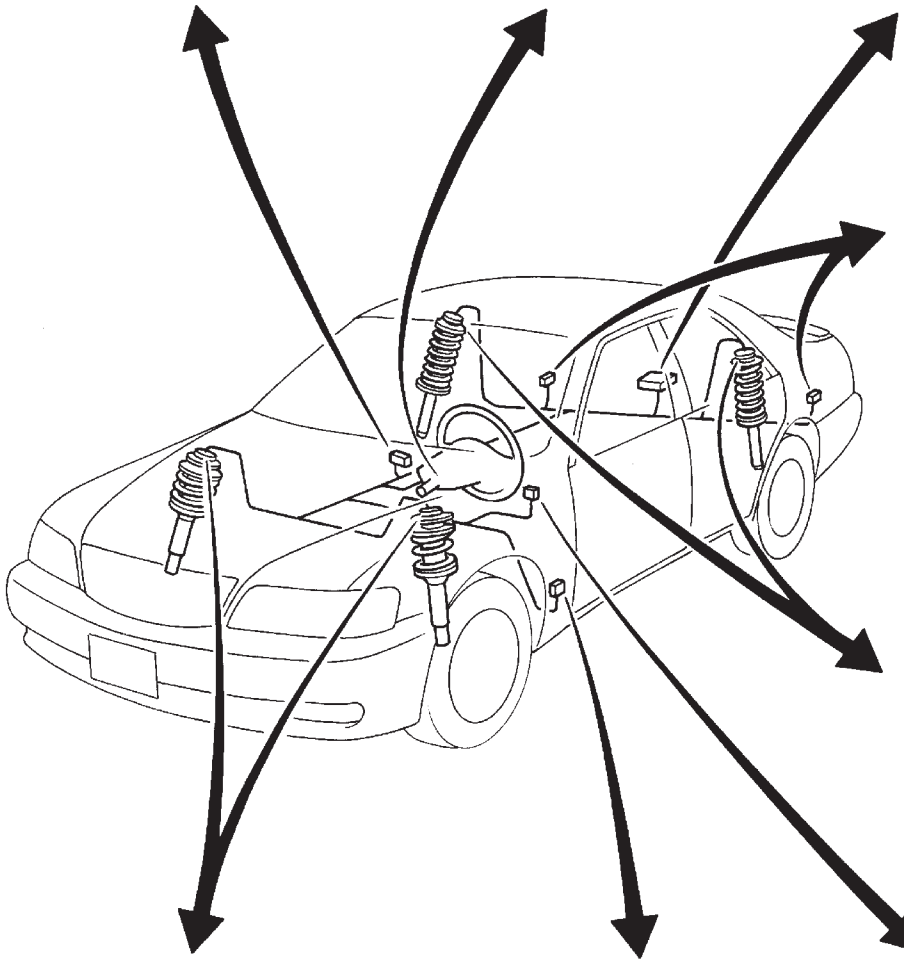


Steering angle sensor

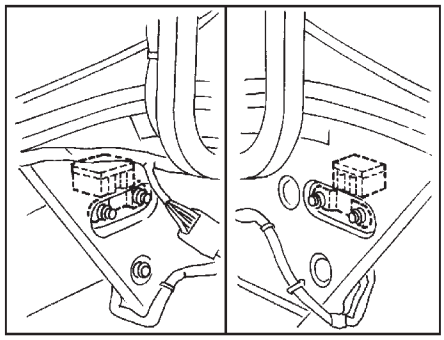


Control unit

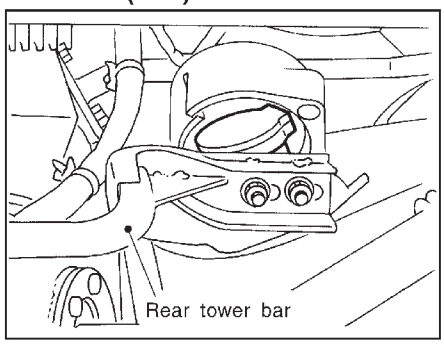


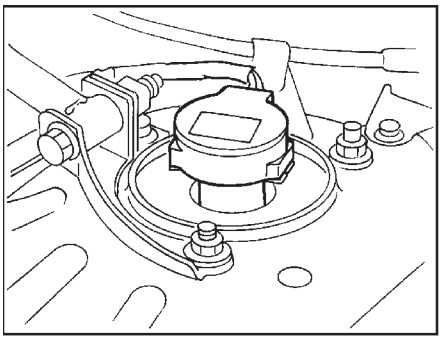


Vertical G sensor (rear)

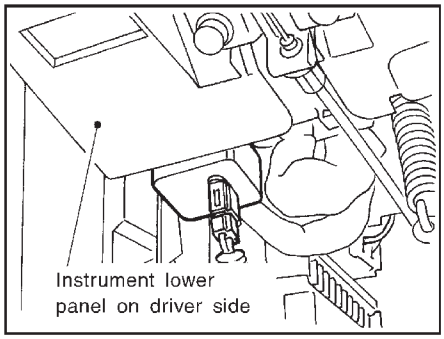


Actuator (rear)

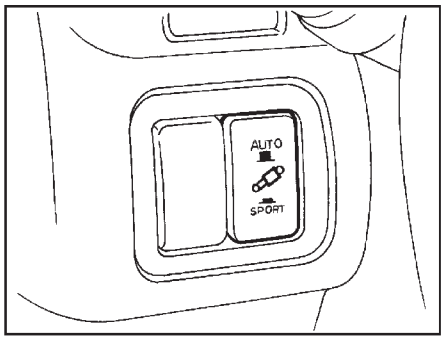




Actuator (front)



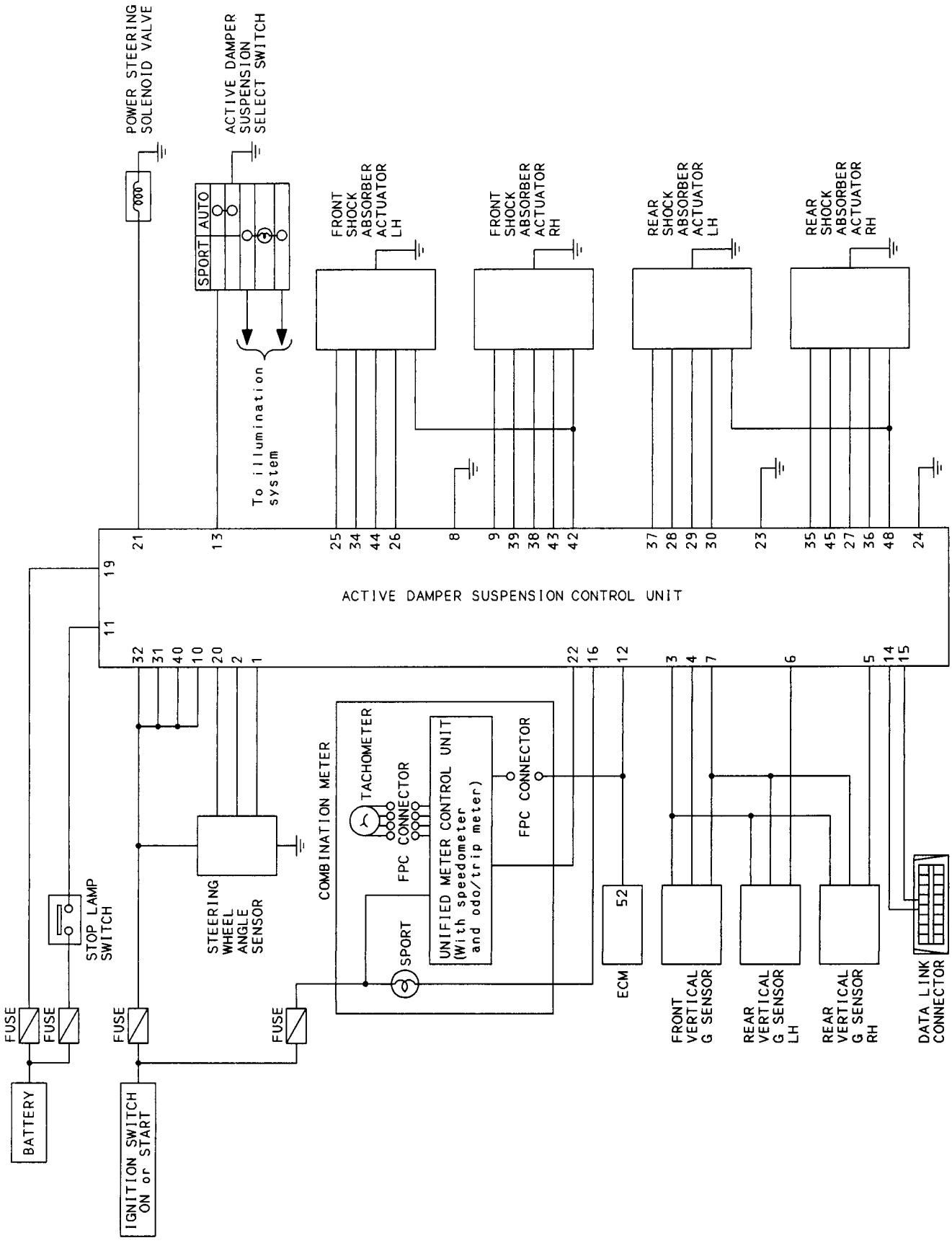
Vertical G sensor (front)



Select switch

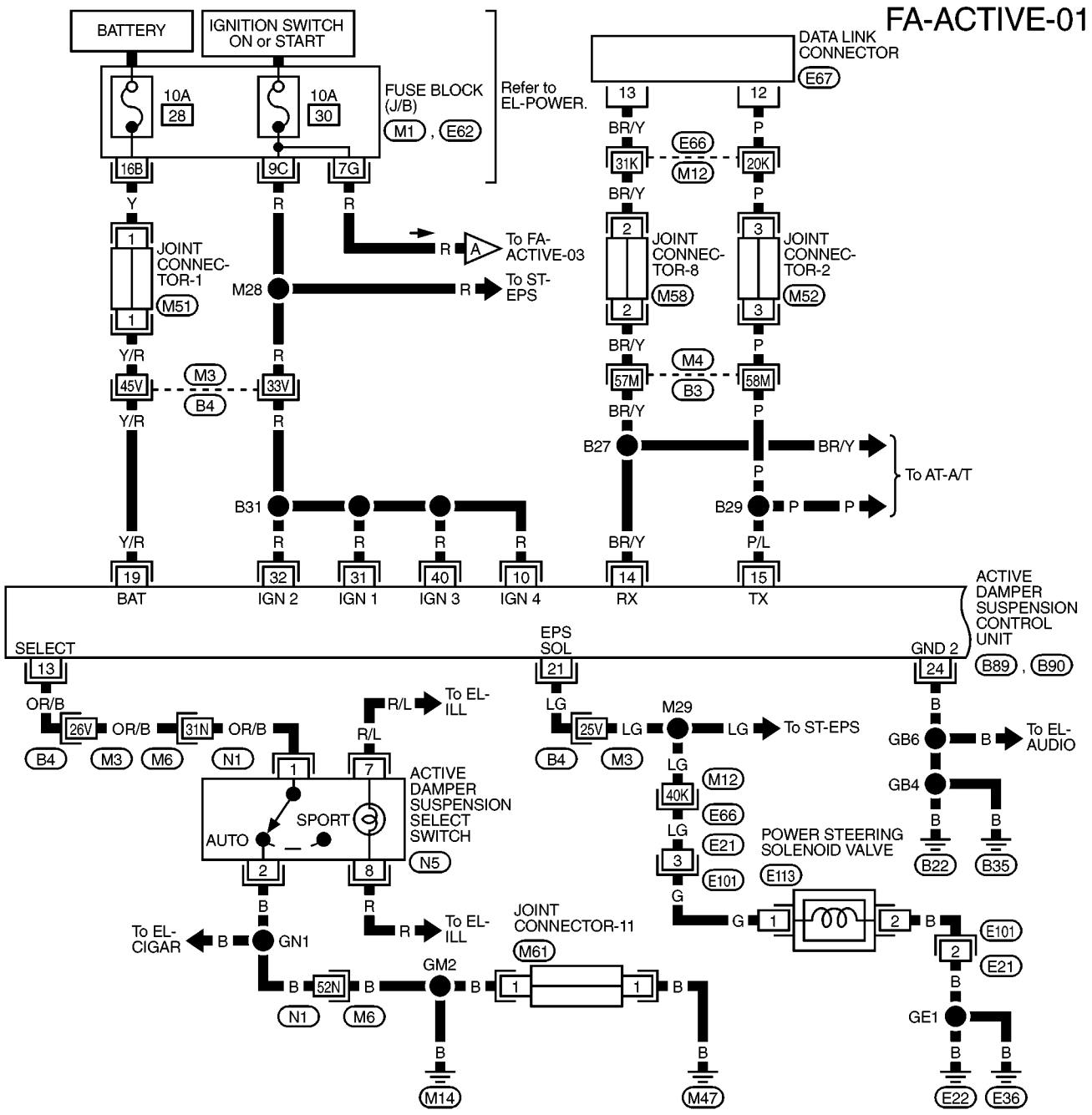
SFA930B

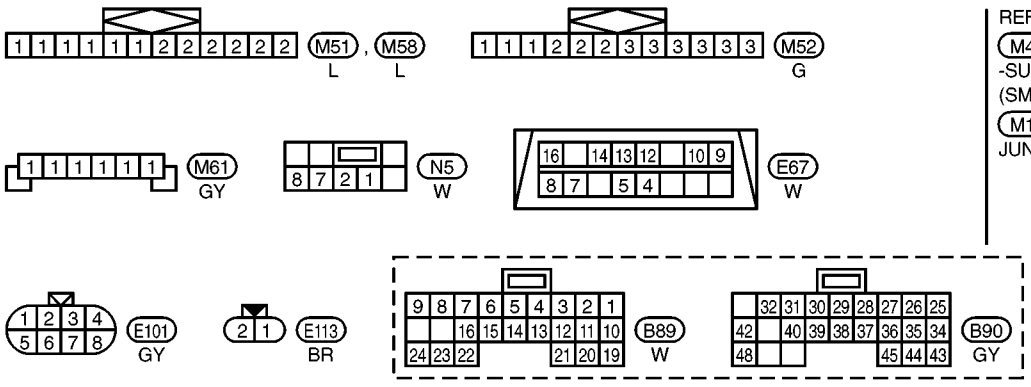
Schematic



TFA001M

Wiring Diagram



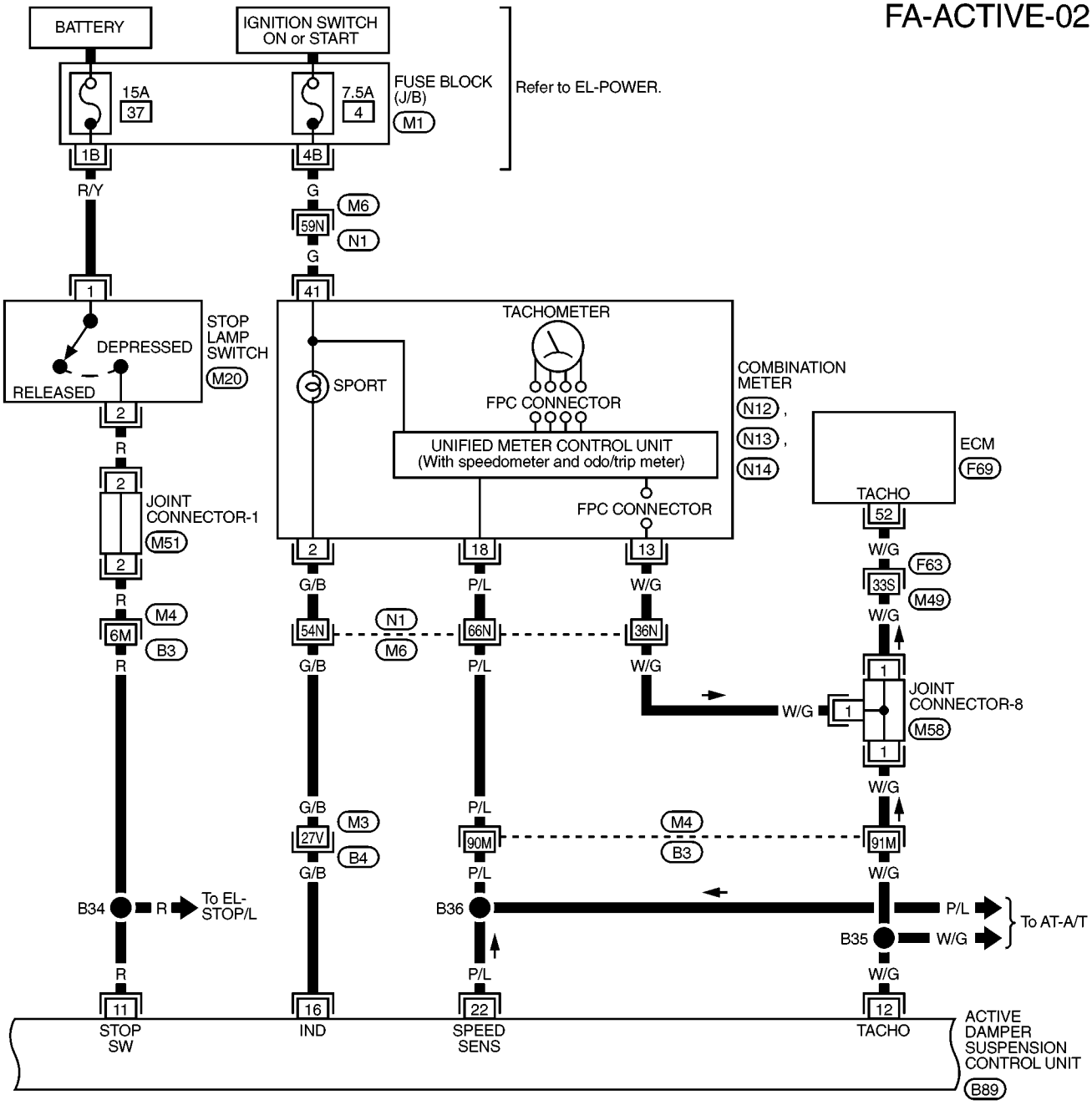


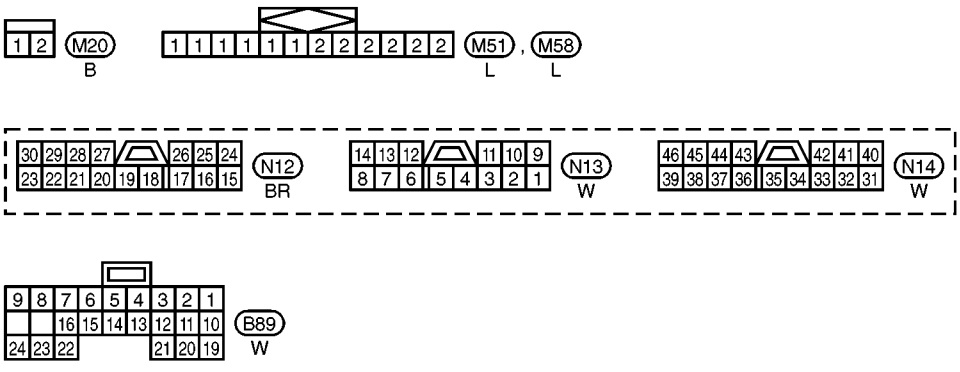
REFER TO THE FOLLOWING.
M4, M6, E66, B4
-SUPER MULTIPLE JUNCTION (SMJ)
M1, E62 -FUSE BLOCK-JUNCTION BOX (J/B)

TFA003M

Wiring Diagram (Cont'd)

FA-ACTIVE-02



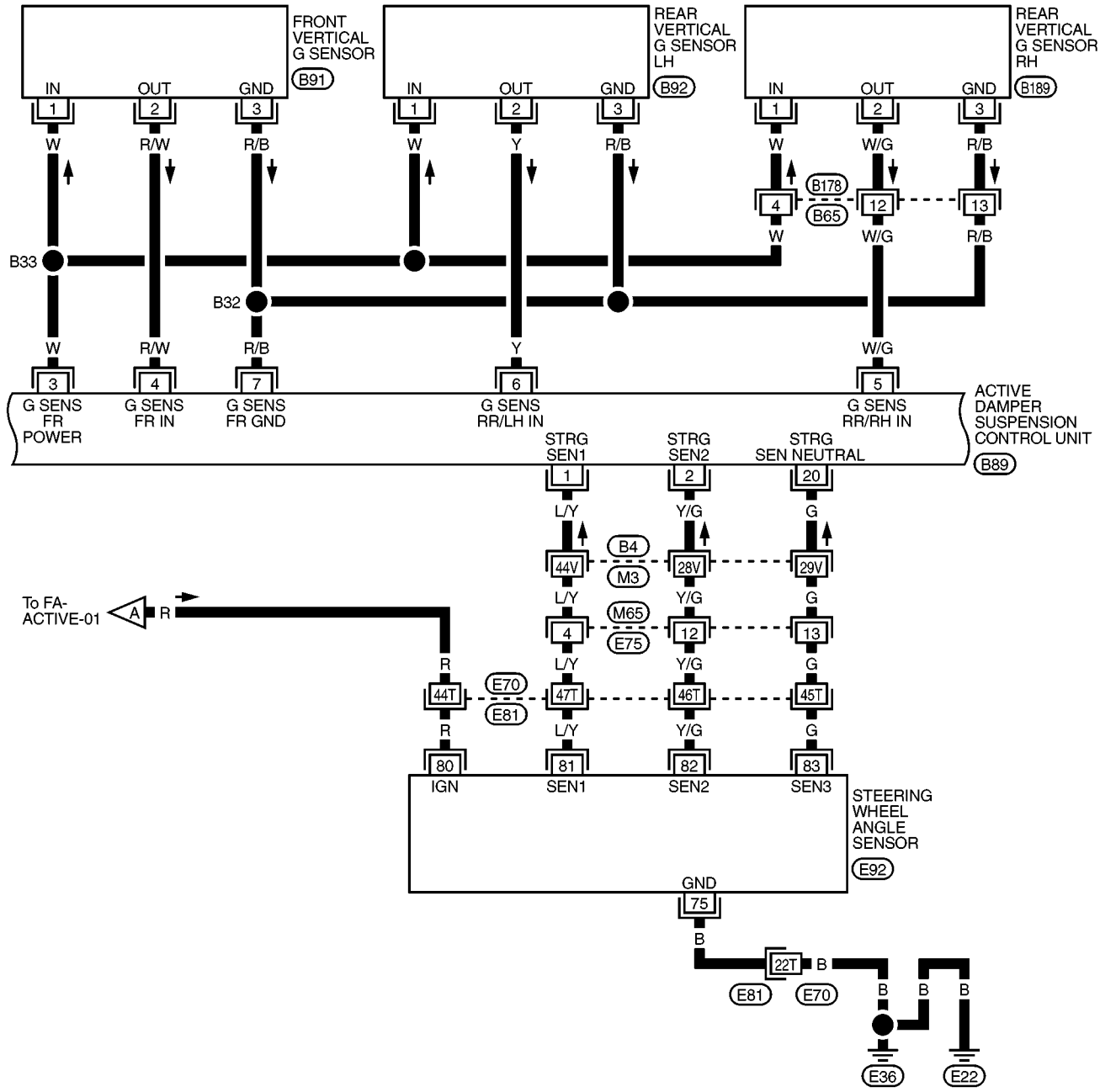


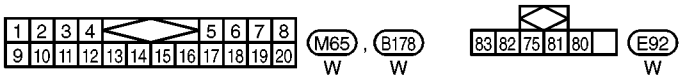
REFER TO THE FOLLOWING.
M4 , M6 , F63 , B4
-SUPER MULTIPLE JUNCTION (SMJ)
M1 -FUSE BLOCK-JUNCTION BOX (J/B)
F69 -ELECTRICAL UNITS

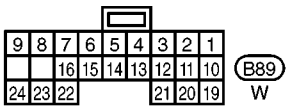
TFA004M

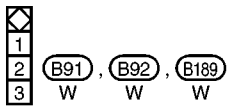
Wiring Diagram (Cont'd)

FA-ACTIVE-03







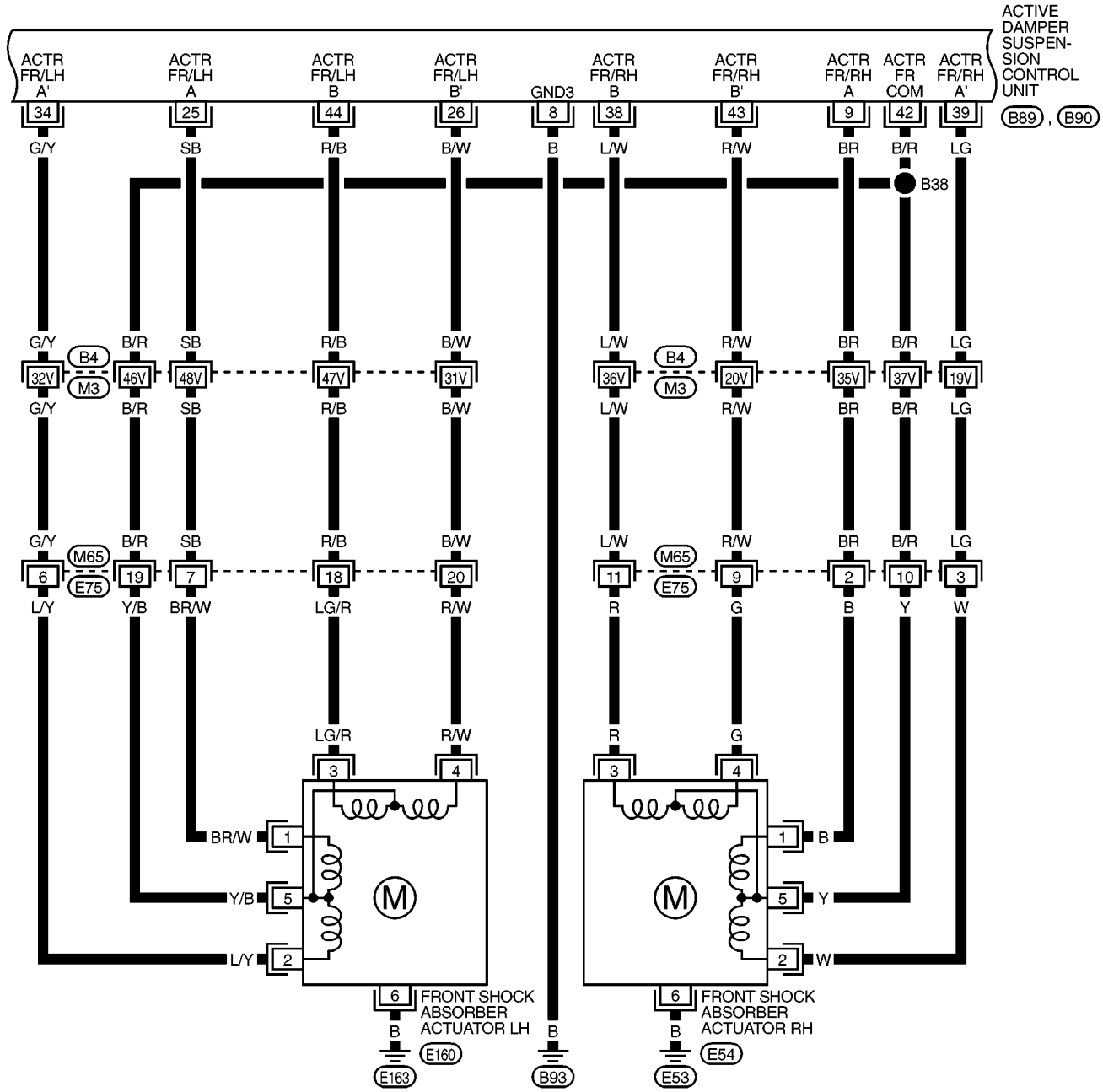


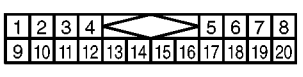
REFER TO THE FOLLOWING.
E81 , B4 -SUPER MULTIPLE JUNCTION (SMJ)

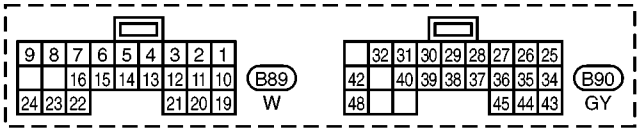
TFA005M

Wiring Diagram (Cont'd)

FA-ACTIVE-04







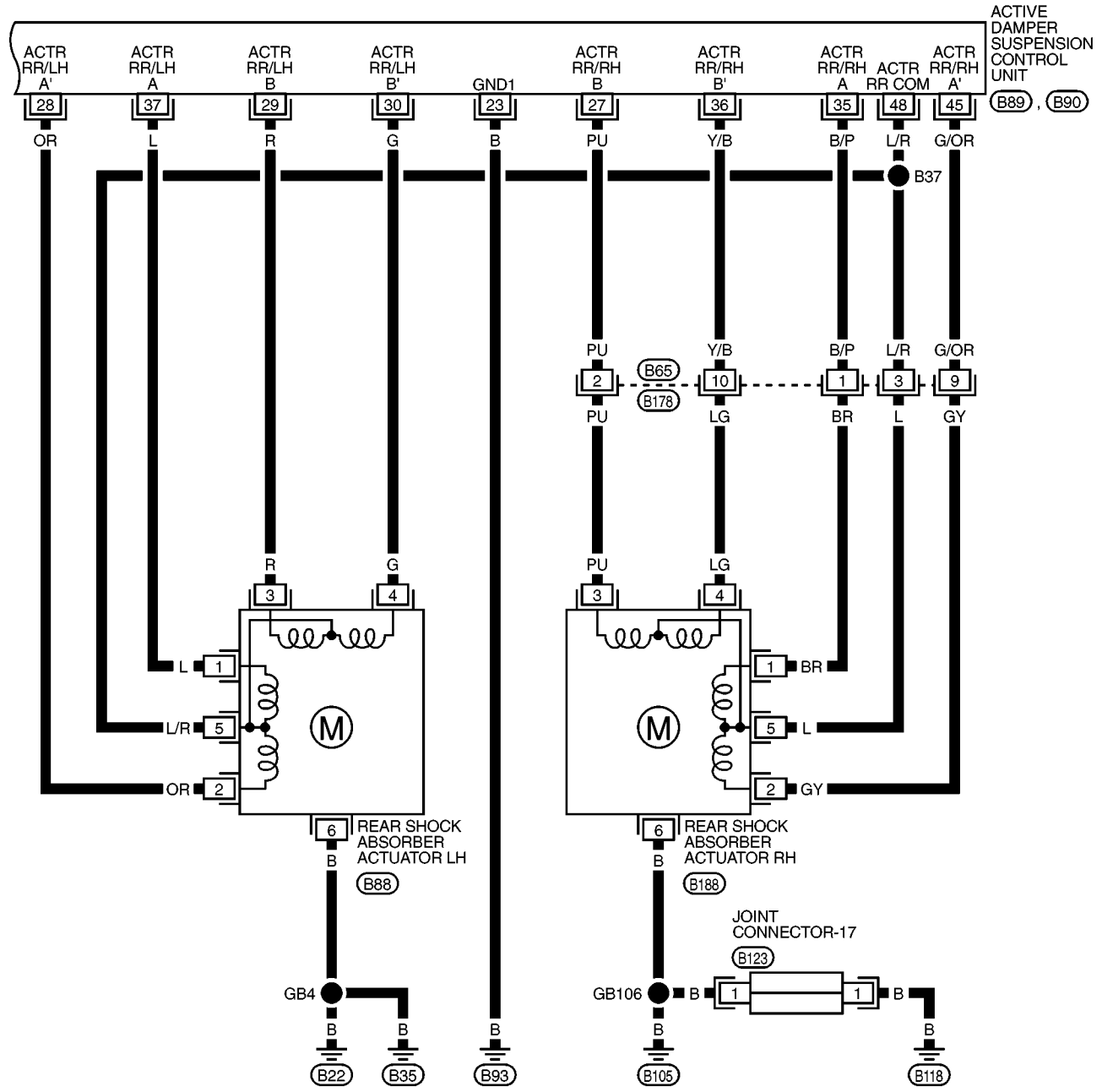
REFER TO THE FOLLOWING.
B4 -SUPER MULTIPLE JUNCTION (SMJ)

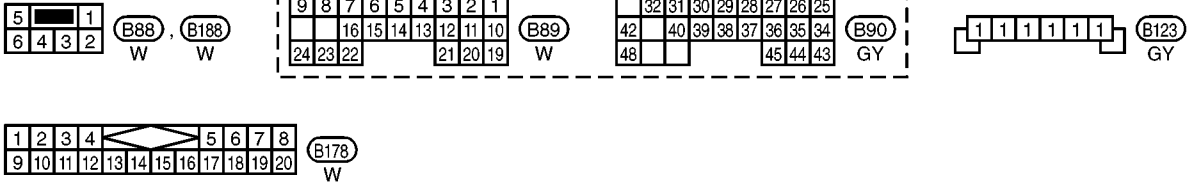
TFA006M

Wiring Diagram (Cont'd)

LHD MODELS

FA-ACTIVE-05





TFA019

Self-diagnoses

FUNCTION

The self-diagnosis system can be used without using CONSULT-II. With this system, both self-diagnostic history and fail-safe history are indicated by the SPORT indicator lamp.

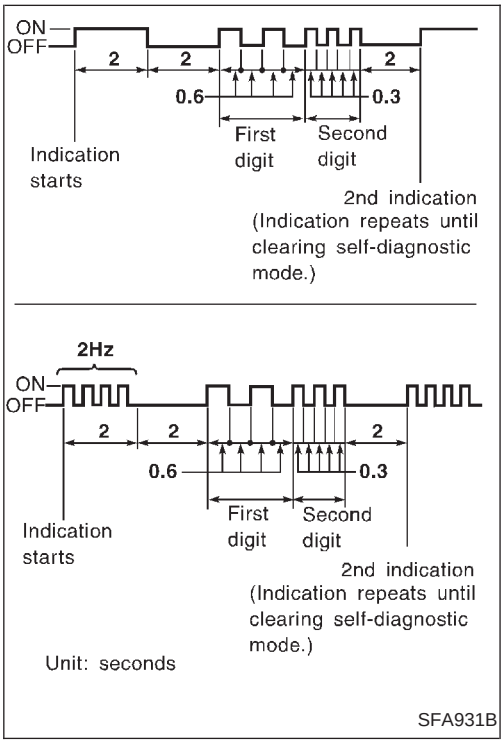
SELF-DIAGNOSTIC PROCEDURE

1. Turn ignition switch to “OFF”.
2. Start the engine.
3. Quickly switch the active damper suspension select switch from “SPORT” to “AUTO”, and vice versa, at least 5 times within 10 seconds immediately after the engine has started.

2 or 3 seconds following the above switch operation, the indicator lamp will come on. This is not the indication of self-diagnosis.

4. Perform the following procedures to enter the corresponding signals.

- Turn steering wheel 180° in either direction from neutral.
- Depress brake pedal.
- Release brake pedal.
- Move the vehicle at least 5 m (16 ft) forward.



HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)

Following the steps listed under the “Self-diagnostic procedure” above, a faulty area or faulty areas, if any, are indicated by a flashing active damper suspension indicator lamp located in the meter cluster.

The indicator lamp flashes to show faulty areas corresponding with No. 11 through 14, then No. 21, 23 and 24, in that order. 2 seconds after all items are indicated, the indicator lamp repeats the flash sequence for all items again.

- When all items are in good order, the indicator lamp flashes at a cycle of 1/4 Hz [ON (2 seconds) and OFF (2 seconds)].
  Display mode:
  First digit “ON” (0.6 seconds)
  Second digit “ON” (0.3 seconds)
- The upper part of the figure at left shows an example of a faulty area corresponding with No. 23.
- The lower part of the figure at left shows an example of a faulty area (No. 23) which previously fell under the fail-safe history data and is still stored in the current fail-safe data history.

After repairing the faulty area(s), erase the self-diagnostic data stored in memory. [Refer to “HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)”, FA-41].

Self-diagnoses (Cont'd)

MALFUNCTION CODE/SYMPTOM CHART

Code No.	Diagnostic item
11	Vehicle speed sensor
12	Steering angle sensor
13	Steering angle (neutral) sensor
14	Stop lamp switch
22	Vertical G sensor (front)
23	Vertical G sensor (rear right)
24	Vertical G sensor (rear left)

HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

Disconnecting the self-diagnostic function

Disconnect the self-diagnostic function using one of the following three methods:

- Turn the ignition switch to "OFF".
- Drive the vehicle at speeds greater than 30 km/h (19 MPH).
- Connect CONSULT-II.

Clearing the self-diagnostic memory

Clear self-diagnostic data and fail-safe data stored in memory as follows:

- While self-diagnosis is being performed, depress the brake pedal at least 5 times and shift the select switch position at least 5 times. Pedal depression and switch shifting must be done within 10 seconds during self-diagnosis.

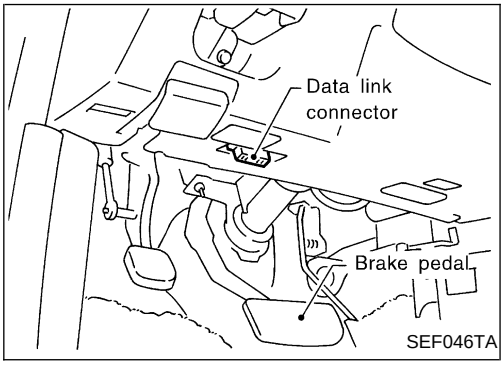
CONSULT-II Inspection Procedure

The troubleshooting system provides four functional modes — self-diagnosis, data monitor, active test and control unit part number display modes.

Mode type	Description	Mode selection	Display representation
SELF-DIAG RESULTS	Self-diagnosis	The desired functional mode can easily be selected by means of touch keys on CONSULT-II.	The desired functional mode can easily be shown on the CONSULT-II display.
DATA MONITOR	• Helps locate main trouble cause according to a self-diagnostic result. • Provides active damper suspension control unit input and output monitoring and print-out function (observation and recording).		
ACTIVE TEST	• Used to precisely locate the main cause for trouble according to the self-diagnostic result obtained in the data monitor mode. • Provides operational checks of indicator light and actuator circuits.		
ECU PART NUMBER	Active damper control unit part numbers are shown on the CONSULT-II display.		

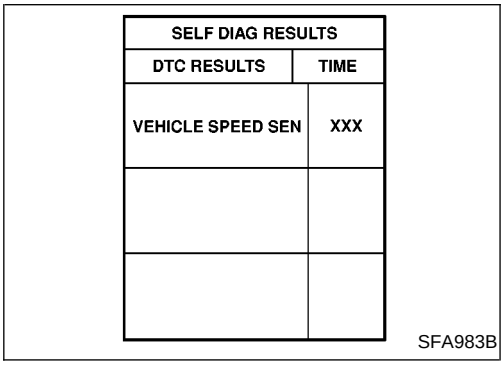
ECU (Active damper suspension control unit) part number mode

Ignore the ECU part number displayed in the ECU PART NUMBER MODE. Refer to parts catalog to order the ECU.



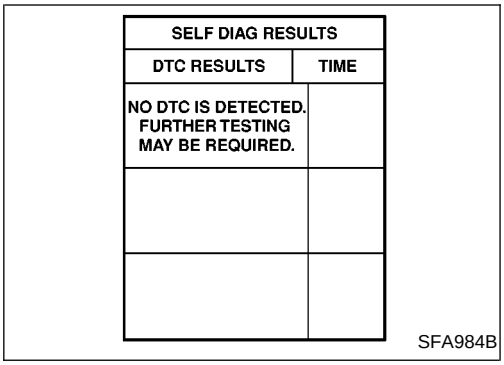
SELF-DIAGNOSIS PROCEDURE

1. Connect CONSULT-II to data link connector and start the engine.



2. Touch “START”, “ACT D/SUS” and “SELF-DIAG RESULTS”.
1) When a faulty item is displayed, record the item.
2) Touch “ERASE”.

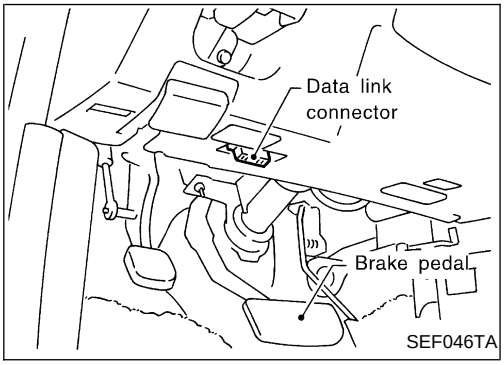
CONSULT-II Inspection Procedure (Cont'd)



3. A self-diagnostic result is displayed again.
   If "NO SELF DIAGNOSTIC FAILURE INDICATED" is displayed, check the item first shown on the display.

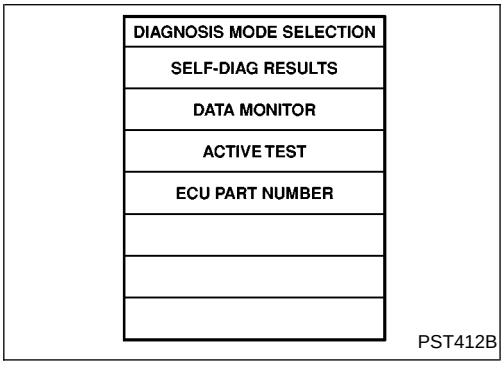
Items shown on display

Faulty system or circuit	Fault detecting conditions
VEHICLE SPEED SEN	• Input signal does not change for some length of time while driving. • Input signal changes abruptly while driving.
VERTI G SENSOR F	• Voltage is greater than or less than the standard value.
VERTI G SENSOR R/R	
VERTI G SENSOR R/L	
STEERING ANGLE SEN [ANG SIGNAL] (.a)	Input signal does not change for some length of time while driving at speeds greater than 60 km/h (37 MPH).
STEERING ANGLE SEN [NEUT SIGNAL] (.b)	• Neutral ("ON") signal is not entered at all while driving a distance of more than 10 km (6 miles). • Neutral ("ON") signal is not entered at all when steering wheel is turned at least 360°. • Neutral ("ON") signal is entered when steering wheel is turned at least 50°.



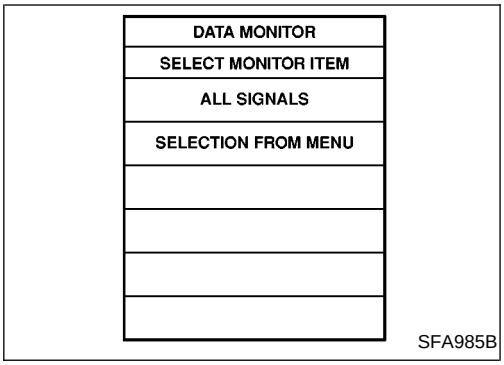
DATA MONITOR PROCEDURE

1. Connect CONSULT-II to data link connector, then start the engine.



2. Touch "START", "ACT D/SUS" and "DATA MONITOR".

CONSULT-II Inspection Procedure (Cont'd)



3. Select the signal to be monitored.
1) When "ALL SIGNALS" is selected, touch "START".
2) When "SELECTION FROM MENU" is to be selected, touch "SETTING". "MONITOR ITEM MENU" will then be indicated on the display. Touch the item to be monitored, then "ENTER" and "START".
3) Print out the data if necessary.

DATA MONITOR MODE

Monitored item	Display	Data item selection		Remarks
		Main item	Item menu selection	
Vehicle speed sensor	VHCL SPEED SE [km/h] or [mph]	○	○	—
Vertical G sensor front	VERTI G SE F [G]	○	○	—
Vertical G sensor rear right side	VERTI G SE RR [G]	○	○	—
Vertical G sensor rear left side	VERTI G SE RL [G]	○	○	—
Steering angle sensor (steering angle signal)	STEERING ANG [°]	○	○	When the battery is disconnected and then reconnected, an abnormal value is displayed until the straight-ahead position (0°) is set during driving.
Active damper select switch	SELECT SWITCH [AUTO-SPORT]	○	○	—
Stop lamp switch	STOP LAMP SW [ON-OFF]	○	○	—
Steering angle sensor (steering neutral signal)	NEUTRAL SIG [ON-OFF]	○	○	—
Damper motor front right	DAMP MTR F/R [Step]	○	○	—
Damper motor front left	DAMP MTR F/L [Step]	○	○	—
Damper motor rear right	DAMP MTR R/R [Step]	○	○	—
Damper motor rear left	DAMP MTR R/L [Step]	○	○	—
Power steering solenoid valve	POWER STR SOL [A]	○	○	EPS solenoid control current flow from control unit
Active damper indicator lamp (SPORT)	INDICATOR [ON-OFF]	○	○	—
Voltage	■ VOLTAGE [V]	—	○	Voltage measured by the voltage probe.
Pulse	■ PULSE [msec] or [Hz] or [%]	—	○	Pulse width, frequency or duty cycle measured by the pulse probe. Only "#" is displayed if item is unable to be measured. Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

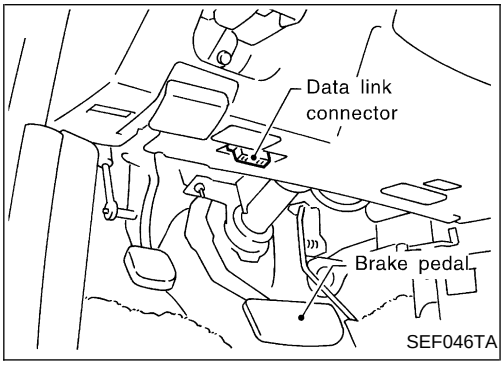
CONSULT-II Inspection Procedure (Cont'd)

Specifications for control unit input and output signals

Standard values emitted by CONSULT-II

Output signals refer to the data which are operated by the control unit. If an output circuit (harness) is broken, normal values are displayed.

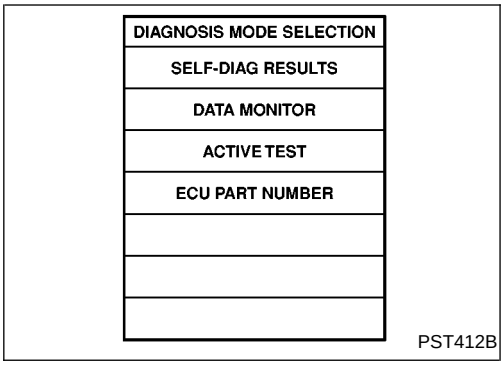
Items to monitor	Data monitor		Items to check (when abnormal)	Reference page
	Conditions	Reference value (when normal)		
VHCL SPEED SE [km/h] or [mph]	During driving or drive wheel rotation	Corresponds with speedometer indication.	Vehicle speed sensor circuit (Refer to "Diagnostic Procedure 1".)	FA-48
VERTI G SE F [G]	Vehicle is stopped on a flat road.	Within ±0.15G	Vertical G sensor circuit (Refer to "Diagnostic Procedure 4".)	FA-51
VERTI G SE RR [G]				
VERTI G SE RL [G]				
STEERING ANG [°]	Steering wheel is turned in either direction.	Steering wheel angle from neutral is displayed.	Steering angle sensor circuit (Refer to "Diagnostic Procedure 2".)	FA-49
SELECT SW [AUTO-SPORT]	Select switch position	Set to "AUTO": AUTO Set to "SPORT": SPORT	Select switch circuit (Refer to "Diagnostic Procedure 5".)	FA-52
STOP LAMP SW [ON-OFF]	Brake pedal position	Brake pedal is depressed. : ON Brake pedal is released. : OFF	Stop lamp switch circuit (Refer to "Diagnostic Procedure 3".)	FA-50
NEUTRAL SIG [ON-OFF]	Steering wheel is set at neutral or is turned in either direction.	Neutral position: ON Other position: OFF	Steering angle sensor circuit (Refer to "Diagnostic Procedure 2".)	FA-49
DAMP MTR F/R [Step]	Actuator position	16 step	Shock absorber actuator circuit (Refer to "Diagnostic Procedure 6".)	FA-54
DAMP MTR F/L [Step]				
DAMP MTR R/R [Step]		16 step		
DAMP MTR R/L [Step]				
POWER STR SOL [A]	Increase vehicle speed from 0 to 100 km/h (0 to 62 MPH).	0 km/h (0 MPH): Approx. 1.1A 100 km/h (62 MPH): Approx. 0.47A	EPS solenoid circuit (Refer to "Diagnostic Procedure 7" and "Diagnostic Procedure 8".)	FA-57 FA-58
INDICATOR [ON-OFF]	Ignition switch is turned to "ON" or engine is operating.	Indicator lamp is on. : ON Indicator lamp is off. : OFF	Indicator lamp circuit (Refer to "Diagnostic Procedure 5".)	FA-52



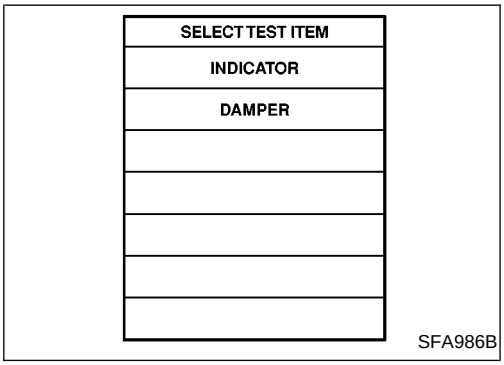
ACTIVE TEST PROCEDURE

1. Connect CONSULT-II to data link connector, then start the engine.

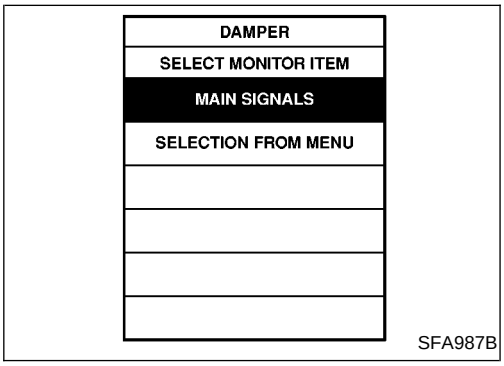
CONSULT-II Inspection Procedure (Cont'd)



2. Touch "START", "ACT D/SUS" and "ACTIVE TEST".

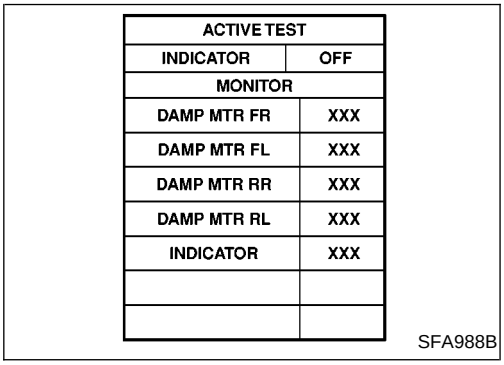


3. Touch "INDICATOR" or "DAMPER" as required.

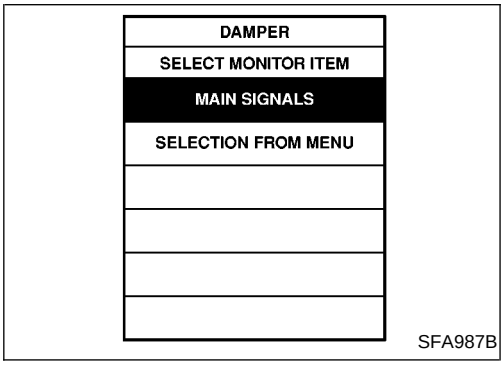


- When "INDICATOR" is to be selected:

1) Touch "MAIN SIGNAL", then "START".



2) When "OFF" is touched, indicator lamp goes out regardless of select switch positions. Monitor indicator will then be turned "OFF".
3) When "ON" is touched, indicator lamp comes on regardless of select switch positions. Monitor indicator will then be turned "ON".



- When "DAMPER" is to be selected:

1) Touch "SELECTION FROM MENU".
2) Select and touch "DAMP MTR F/R" or "DAMP MTR F/L", and "DAMP MTR R/R" or "DAMP MTR R/L", as required.
3) Touch "ENTER", then "START".

CONSULT-II Inspection Procedure (Cont'd)

ACTIVE TEST	
DAMPER TEST CONDITION	
FL-N	FR-N
RL-N	RR-N
MONITOR	
DAMP MTR FR	XXX
DAMP MTR FL	XXX

SFA989B

4) "4 step" for front damper motors and "4 step" for rear damper motor will be then shown on the display.
5) Touch "CONDITION CHANGE", "FL-N, FR-N, RL-N, RR-N" and "START".

ACTIVE TEST	
DAMPER TEST CONDITION	
FL-HS	FR-HS
RL-HS	RR-HS
MONITOR	
DAMP MTR FR	XXX
DAMP MTR FL	XXX

SFA990B

6) "96 step" for front damper motors and "96 step" for rear damper motor will then appear on the display.
7) Touch "CONDITION CHANGE", "FL-HS, FR-HS, RL-HS, RR-HS" and "START".

ACTIVE TEST	
DAMPER TEST CONDITION	
FL-SS	FR-SS
RL-SS	RR-SS
MONITOR	
DAMP MTR FR	XXX
DAMP MTR FL	XXX

SFA991B

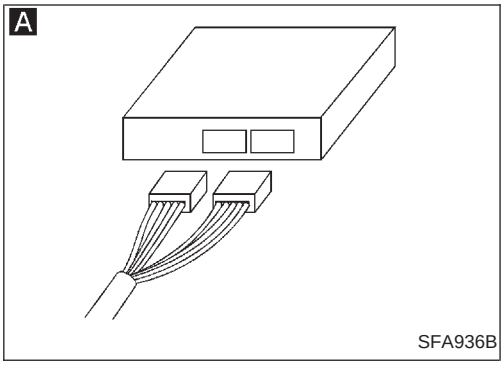
8) "0 step" for front damper motors and "0 step" for rear damper motor will then appear on the display.
9) Touch "CONDITION CHANGE" and "FL-SS, FR-SS, RL-SS, RR-SS" and "START".

ACTIVE TEST	
DAMPER TEST CONDITION	
FL-SH	FR-SH
RL-SH	RR-SH
MONITOR	
DAMP MTR FR	XXX
DAMP MTR FL	XXX

SFA992B

10) "−40 step" for front damper motors and "−40 step" for rear damper motor will then appear on the display.
11) Print out data as required.

A



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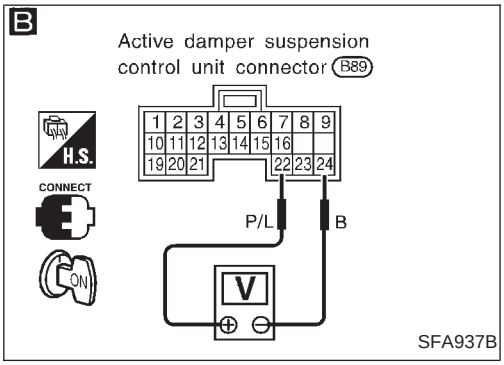
B



SFA937B

Diagnostic Procedure 1 (Vehicle speed sensor)

Code No. 11

A

Disconnect control unit connector, then re-connect it securely. Perform self-diagnosis to check that proper test results are obtained.

OK → INSPECTION END

NG ↓

B

CHECK CONTROL UNIT INPUT SIGNAL.

1. Use a jack to raise the vehicle.
2. With vehicle operating at extremely low speeds, measure vehicle speed sensor input signal voltage between control unit connector terminals ㉒ and ㉔.
   Voltage:
   Varies from 0V to 5V.

OK → Replace control unit.

NG ↓

Speedometer is operating properly.

NG → Faulty speedometer circuit (Refer to “Inspection/ Vehicle Speed Sensor Signal Circuit” of “METER AND GAUGES” in EL section.)

OK ↓

Faulty vehicle speed sensor or vehicle speed sensor-to-control unit harness

Diagnostic Procedure 2 (Steering angle sensor)

Code No. 12, 13

A

Disconnect control unit connector and steering angle sensor connector, then reconnect them securely. Perform self-diagnosis to check that proper test results are obtained.

OK → INSPECTION END

NG ↓

B

CHECK CONTROL UNIT INPUT SIGNAL.
1. Turn ignition switch to "ON".
2. Slowly turn steering wheel at least 90° to left or right from neutral. Measure voltage between control unit connector terminals ① and ㉔, ② and ㉔, and ⑳ and ㉔.

Voltage:
Varies from 0V to 5V.

OK → Replace control unit.

NG ↓

C

CHECK STEERING ANGLE SENSOR OUTPUT SIGNAL.
1. Turn ignition switch to "ON".
2. Slowly turn steering wheel at least 90° to left or right from neutral. Measure voltage between control unit connector terminals ㉛ and ㉕, ㉜ and ㉕, and ㉝ and ㉕.

Voltage:
Varies from 0V to 5V.

OK → Faulty control unit-to-steering angle sensor harness

NG ↓

D

CHECK STEERING ANGLE SENSOR POWER CIRCUIT.
1. Turn ignition switch to "ON".
2. Slowly turn steering wheel at least 90° to left or right from neutral. Measure voltage between steering angle sensor connector terminal ㉚ and body ground.

Voltage:
Battery voltage

NG → Faulty power circuit. Replace steering angle sensor and repair faulty power circuit. Perform self-diagnosis again.

OK ↓

E

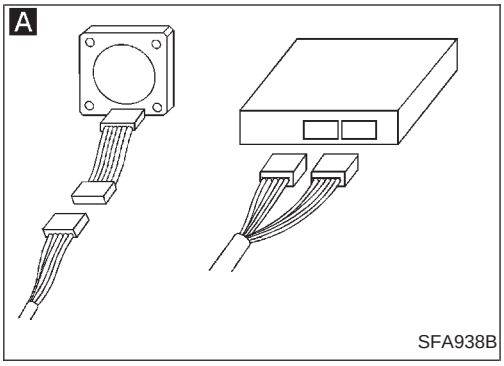
CHECK STEERING ANGLE SENSOR GROUND CIRCUIT.
Check continuity between steering angle sensor connector terminal ㉕ and body ground.

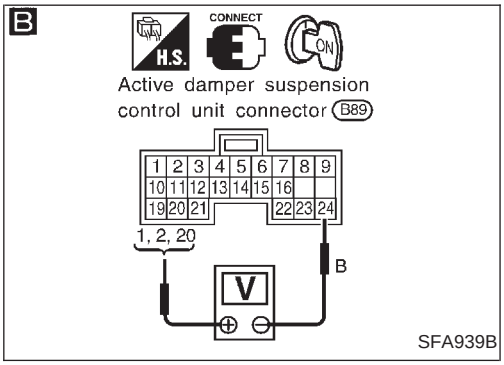
Continuity should exist.

OK → Replace steering angle sensor.

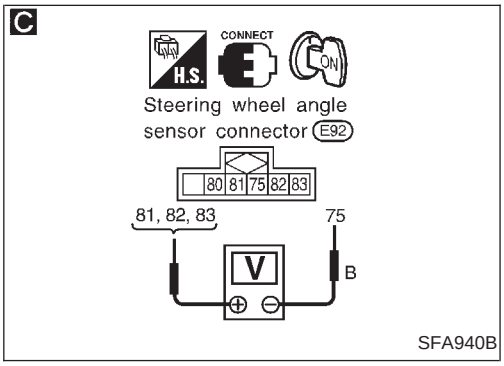
NG ↓

Faulty ground harness.


SFA938B



SFA939B



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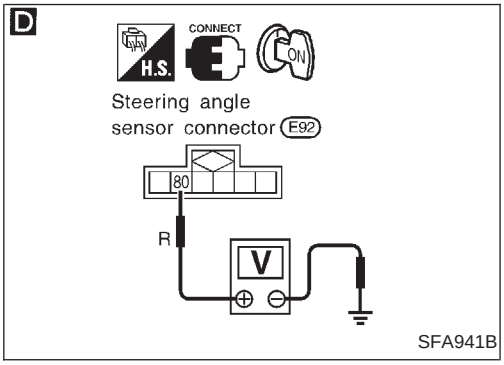

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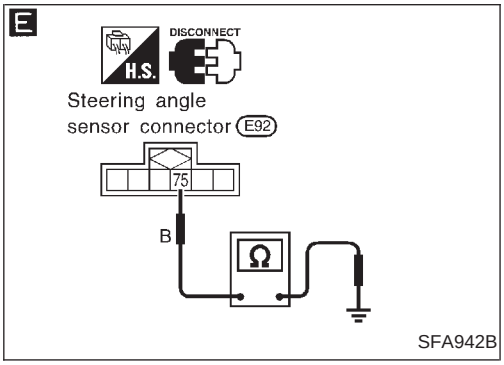

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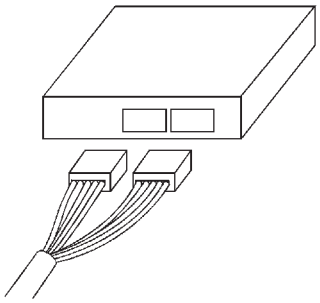
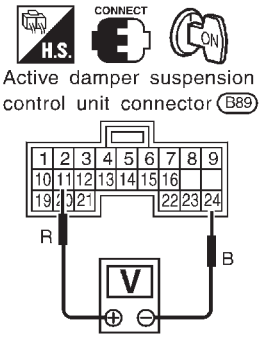
A



SFA936B

B



SFA943B

Diagnostic Procedure 3 (Stop lamp switch)

Code No. 14

A

Disconnect control unit connector, then re-connect it securely. Perform self-diagnosis to check that proper test results are obtained.

OK → INSPECTION END

NG ↓

B

CHECK CONTROL UNIT INPUT SIGNAL.
1. Turn ignition switch to “ON”.
2. Measure voltage between control unit connector terminals ⑪ and ㉔.

Voltage:
Brake pedal depressed:
Approx. 12V
Brake pedal released:
0V

NG → Faulty control unit-to-stop lamp switch harness.

OK ↓

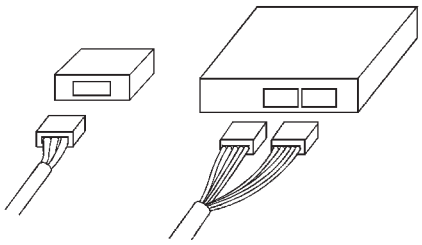
Check that stop lamps illuminate when brake pedal is depressed.

OK → Faulty control unit or control unit ground circuit.

NG ↓

Faulty battery-to-stop lamp switch harness or stop lamp switch

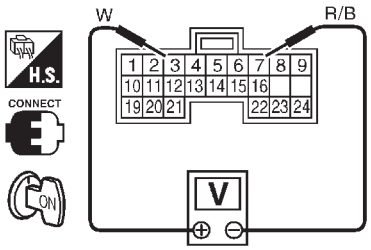
A



SFA944B

B

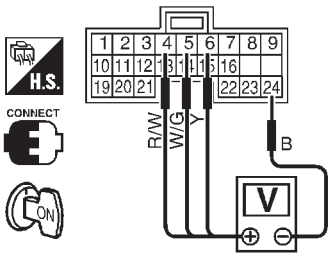
Active damper suspension control unit connector B89



SFA945B

C

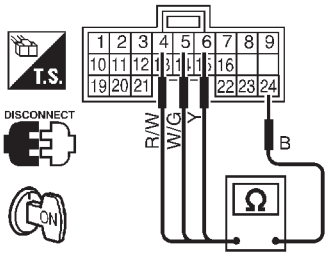
Active damper suspension control unit connector B89



SFA946B

D

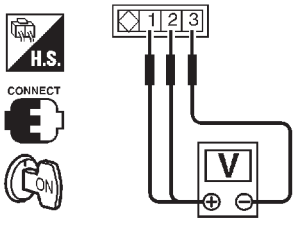
Active damper suspension control unit connector B89



SFA968B

E

Front vertical G sensor connector B91
Rear RH vertical G sensor connector B189
Rear LH vertical G sensor connector B92



SFA947B

Diagnostic Procedure 4 (Vertical G sensor)

Code No. 22, 23, 24

A

Disconnect control unit connector and vertical G sensor connector, then re-connect them securely. Perform self-diagnosis to check that proper test results are obtained.

OK → INSPECTION END

NG ↓

B

CHECK CONTROL UNIT VERTICAL G SENSOR POWER CIRCUIT.
1. Turn ignition switch to "ON".
2. Measure voltage between control unit connector terminals ③ and ⑦.

Voltage:
Approx. 5V

NG → Faulty control unit or control unit ground circuit.

OK ↓

C

CHECK CONTROL UNIT VERTICAL G SENSOR INPUT SIGNAL.
Measure voltage between control unit connector terminals ④ and ㉔, ⑤ and ㉔, and ⑥ and ㉔.

Voltage:
Approx. 2.5V

OK → Replace control unit.

NG ↓

D

CHECK CONTROL UNIT VERTICAL G SENSOR INPUT SIGNAL CIRCUIT.
Check continuity between control unit connector terminals ④, ⑤, ⑥ and ㉔.

Continuity should not exist.

NG → Faulty control unit-to-vertical G sensor harness.

OK ↓

E

CHECK VERTICAL G SENSOR OUTPUT SIGNAL.
1. Turn ignition switch to "ON".
2. Measure voltage between vertical G sensor connector terminals ① and ③ and ② and ③.

Voltage:
① — ③
Approx. 5V
② — ③
Approx. 2.5V

NG → Replace vertical G sensor.

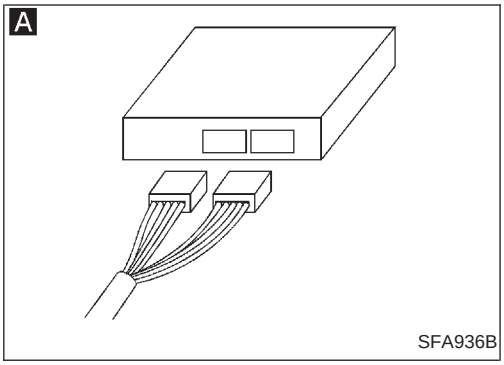
OK ↓

Faulty control unit-to-vertical G sensor harness.

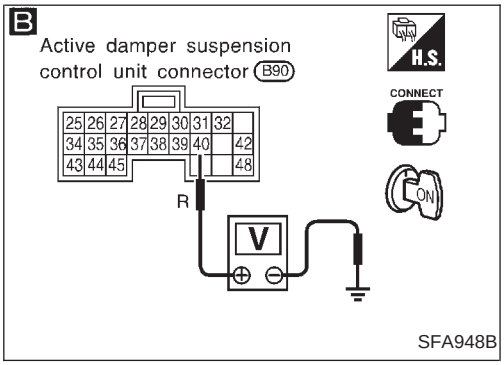
Note: The front vertical G sensor is installed on the rear of the inner pillar and the rear vertical G sensor is located on the rear of the outer wheelhouse. To check each vertical G sensor output signal, remove the vertical G sensor, set it vertical, then measure voltage between terminals.
Be careful not to drop or bump the vertical G sensor as it is easy to break. If dropped or bumped, replace with a new one.

Diagnostic Procedure 5 (SPORT indicator does not come on when ignition switch is turned on.)

A

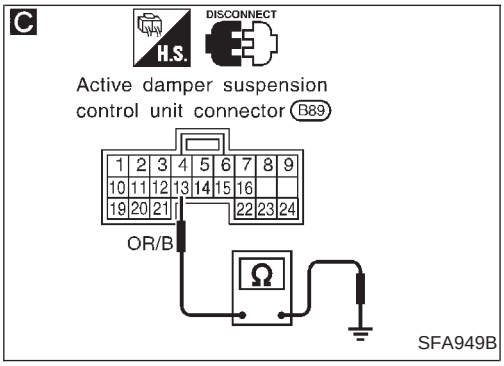

SFA936B

B



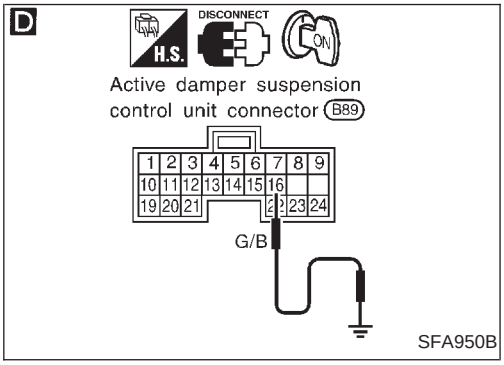
SFA948B

C



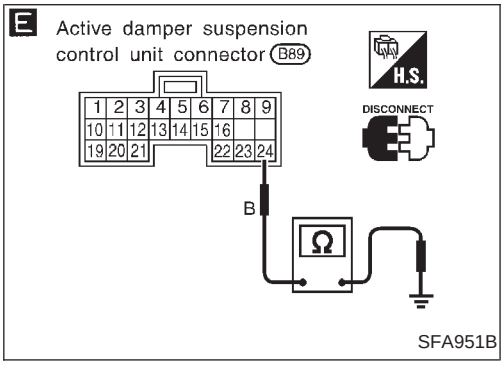
SFA949B

D



SFA950B

E



SFA951B

A

Disconnect control unit connector, then re-connect it securely. Turn ignition switch to “ON” and check that indicator lamp illuminates.

OK → INSPECTION END

NG ↓

B

CHECK POWER CIRCUIT.
1. Turn ignition switch to “ON”.
2. Measure voltage between control unit connector terminal ㊵ and body ground.
   Voltage:
   Battery voltage

NG → Faulty power circuit.

OK ↓

C

CHECK SELECT SWITCH CIRCUIT.
1. Disconnect control unit connector.
2. Check continuity between control unit body harness connector terminal ⑬ and body ground.
   Continuity:
   AUTO: Continuity should exist.
   SPORT: Continuity should not exist.

NG → Ⓐ

OK ↓

D

CHECK INDICATOR LAMP CIRCUIT.
Short control unit body harness connector terminal ⑯ to body ground to check that indicator lamp illuminates.

No → Ⓑ

Yes ↓

E

CHECK CONTROL UNIT GROUND CIRCUIT.
Check continuity between control unit body harness connector terminal ㉔ and body ground.
Continuity should exist.

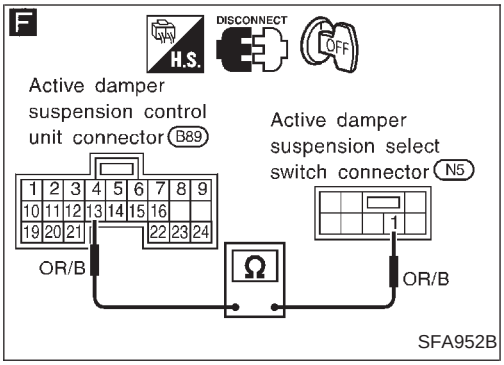
NG → Faulty control unit ground circuit.

OK ↓

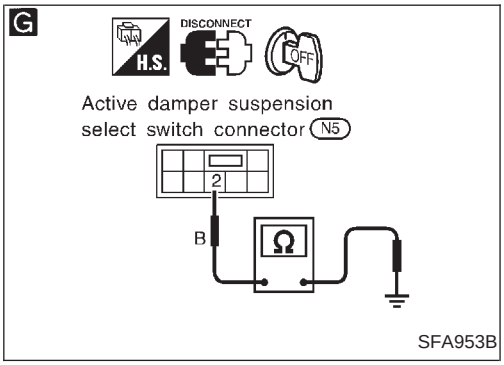
Replace control unit.

Diagnostic Procedure 5 (SPORT indicator does not come on when ignition switch is turned on.) (Cont'd)

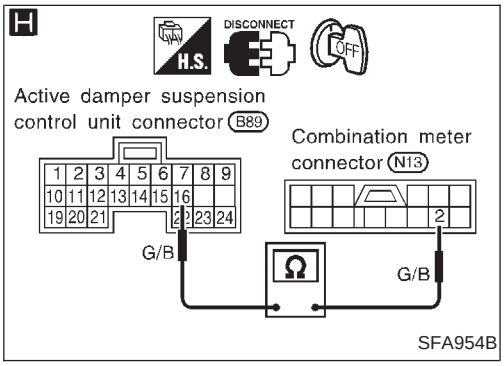
F



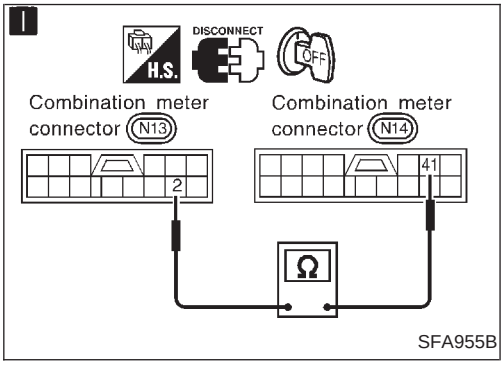
G



H



I



Ⓐ

F

CHECK SELECT SWITCH CIRCUIT.
Check continuity between control unit body harness connector terminal ⑬ and select switch body harness connector terminal ① .
Continuity should exist.

NG → Faulty control unit-to-select switch harness.

OK ↓

G

CHECK SELECT SWITCH GROUND CIRCUIT.
Check continuity between select switch body harness connector terminal ② and body ground.
Continuity should exist.

NG → Faulty select switch ground circuit.

OK ↓

Replace select switch.

Ⓑ

H

CHECK INDICATOR LAMP CIRCUIT.
Check continuity between control unit body harness connector terminal ⑯ and indicator lamp body harness connector terminal ② .
Continuity should exist.

NG → Faulty control unit-to-indicator lamp harness.

OK ↓

I

CHECK INDICATOR LAMP.
Check continuity between indicator lamp meter connector terminals ㊶ and ② .
Continuity should exist.

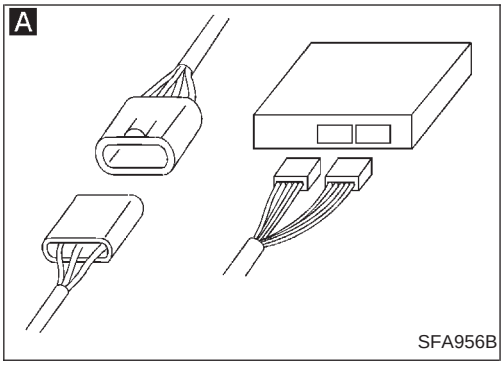
NG → Replace indicator lamp.

OK ↓

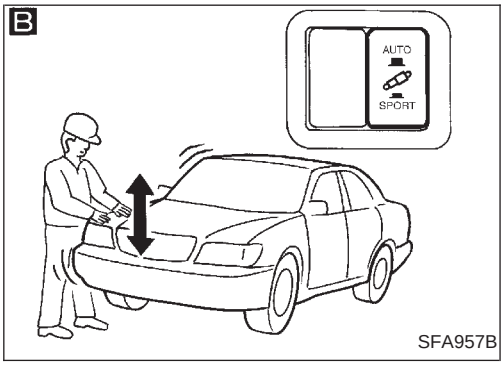
Faulty power circuit.

Diagnostic procedure 6 (Hard or soft feel)

A

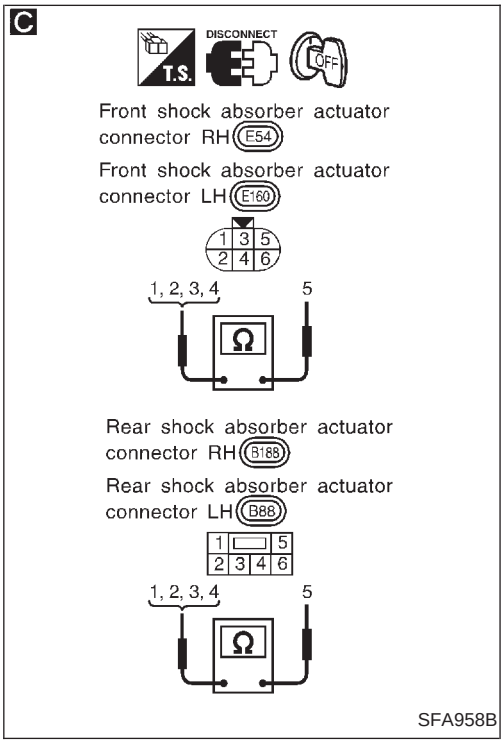

SFA956B

B



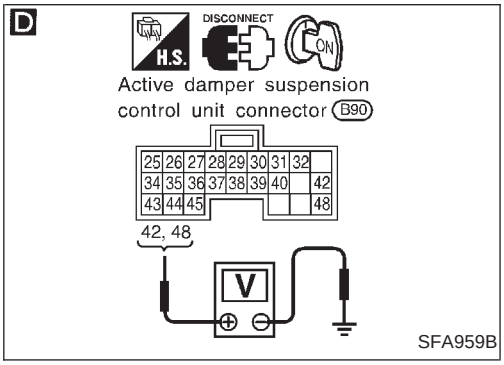
SFA957B

C



SFA958B

D



SFA959B

A

Disconnect control unit connector and shock absorber actuator connector, then re-connect them. Perform self-diagnosis to check that proper test results are obtained.

NG → Check and repair faulty area.

OK ↓

B

CHECK SHOCK ABSORBER ACTUATOR OPERATION.

1. Set the diagnostic system in the self-diagnosis mode.
2. Set select switch to “AUTO”, then move vehicle body up and down to check that dampening force of each shock absorber is high. Brake pedal should be released during tests.
3. Set select lever to “SPORT”, then move vehicle body up and down to check that dampening force of each shock absorber is low.

OK → Ⓐ

NG ↓

C

CHECK SHOCK ABSORBER ACTUATOR.

Measure resistance between shock absorber actuator terminals ① and ⑤, ② and ⑤, and ③ and ⑤, and ④ and ⑤.

Resistance:

Approx. 9.4Ω

NG → Replace shock absorber actuator.

OK ↓

D

CHECK CONTROL UNIT OUTPUT SIGNAL.

1. Turn ignition switch to “ON”.
2. Measure voltage between control unit connector terminals ㊷, ㊽ and body ground.

Voltage: Battery voltage

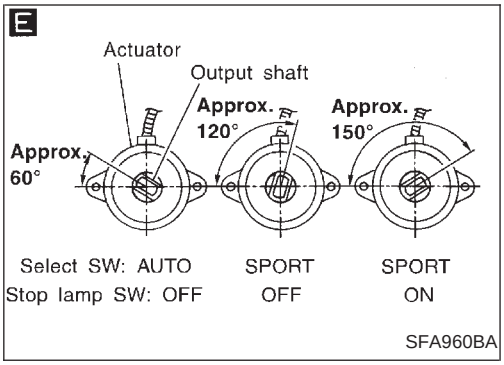
NG → Ⓒ

OK ↓

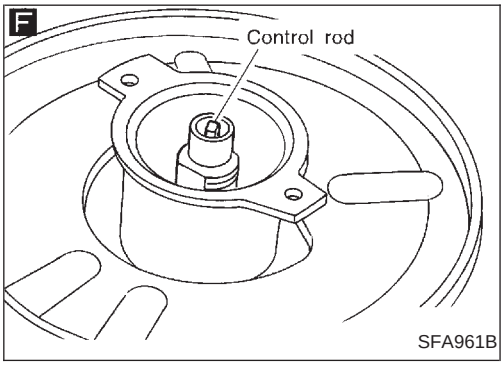
Ⓑ

Diagnostic procedure 6 (Hard or soft feel) (Cont'd)

E



F



Ⓑ

E

CHECK SHOCK ABSORBER ACTUATOR OPERATION.
1. Remove actuator from strut.
2. Set diagnostic system in the self-diagnostic mode.
3. Check that actuator operates as depicted in the figure at left when select switch is set to "AUTO" or "SPORT", and brake pedal is depressed or released.

NG → Ⓓ

OK ↓

F

CHECK SHOCK ABSORBER CONTROL ROD.
Pinch control rod with your fingers, then turn it 2 or 3 rotations to check that it rotates smoothly without free play.

NG → Replace shock absorber.

OK ↓

1. Install actuator and perform self-diagnosis.
2. Turn ignition switch to "ON" to initialize actuator positioning, then re-perform self-diagnosis to check actuator operation. (Refer to B .)

OK → INSPECTION END

NG ↓

1. Replace with a new actuator, then perform self-diagnosis.
2. Turn ignition switch to "ON" to initialize actuator positioning, then re-perform self-diagnosis to check actuator operation. (Refer to B .)

OK → Replace actuator.

NG ↓

Replace shock absorber.

Ⓐ

Check for improved riding comfort.

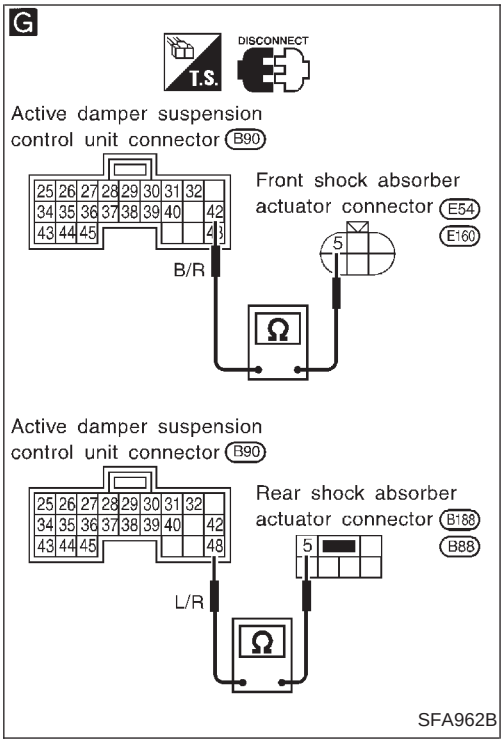
NG → Replace shock absorber.

OK ↓

INSPECTION END

Diagnostic procedure 6 (Hard or soft feel) (Cont'd)

G



Ⓒ

G

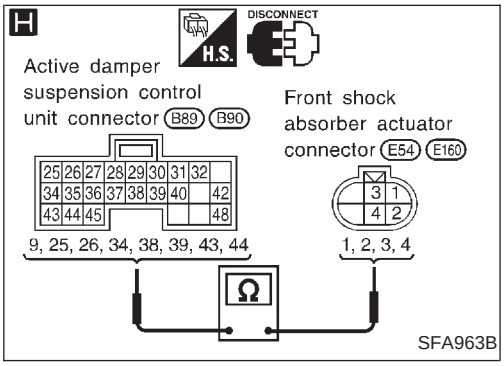
Check continuity between control unit connector terminals ㊷, ㊽ and shock absorber actuator terminal ⑤.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

Replace control unit.

H



Ⓓ

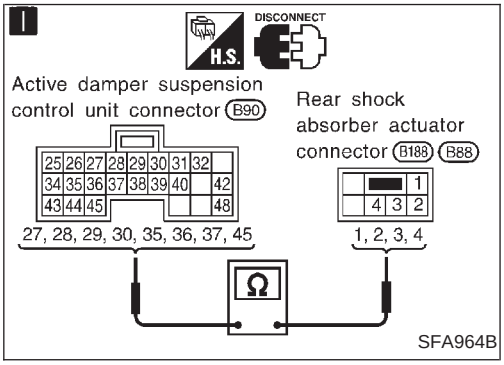
H

Check continuity between control unit connector terminals ⑨, ㉕, ㉖, ㉞, ㊳, ㊴, ㊸, ㊹ and front shock absorber actuator connector terminals ①, ②, ③, ④.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

I



I

Check continuity between control unit connector terminals ㉗, ㉘, ㉙, ㉚, ㉟, ㊱, ㊲, ㊺ and rear shock absorber actuator connector terminals ①, ②, ③, ④.
Continuity should exist.

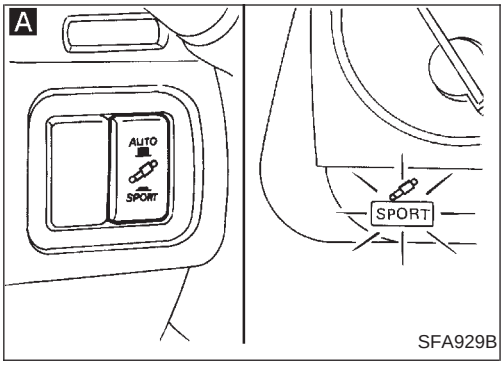
NG → Repair harness or connectors.

OK ↓

Replace control unit.

Diagnostic Procedure 7 (Heavy steering operation during stationary turns)

A



SFA929B

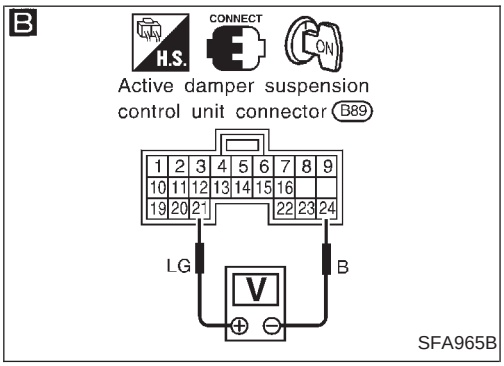
Perform self-diagnosis to check that vehicle speed sensor and stop lamp switch are in good order.
When self-diagnosis is performed using CONSULT-II, abnormalities concerning stop lamp switch cannot be displayed. Always perform self-diagnosis using indicator lamp located in meter cluster.

NG → Faulty vehicle speed sensor. Go to “Diagnostic Procedure 1 (Vehicle speed sensor)”.

NG → Faulty stop lamp switch. Go to “Diagnostic Procedure 3 (Stop lamp switch)”.

OK ↓

B



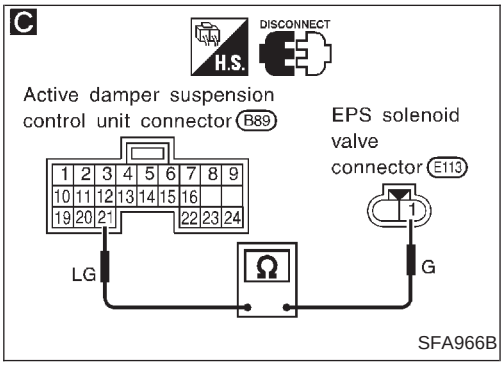
SFA965B

Check control unit output signal.
1. Turn ignition switch to “ON”.
2. Measure voltage between control unit connector terminals ㉑ and ㉔.
Voltage:
Approx. 4 - 6V

NG → Replace control unit.

OK ↓

C



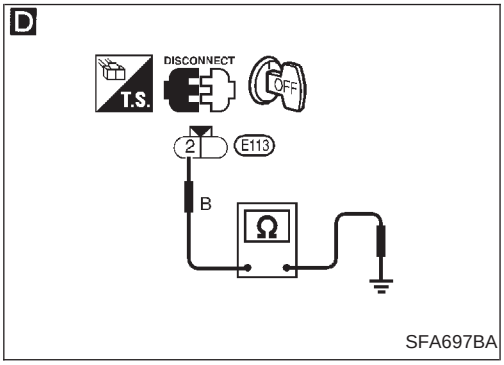
SFA966B

Check continuity between control unit connector terminal ㉑ and EPS solenoid valve terminal ①.
Continuity should exist.

NG → Faulty control unit-to-EPS solenoid valve harness.

OK ↓

D



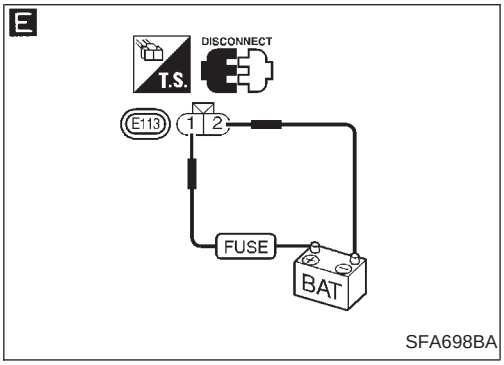
SFA697BA

Check continuity between EPS solenoid valve terminal ② and body ground.
Continuity should exist.

NG → Faulty EPS solenoid valve ground circuit.

OK ↓

E



SFA698BA

Check EPS solenoid valve.
Disconnect EPS solenoid valve connector.
Apply battery voltage to solenoid terminal to check that solenoid valve plunger clicks.

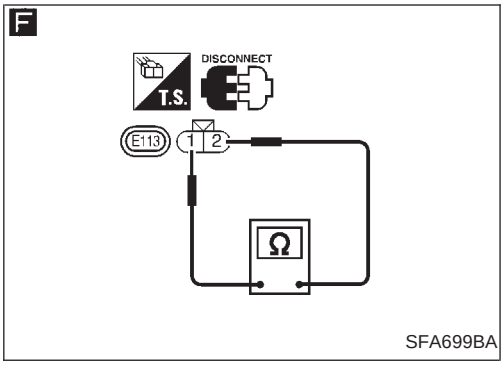
NG → Replace EPS solenoid valve.

OK ↓

Ⓐ

Diagnostic Procedure 7 (Heavy steering operation during stationary turns) (Cont'd)

F



SFA699BA

Ⓐ

F

Measure resistance between EPS solenoid valve terminals ① and ② .
Resistance:
Approx. 4 - 6Ω

NG → Replace EPS solenoid valve.

OK

CHECK AND ADJUST STEERING GEAR.
Adjust steering gear assembly to check that problem is eliminated.

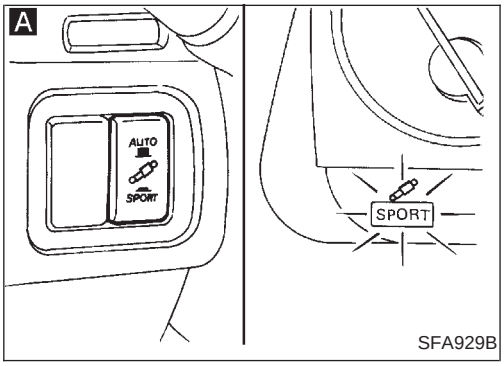
OK → INSPECTION END

NG

- Faulty steering gear assembly
- Faulty oil pump assembly

Diagnostic Procedure 8 (Light steering during high-speed operation)

A



SFA929B

A

Perform self-diagnosis to check that vehicle speed sensor is in good order.

NG → Faulty vehicle speed sensor. Go to "Diagnostic Procedure 1 (Vehicle speed sensor)".

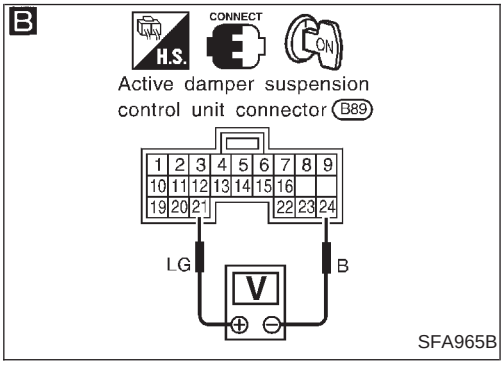
OK

Lift drive wheels using a jack. Start the engine to check speedometer operation.

NG → Faulty speedometer. Refer to "INSPECTION/ SPEEDOMETER AND VEHICLE SPEED SENSOR" of "METER AND GAUGES" in EL section.

OK

B



SFA965B

B

Increase vehicle speed from 0 to 100 km/h (0 to 62 MPH), then measure voltage between control unit connector terminals ㉑ and ㉔.
Voltage:
Approx. 1.1V [0 km/h (0 MPH)]
Approx. 0.5V [100 km/h (62 MPH)]

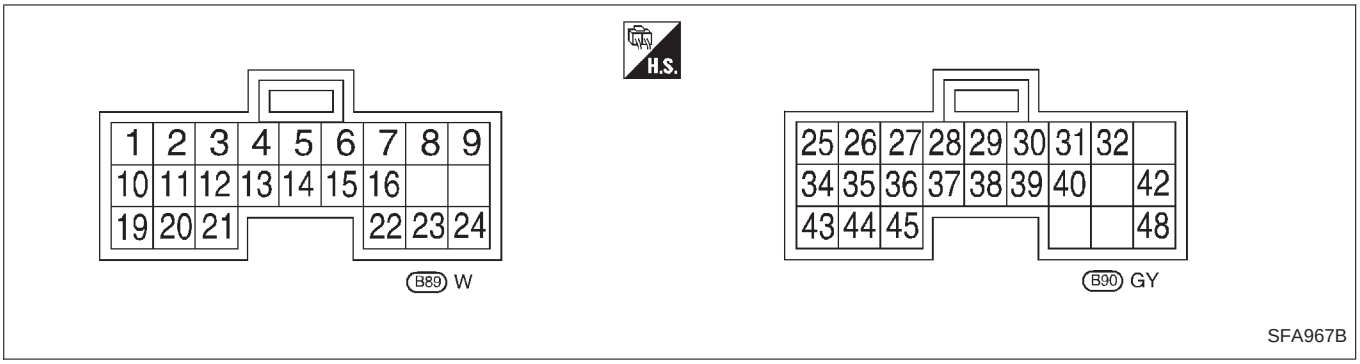
OK → Go to C under "Diagnostic Procedure 7 (Heavy steering operation during stationary turns)".

NG

Replace control unit.

Electrical Component Inspection

INSPECTION OF ACTIVE DAMPER SUSPENSION CONTROL UNIT

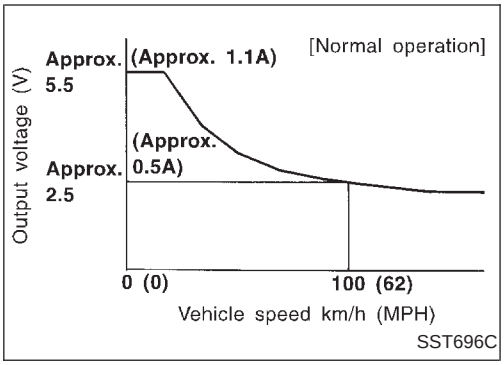


Active damper suspension control unit inspection table

Terminal No.		Parts to check	Specifications	
+	−			
10, 19, 31 32, 40	Ground	Power supply	Turn ignition switch “ON”	Battery voltage (Approx. 12V)
8, 23, 24		Ground	—	
9, 25, 26 27, 28, 29 30, 34, 35 36, 37, 38 39, 43, 44 45		Shock absorber actuator	—	
42, 48			Battery voltage (Approx. 12V)	
13		Select switch	“SPORT” “AUTO”	0V Approx. 5V
21		EPS solenoid	At 0 km/h (0 MPH) At 100 km/h (62 MPH)	Approx. 1.1A Approx. 0.47A
16		Indicator lamp (SPORT)	Select switch set to “SPORT” Select switch set to “AUTO”	0V Battery voltage (Approx. 12V)
1, 2		Steering angle sensor	Steering wheel slowly turned to either side from neutral	0 to 5V (Approx.) are repeated.
20			Steering wheel set to neutral	Approx. 5V
11		Stop lamp switch	Brake pedal released Brake pedal depressed	0V Battery voltage (Approx. 12V)
3		Vertical G sensor power supply	—	Approx. 5V
4, 5, 6		Vertical G sensor	Vehicle standstill	Approx. 2.5V
22		Vehicle speed sensor	During extremely low speeds	0 to 5V (Approx.) are repeated.
14, 15	—	CONSULT-II	—	

Electrical Component Inspection (Cont'd)

EPS solenoid valve current flow characteristics



General Specifications

Suspension type	Independent macpherson strut with coil spring
Strut type	Standard: Double-acting hydraulic Optional: Adjusting hydraulic (Active damper suspension)
Stabilizer bar	Standard equipment

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

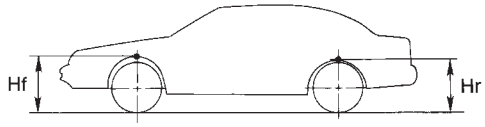
Camber			Minimum	−1°25′ (−1.42°)
			Nominal	−0°40′ (−0.67°)
		Degree minute (Decimal degree)	Maximum	0°05′ (0.08°)
			Left and right difference	1° (1.00°) or less
Caster			Minimum	5°40′ (5.67°)
			Nominal	6°25′ (6.42°)
		Degree minute (Decimal degree)	Maximum	7°10′ (7.17°)
			Left and right difference	1° (1.00°) or less
Kingpin inclination			Minimum	12°25′ (12.42°)
		Degree minute (Decimal degree)	Nominal	13°10′ (13.17°)
			Maximum	13°55′ (13.92°)
Total toe-in			Minimum	1 (0.04)
	Distance (A − B)		Nominal	2 (0.08)
		mm (in)	Maximum	3 (0.12)
	Angle (left plus right)		Minimum	4′ (0.07°)
		Degree minute (Decimal degree)	Nominal	10′ (0.17°)
			Maximum	16′ (0.27°)
Wheel turning angle	Full turn*2		Minimum	36°50′ (36.83°)
	Inside	Degree minute (Decimal degree)	Nominal	39°50′ (39.83°)
			Maximum	40°50′ (40.83°)
	Outside	Degree minute (Decimal degree)	Nominal	32°25′ (32.42°)

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

Inspection and Adjustment (Cont'd)

WHEELARCH HEIGHT (Unladen*)



SFA818A

Tire		215/60R16	225/50R17
Front (Hf)	mm (in)	731 (28.78)	722 (28.43)
Rear (Hr)	mm (in)	734 (28.90)	723 (28.46)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

WHEEL BEARING

Wheel bearing end play limit	mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut Tightening torque	N·m (kg-m, ft-lb)	206 - 284 (21 - 29, 152 - 210)
Maximum wheel bearing preload measured at wheel hub bolt	N (kg, lb)	37.2 (3.8, 8.4)

LOWER BALL JOINT

Swinging force at cotter pin hole	N (kg, lb)	8.8 - 85.3 (0.9 - 8.7, 2.0 - 19.2)
Turning torque	N·m (kg-cm, in-lb)	0.5 - 4.9 (5 - 50, 4.3 - 43)
Vertical end play	mm (in)	0 (0)

WHEEL RUNOUT (Radial and lateral)

Wheel type		Aluminum wheel
Radial runout limit	mm (in)	0.3 (0.012) or less
Lateral runout limit	mm (in)	