FRONT AXLE & FRONT SUSPENSION

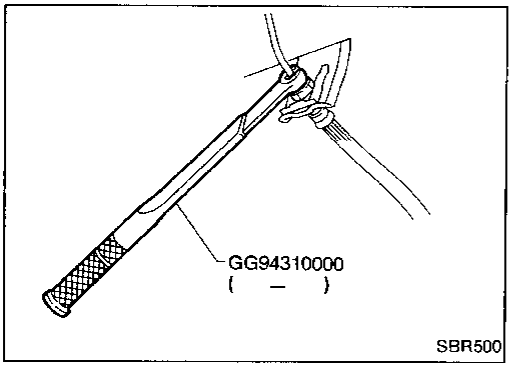
SECTION FA

CONTENTS

Note: Refer to Foldout page for "FULL-ACTIVE SUSPENSION WIRING DIAGRAM".

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".



Precautions

- **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.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Use flare nut wrench when removing or installing brake tubes.**

SPECIAL CAUTIONS FOR FULL-ACTIVE SUSPENSION

- Stopping the engine may cause the vehicle's height to change. Therefore, the following operations should not be performed for approximately 3 minutes after the engine has been stopped.

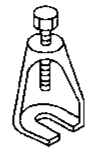
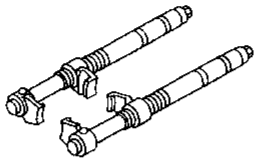
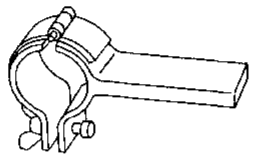
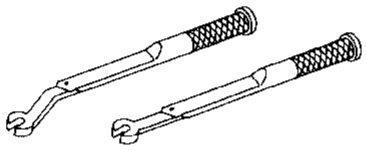
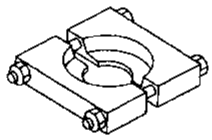
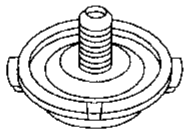
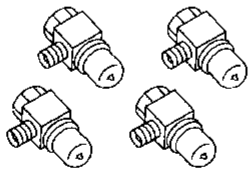
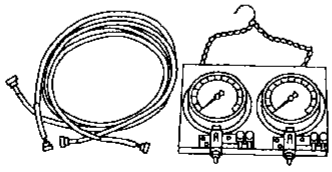
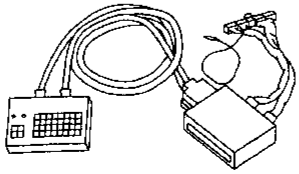
(1) Disconnecting battery cables
(2) Removing fuses
(3) Jacking up the vehicle
(4) Inserting your arm into the wheelhouse

- Make the best use of CONSULT, the electronic diagnostic tester, during system checks or part replacement.
- Control unit retains self-diagnostic results in memory. Before disconnecting battery terminals or fuse (No. 17) check the self-diagnostic results. Failure to do this may clear important data.
- Do not allow foreign matter to enter any part of active suspensions while removing or installing parts. Carefully observe the following instructions:

(1) Select an area that is clean and free from dust or dirt.
(2) Wash your hands and work with bare hands.
(3) Do not remove plugs (if so equipped) until parts are ready for immediate replacement.

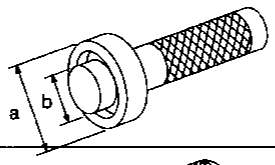
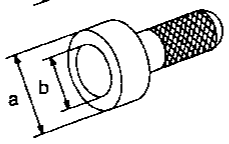
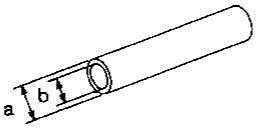
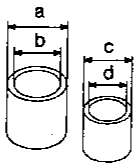
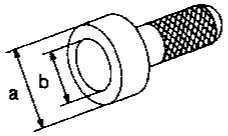
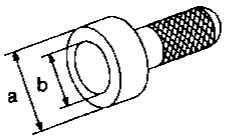
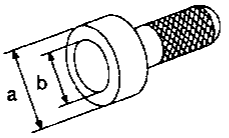
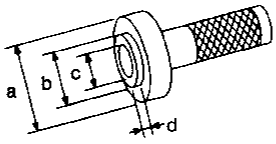
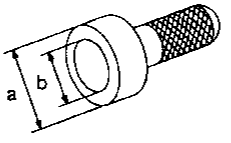
- Pipes are always filled with highly pressurized oil (regardless of ON-OFF engine operation). Be sure to relieve pressure before removing parts.
- Do not get under vehicle or start engine when lifting vehicle with only a jack.
- Lift vehicle with all wheels off ground and place on rigid racks before working under vehicle.
- Use only genuine "Fluid A-Active Suspension" in active suspension system.
- Fill reservoir tank with specified amount of fluid. Do not overfill as this may cause fluid to overflow from reservoir tank when oil pressure is relieved from hydraulic lines or before using vehicle after an extended period of time.
- Be extremely careful when opening multivalve unit bypass valve or pressure control unit bypass valve since this may cause vehicle height to decrease abruptly.
- Be extremely careful when loosening air vent bleeders on pressure control units and accumulators because of highly pressurized oil.
- Before disposing of main accumulator, pressure control units or actuators, closely observe instructions on caution labels and completely discharge nitrogen gas from accumulators.
  Each pressure control unit is equipped with a return accumulator and each actuator, with a sub-accumulator.
- Before disposing of pump or pump accumulators, slowly loosen safety plugs to completely discharge nitrogen gas from accumulators. Each gas chamber is filled with oil. Place a cloth around safety plug to prevent oil from spouting out before loosening safety plug.
  Pump is equipped with a small accumulator.

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST29020001 (J24319-01) Steering gear arm puller	 NT143	Removing tie-rod ball joint and lower ball joint
HT71780000 (—) Spring compressor	 NT144	Removing and installing coil spring
ST35652000 (—) Shock absorber attachment	 NT145	Fixing shock absorber
GG94310000 (—) Flare nut torque wrench	 NT064	Removing and installing brake piping
ST30031000 (J22912-01) Bearing inner race puller	 NT071	Removing bearing inner race
KV99104300 (—) Filler cap adapter	 NT149	Evacuating pump line
KV991044S0 (—) Oil pressure gauge adapter	 NT150	Measuring actuator oil pressure
KV991V0010 (—) Brake fluid pressure gauge (Two sets are required)	 NT151	Measuring actuator oil pressure
EG17710000 (—) Check adapter	 NT152	Measuring input and output signals of control unit

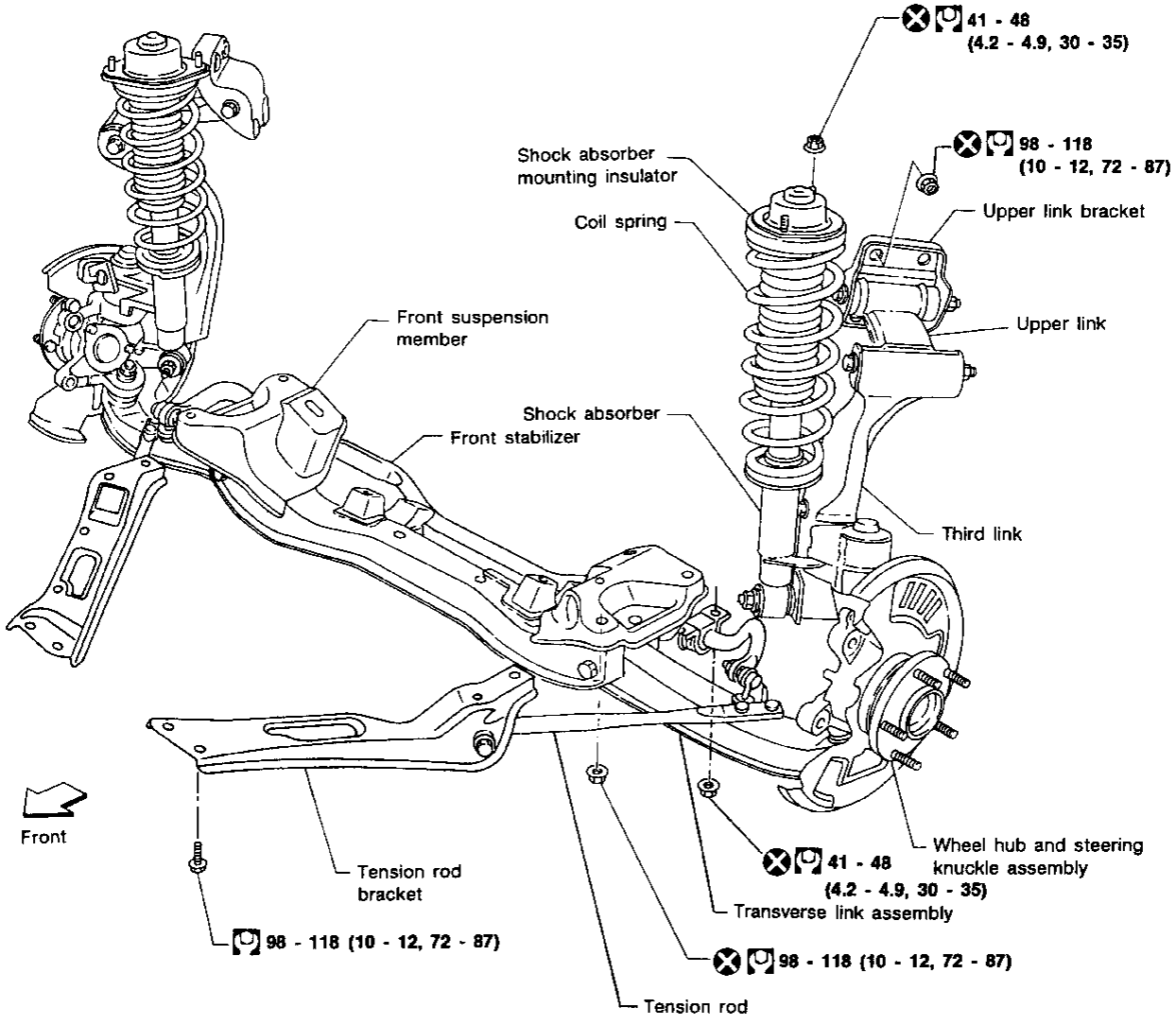
GI MA EM LC EF & EC FE AT PD FA RA BR ST BF HA EL

Commercial Service Tools

Tool name	Description	
Wheel bearing drift		Removing wheel bearing **a: 60 mm (2.36 in) dia.** **b: 37 mm (1.46 in) dia.**
Wheel bearing drift	 NT115	Installing wheel bearing **a: 75 mm (2.95 in) dia.** **b: 65 mm (2.56 in) dia.**
Baffle plate drift	 NT065	Installing baffle plate **a: 125 mm (4.92 in) dia.** **b: 106 mm (4.17 in) dia.**
Tension rod bushing drift	 NT155	Removing and installing tension rod bushing **a: 78 mm (3.07 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.**
Grease seal drift	 NT115	Installing wheel hub grease seal **a: 86 mm (3.39 in) dia.** **b: 76 mm (2.99 in) dia.**
Cap drift	 NT115	Installing kingpin cap **a: 60 mm (2.36 in) dia.** **b: 52 mm (2.05 in) dia.**
Bearing drift	 NT115	Installing kingpin lower bearing **a: 57 mm (2.24 in) dia.** **b: 50 mm (1.97 in) dia.**
Bearing drift	 NT156	Installing kingpin upper bearing **a: 57 mm (2.24 in) dia.** **B: 46 mm (1.81 in) dia.** **c: 40 mm (1.57 in) dia.** **d: 2.5 mm (0.098 in)**
Grease seal drift	 NT115	Installing kingpin grease seal **a: 68 mm (2.68 in) dia.** **B: 58 mm (2.28 in) dia.**

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.**



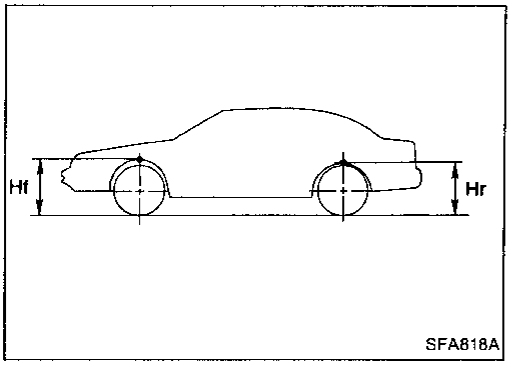
: N·m (kg-m, ft-lb)

SFA860A

Front Axle and Front Suspension Parts

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

- Retighten all nuts and bolts to the specified torque.
  Tightening torque: Refer to FRONT SUSPENSION (FA-15).
- Make sure that cotter pin is inserted.



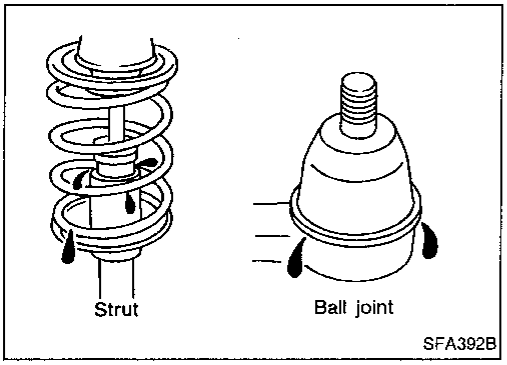
- Check wheelarch height from the ground.

Conventional suspension models

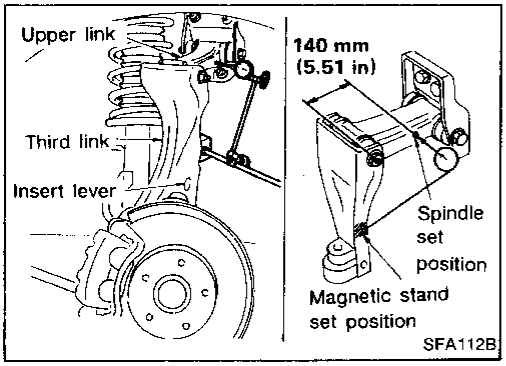
(1) Vehicle must be unladen*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).
  * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
(2) Bounce the vehicle up and down several times before measuring.
  Standard height:
  Front (Hf)
  706 mm (27.80 in)
  Rear (Hr)
  696 mm (27.40 in)
(3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.

Full-active suspension models

Refer to FULL-ACTIVE SUSPENSION — "VEHICLE HEIGHT ADJUSTMENT" in Repair of Component Parts (FA-34) and SDS (FA-111).



- Check shock absorber for oil leakage or other damage.
- Check suspension lower ball joint and tie-rod ball joint for grease leakage, and dust cover for cracks or other damage.



- Check upper link free play.

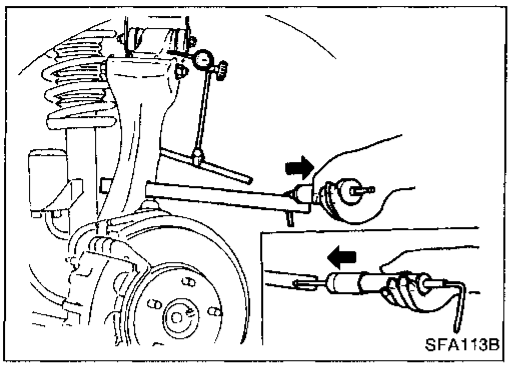
(1) Jack up front of vehicle and set stands.
(2) Set steering wheel in straight-forward direction and lock it using key lock.
(3) Remove front wheels.

Models with FULL-ACTIVE SUSPENSION

On axle side

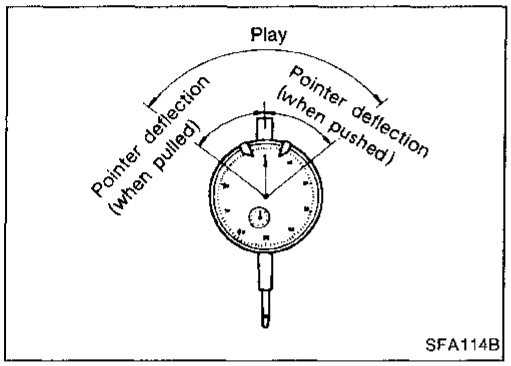
(4) Install dial gauge.
a. Install magnet stand on third link.
b. Set dial gauge in position.
  Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of upper link retaining bolt on third link side. (Reset the dial gauge.)

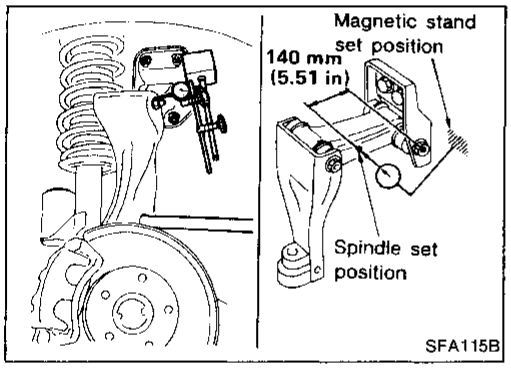
Front Axle and Front Suspension Parts (Cont'd)



(5) Install lever and measure free play.
Insert lever [25 mm (0.98 in) wide, 350 mm (13.78 in) long, approx.] into the hole on third link. While applying a load of 147 to 196 N (15 to 20 kg, 33 to 44 lb) to lever using push-pull gauge, read dial gauge indication.
Free play = (Gauge pointer deflection when push-pull gauge is pulled) + (Gauge pointer deflection when push-pull gauge is pushed)

Allowable free play range:
5.0 mm (0.197 in), max.





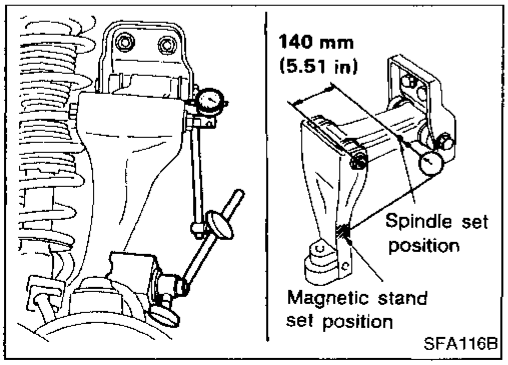
On body side

(6) Install dial gauge.
a. Install magnet stand on hoodledge wheelhouse side.
b. Set dial gauge in position.
Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of upper link retaining bolt on bracket side. (Reset the dial gauge.)

(7) Follow the same procedures for setting lever and measuring free play as those outlined under "On axle side" above.

Allowable free play range:
5.0 mm (0.197 in), max.

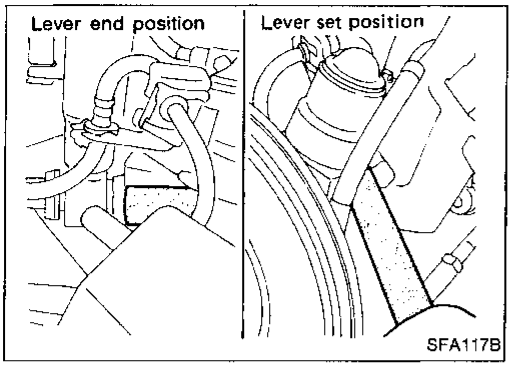
(8) If free play exceeds specifications, replace upper link assembly.



Models without FULL-ACTIVE SUSPENSION
On axle side

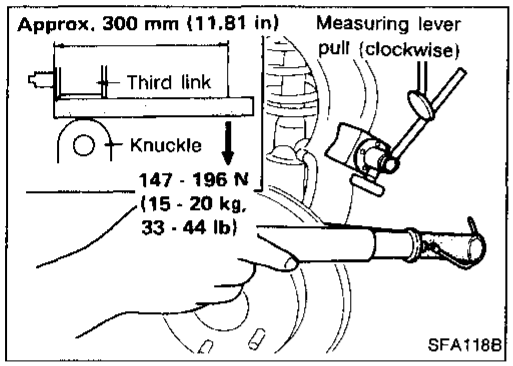
(4) Install dial gauge.
a. Install magnet stand on third link.
b. Set dial gauge in position.
Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of upper link retaining bolt on third link side. (Reset the dial gauge.)

Front Axle and Front Suspension Parts (Cont'd)



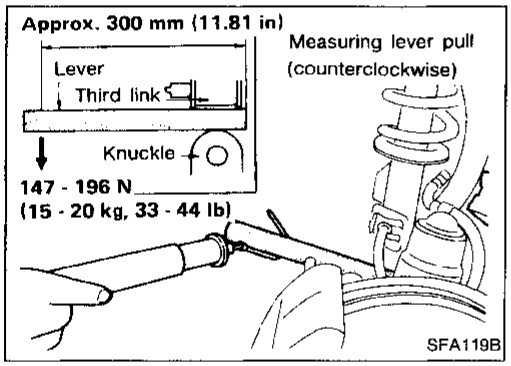
(5) Install lever.
Insert lever [30 mm (1.18 in) outside dia., 350 mm (13.78 in) long, approx.] between lower end of third link and kingpin location.

Make sure lever does not interfere with splash guard, brake hoses, etc., when set in position.



— Free play in direction "A" —

Attach spring scale to lever tip. Pull spring scale with a force of 147 to 196 N (15 to 20 kg, 33 to 44 lb) and then read dial gauge indication.

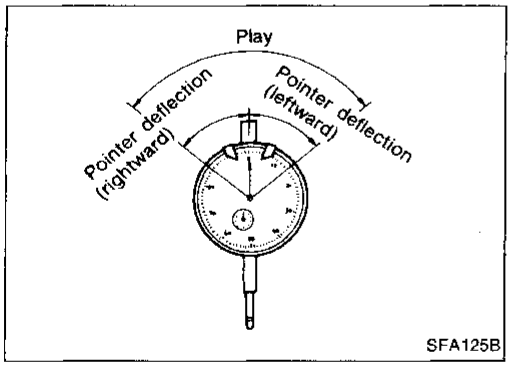


— Free play in direction "B" —

With dial gauge held in position, invert lever. Attach spring scale to lever tip. Pull spring scale with a force of 147 to 196 N (15 to 20 kg, 33 to 44 lb) and then read dial gauge indication.

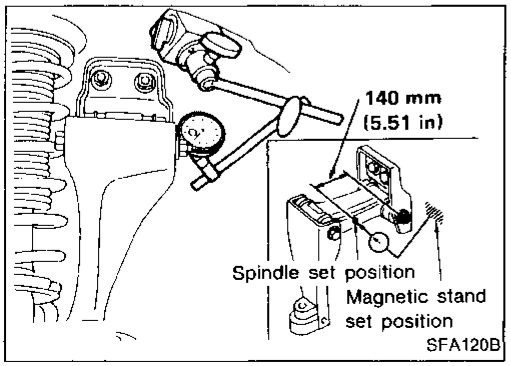
Free play = (Gauge pointer deflection in direction "A") + (Gauge pointer deflection in direction "B")

Allowable free play range:
5.0 mm (0.197 in), max.



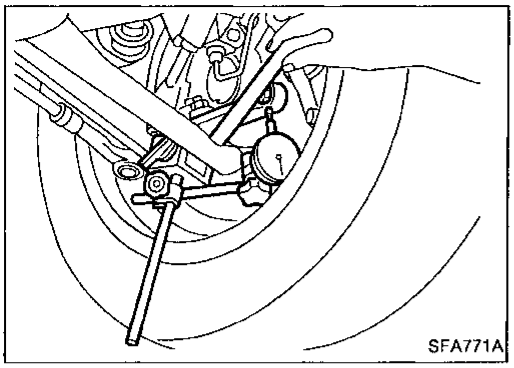
On body side

(6) Install dial gauge.
a. Install magnet stand on hoodledge wheelhouse side.
b. Set dial gauge in position.
Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of retaining bolt on bracket side. (Reset the dial gauge.)



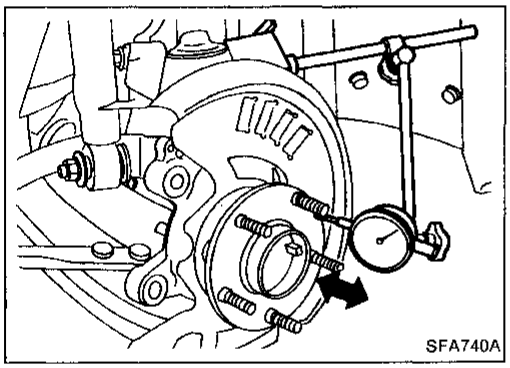
(7) Follow the same procedures for setting lever and measuring free play as those outlined under "On axle side" above.
Allowable free play range: 5.0 mm (0.197 in), max.
(8) If free play exceeds specifications, replace upper link assembly.

Front Axle and Front Suspension Parts (Cont'd)



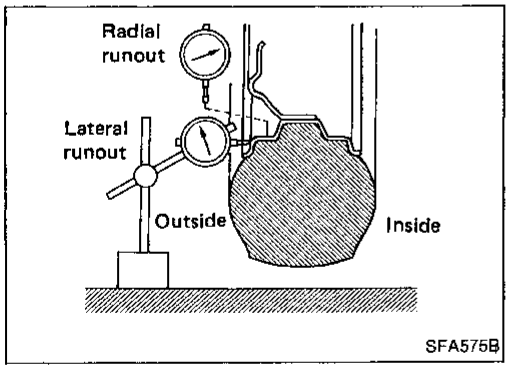
- Check suspension ball joint end play.

(1) Jack up front of vehicle and set the stands.
(2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
(3) Make sure front wheels are straight and brake pedal is depressed.
(4) Place a pry bar between transverse link and inner rim of road wheel.
(5) While pushing and releasing pry bar, observe maximum dial indicator value.
Vertical end play: 0 mm (0 in)
(6) If not to above specification, remove and recheck it.



Front Wheel Bearing

- Check wheel bearings for smooth operation.
- Check axial end play.
Axial end play: 0.05 mm (0.0020 in) or less
- If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to FRONT AXLE — Wheel Hub and Steering Knuckle (FA-11).



Front Wheel Alignment

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

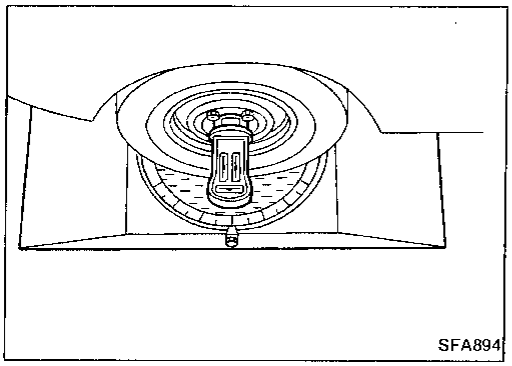
* "Unladen": Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

PRELIMINARY INSPECTION

Make the following checks. Adjust, repair or replace if necessary.

- Check tires for wear and improper inflation.
- Check front wheel bearings for looseness.
- Check wheel runout.
Wheel runout:
Refer to Inspection and Adjustment in SDS (FA-112).
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen).

Front Wheel Alignment (Cont'd)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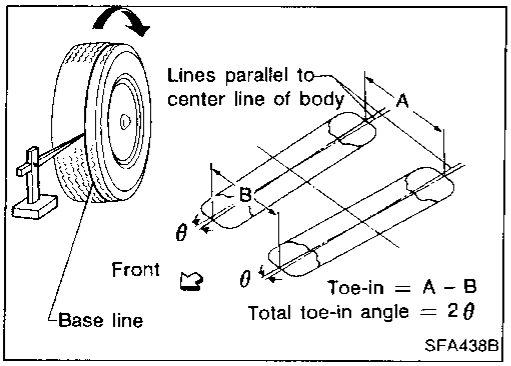
CAMBER, CASTER AND KINGPIN INCLINATION

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 "Inspection and Adjustment" in SDS (FA-112).
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.

TOE-IN



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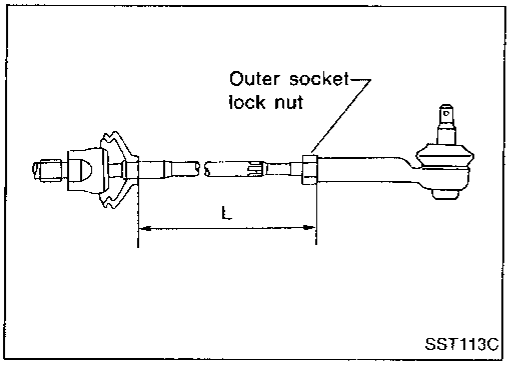
1. Draw a base line on tread surface of tires.
- After lowering front of vehicle, move it up and down to eliminate friction, and set wheels in straight-ahead position.

2. Measure toe-in.
- Measure distance "A" and "B" at same height as hub center.
  Total toe-in:
  Refer to "Inspection and Adjustment" in SDS (FA-112).

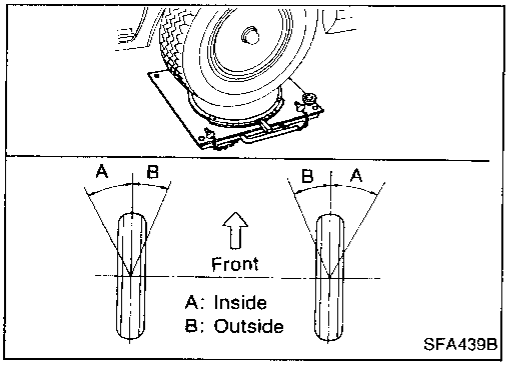


SST113C

3. Adjust toe-in by varying length of steering tie-rods.
(1) Loosen lock nuts.
(2) Adjust toe-in by turning tie-rod forward or backward.

Make sure both tie-rods are the same length.
Standard length "L":
153.6 mm (6.05 in)

(3) Tighten lock nuts to the specified torque.
: 78 - 98 N·m
(8.0 - 10.0 kg-m, 58 - 72 ft-lb)



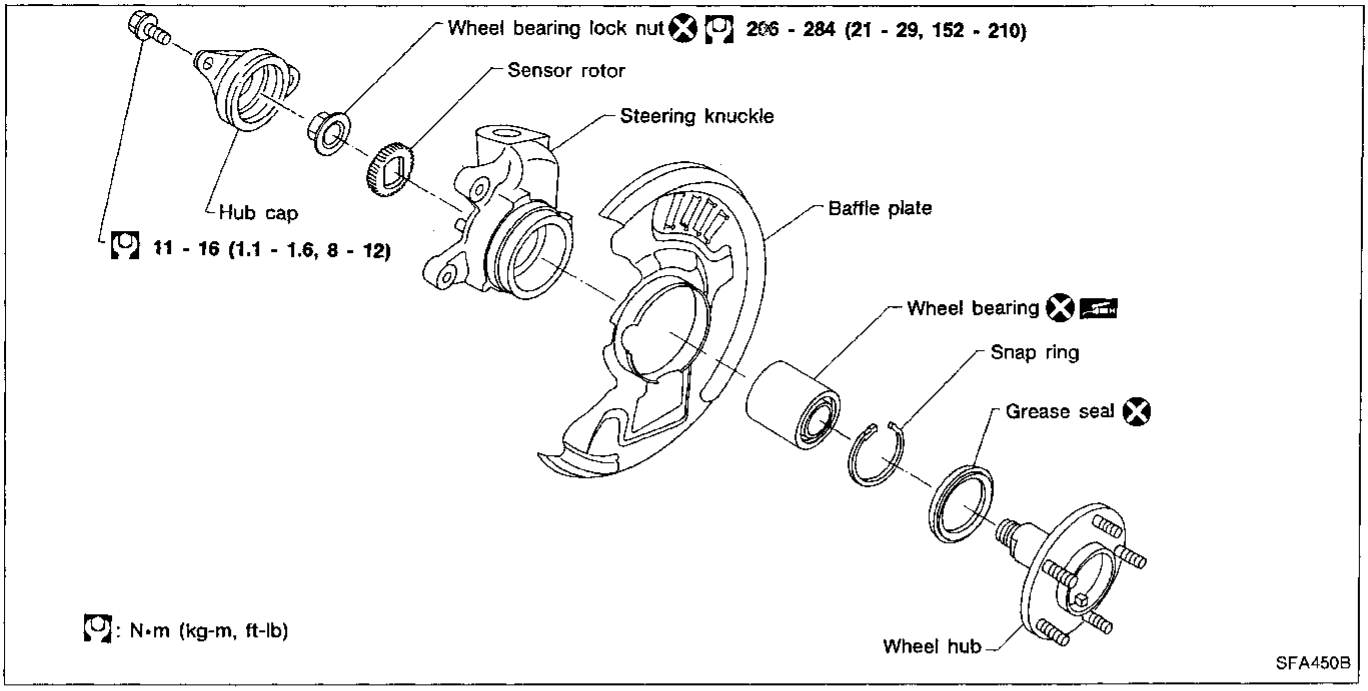
SFA439B

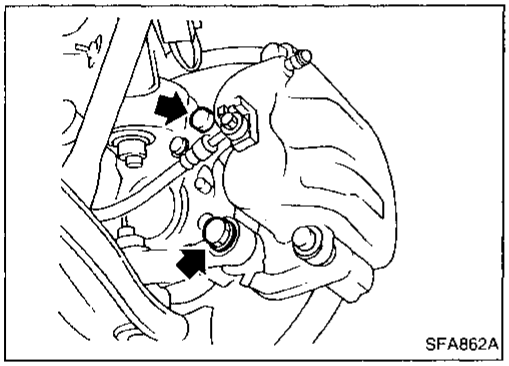
FRONT WHEEL TURNING ANGLE

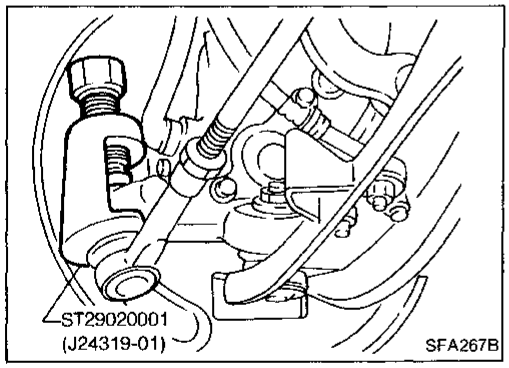
1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.
2. Rotate steering wheel fully to the right or left; measure turning angle.

Wheel turning angle:

		Conventional suspension	Full-active suspension
Full turn	Inside wheel: A	35°30' - 39°30'	35° - 39°
	Outside wheel: B	32°	32°







Wheel Hub and Steering Knuckle

REMOVAL

CAUTION:
Wheel bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly.

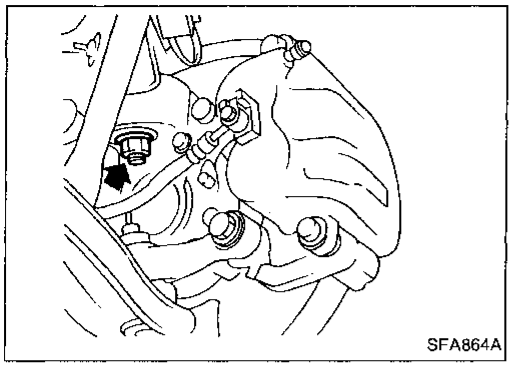
- **Growling noise is emitted from wheel bearing during operation.**
- **Wheel bearing drags or turns roughly when hub is turned by hand.**
- Remove brake caliper assembly and rotor.

Brake line 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 wheel hub and steering knuckle, disconnect the ABS wheel sensor to prevent the sensor from being damaged. Refer to "TRACTION CONTROL SYSTEM" in BR section.
- Remove tie-rod ball joint and lower ball joint with Tool.

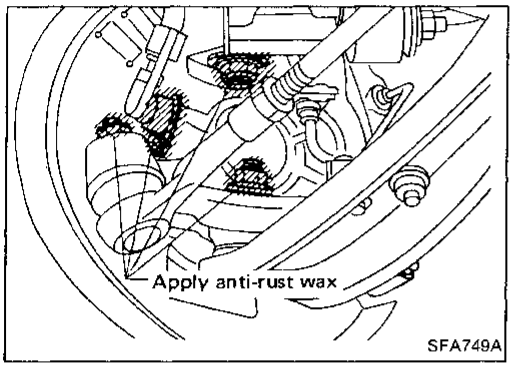
CAUTION:
Steering knuckle is made from aluminum alloy.
Be careful not to hit steering knuckle.

Wheel Hub and Steering Knuckle (Cont'd)


SFA864A

- Remove kingpin lower nut then remove steering knuckle assembly.

INSTALLATION

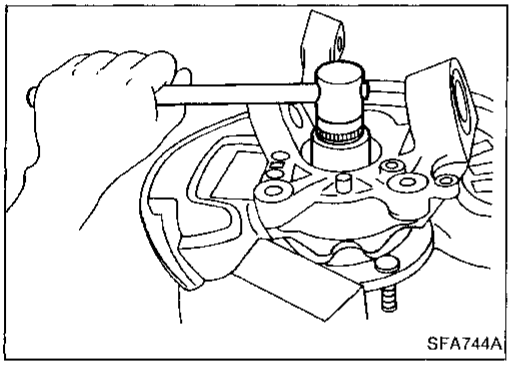


SFA749A

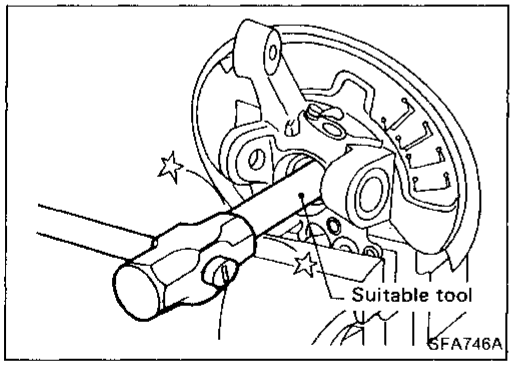
- Install steering knuckle assembly.
- Apply anti-rust wax as follows:
  - Portions around lower ball joint connections
  - Portions around tie-rod ball joint connections
  - Portions around kingpin lower nut location
  - Portions around ABS sensor connection

DISASSEMBLY

CAUTION:
When removing wheel bearing from steering knuckle, replace wheel bearing assembly (outer race, inner races and grease seal) with a new one.

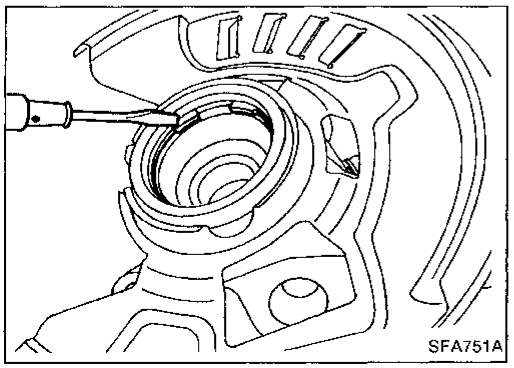

SFA744A

- Remove hub cap and wheel bearing lock nut.



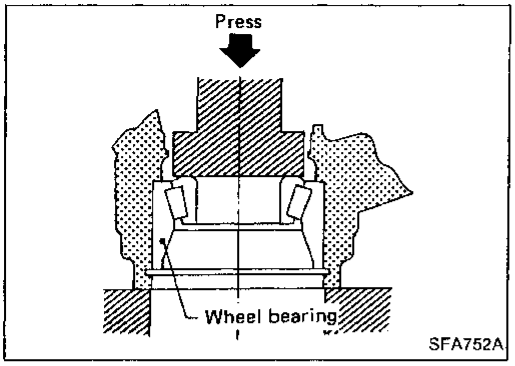
SFA746A

- Remove wheel hub with a suitable tool.

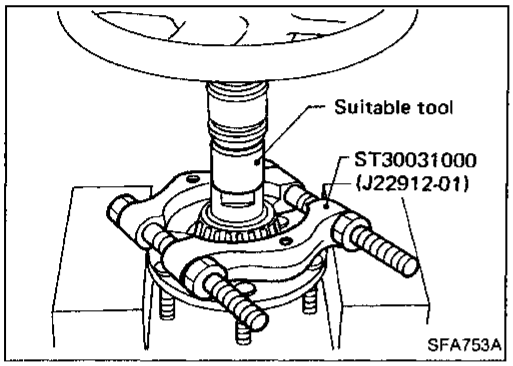

SFA751A

- Remove circular clip with a suitable tool.

Wheel Hub and Steering Knuckle (Cont'd)



- Press out wheel bearing assembly from steering knuckle.



- Drive out wheel bearing inner race (to outside) from wheel hub, then remove grease seal.

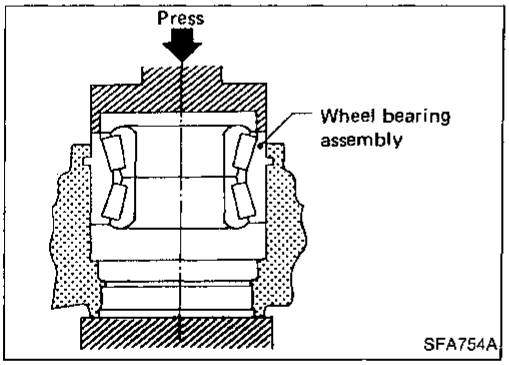
INSPECTION

Wheel hub and steering knuckle

Check wheel hub and steering knuckle for any cracks.

Circular clip

Check circular clip for wear or cracks.
Replace if necessary.

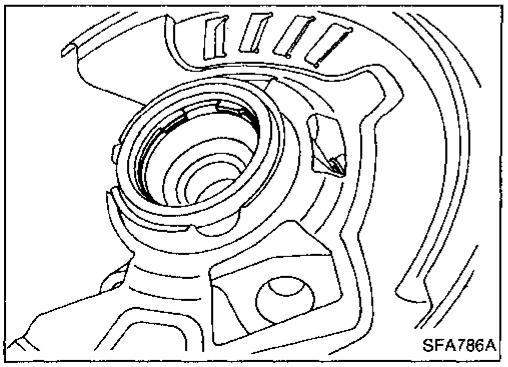


ASSEMBLY

1. Press new wheel bearing assembly into steering knuckle from outside of steering knuckle.
   Maximum load *P*:
   34.3 kN (3.5 ton, 3.9 US ton, 3.44 Imp ton)

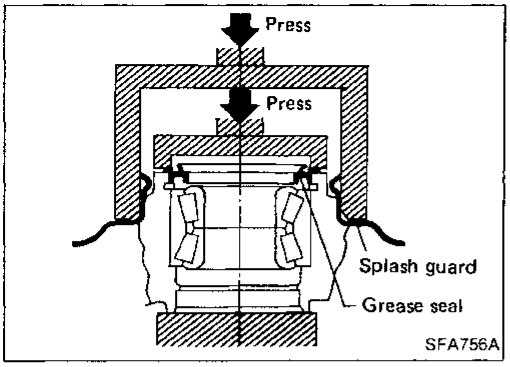
CAUTION:

- **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.**

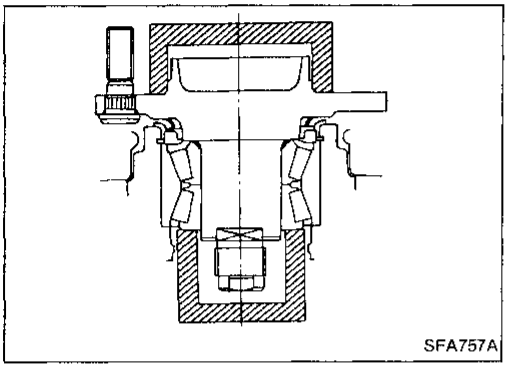


2. Install circular clip into groove of steering knuckle.

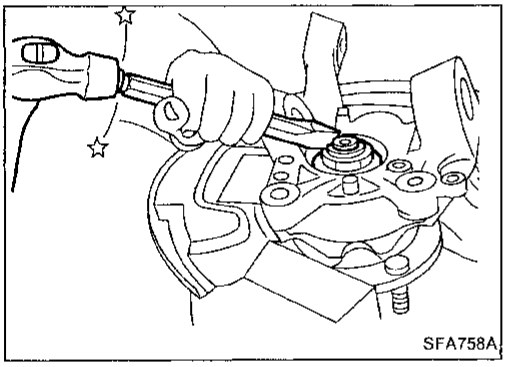
Wheel Hub and Steering Knuckle (Cont'd)



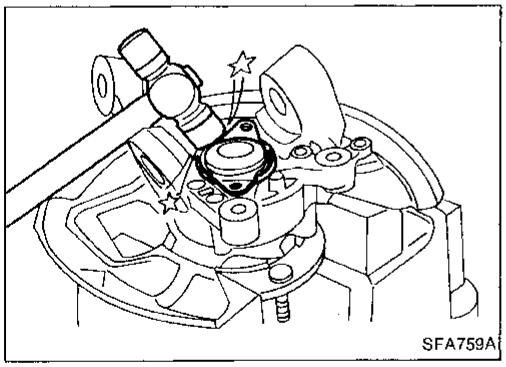
3. Apply multi-purpose grease to sealing lip.
4. Install grease seal.
   Maximum load P:
   10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)
5. Install splash guard.



6. Press wheel hub into steering knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)
7. Tighten wheel bearing lock nut to the specified torque.
   : 206 - 284 N·m (21 - 29 kg-m, 152 - 210 ft-lb)
8. Check that wheel bearings operate smoothly.



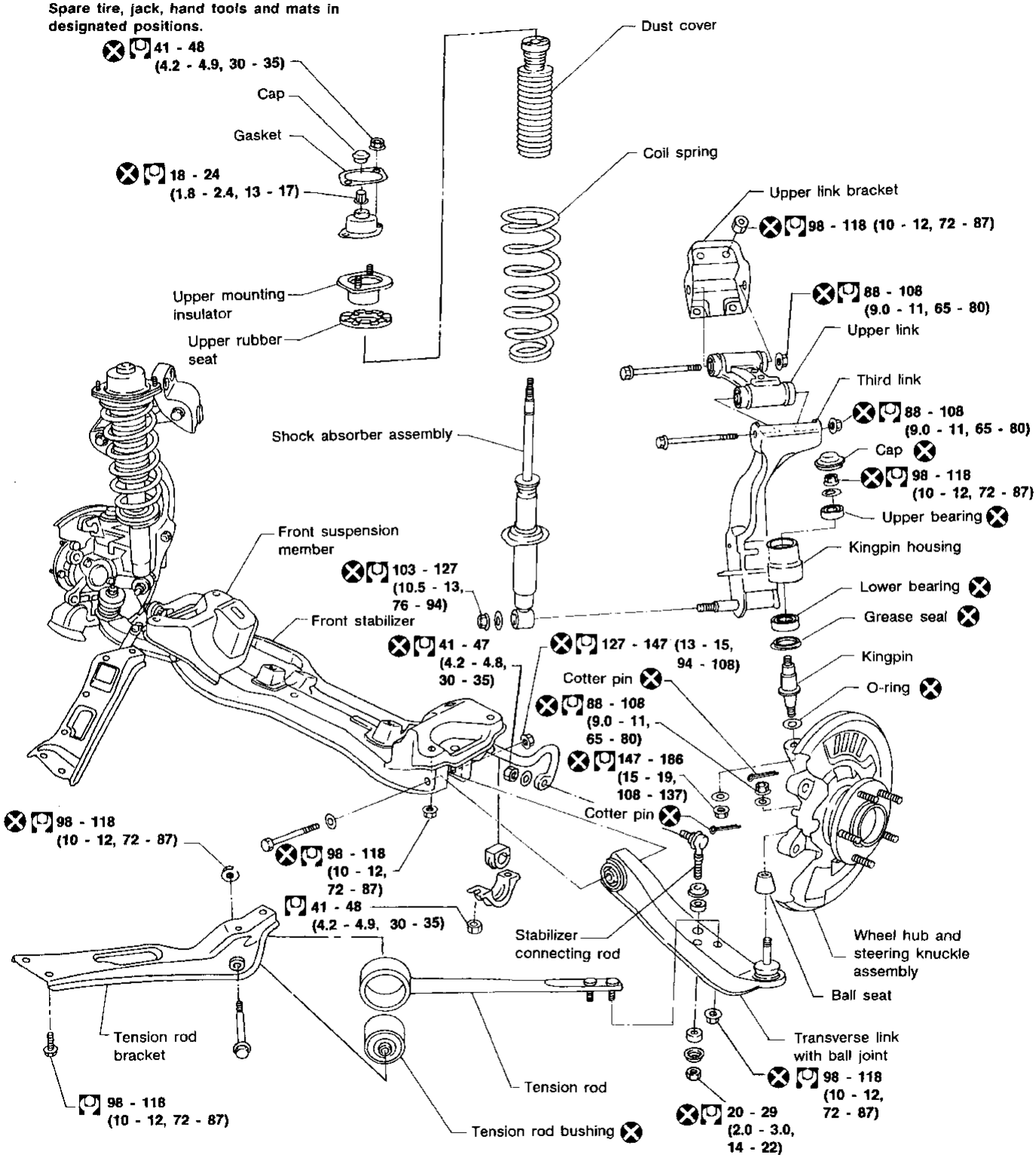
9. Stake wheel bearing lock nut.



10. Install hub cap.
    Drive hub cap onto steering knuckle by lightly tapping with a plastic hammer. After hub cap is in close contact with steering knuckle, tighten bolts.

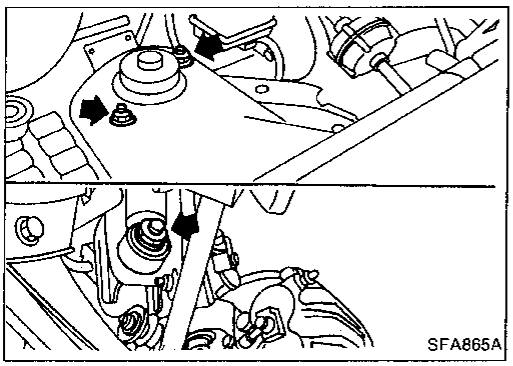
When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

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



: N·m (kg-m, ft-lb)

SFA270B

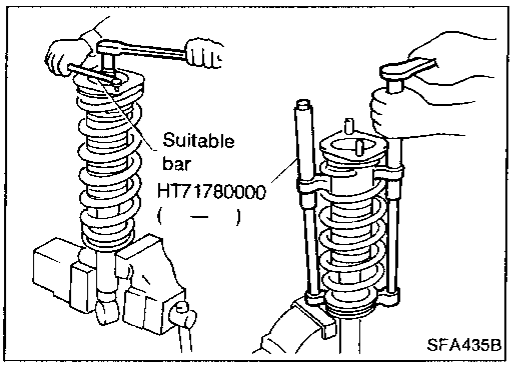


Coil Spring and Shock Absorber

REMOVAL

Remove shock absorber fixing nuts.

Do not remove piston rod lock nut.

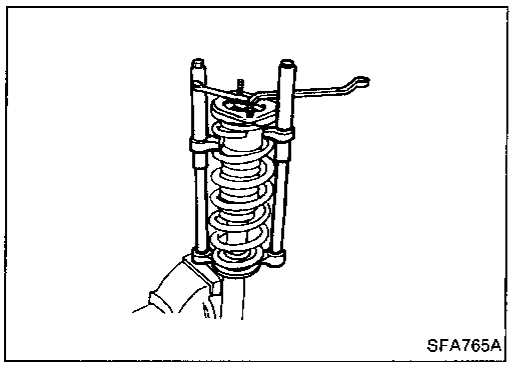


DISASSEMBLY

1. Set shock absorber on vise with Tool, then loosen piston rod lock nut.

Do not remove piston rod lock nut.

2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.



3. Remove piston rod lock nut.

INSPECTION

Shock absorber assembly

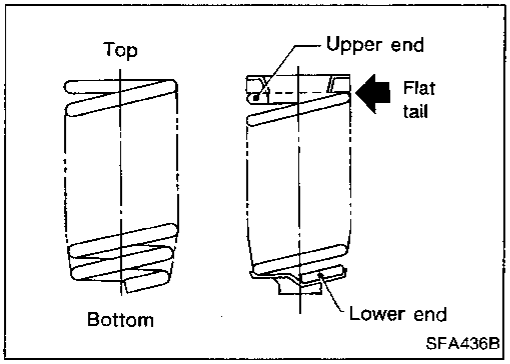
- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

Mounting insulator and rubber parts

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

Coil spring

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



ASSEMBLY

- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)
- When installing coil spring on shock absorber, it must be positioned as shown in figure at left.

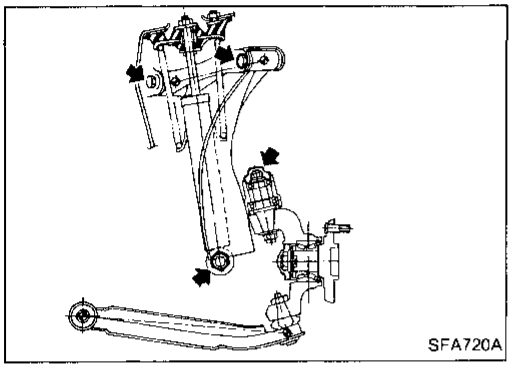
Third Link and Upper Link

REMOVAL

CAUTION:

Kingpin bearing usually does not require maintenance. If any of the following symptoms are noted, replace kingpin bearing assembly.

- **Growling noise is emitted from kingpin bearing during operation.**
- **Kingpin bearing drags or turns roughly when steering knuckle is turned by hand.**


SFA720A

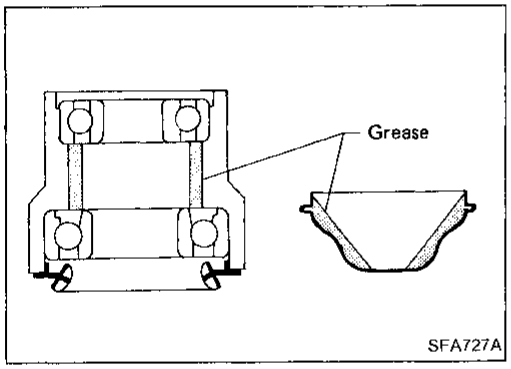
1. Remove cap and kingpin upper nut.

Do not remove kingpin lower nut.

2. Remove shock absorber fixing nut and upper link fixing bolts.
3. Remove third link and upper link.

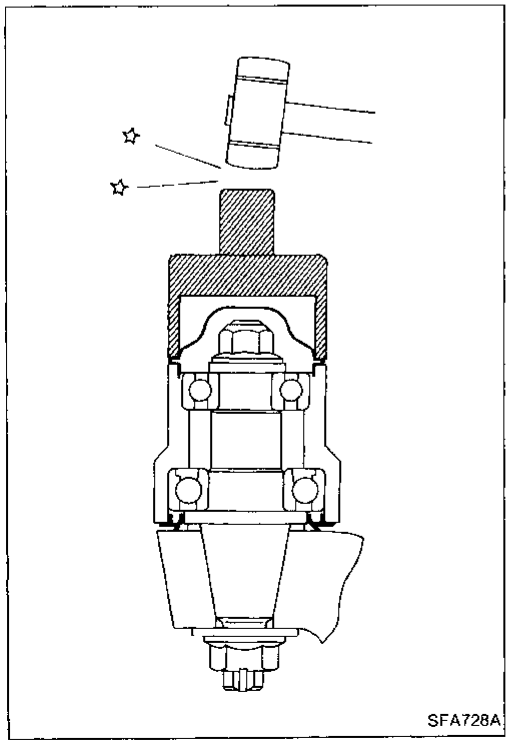
INSTALLATION

Third link



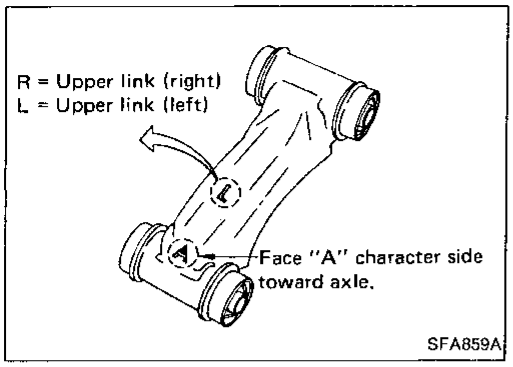
SFA727A

- Pack kingpin housing and cap with multi-purpose grease.
  Grease capacity:
  Kingpin housing: 10 g (0.35 oz)
  Cap: 5 g (0.18 oz)


SFA728A

- Install third link and cap.

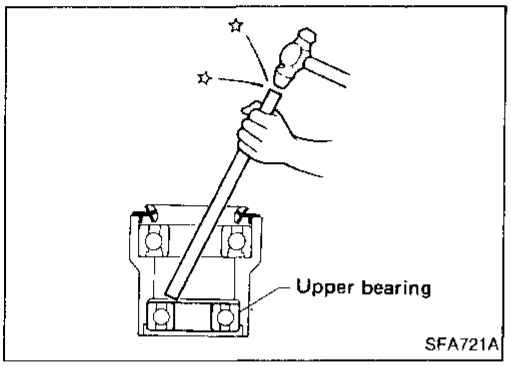
Third Link and Upper Link (Cont'd)



Upper link

- Upper link has characters "A" and "L" (or "R") on it as shown. Always install upper link with "A" side facing axle and side without a character facing vehicle body.

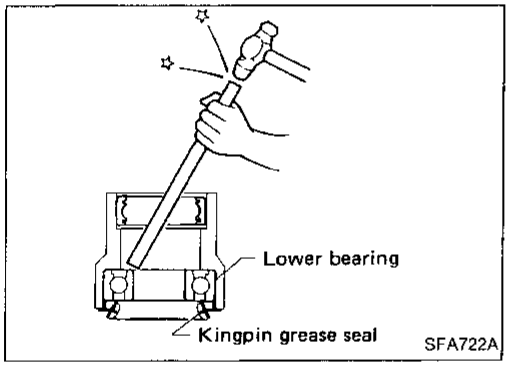
Upper link bushings cannot be disassembled.



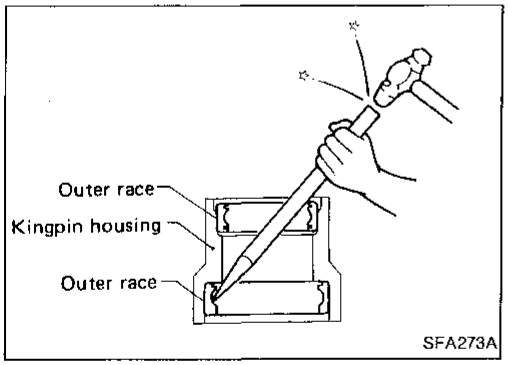
DISASSEMBLY

Third link

- Remove upper bearing (inner race and ball).

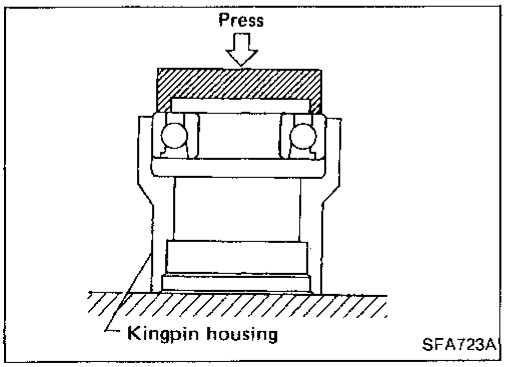


- Remove kingpin grease seal.
- Remove lower bearing (inner race and ball).



- Remove upper and lower outer race.

Be careful not to damage kingpin housing.

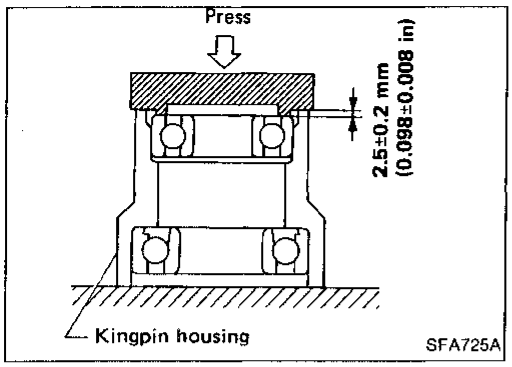


ASSEMBLY

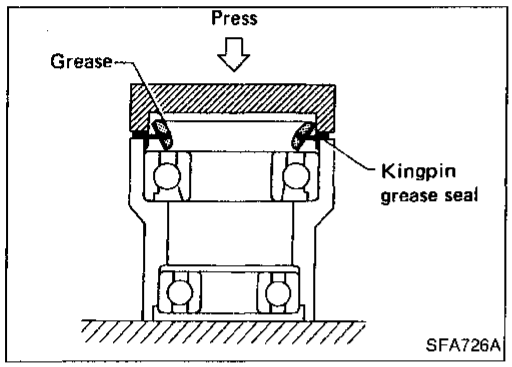
- Install lower bearing.

Third Link and Upper Link (Cont'd)

ASSEMBLY



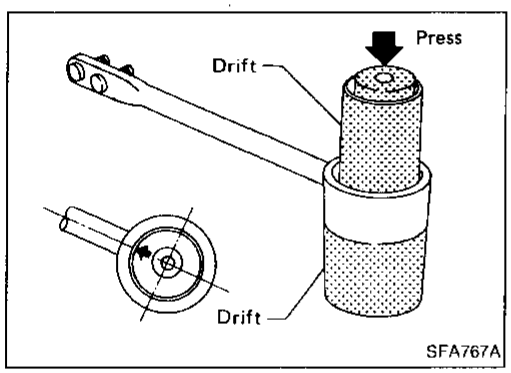
- Install upper bearing.



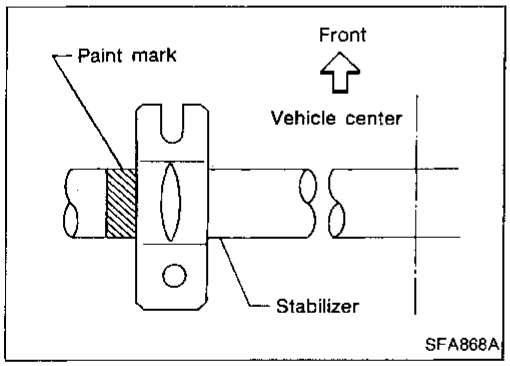
- Install lower oil seal.
- Apply multi-purpose grease to oil seal lip.

Tension Rod and Stabilizer Bar

REMOVAL AND INSTALLATION



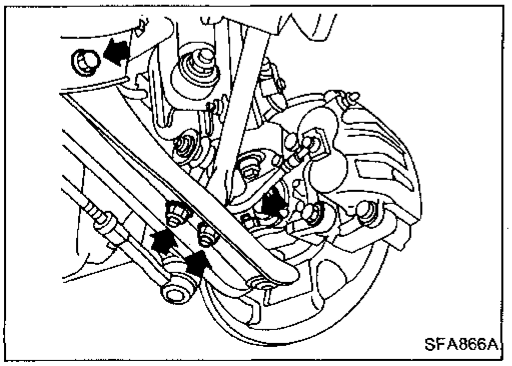
- Remove tension rod and stabilizer bar.
- When removing tension rod bushing, place one drift on lower side of bushing and the other on upper side, and press bushing out.
- Place arrow mark on bushing facing tension rod before installing bushing.



- When installing stabilizer, make sure that paint mark and clamp face in the correct direction.

Transverse Link and Lower Ball Joint

REMOVAL AND INSTALLATION



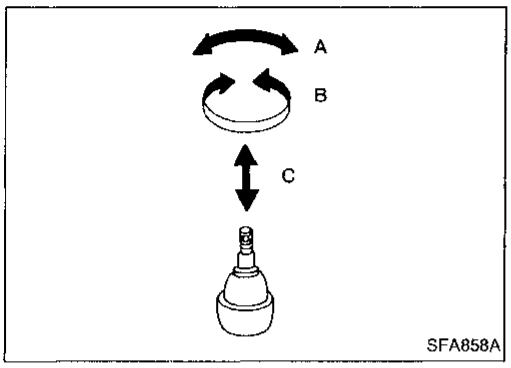
- Disconnect tension rod, stabilizer connecting rod and knuckle. Then remove transverse link assembly.
- During installation, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment.
  Refer to "Front Wheel Alignment" of ON-VEHICLE SERVICE (FA-9).

Transverse Link and Lower Ball Joint (Cont'd)

INSPECTION

Transverse link

- Check transverse link for damage, cracks or deformation. Replace it if necessary.
- Check rubber bushing for damage, cracks and deformation. Replace transverse link if necessary.



Lower ball joint

Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly.

Swing force, turning torque and vertical end play

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

Swing force "A":
(measuring point: cotter pin hole of ball stud)
7.8 - 53.0 N (0.8 - 5.4 kg, 1.8 - 11.9 lb)
Turning torque "B":
0.49 - 3.43 N·m (5.0 - 35 kg-cm, 4.3 - 30.4 in-lb)
Vertical end play limit "C": 0 mm (0 in)

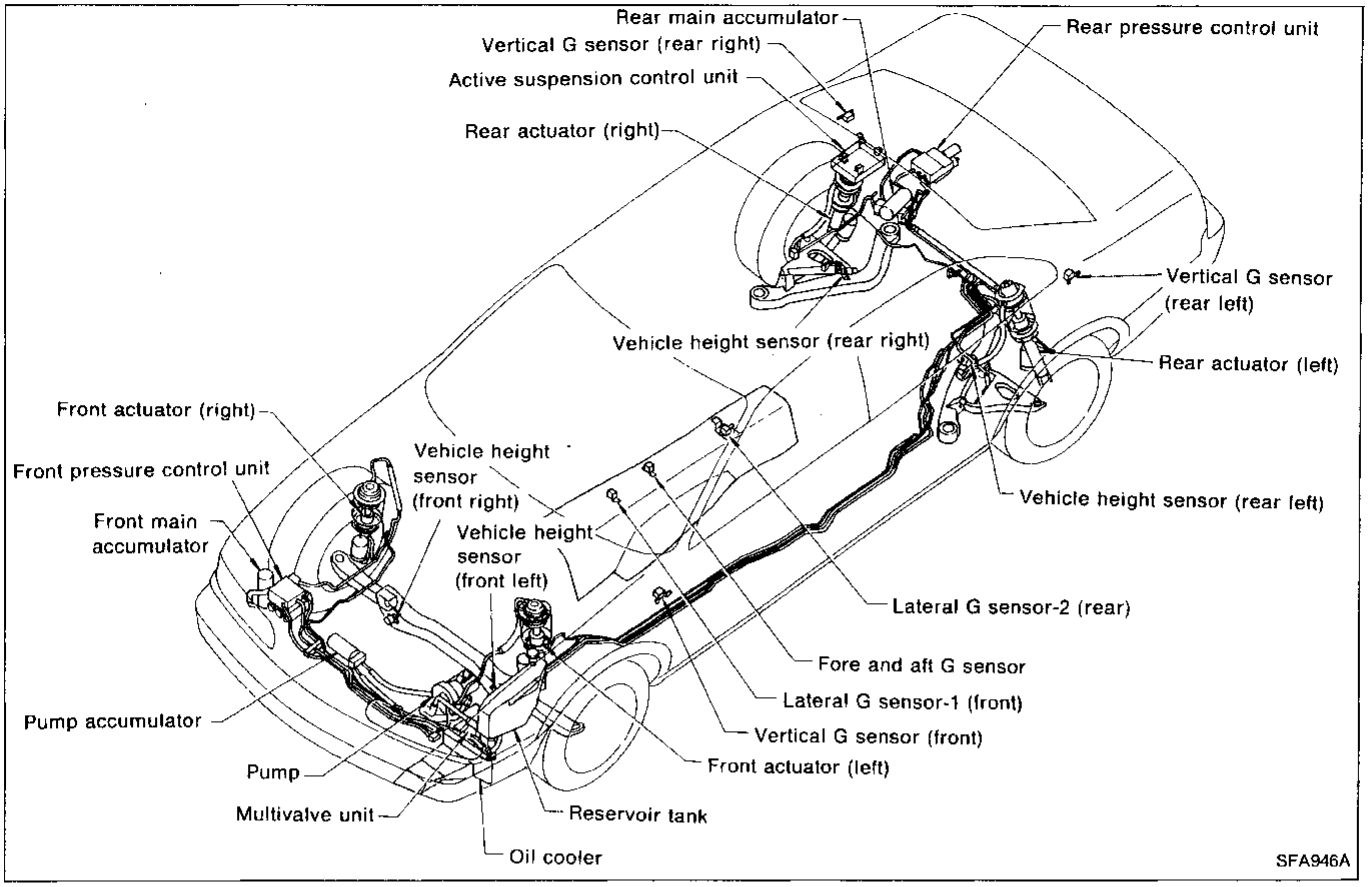
Outline

SPECIFICATIONS

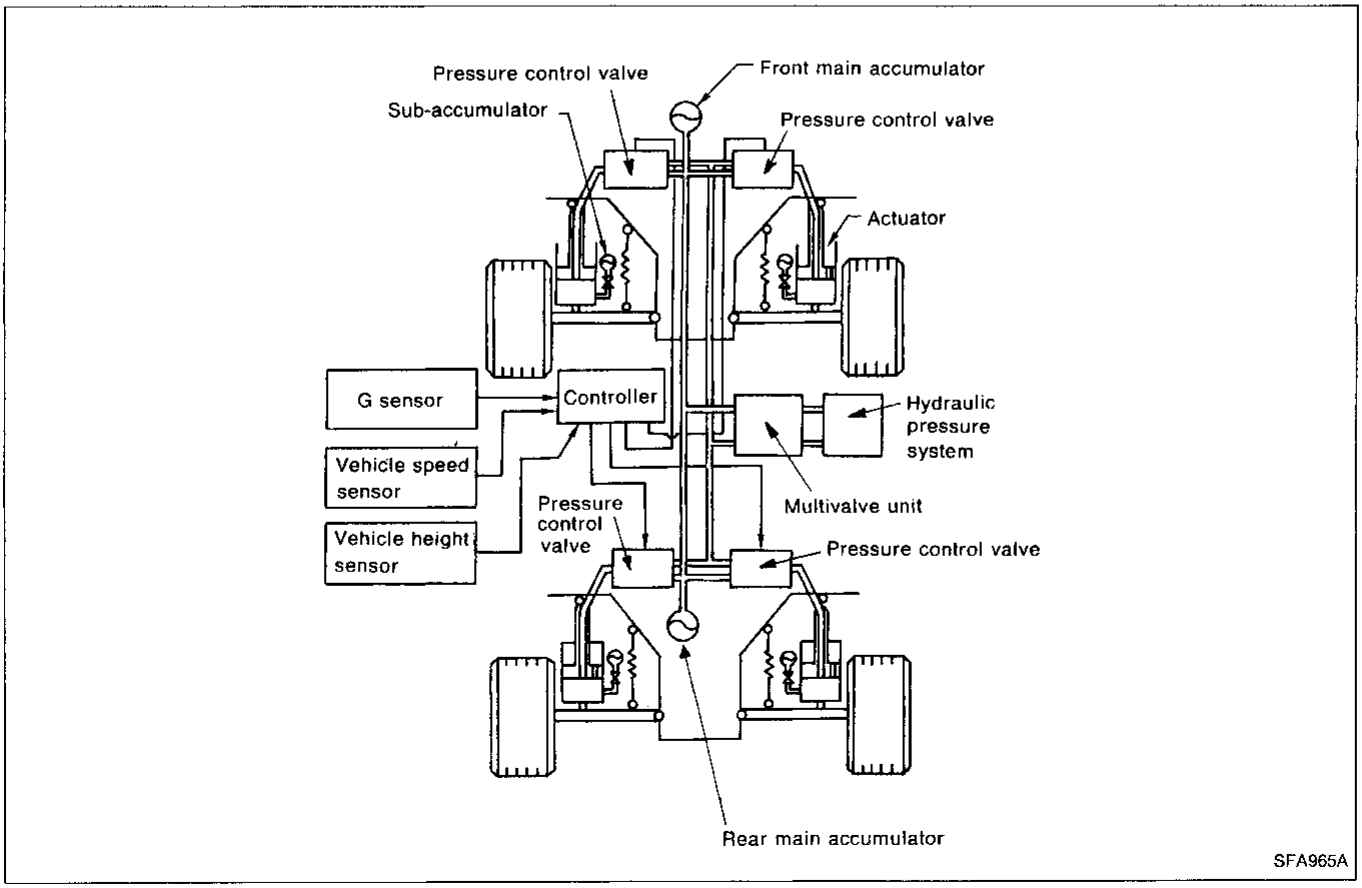
Item		Specifications	VH45DE	
			Front	Rear
Suspension			Multilink, independent type	
Wheel alignment (unloaded)	Toe-in	mm (in)	−1 to 1 (−0.04 to 0.04)	0 - 4 (0 - 0.16)
	Camber	(deg)	−1°40′ to −0°10′	−2°00′ to −1°00′
	Caster	(deg)	6°10′ - 7°40′	—
	Kingpin inclination	(deg)	12°10′ - 13°40′	—
Coil spring	Spring constant	N/mm (kg/mm, lb/in)	17.7 (1.8, 101)	14.7 (1.5, 84)
	Free length	mm (in)	369 (14.53)	280 (11.02)
	Coil center diameter	mm (in)	120 (4.72)	120 (4.72)
	Wire diameter	mm (in)	12 (0.47)	11 (0.43)
	No. of active coils		5.8	4.0
Power cylinder	Cylinder inside diameter	mm (in)	60 (2.36)	60 (2.36)
	Stroke	mm (in)	145.1 (5.71)	158.6 (6.24)
Tension rod outside diameter		mm (in)	20 (0.79)	—
Stabilizer outside diameter		mm (in)	28 (1.10) (Solid)	20 (0.79) (Hollow)
Pump	Type		6 + 6 spool, radial plunger type (combined with select valve) (arranged with power steering vane pump in tandem)	
Recommended fluid	Name		Genuine "Fluid A-Active Suspension"	
	Approx. quantity	ℓ (US qt, Imp qt)	5.7 (6, 5)	
Oil cooler radiation		kW (kcal/h, BTU/h)	2.559 (2,200, 8,730)	
Oil cooler fan motor power consumption		(W)	35	

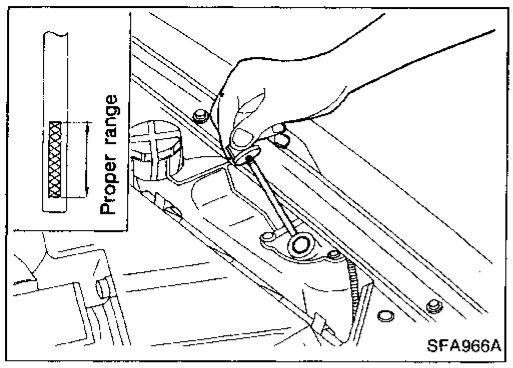
Outline (Cont'd)

FULL-ACTIVE SUSPENSION PARTS LOCATION



SYSTEM DIAGRAM





On-vehicle Service

CHECKING FLUID LEVEL

1. Put vehicle on level ground and set selector lever in "P".
2. Make sure that no passengers nor any cargo is in vehicle, and that necessary equipment, such as spare tire, jack, on-board tools, are provided.
3. Confirm vehicle height selector switch is in "NORMAL".
4. With CONSULT

a. Connect CONSULT.
b. Start engine.
c. Check oil temperature using CONSULT data monitor. Adjust oil temperature to 60±4°C (140±7.2°F) by racing engine.

4. Without CONSULT

a. Start engine, and warm up to raise active suspension fluid temperature about 60°C (140°F).
5. Remove reservoir level gauge, and make sure that level is in the proper range.

- Level gauge is a screw type, and level should be checked with the level gauge fitted securely.
- If level is too low, add specified fluid (genuine "Fluid A-Active Suspension") through filler. Add fluid until actual level is aligned with proper UPPER range mark.

CAUTION:

- **Never use a non-specified brand of fluid.**
- **If level is too high, suck out until proper level is reached; otherwise, fluid may overflow when releasing pressure.**
- **If fluid is spilled on nearby parts, be sure to wipe clean.**
- **If alarm lamp is ON indicating insufficient oil quantity, erase the CONSULT self-diagnosis result data.**

CHANGING FLUID

Every 96,000 km (60,000 miles) of operation, change fluid (genuine "Fluid A-Active Suspension").

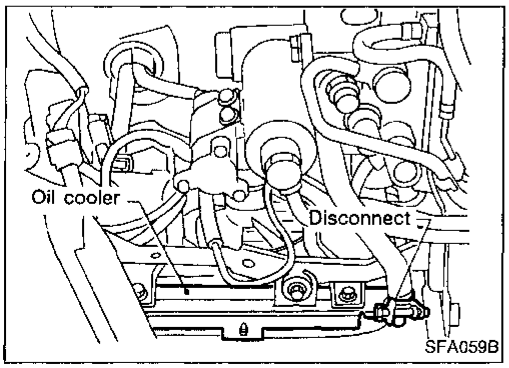
1. Make sure vehicle is located in clean area and free from foreign particles. Raise vehicle and support with a rigid jack.

Do not allow foreign particles to enter hydraulic system.

2. Open bypass valves of multivalve unit and pressure control unit as outlined under "RELIEVING PRESSURE, Repair of Component Parts".
3. Place a container under oil cooler to catch fluid. Disconnect rubber hose to multivalve unit (on lower side of oil cooler) and drain fluid into container.
4. Lower vehicle to ground. Reduce vehicle height and drain fluid from actuators as much as possible.
5. Raise vehicle again and reconnect rubber hose to its original position.

Discard old hose clamp; replace it with a new one.

6. Close multivalve unit bypass valve and pressure control unit bypass valves.
7. Refer to "Repair of Component Parts" and "Work Procedures by Unit", then start with evacuating hydraulic lines.



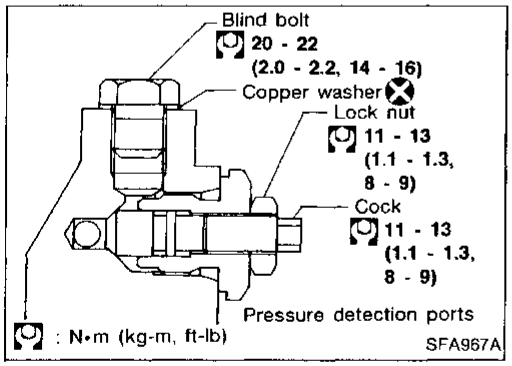
On-vehicle Service (Cont'd)

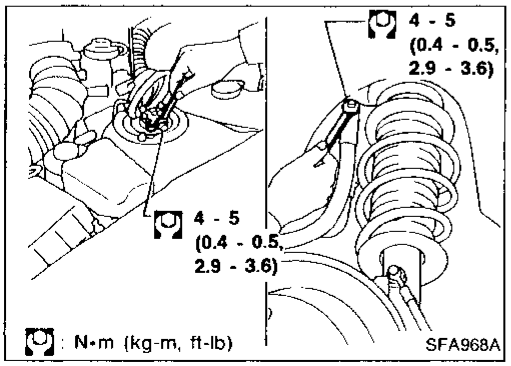
CHECKING FLUID LEAKAGE

Oil leak check

Genuine "Fluid A-Active Suspension" is clear and light yellow-green when it is new. After use, it will turn to light yellow. After locating leaking point using table below as a guide, wipe away oil completely and check that oil leaks at the same point again. Do not confuse "Fluid A-Active Suspension" oil used in other systems.

Location where oil leaks can occur	Fluid used near the same locations in systems other than active suspension system	Remarks
Inside front right fender protector	LLC (green), washer fluid (no color or blue)	—
Inside front left fender protector	—	If oil spills while replenishing reservoir tank fluid, it will flow out via oil cooler. Do not regard this as a leak of the oil cooler.
Inside undercover	LLC (green), power steering fluid (red), automatic transmission fluid (red), brake fluid (red), engine oil, etc.	Spilled oil may come in contact with front and/or rear of cover due to piping layout, unit locations, etc.
Inside wheelhouse	Brake fluid (red)	Oil may possibly leak at or around actuator, and hose and tube connections.
Inside rear pressure control unit protector	—	—
Inside pipe protector	—	Protector on outer side of left side member
Rear suspension member upper portion	Brake fluid (red), gasoline, etc.	—





Corrective measures for oil leaks

When repairing oil leaks, or when removing piping or hydraulic parts, refer to "Repair of Component Parts" and perform required work associated with leak repair if instructed.

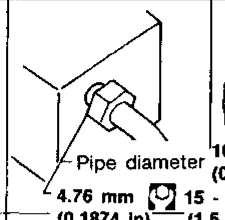
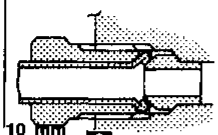
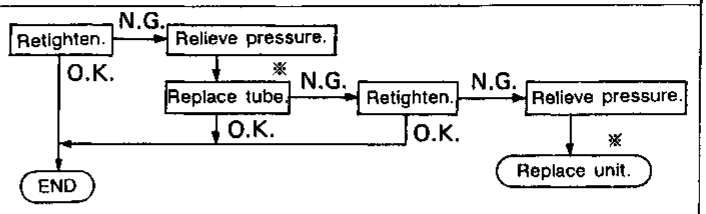
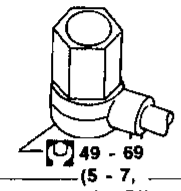
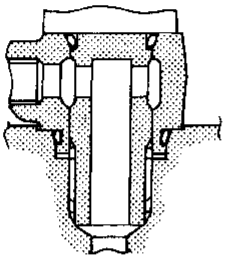
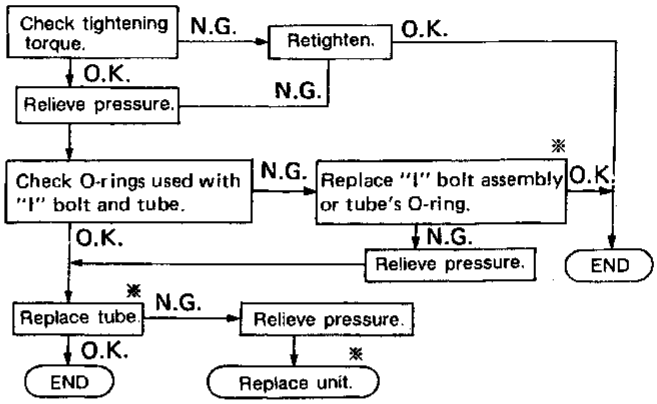
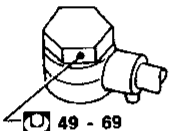
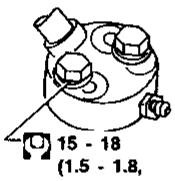
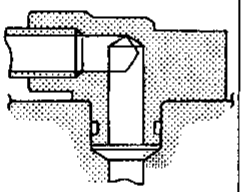
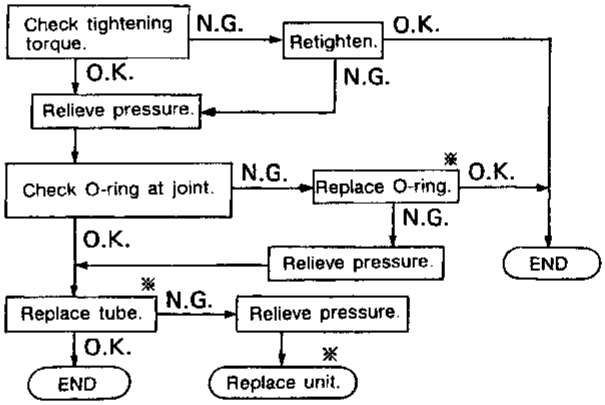
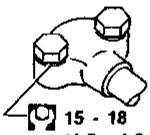
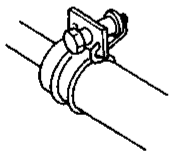
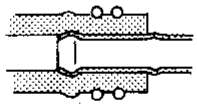
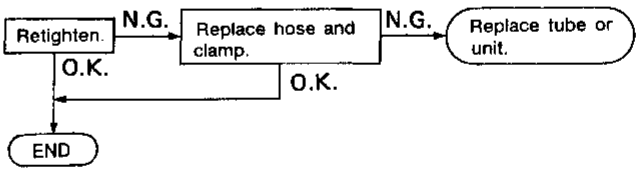
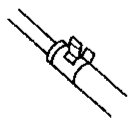
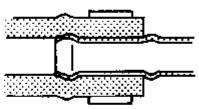
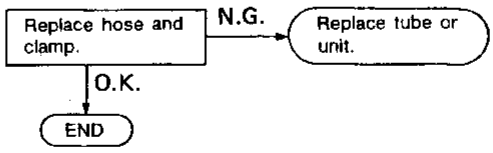
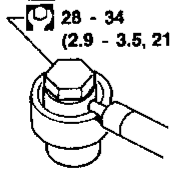
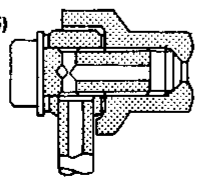
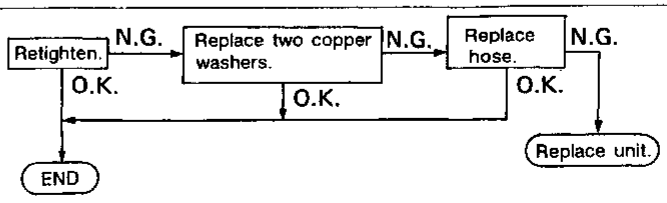
1. Leaks at pipe connections
   Refer to "Corrective measures for leaks at pipe connections".
2. Leaks at pressure detection ports
- Make sure cock is tightened to specified torque.
- Discard copper washer under blind bolt; replace it with a new one.
- If leakage is still present, replace faulty detection port.

3. Leaks at air bleeder
- Make sure that air bleeder is tightened to specified torque.
- If retightening air bleeder does not eliminate leaks, replace affected unit with a new one.

4. Leaks at other parts
   Replace affected unit with a new one.

On-vehicle Service (Cont'd)

Corrective measures for leaks at pipe connections

No.	Parts to check	External shape and tightening torque N·m (kg-m, ft-lb)	Internal construction	Remedy
1	Flare nut	 Pipe diameter 4.76 mm (0.1874 in) 15 - 18 (1.5 - 1.8, 11 - 13) 10 mm (0.39 in) 39 - 49 (4 - 5, 29 - 36)		
2	"I" joint (large)	 49 - 69 (5 - 7, 36 - 51)		
3	"I" joint (small)	 49 - 69 (5 - 7, 36 - 51)		
4	Flange joint (large)	 15 - 18 (1.5 - 1.8, 11 - 13)		
5	Flange joint (small)	 15 - 18 (1.5 - 1.8, 11 - 13)		
6	Hose clamp (spring)			
7	Hose clamp (screw)			
8	Copper washer "I" joint	 28 - 34 (2.9 - 3.5, 21 - 25)		

(1) ※: Refers to items that require air bleeding.
(2) Refer to "Repair of Component Parts" for pressure relieving and air bleeding procedures.

SFA969A

Repair of Component Parts

WORK PROCEDURES BY UNIT

Work accompanied by removal and installation of hydraulic parts differs due to difference in pressure application method and air bleeding procedures. This section deals with work associated with removal or installation of hydraulic parts.
After associated work is selected from that indicated in table below, also use "Basic work flowchart" as a guideline and perform only required work.

Work associated with, and classified by, each unit

○: Work necessary, X: Work not necessary

Unit to remove or install		Associated work						
		Relieving pressure	Evacuating hydraulic line	Flushing (dust removal, etc.)	Air bleeding			Vehicle height adjustment
					Pressure control unit	Actuator	Multivalve unit	
Reservoir tank		X	○	X	○	○	○	X
Pump		○	○	X	○	○	○	X
Pump accumulator		○	X	X	○	○	○	X
Multivalve unit		○	X	○	○	○	○	X
Main accumulator		○	X	○	○	○	○	X
Pressure control unit		○	X	○	○	○	○	○
Actuator		○	X	X	○	○	○	○
Drain filter		X	X	X	○	○	○	X
Oil cooler		X	X	X	○	○	○	X
Piping	Reservoir tank to pump	X	○	X	○	○	○	X
	Pump to multivalve unit	○	X	△*2	○	○	○	X
	Multivalve to pressure control unit	○	X	○	○	○	○	X
	Pressure control unit to actuator*1	○	X	△*2	○	○	○	X
	Drain pipe	△*2	X	△*2	X	△*2	X	X
Oil replacement		○	○	○	○	○	○	○

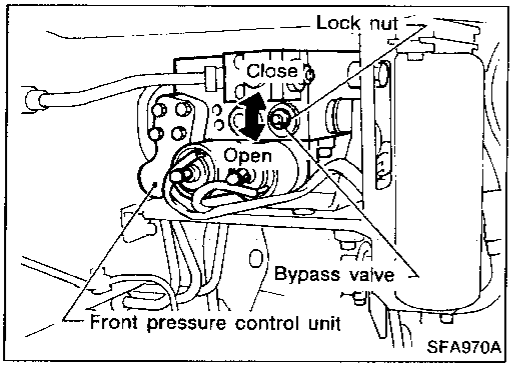
*1: Work includes pressure detection port servicing and associated piping.
*2: Except for concentrated piping units, associated work is not necessary.

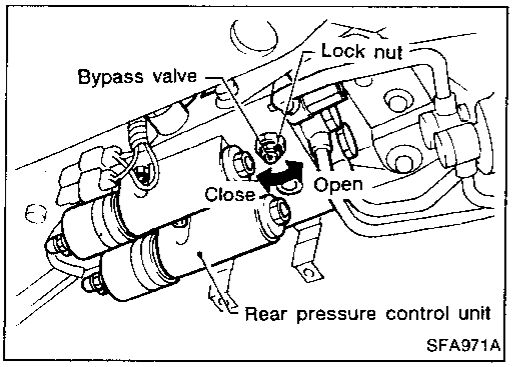
Repair of Component Parts (Cont'd)

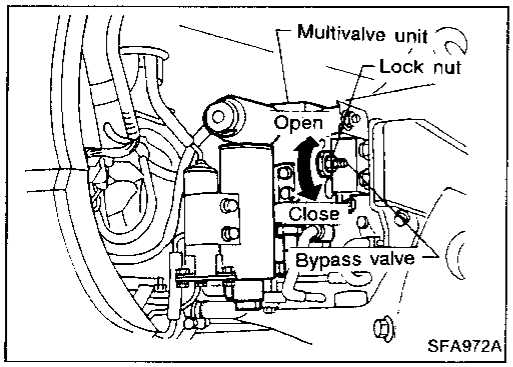
Basic work flowchart

Raise vehicle.	
Remove fender protectors, undercovers, etc. which hamper smooth repair work.	**Determine whether or not work (marked "*") needs to be performed by referring to "Work associated with, and classified by, each unit".**
Relieve pressure.*	Refer to "RELIEVING PRESSURE". FA-28
Replace parts.	Refer to "TIGHTENING TORQUE". FA-36
Evacuate system.*	Refer to "EVACUATING HYDRAULIC LINES". FA-28
Flush to remove foreign particles.*	Refer to "FLUSHING". FA-28
Bleed air from pressure control unit.*	Refer to "AIR BLEEDING". FA-30
Bleed air from actuator.*	Refer to "AIR BLEEDING". FA-30
Bleed air from multivalve unit.*	Refer to "AIR BLEEDING". FA-30
Check oil leakage.*	Refer to "OIL LEAK CHECK". FA-31
Install fender protectors, undercovers if removed.	Refer to "PROTECTOR INSTALLATION". FA-32
Lower vehicle to ground.	
Check and correct level.	Refer to "OIL LEVEL CHECK". FA-32
Check system operation.	Refer to "SYSTEM OPERATION CHECK". FA-33
Adjust vehicle height.*	Refer to "VEHICLE HEIGHT ADJUSTMENT". FA-34
END	

Repair of Component Parts (Cont'd)







RELIEVING PRESSURE

Before relieving pressure from hydraulic parts, carefully read "Service Notice" and familiarize yourself with its contents.

- Move vehicle to lift-up position and stop engine. Wait for at least 3 minutes before lifting vehicle.
- Lift vehicle until all four wheels are completely off the ground.
- Remove left and right fender protectors and rear pressure control unit protectors.
- Loosen lock nuts on bypass valve for front and rear pressure control units. Slowly open bypass valve until they are fully open.

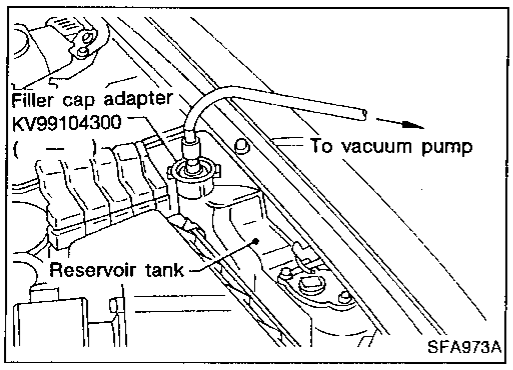
Always use a closed wrench to prevent slippage when loosening lock nuts [6 mm (0.24 in) across flats].

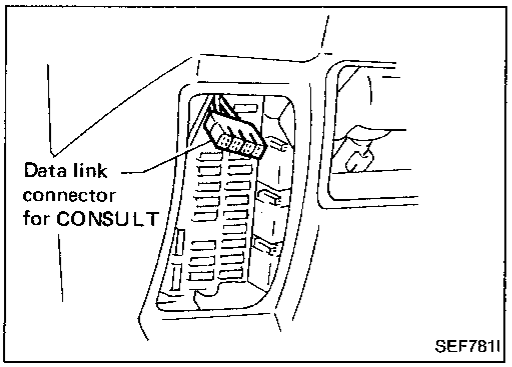
- Loosen lock nut bypass valve on multivalve unit, and slowly tighten cock until it is fully open.

CAUTION:
Multivalve unit bypass valve is opened when tightened.

- After replacing parts or flushing hydraulic lines, close all three bypass valves securely.

  Bypass valve:
  [O]: 11 - 13 N·m (1.1 - 1.3 kg-m, 8 - 9 ft-lb)
  Lock nut:
  [O]: 11 - 13 N·m (1.1 - 1.3 kg-m, 8 - 9 ft-lb)
  (Loosen Multivalve unit bypass valve completely.)





EVACUATING HYDRAULIC LINES

After pump, etc., is replaced, air may enter line between reservoir tank and pump, which in turn degrades oil discharge efficiency. To evacuate hydraulic line, proceed as follows:

- After parts are replaced, make sure all pipe connections are tight and secure.
- Make sure oil level in reservoir tank is correct.
- Install oil level gauge securely.
- Remove filler cap from reservoir tank and install a filler cap adapter instead.
- Connect vacuum pump (used for air conditioning system) and vacuum hose to filler cap adapter, and evacuate for at least two minutes.

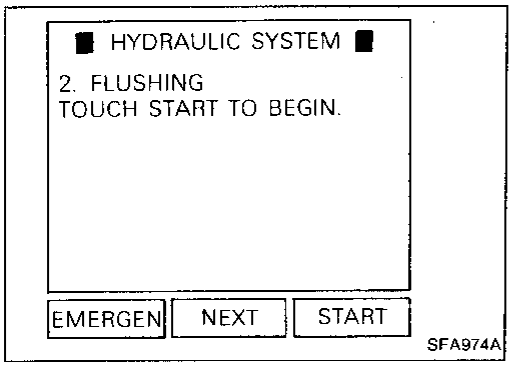
If possible, use a gauge manifold to check for complete evacuation.

FLUSHING

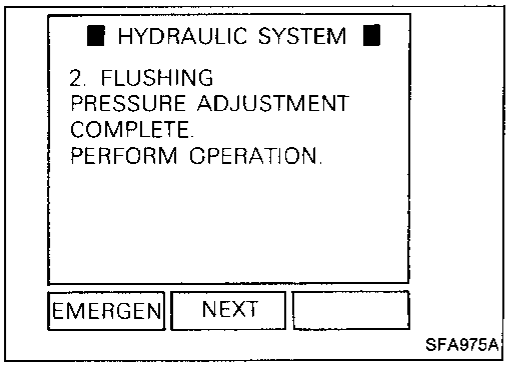
Flushing is performed to forcefully remove foreign particles from oil lines after hydraulic parts are replaced. Bypass valves are opened fully to permit circulation of oil through entire circuit system, thereby removing foreign particles from oil into filters built into reservoir tank, multivalve unit and pressure control units.

Repair of Component Parts (Cont'd)

- Turn ignition switch "OFF" and connect CONSULT.
- Check oil level in reservoir tank.
- Lift vehicle. Completely open front and rear pressure control unit bypass valves, as well as multivalve unit bypass valve. (Make sure multivalve unit bypass valve is tightened to open.)
- Lower vehicle until wheels are slightly off ground.
- Turn ignition switch "ON". Touch "START", "ACTIV SUS", "WORK SUPPORT", and "HYDRAULIC SYSTEM" on CONSULT display in that order.



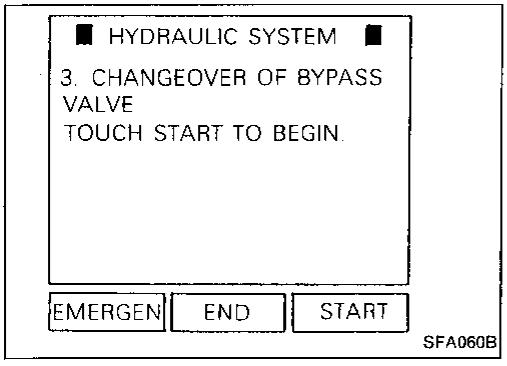
- When display shows "1. FILLING OIL", touch "NEXT" so that display shows "2. FLUSHING" image.
- Touch "START" and wait until flush setting is completed.



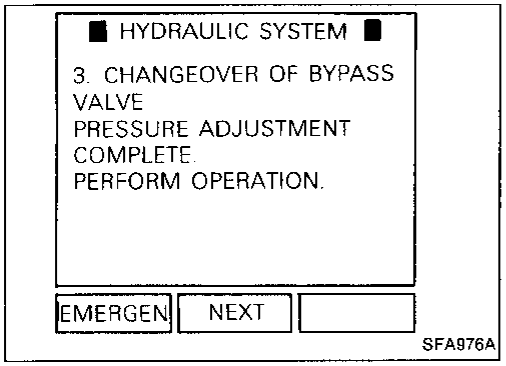
- Start engine. Idle for five minutes to execute flushing.

While flushing is being performed, both flow control and fail-safe valves are held open and control pressure is held at 4,609 kPa (47 kg/cm^2, 668 psi) (neutral pressure).

- After flushing is completed, stop engine.



- Turn ignition switch "ON". (Do not start engine.) Touch "NEXT" on CONSULT display. When display shows "3. CHANGEOVER OF BYPASS VALVE", touch "START".



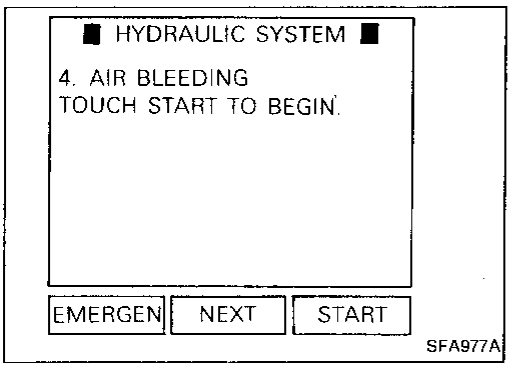
- After flush setting is completed, lift vehicle.
- Tighten both front pressure control unit bypass valve and rear pressure control unit bypass valve to specified torque and secure with lock nuts.
- Completely loosen multivalve unit bypass valve and secure with lock nut.

: Bypass valve 11 - 13 N·m (1.1 - 1.3 kg-m, 8 - 9 ft-lb)
: Lock nut 11 - 13 N·m (1.1 - 1.3 kg-m, 8 - 9 ft-lb)

Always use a box wrench to prevent slippage when loosening bypass valve [6 mm (0.24 in) across flats].

- Lower vehicle until wheels are slightly off ground.

Repair of Component Parts (Cont'd)



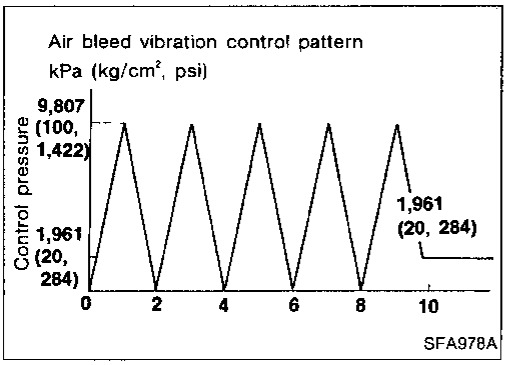
AIR BLEEDING

Air bleeding discharges air trapped in oil in hydraulic lines during part replacement. Bleeding air from oil and oil lines is accomplished by directing pulsating oil under pressure so that all air in line is forced to accumulate at actuator's upper section. It is then discharged into atmosphere through air bleeder located on actuator. When front or rear pressure control unit is replaced, bleed air from its interior.

- Lift vehicle until wheels are at least 50 mm (1.97 in) above ground. Start engine and idle it for approximately two minutes.
- With CONSULT set to "WORK SUPPORT" mode, call up "4. AIR BLEEDING" on display.

When "NEXT" is touched, followed by changeover of bypass valve operations, display will show "4. AIR BLEEDING".

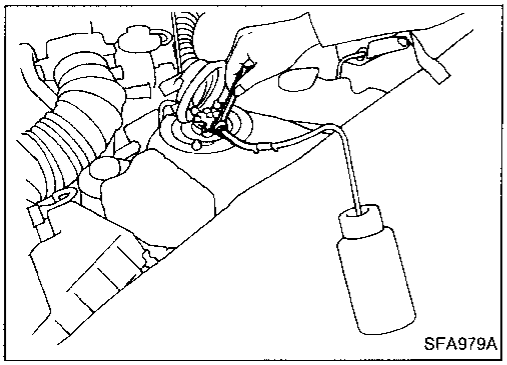
- Check oil level in reservoir tank and add oil so that it is slightly higher than specified level.



- Touch "START" on CONSULT display. Display will then show control pattern shown in figure at left and air bleed vibration will be executed.

While air bleed vibration is being executed, both flow control and fail-safe valves are held open.

- After making sure air bleed vibration is completed on display, stop engine.

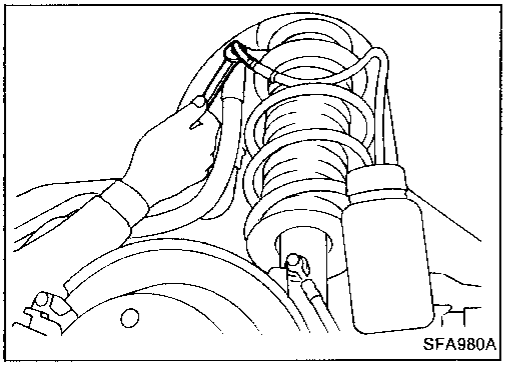


Bleeding air from actuators

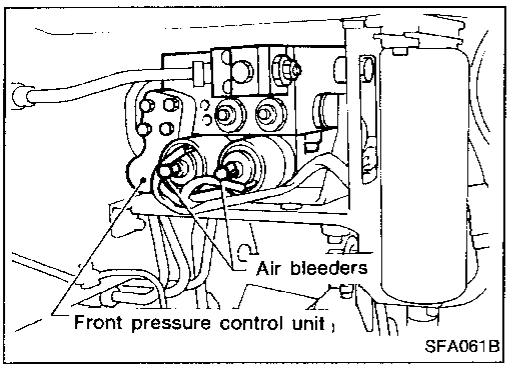
- Connect vinyl tube to air bleeder of actuator requiring air bleeding.
- Slowly loosen air bleeder, drain oil until air bubbles disappear. Tighten air bleeder.
- **While bleeding air, check oil level in reservoir tank occasionally, and add oil as needed.**
- **Be careful not to spill oil on adjacent body parts.**

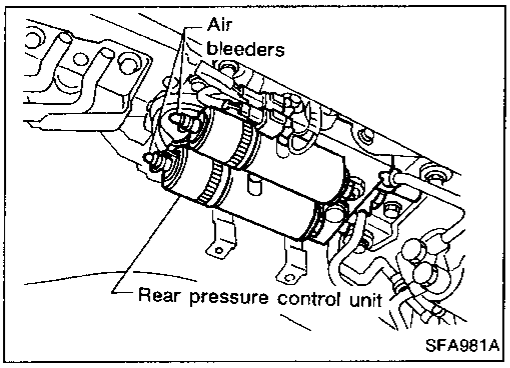
  Air bleeder:

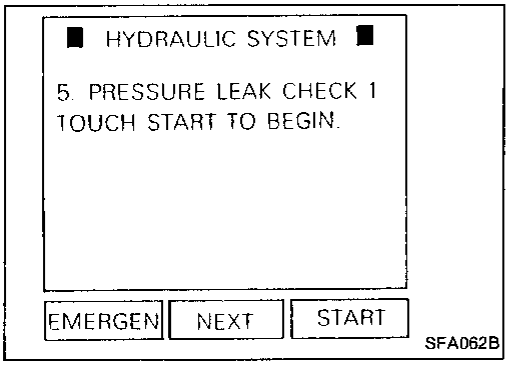
  : 6 - 8 N·m (0.6 - 0.8 kg-m, 4.3 - 5.8 ft-lb)
- If air is not completely bled from actuator, repeat air bleed vibration operation.



Repair of Component Parts (Cont'd)







Bleeding air from pressure control units

When noise is persistently produced or after any pressure control unit is replaced, bleed air from pressure control unit using same procedures as with actuators.

Each pressure control unit is provided with two air bleeders. Bleed air from both bleeders.

Bleeding air from multivalve unit

(1) Race engine, or drive vehicle until oil temperature rises to 60 to 70°C (140 to 158°F) (or, more specifically, until full-active suspension oil cooler motor fan operates).
(2) Connect CONSULT, and perform "4-wheel vibration" mode of work support to allow oil to be circulated through system.
(3) Sudden rise in oil pressure is required for testing. For this purpose, start engine with accelerator pedal depressed. Increase engine speed to approx. 4,000 rpm, and maintain this speed for 20 seconds. Stop engine, and leave as is for 3 minutes.
(4) Repeat step (3) above five to six times.
(5) If noise is still heard after completing these operations, leave vehicle for more than 30 minutes, and then perform steps (1) thru (4) again.

OIL LEAK CHECK

Neutral pressure leak check

- Start engine and idle it for approximately 2 minutes.
- Set CONSULT to "WORK SUPPORT" mode and call up "5. PRESSURE LEAK CHECK 1" on CONSULT display.

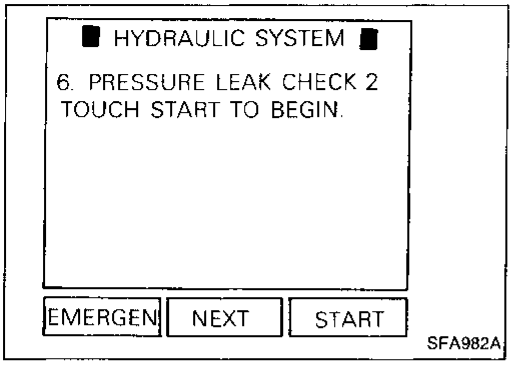
When "NEXT" is touched, followed by air bleeding operations, display will show "5. PRESSURE LEAK CHECK 1".

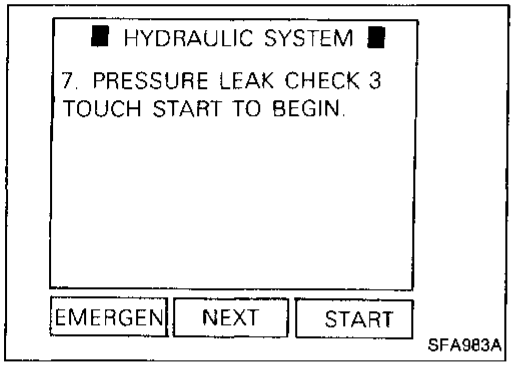
- Touch "START" to control actuator oil pressure at 4,609 kPa (47 kg/cm^2, 668 psi).

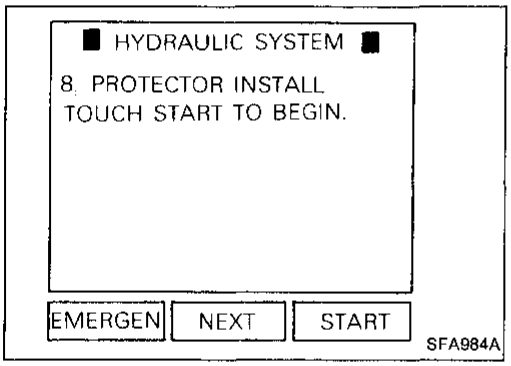
While neutral pressure leak check is being executed, both flow control and fail-safe valves are held open.

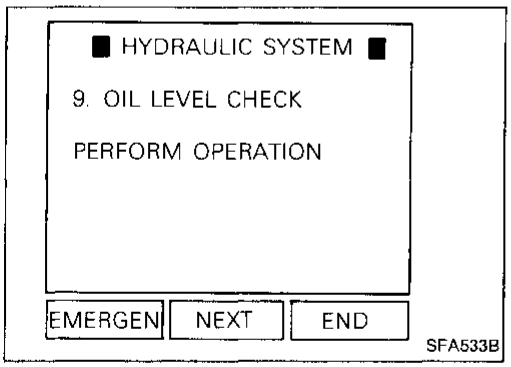
- After making sure neutral pressure control is completed on display, lift vehicle and hold it for at least 3 minutes.
- Check that leaks are not present at pipes and connections. Lower vehicle so that wheels are approximately 50 mm (1.97 in) above ground.

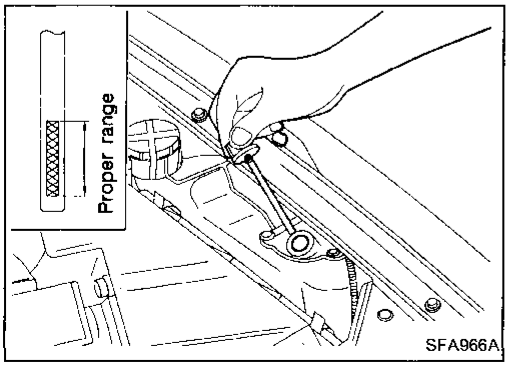
Repair of Component Parts (Cont'd)











High pressure leak check

- After completing neutral pressure leak checks, touch "NEXT" on CONSULT display. Display will then show "6. PRESSURE LEAK CHECK 2".
- Touch "START" on display. Actuator oil pressure is then controlled at 9,807 kPa (100 kg/cm^2, 422 psi) rather than at 4,609 kPa (47 kg/cm^2, 668 psi).

While high pressure leak check is being executed, both flow control and fail-safe valves are held open.

- After making sure high pressure leak check is completed on display, lift vehicle for at least three minutes.
- Check that leaks are not present at piping and connections. Lower vehicle so that wheels are still at least 50 mm (1.97 in) above ground.

Return line leak check

- After completing high pressure leak checks, touch "NEXT" on CONSULT display. Display now shows "7. PRESSURE LEAK CHECK 3".
- Touch "START" to control actuator oil pressure at 4,609 kPa (47 kg/cm^2, 668 psi) rather than at 9,807 kPa (100 kg/cm^2, 1,422 psi).

While return line leak check is being executed, both flow control and fail-safe valves are held open.

- After making sure return line leak check is completed on display, lift vehicle for at least three minutes.
- Check that leaks are not present at piping and connections.

PROTECTOR INSTALLATION

- Touch "NEXT" on CONSULT display. Display now shows "8. PROTECTOR INSTALL".
- Touch "START" to control actuator oil pressure at 0 kPa (0 kg/cm^2, 0 psi) and to open fail-safe valve.
- After making sure display is set to protector installation mode, stop engine.
- Re-install parts (fender protectors, undercover, etc.).

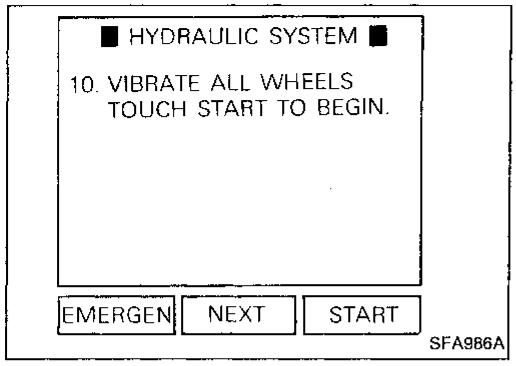
OIL LEVEL CHECK

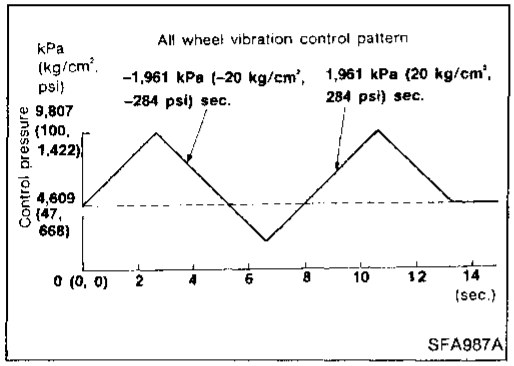
1. Lower vehicle onto flat floor.
2. Start engine. Touch "NEXT" on CONSULT display. Display will then show "9. OIL LEVEL CHECK".
3. Press "END" to exit from the work support mode.

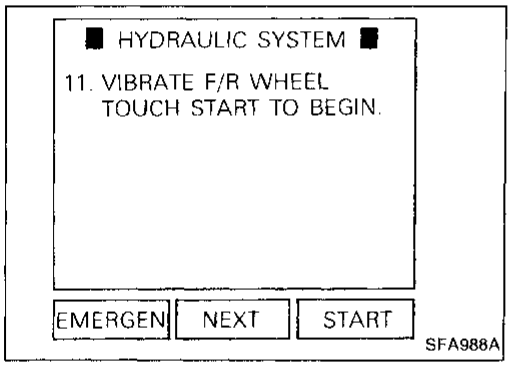
Note: The Consult does not support the inspection (oil level check) in this mode.
The work instruction is displayed on the Consult screen. Perform this operation (oil level check) after exiting the work support mode by touching "END".

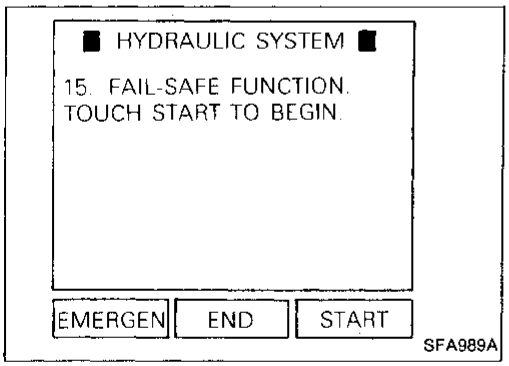
4. For oil level check refer to FA-23.

Repair of Component Parts (Cont'd)









SYSTEM OPERATION CHECK

The system operation check is to check for proper active suspension system operation. The active suspension system has three functions — a function that changes control pressure for all four wheels at the same time, a function that changes it for any one wheel, and a function that activates the fail-safe valve. Extreme care should be taken when conducting system operation checks since the vehicle moves up and down greatly.

All wheel vibration check

- Restart work support and skip to No. 10.

CAUTION:

Before conducting all wheel vibration check, make sure vehicle is placed on a flat surface with engine idling.

- Make sure there are no obstacles which may hamper the up-down vehicle movement.
- Release parking brakes to eliminate friction which may occur during vehicle height changes.

Make sure selector lever is set to "P" and foot brake is released.

- Touch "START" on CONSULT display. Display will then show control pattern like the one shown in figure at left, and all four wheels will vibrate simultaneously.

While all wheels are being vibrated, both flow control and fail-safe valves are held open.

- Make sure vehicle moves up and down smoothly without noise and vibration.
- After making sure wheel vibration control has been completed.

Single wheel vibration check

- When either "11. VIBRATE F/R WHEEL" through "14. VIBRATE R/L WHEEL" shown on CONSULT display is selected, only selected wheel can be vibrated in a pattern similar to all wheels vibration control pattern.

Fail-safe function check

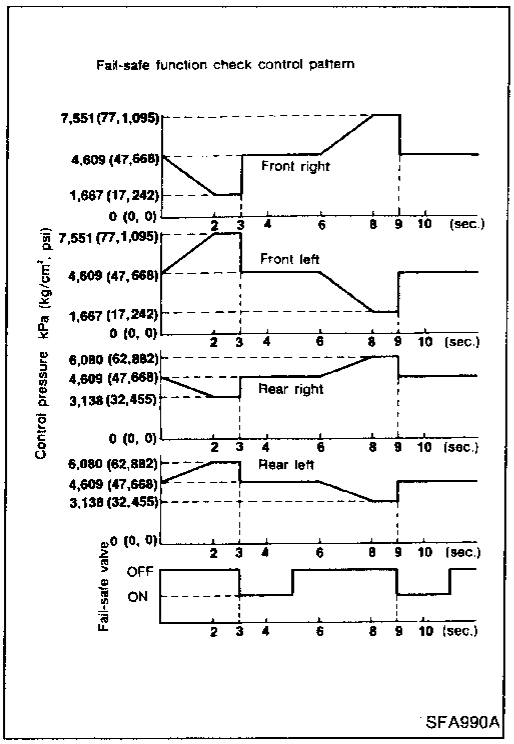
- Check that wheel vibration checks have been completed while observing CONSULT display.
- Call up "15. FAIL-SAFE FUNCTION" mode on CONSULT display.

Make sure engine is idling with vehicle on a flat surface.

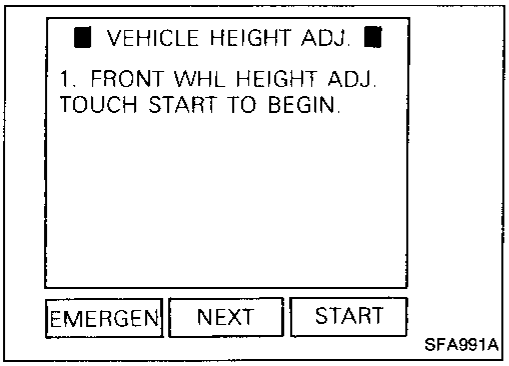
- Make sure there are no obstacles that interfere with vehicle roll.
- Release parking brakes to remove friction which may occur while vehicle height changes.

Make sure selector lever is set to "P" and foot brake is released.

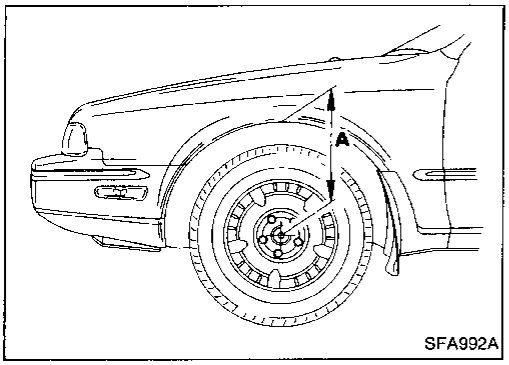
Repair of Component Parts (Cont'd)



SFA990A



SFA991A



SFA992A

- Touch "START" on CONSULT display. Control pattern shown in figure at left will then appear, and each wheel and fail-safe valve is controlled.

Flow control valve is held "open" during fail-safe function checks.

- Make sure vehicle rolls to right or left and quickly returns to level position after fail-safe valve is closed.

A sound is heard when fail-safe valve is opened or closed. This is normal.

- After completing fail-safe function checks, touch "END" on CONSULT display.

VEHICLE HEIGHT ADJUSTMENT

Front wheelarch height adjustment

- Set CONSULT to work support mode. Touch "VEHICLE HEIGHT ADJ." so that "1. FRONT WHL HEIGHT ADJ." appears on CONSULT display.

Make sure engine is idling, selector lever is set to "P", parking brake is "OFF", foot brake is "OFF", and vehicle is on a level surface.

- Touch "START" on CONSULT display and wait until CONSULT is ready for front wheel height adjustment.
- Set height control switch (located on center console) from "N" (Normal) to "H" (High) and then return to "N".
- Move vehicle 2 to 3 meters (7 to 10 ft) back and forth so that it settles down.

Make sure engine is idling, selector lever is set to "P", parking brake is "OFF", and foot brake is "OFF".

- Measure distance "A" between center of one front wheel and lower end of fender molding. Similarly measure distance for the other front wheel. Determine distance difference between both measured values.

During front height adjustment, front wheels are controlled in response to output sent from vehicle height sensors and rear wheels are held at a neutral pressure of 4,609 kPa (47 kg/cm^2, 668 psi).

- Compare measured distances "A" with specifications indicated below. If either distance is outside specifications, loosen bolts on affected vehicle height sensor, and rotate height sensor to adjust vehicle height.

Specifications:

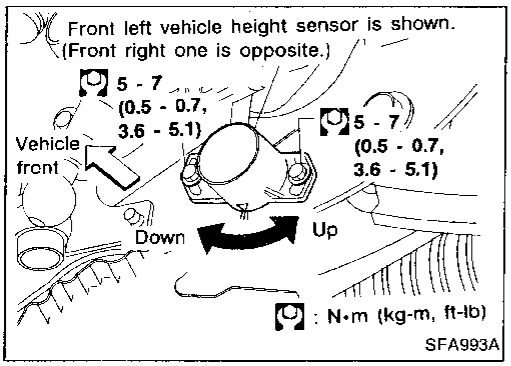
Distance "A"

375 - 395 mm (14.76 - 15.55 in)

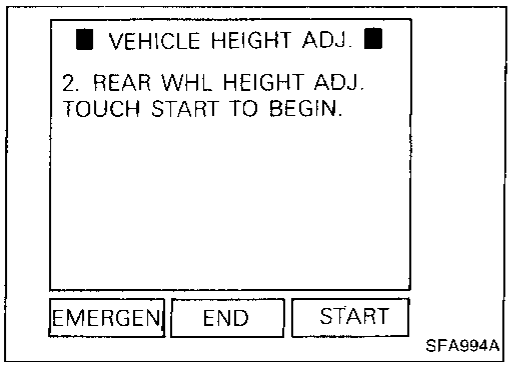
Distance difference between left and right front wheels

10 mm (0.39 in) or less

Repair of Component Parts (Cont'd)



- Turning left vehicle height sensor counterclockwise (when viewed from front side) by 1 graduation (5°) increases vehicle height 14 mm (0.55 in); Turning right vehicle height sensor 1 graduation clockwise increases vehicle height 14 mm (0.55 in).
- After height adjustment, tighten height sensor bolts to specified torque [5 to 7 N·m (0.5 to 0.7 kg-m, 3.6 to 5.1 ft-lb)].

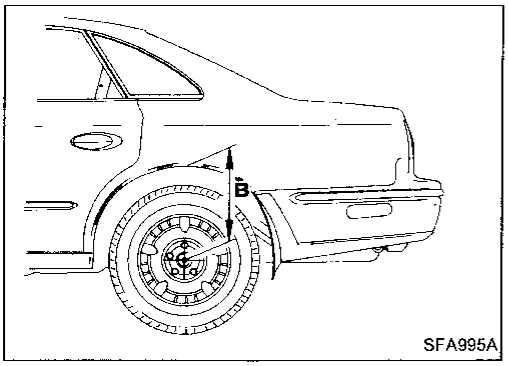


Rear wheel height adjustment

- Touch "NEXT" so that "2. REAR WHL HEIGHT ADJ." appears on CONSULT display.

Make sure engine is idling, selector lever is set "P", parking brake is "OFF", foot brake is "OFF" and wheel is on a flat surface.

- Touch "START" on CONSULT display and wait until CONSULT is ready for rear wheel height adjustment.



- Measure distance "B" between center of one rear wheel and lower end of fender molding. Similarly measure distance for the other rear wheel. Determine difference between both measured values.

Make sure front wheels are held at a neutral pressure of 4,609 kPa (47 kg/cm^2, 668 psi) during rear vehicle height adjustment. Rear wheels are controlled in response to output value of vehicle height sensors.

- Compare measured distance "B" with specifications indicated below. If either distance is outside specifications, loosen stopper nut on vehicle height sensor connecting rod and change rod length to adjust vehicle height.

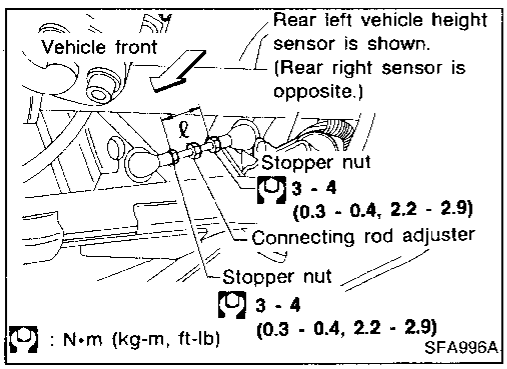
Specifications:

Distance "B"

351 - 371 mm (13.82 - 14.61 in)

Difference in distance "B" between left and rear wheels

10 mm (0.39 in) or less

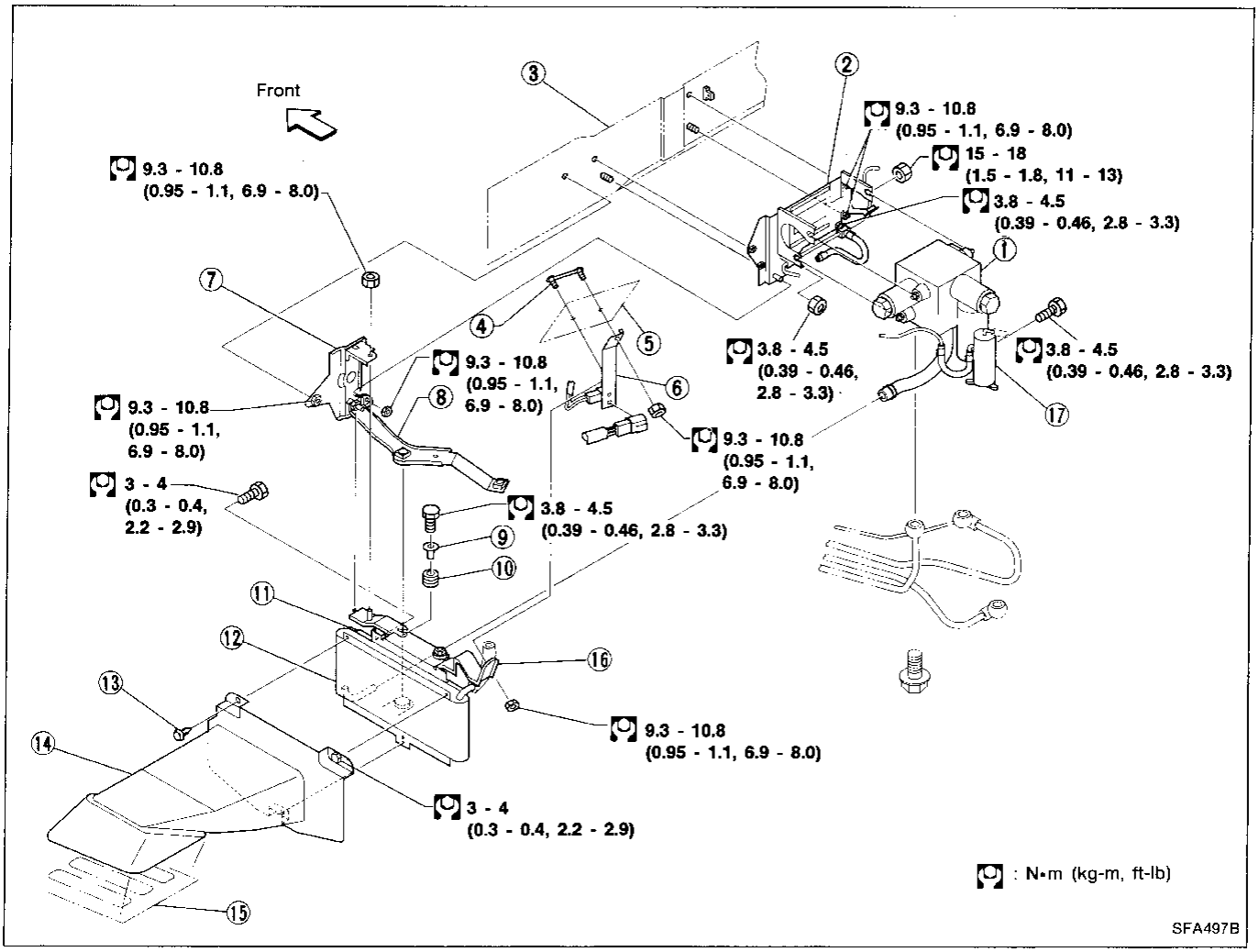


- Measure distance ℓ between stopper nuts seating surfaces.
- Turning connecting rod adjuster one complete rotation (1 pitch = 1.6 mm) causes vehicle height to increase by 7.5 mm (0.295 in).
- After adjusting connecting rod length, tighten stopper nut to specified torque [3 to 4 N·m (0.3 to 0.4 kg-m, 2.2 to 2.9 ft-lb)].
- Touch "END" on CONSULT display and stop engine.

Repair of Component Parts (Cont'd)

COMPONENT PART TIGHTENING TORQUE

Removal and installation of multivalve unit and oil cooler

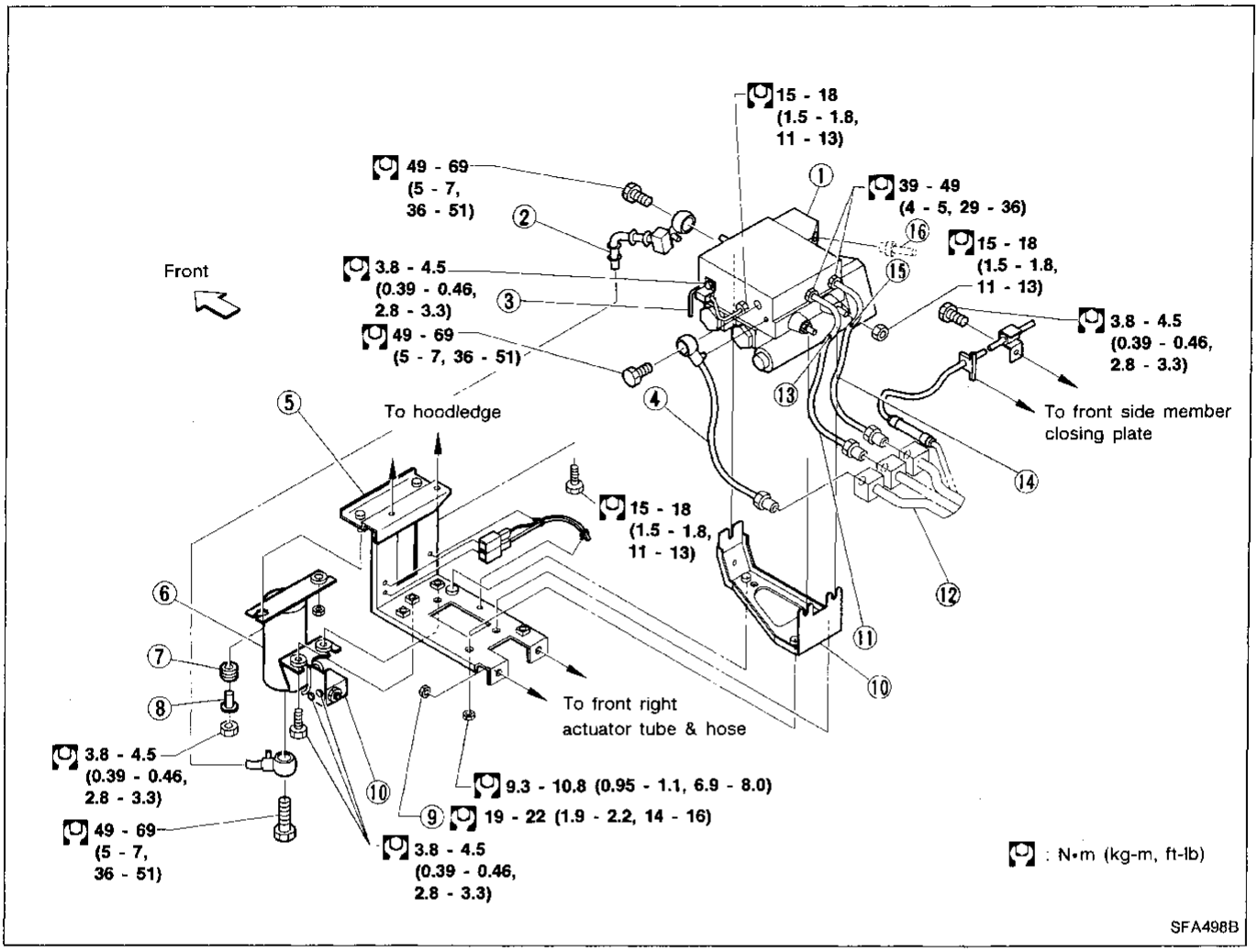


① Multivalve unit
② Multivalve unit bracket
③ Front side member closing plate
④ Bolt plate
⑤ Lower hoodledge
⑥ Connector bracket
⑦ Oil cooler side bracket
⑧ Oil cooler lower bracket
⑨ Insulator collar
⑩ Insulator
⑪ Oil cooler shroud
⑫ Oil cooler
⑬ Clip
⑭ Oil cooler duct
⑮ Bumper finisher
⑯ Oil cooler upper bracket
⑰ Drain filter

- Before removing oil cooler or multivalve unit, remove left and right front turn signal lamps and bumper finishers. Oil cooler or multivalve unit is now accessible for removal.
- Before removing or installing multivalve unit, make sure oil cooler is removed first.

Repair of Component Parts (Cont'd)

Removal and installation of front pressure control unit and front main accumulator



① Front pressure control unit
② Front main accumulator high pressure hose
③ Pressure detection tube
④ Front unit feed tube
⑤ Front pressure control unit bracket
⑥ Front main accumulator
⑦ Insulator
⑧ Insulator collar
⑨ Pressure detection connector
⑩ Front pressure control unit inner bracket
⑪ Front unit return tube
⑫ Front cross tube & hose set
⑬ Mark (white)
⑭ Front unit left tube
⑮ Mark (blue)
⑯ Front right actuator tube & hose

— Removal and installation of front pressure control unit —

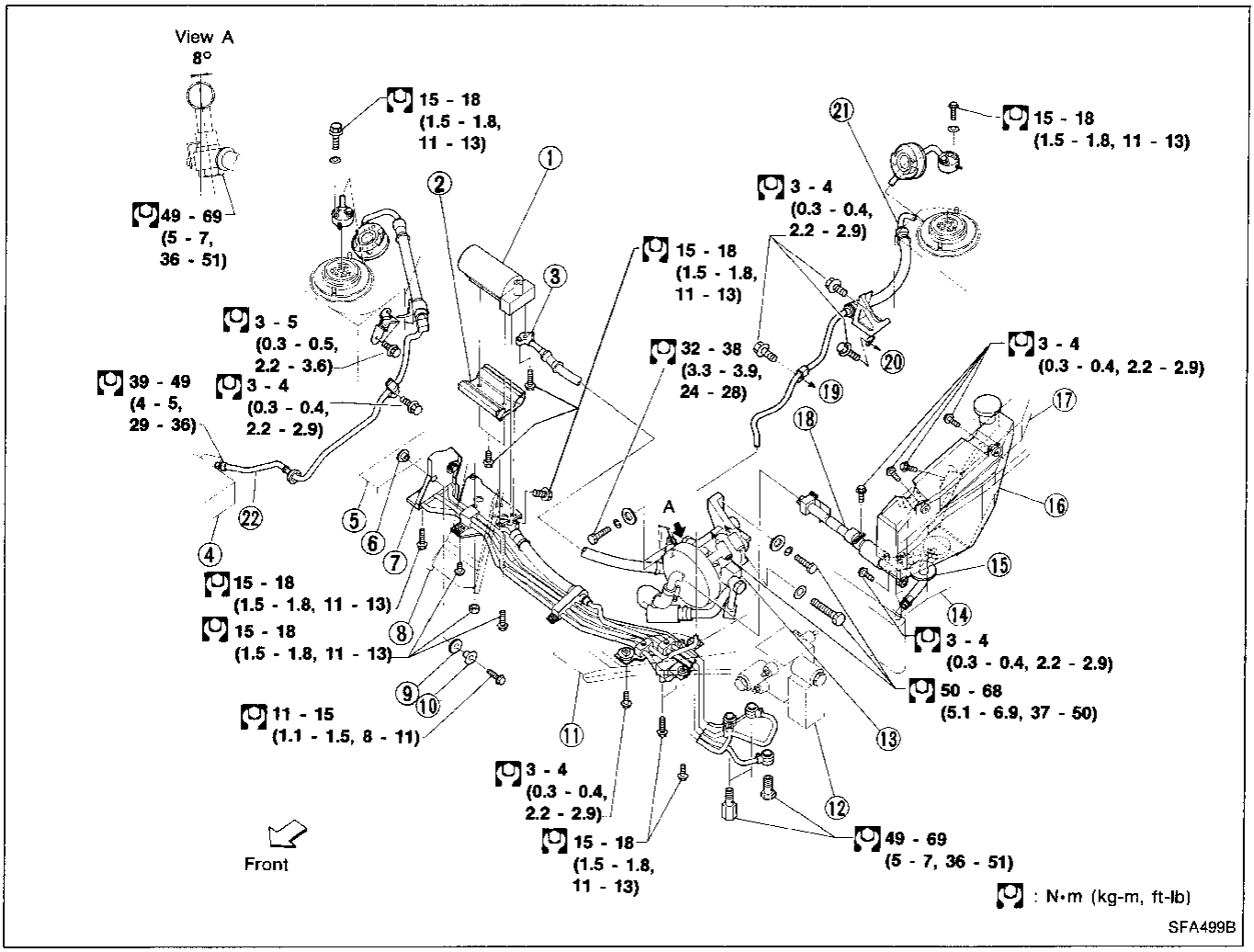
- Before removing or installing front pressure control unit, remove left and right front turn signal lamps bumper finishers and TCS pump. (Refer to "Removal and Installation of TCS Actuator" in BR section.) Front pressure control unit will then be accessible.
- Before discarding front pressure control unit, drill holes in return accumulator to completely discharge nitrogen gas as instructed on caution label. Caution label is located on return accumulator of front pressure control unit.

Repair of Component Parts (Cont'd)

— Disposal of front main accumulator —

Before discarding front main accumulator, drill holes in it to completely discharge nitrogen gas as instructed on caution label on main accumulator.

Removal and installation of pump, pump accumulator, reservoir tank and piping (in engine compartment)



① Pump accumulator
② Accumulator mount insulator
③ Pump's high pressure hose
④ Front pressure control unit
⑤ Side member
⑥ Valve mount inner insulator
⑦ Tube bracket
⑧ Right tension rod bracket
⑨ Valve mount outer insulator
⑩ Insulator collar
⑪ Left tension rod bracket
⑫ Multivalve unit
⑬ Pump
⑭ Lower hoodledge
⑮ Tank return hose
⑯ Reservoir tank
⑰ Upper hoodledge
⑱ Suction hose
⑲ To power steering bracket
⑳ To strut housing
㉑ Front left actuator tube & hose
㉒ Front right actuator tube & hose

Repair of Component Parts (Cont'd)

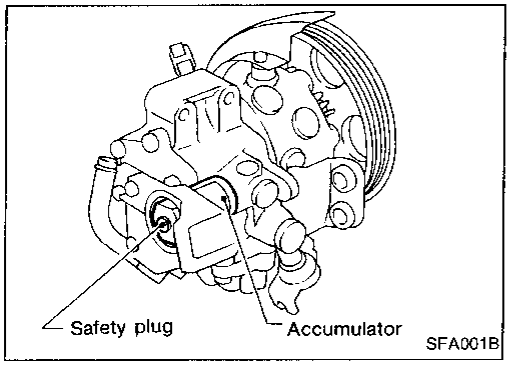
— Pump removal and installation —

- Before removing pump, remove pump pulley and proceed as follows:

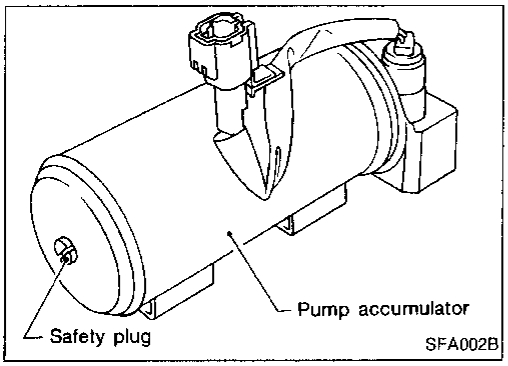
(1) Insert screwdriver in pulley hole (to prevent pulley from turning), and loosen pulley nut.
(2) Remove pulley.
(3) Remove pump.

- Tighten pulley nut to specified torque after installing pulley. Be sure to install pulley key.

  Pulley nut:
  : 88 - 98 N·m (9.0 - 10.0 kg-m, 65 - 72 ft-lb)



- Before discarding pump, slowly loosen safety plug on accumulator (a part of pump) to discharge nitrogen gas and then loosen it completely.

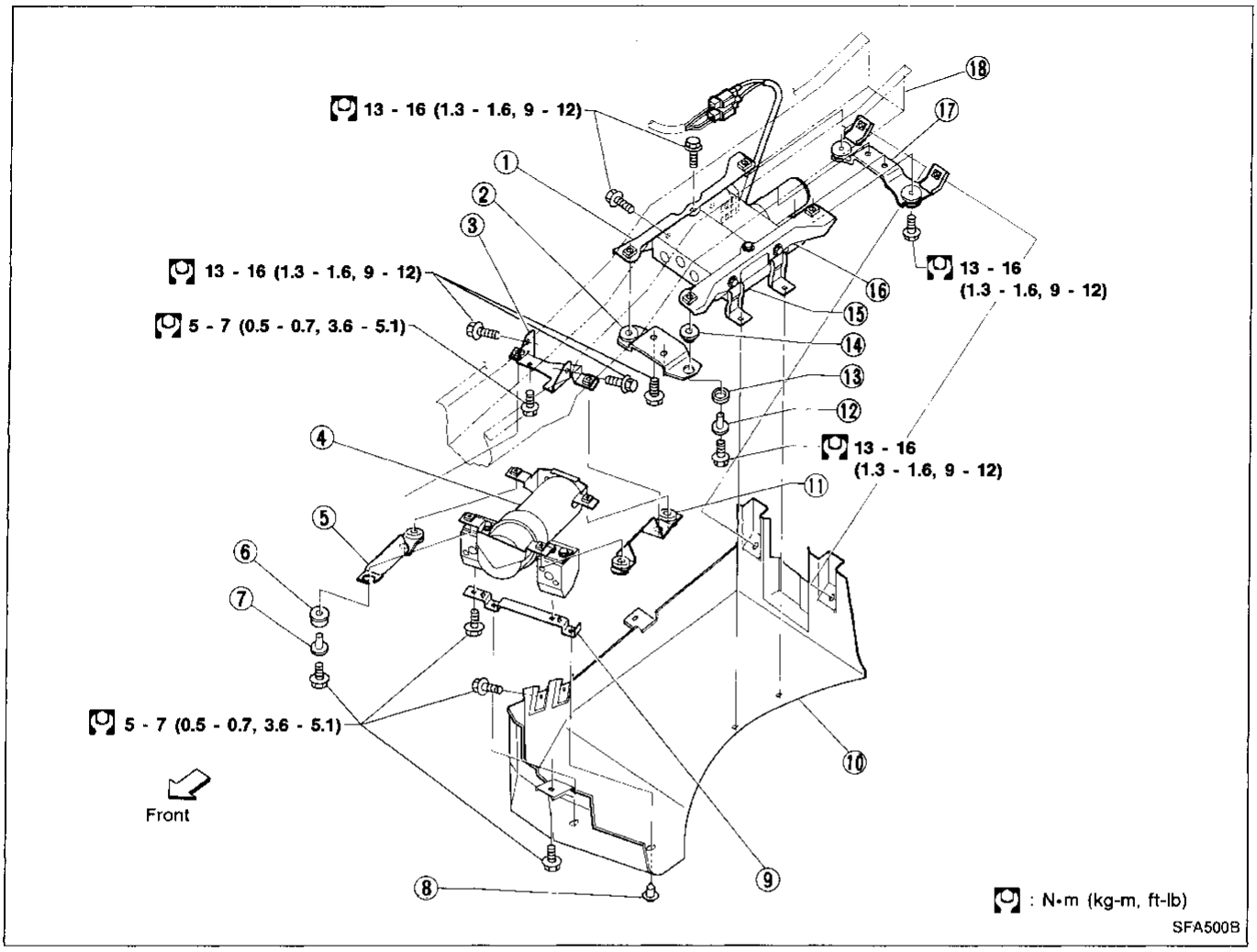


— Disposal of pump accumulator —

Before disposing of pump accumulator, slowly loosen safety plug to discharge nitrogen gas and then loosen it completely.

Repair of Component Parts (Cont'd)

Removal and installation of rear pressure control unit and rear main accumulator



① Control unit bracket C
② Control unit bracket A
③ Accumulator bracket C
④ Rear main accumulator
⑤ Accumulator bracket A
⑥ Insulator
⑦ Insulator collar
⑧ Clip
⑨ Control unit protector stay
⑩ Control unit protector
⑪ Accumulator bracket B
⑫ Insulator collar
⑬ Mount outer insulator
⑭ Mount inner insulator
⑮ Rear pressure control unit
⑯ Control unit bracket D
⑰ Control unit bracket B
⑱ Side member

— Disposal of rear pressure control unit —

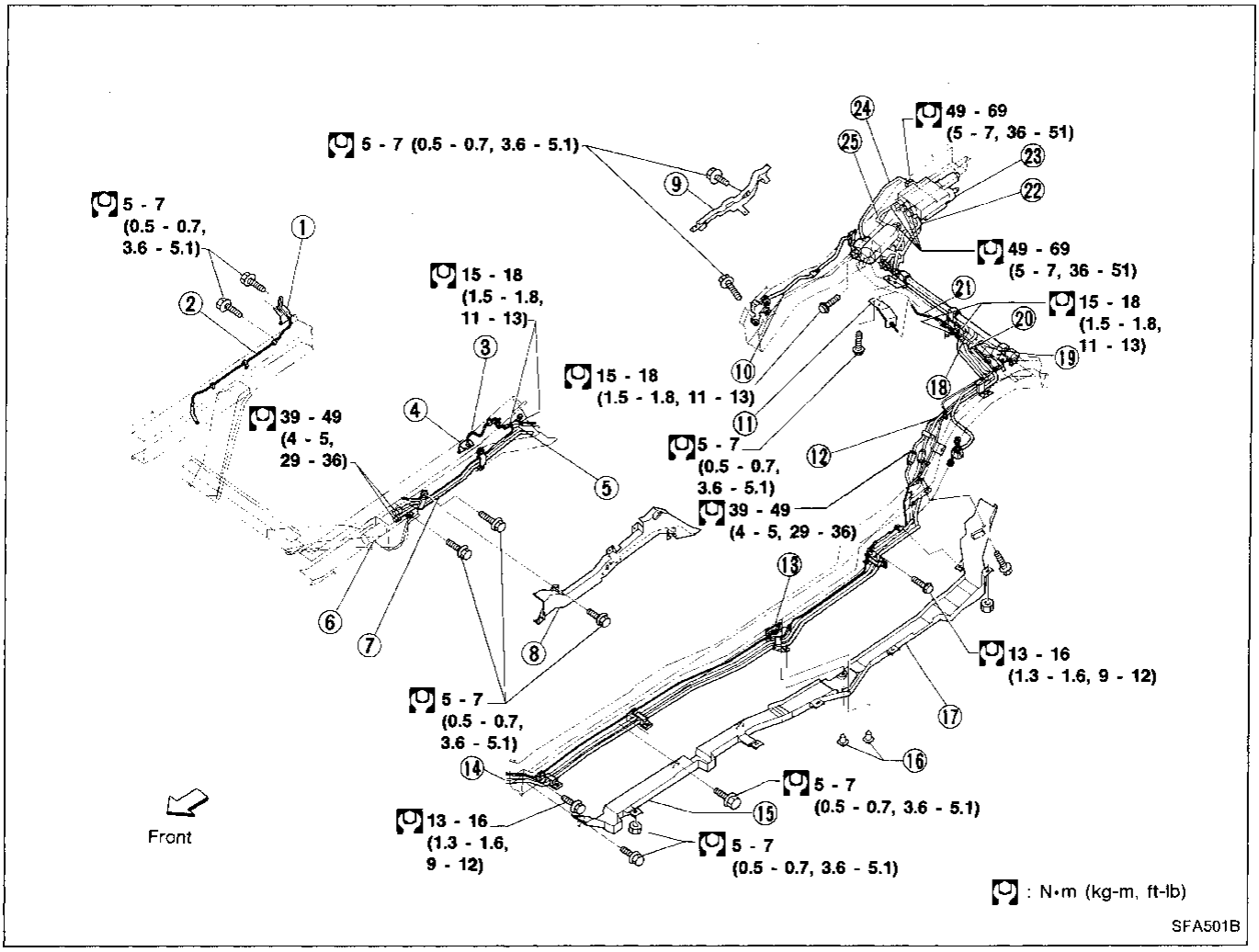
Before discarding rear pressure control unit, drill holes in accumulator to completely discharge nitrogen gas as instructed on caution label. Caution label is located on return accumulator of pressure control unit.

— Disposal of rear main accumulator —

Before discarding rear main accumulator, drill holes in accumulator to completely discharge nitrogen gas as instructed on accumulator caution label.

Repair of Component Parts (Cont'd)

Removal and installation of underfloor piping

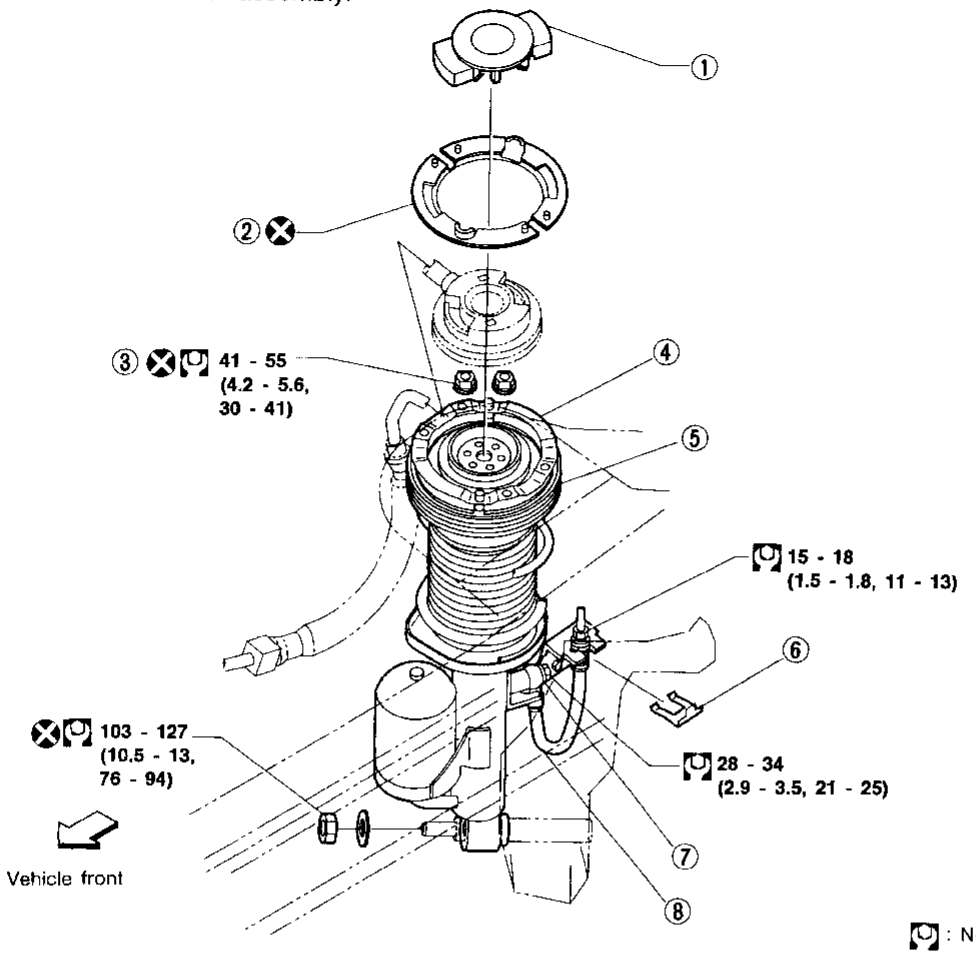


① Drain tube bracket
② Front right suspension drain tube
③ Front left suspension drain tube
④ Drain tube bracket
⑤ Drain tube connector
⑥ Multivalve unit
⑦ Front floor tube assembly
⑧ Front left tube protector
⑨ Rear right tube protector
⑩ Rear right actuator tube
⑪ Drain tube bracket
⑫ Rear floor tube assembly
⑬ Tube bracket
⑭ Front floor tube assembly
⑮ Front floor tube protector
⑯ Clip
⑰ Rear floor tube protector
⑱ Rear right floor drain tube
⑲ Drain tube bracket
⑳ Rear left suspension drain tube
㉑ Rear right suspension drain tube
㉒ Pressure detection tube C
㉓ Rear pressure control unit
㉔ Rear unit connecting tube
㉕ Pressure detection tube B

Repair of Component Parts (Cont'd)

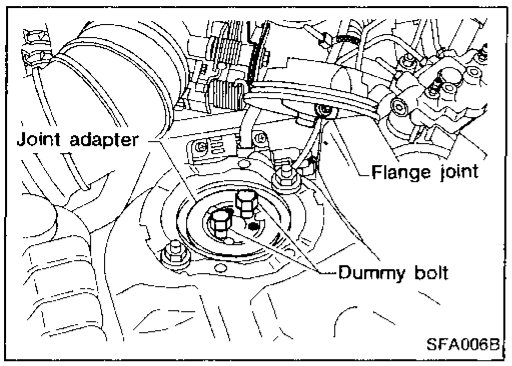
Removal and installation of front actuator

Figure shows front left actuator assembly.



① Air filter
② Insulator cap clip
③ Nut
④ Insulator cap seat
⑤ Actuator assembly
⑥ Drain hose lock spring
⑦ Drain hose gasket
⑧ Front drain hose

Repair of Component Parts (Cont'd)



— Removal and installation of actuator assembly —

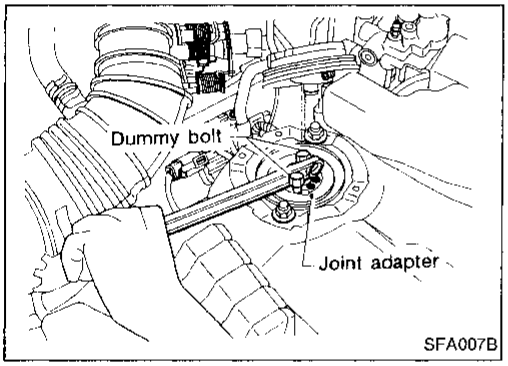
1. Removal

- Except for pipes, use same removal procedures outlined for vehicles which are not equipped with active suspensions. To facilitate disassembly of actuator assembly, loosen joint adapter first:

(1) Disconnect flange joint from upper side of actuator.

(2) Install two dummy bolts [approximately 15 mm (0.59 in) thread size] in bolt holes used to connect joint adapter flange joint.

- **Do not use flange joint bolts in place of dummy bolts.**
- **Do not allow foreign particles to enter oil hole in center of joint adapter.**



(3) Attach suitable rod (e.g., ratchet handle) to dummy bolt, and loosen joint adapter.

Loosen joint adapter just enough so that it can be easily removed after removing actuator assembly.

2. Installation

Install actuator assembly and tighten joint adapter to specified torque.

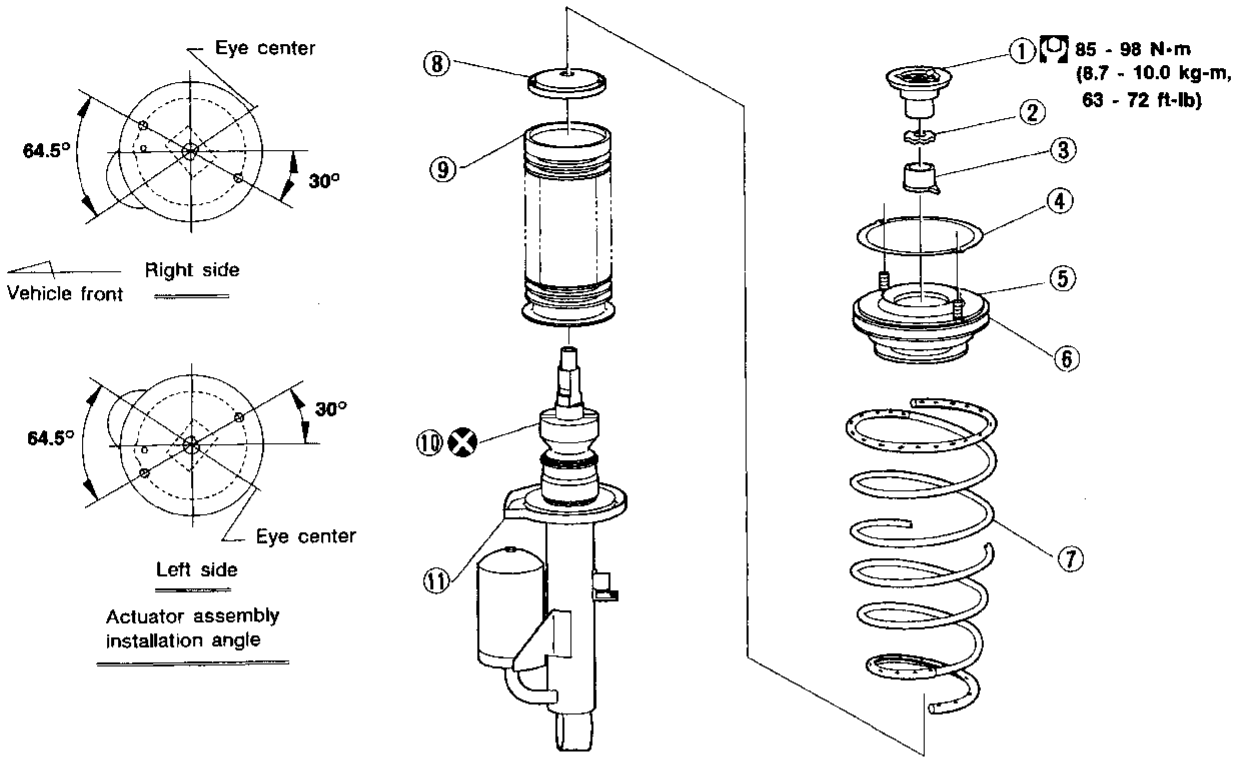
CAUTION:

Make sure dust boot is not twisted or deformed.

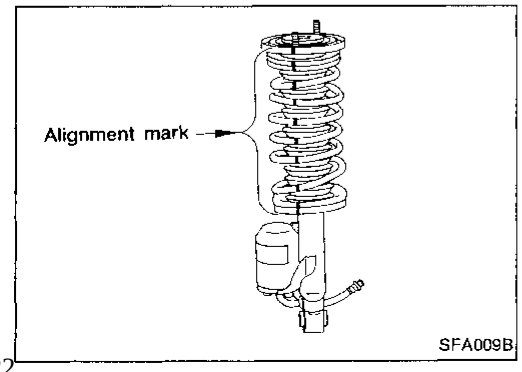
Repair of Component Parts (Cont'd)

Disassembly and reassembly of front actuator

Figure shows front left actuator.



① Joint adapter
② Wave washer
③ Spool lock washer
④ Insulator spacer
⑤ Rebound insulator stopper
⑥ Mount insulator
⑦ Coil spring
⑧ Bumper rubber seat
⑨ Front actuator dust cover
⑩ Bound bumper
⑪ Front actuator

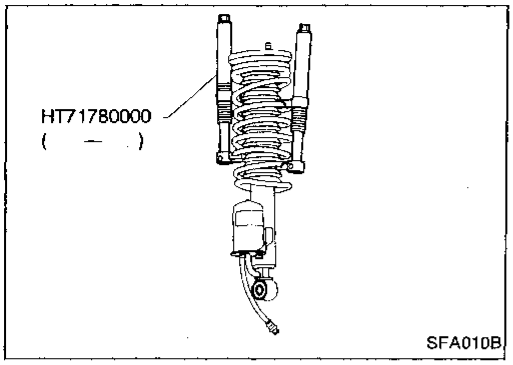


— Disassembly and reassembly of actuator assembly —

1. Disassembly

- Scribe alignment marks on actuator, coil spring and mount insulator before disassembling.

Repair of Component Parts (Cont'd)



- Compress coil spring using Tool.
- Loosen joint adapter and disassemble actuator assembly.

2. Reassembly

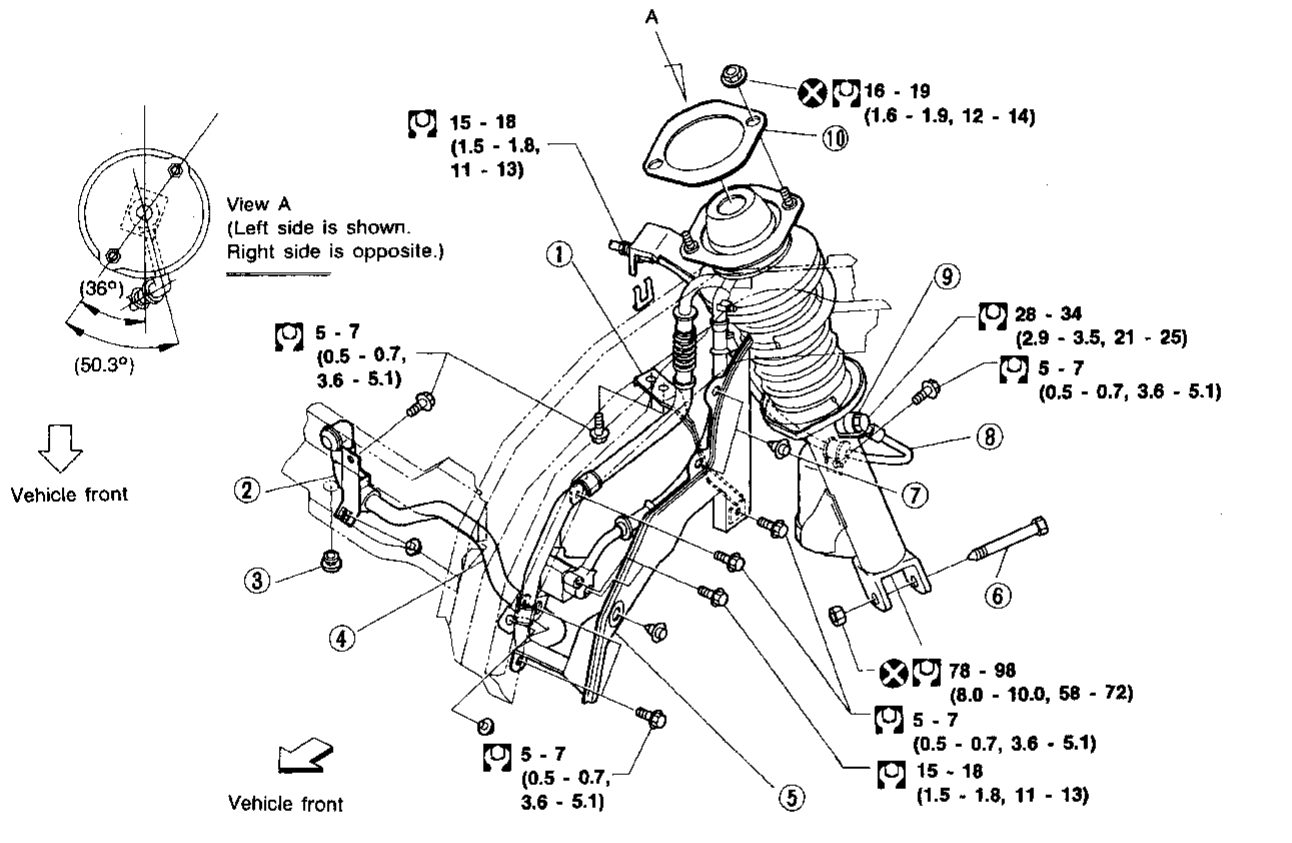
Reassemble all parts by aligning alignment marks.

— Disposal of front actuator —

Before discarding actuator, drill holes in accumulator to completely discharge nitrogen gas as instructed on caution label on sub-accumulator (a part of actuator).

Removal and installation of rear actuator

Figure shows rear left actuator assembly.

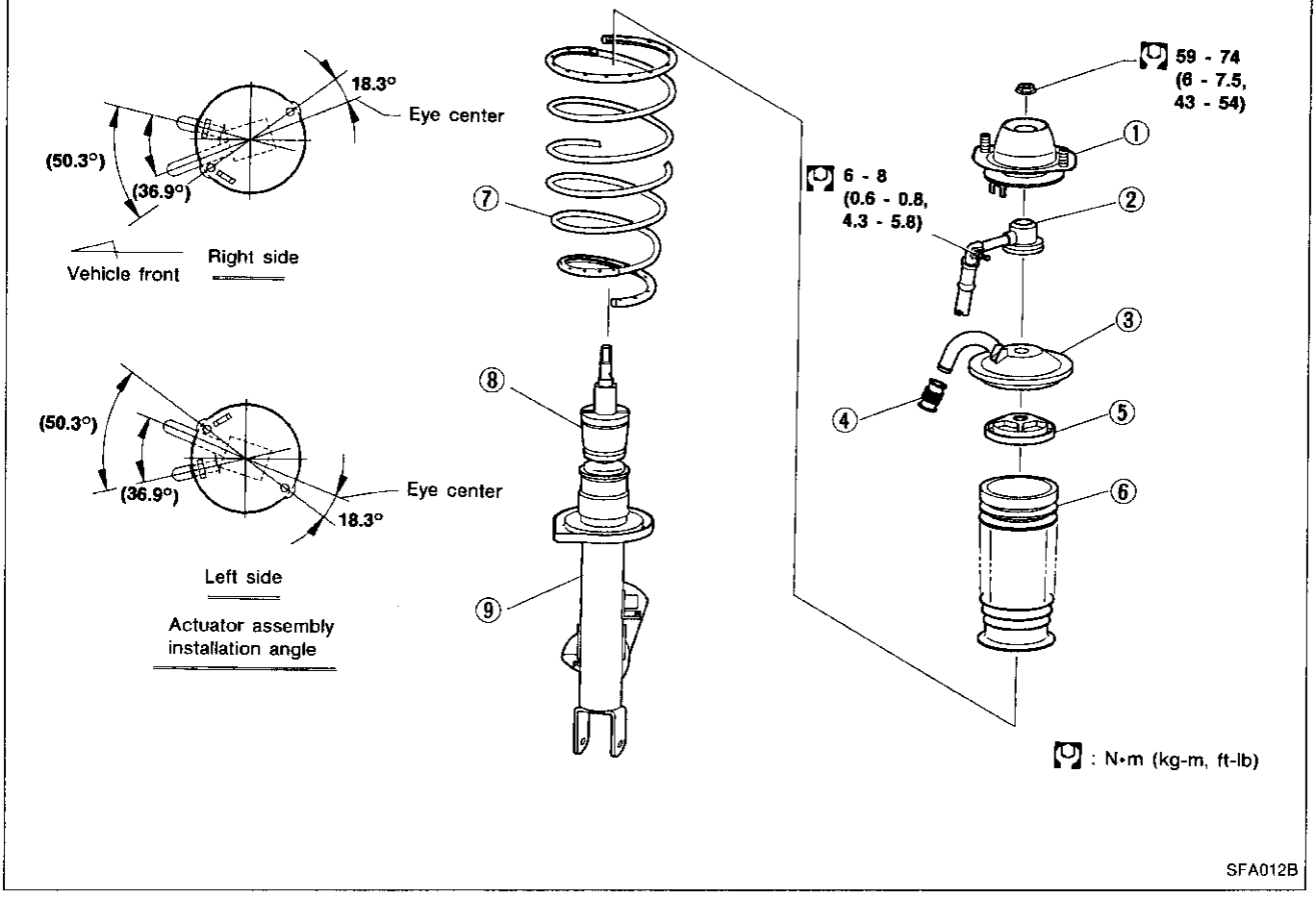


① Rear joint hose protector bracket
② Tube bracket
③ Plug
④ Air tube
⑤ Rear joint hose protector
⑥ Rear actuator lower pin
⑦ Clip
⑧ Rear drain hose
⑨ Drain hose gasket
⑩ Actuator mount seal

Repair of Component Parts (Cont'd)

Disassembly of rear actuator

Figure shows rear left actuator.



① Mount insulator
② Rear joint hose
③ Spring upper seat
④ Air tube connector
⑤ Bound bumper cover
⑥ Rear actuator dust cover
⑦ Coil spring
⑧ Bound bumper
⑨ Rear actuator

— Removal and installation of coil spring —

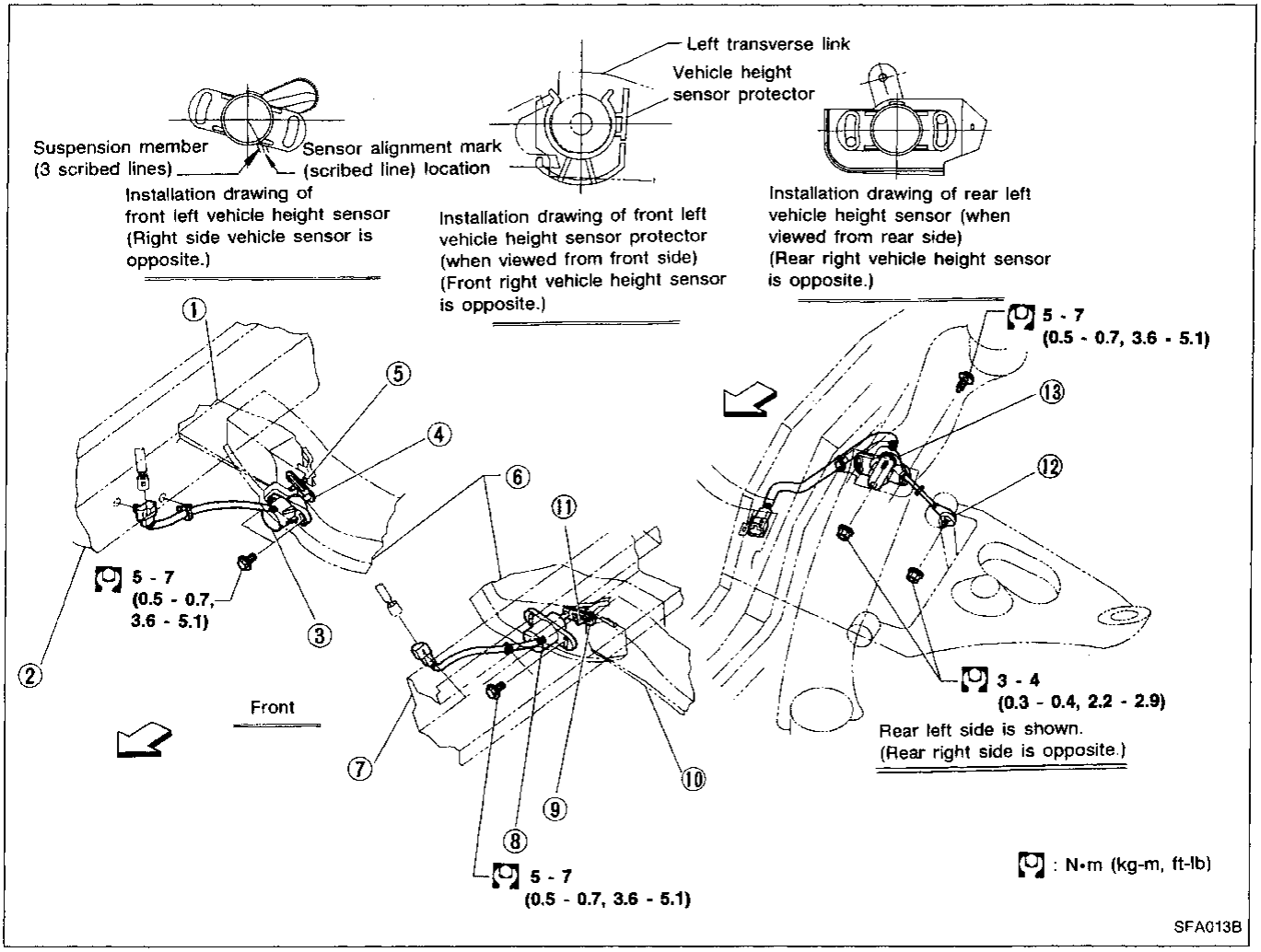
Use same procedures outlined for vehicles which are not equipped with active suspensions.

— Installation and disposal of rear actuator —

- Be careful not to twist or deform dust boot when installing actuator assembly.
- Before discarding actuator, drill holes in accumulator to completely discharge nitrogen gas as instructed on caution label on sub-accumulator (a part of actuator).

Repair of Component Parts (Cont'd)

Removal and installation of vehicle height sensor



① Right transverse link
② Right side member
③ Front right vehicle height sensor
④ Sensor arm
⑤ Clevis pin
⑥ Suspension member
⑦ Left side member
⑧ Front left vehicle height sensor
⑨ Sensor arm
⑩ Left transverse link
⑪ Clevis pin
⑫ Sensor connecting rod
⑬ Rear left vehicle height sensor

NOTE

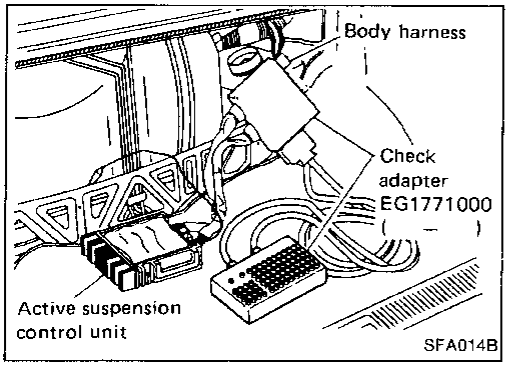
Contents

Note: Refer to foldout page for "FULL-ACTIVE SUSPENSION WIRING DIAGRAM".

How to Perform Diagnoses for Quick and Accurate Repair

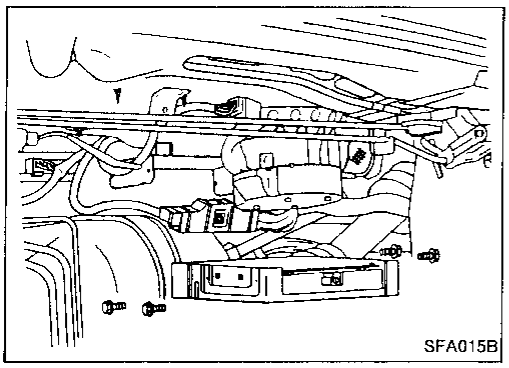
INTRODUCTION

- Before attempting to diagnose any part of the active suspension, refamiliarize yourself with instructions outlined under "Precautions" (FA-2).
- Trouble is usually caused by a faulty part in either the electrical or hydraulic system. However, it sometimes occurs due to a combination of problems in both systems. For this reason, reproduction tests are a must in determining the cause of the trouble.
- As a result of the diagnosis, if trouble is due to faulty hydraulic component parts, refer to "WORK PROCEDURES BY UNIT" in "Repair of Component Parts" (FA-26), and perform required operations (such as relieving pressure, bleeding air, etc.) associated with repair work.



- When voltage or resistance is measured at active suspension control unit connector terminals, always use a check adapter (EG17710000). If no abnormalities are found through this inspection, check with CONSULT set to FIELD TEST mode and attempt to record data concerning faults (difficult to reproduce) which occur occasionally.

For operation of CONSULT's FIELD TEST mode, refer to CONSULT OPERATION MANUAL INTRODUCTION & SUB MODE, which is issued separately.

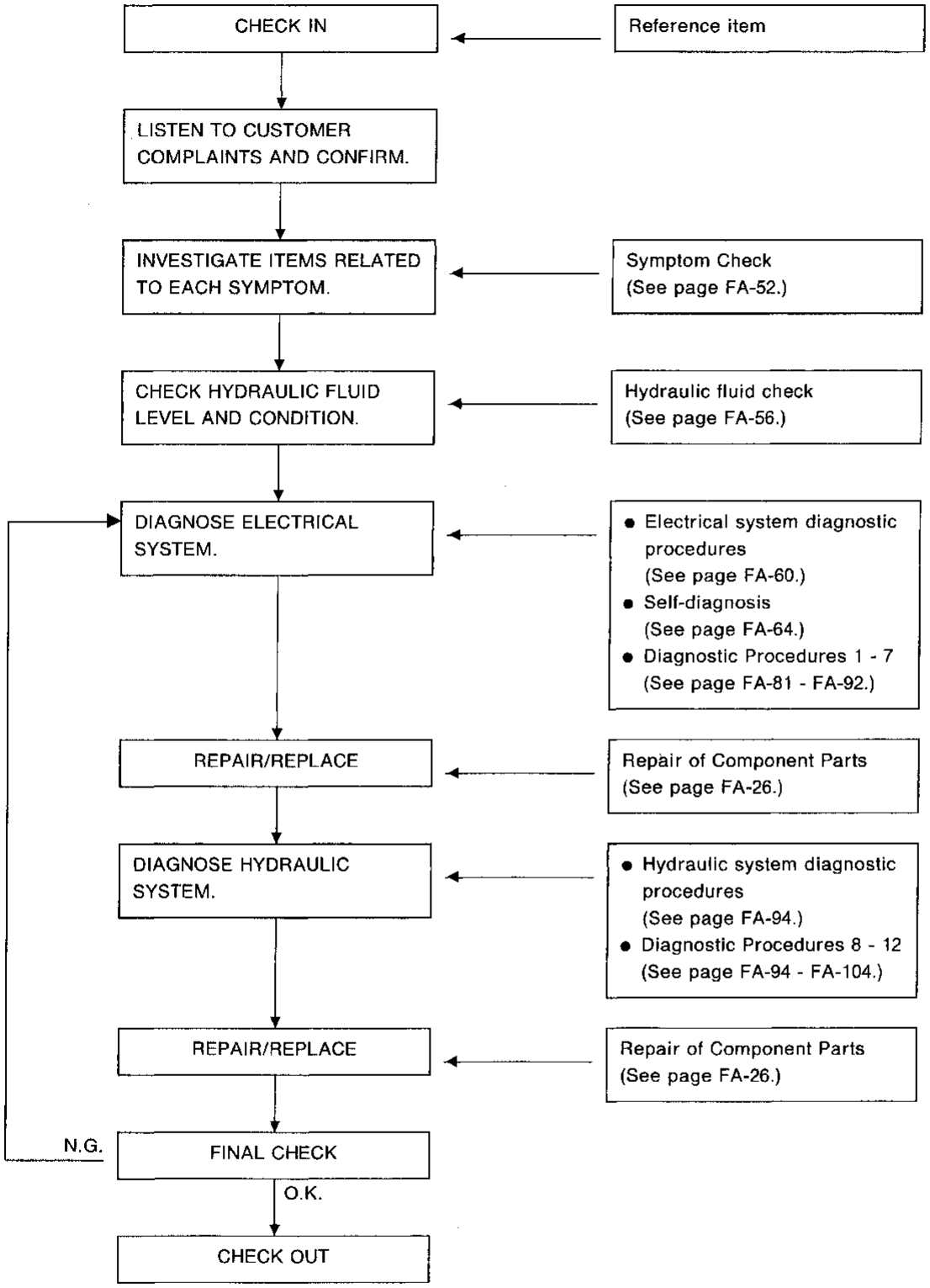


- When control unit is determined to be faulty, recheck with CONSULT set to self-diagnostic mode for confirmation. It is advisable to record numerals (C/U MALFUNCTION 1 through 5) indicated on CONSULT display on old control unit so that cause of trouble can be analyzed for future reference. Replace only control unit, not bracket.

Control unit bracket is secured to upper side of parcel shelf. Do not attempt to press control unit upper lid since this may damage PC boards.

How to Perform Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



Symptom Chart

PROCEDURE				Preliminary check		Diagnostic procedure											Main power supply and ground circuit check	
REFERENCE (FA-)				56	56	81	82	83	86	86	91	92	94	96	98	102	104	—	—
SYMPTOM				Preliminary check 1	Preliminary check 2	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8	Diagnostic Procedure 9	Diagnostic Procedure 10	Diagnostic Procedure 11	Diagnostic Procedure 12	Control unit	Fuse
No warning lamp comes on when ignition switch is turned "ON".						①												○	
System is not set in self-diagnosis mode.							①											○	○
Electrical system problems	Abnormalities when starting engine (1) Abrupt rise in vehicle height (2) Tilting of vehicle			①	②			③											
	Abnormalities when stopping engine			①	②				③										
	Abnormal vehicle height control			①	②					③									
	Abnormal roll control			①	②						③								
	Abnormal pitch control			①	②							③							
Hydraulic system problems	Abnormalities when starting engine												④*						
	Abnormalities when stopping engine													④*					
	Abnormal vehicle height control														④*				
	Steering or riding comfort irregularities															④*			
	Noise																④*		
Self-diagnostic results	Self-diagnosis code No.	Diagnosed part	CONSULT indication																
	11	Car speedometer sensor system is faulty.	CAR SPEED SEN1·MTR																
	12	A/T output shaft revolution sensor system is faulty.	CAR SPEED SEN2																
	13	Fore and aft G sensor system is faulty.	FOR&AFT G SENSOR																
	14	Lateral G sensor system (1) or (2) is faulty.	LATERAL G SEN 1·2																
	—	Lateral G sensor system 1 is faulty.	LATERAL G SENSOR 1																
	—	Lateral G sensor system 2 is faulty.	LATERAL G SENSOR 2																
	15	Vertical G sensor system (front) is faulty.	VERT1 G SENSOR F																
	16	Vertical G sensor system (rear right) is faulty.	VERT1 G SENSOR R/R																
	17	Vertical G sensor system (rear left) is faulty.	VERT1 G SENSOR R/L																

* Troubleshooting of the hydraulic system must be started after solving electrical system problems.

Symptom Chart (Cont'd)

Electrical component inspection

68	68	69	70	71	72	73	75	76	76	77	77	78	78	79	79	80	80	88	89	90	91
Car speed sensor 1 (meter)	Car speed sensor 2 (A/T)	Fore and aft G sensor	Lateral G sensor 1·2	Lateral G sensor 1 (or 2)	Vertical G sensor	Height sensor	Height control switch	Height sensor power supply	Pressure control valve	Flow control valve	Fail-safe valve	Pump solenoid	Oil temperature sensor	Oil warning	Ignition signal	Engine revolution signal	G sensor power supply	Stop lamp switch	Parking brake switch	Door switch	Neutral position switch
																		○	○	○	○
①																					
	①																				
		①																			
			①	②																	
				①																	
				①																	
					①																
					①																
					①																

Symptom Chart (Cont'd)

PROCEDURE				Preliminary check		Diagnostic procedure											Main power supply and ground circuit check	
REFERENCE (FA-)				56	56	81	82	83	86	86	91	92	94	96	98	102	104	—	—
SYMPTOM				Preliminary check 1	Preliminary check 2	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8	Diagnostic Procedure 9	Diagnostic Procedure 10	Diagnostic Procedure 11	Diagnostic Procedure 12	Control unit	Fuse
Self-diagnostic results	21	Vehicle height sensor system (front right) is faulty.	HEIGHT SENSOR F/R																
	22	Vehicle height sensor system (front left) is faulty.	HEIGHT SENSOR F/L																
	23	Vehicle height sensor system (rear right) is faulty.	HEIGHT SENSOR R/R																
	24	Vehicle height sensor system (rear left) is faulty.	HEIGHT SENSOR R/L																
	25	Height control switch system is faulty.	HEIGHT SWITCH																
	26	Height sensor power supply system is faulty	H SEN POWER SUPPLY																
	31	Pressure control valve (front right) is faulty.	PRES CONT VALV																
	32	Pressure control valve (front left) is faulty.	PRES CONT VALV																
	33	Pressure control valve system (rear right) is faulty.	PRES CONT VALV																
	34	Pressure control valve system (rear left) is faulty.	PRES CONT VALV																
	35	Flow control valve system is faulty.	FLOW CONTROL VALVE																
	36	Fail-safe valve system is faulty.	FAIL-SAFE VALVE																
	41	Pump or pressure switch system is faulty.	PUMP																
	42	Oil temperature sensor system is faulty.	OIL TEMP SENSOR																
	43	Oil temperature is too high.	WARN OIL TEMP																
	44	Pump solenoid-1 system is faulty.	PUMP SOLENOID 1																
	45	Oil level is too low.	WARN OIL SHORTAGE																
	46	Ignition power supply system is faulty.	IGN-ON PWR SUPPLY																
	51	Engine stops during driving	WARN ENGINE STALL																
	52	G sensor power supply system is faulty.	G-SEN POWER SUPPLY																
	53	Control unit is malfunctioning internally.	C/U MALFUNCTION 1-5															①	
	54	Pump solenoid-2 system is faulty.	PUMP SOLENOID 2																

Symptom Chart (Cont'd)

Electrical component inspection

68	68	69	70	71	72	73	75	76	76	77	77	78	78	79	79	80	80	88	89	90	91
Car speed sensor 1 (meter)	Car speed sensor 2 (A/T)	Fore and aft G sensor	Lateral G sensor 1-2	Lateral G sensor 1 (or 2)	Vertical G sensor	Height sensor	Height control switch	Height sensor power supply	Pressure control valve	Flow control valve	Fail-safe valve	Pump solenoid	Oil temperature sensor	Oil warning	Ignition signal	Engine revolution signal	G sensor power supply	Stop lamp switch	Parking brake switch	Door switch	Neutral position switch
						①															
						①															
						①															
						①															
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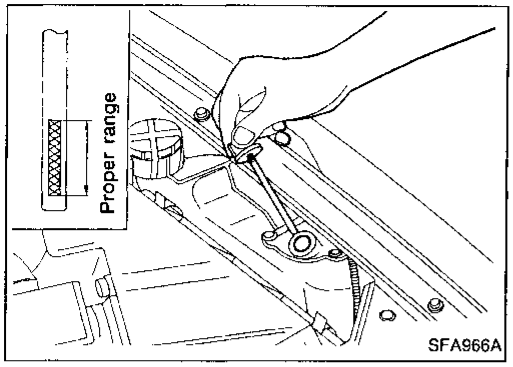
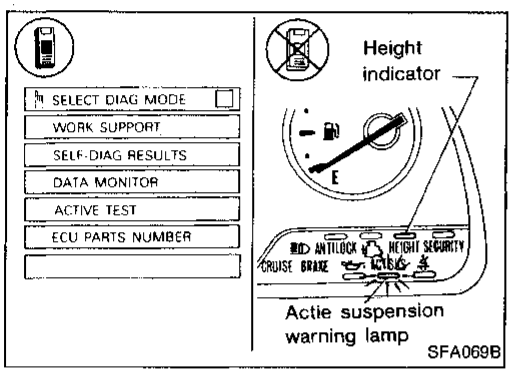


Preliminary Check

CHECK 1

Check hydraulic fluid level and condition. Refer to "FULL-ACTIVE SUSPENSION — On-vehicle Service". FA-23



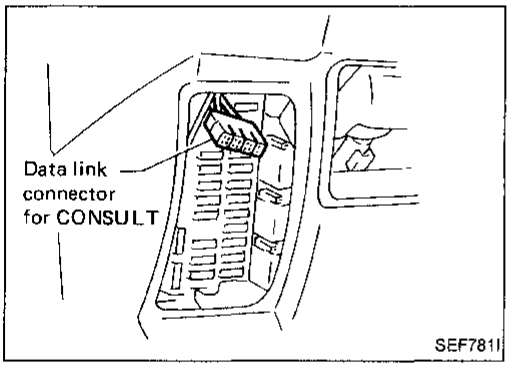
CHECK 2

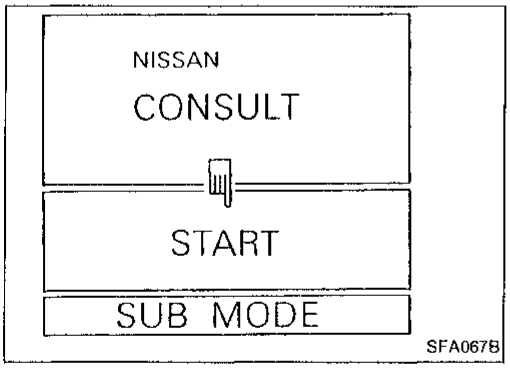
Perform self-diagnosis.
Refer to "Self-diagnosis". FA-64

Diagnosis by CONSULT

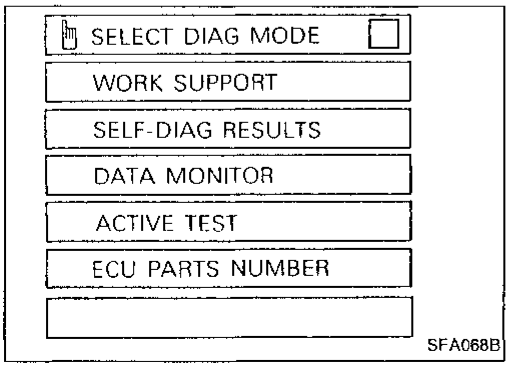
CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector.
   (Data link connector is located in left dash side panel.)
3. Turn on ignition switch.





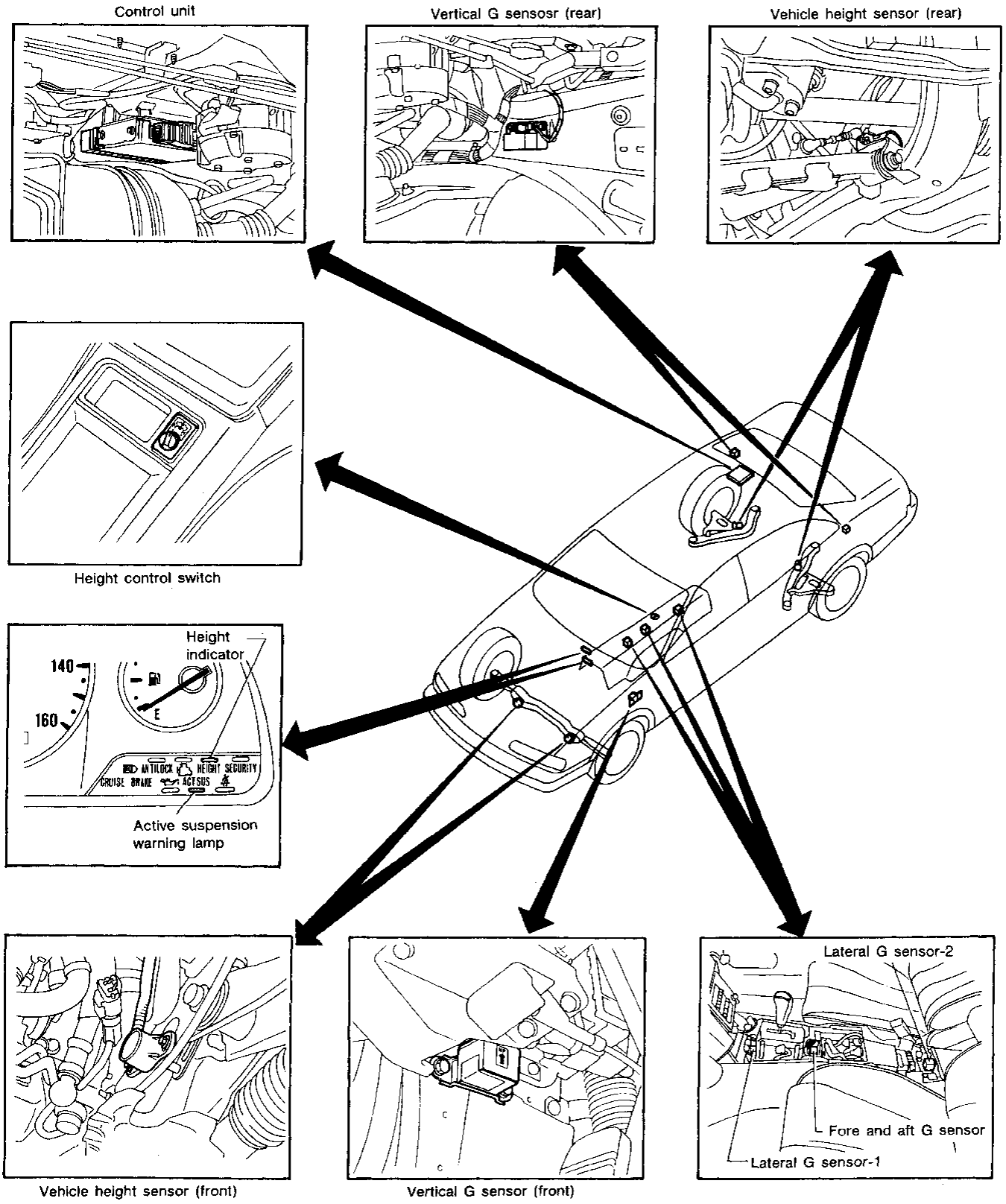
4. Touch "START".
5. Touch "ACTIV SUS".



6. Perform each diagnostic mode.

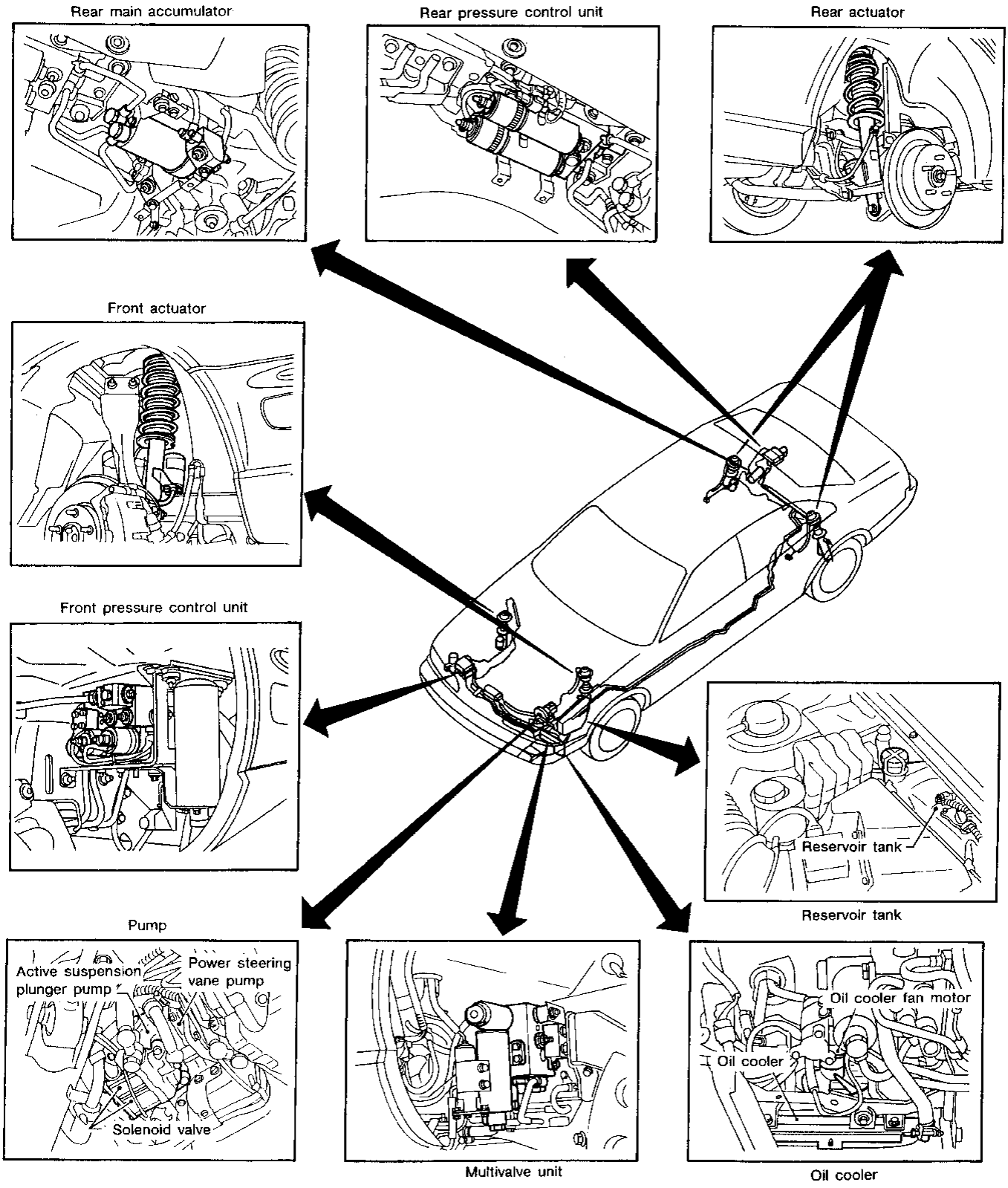
Refer to CONSULT Operation Manual "FULL-ACTIVE SUSPENSION" for details.

Component Parts and Harness Connector Locations



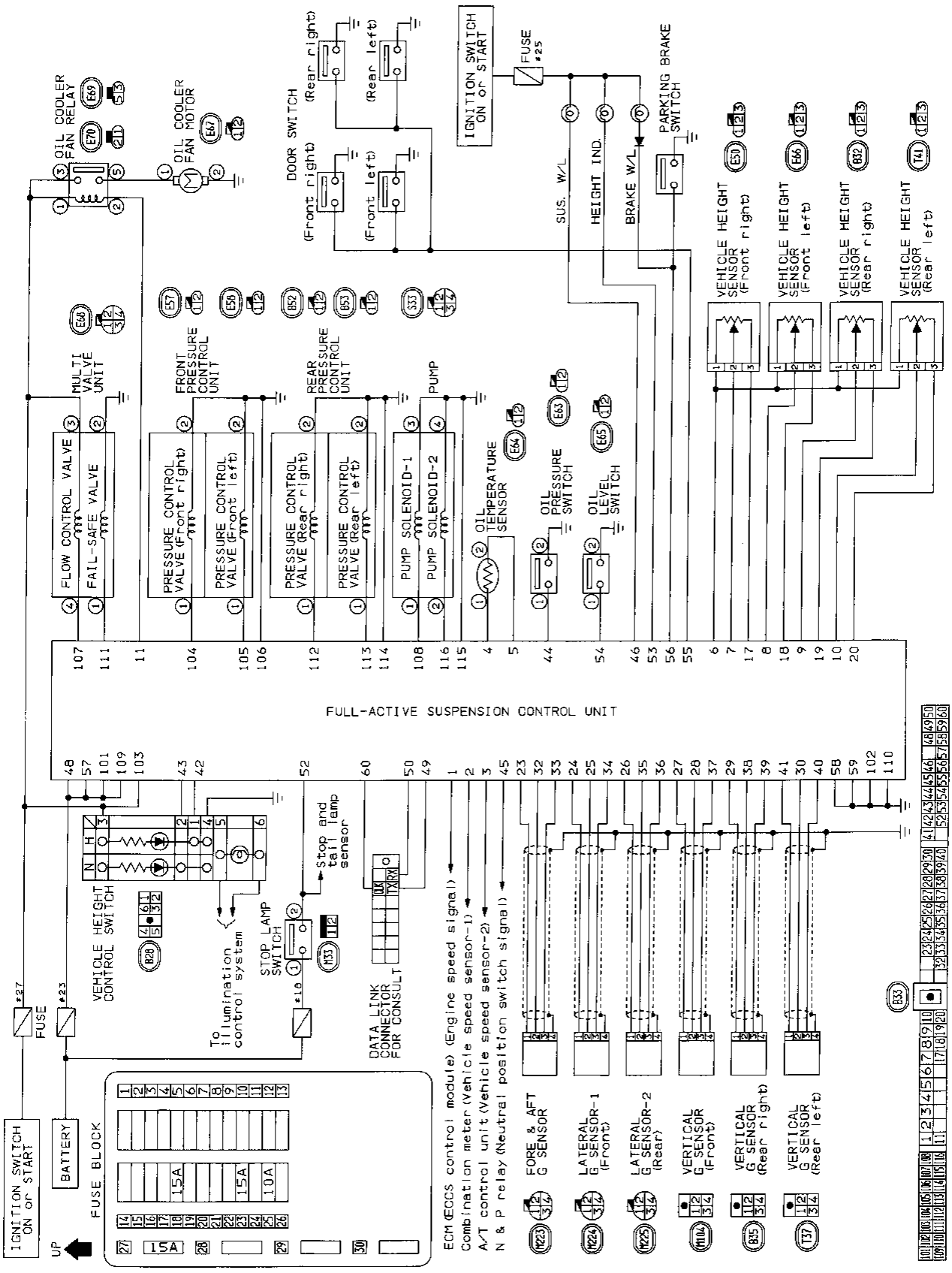
SFA017B

Component Parts and Harness Connector Locations (Cont'd)



SFA018B

Circuit Diagram for Quick Pinpoint Check

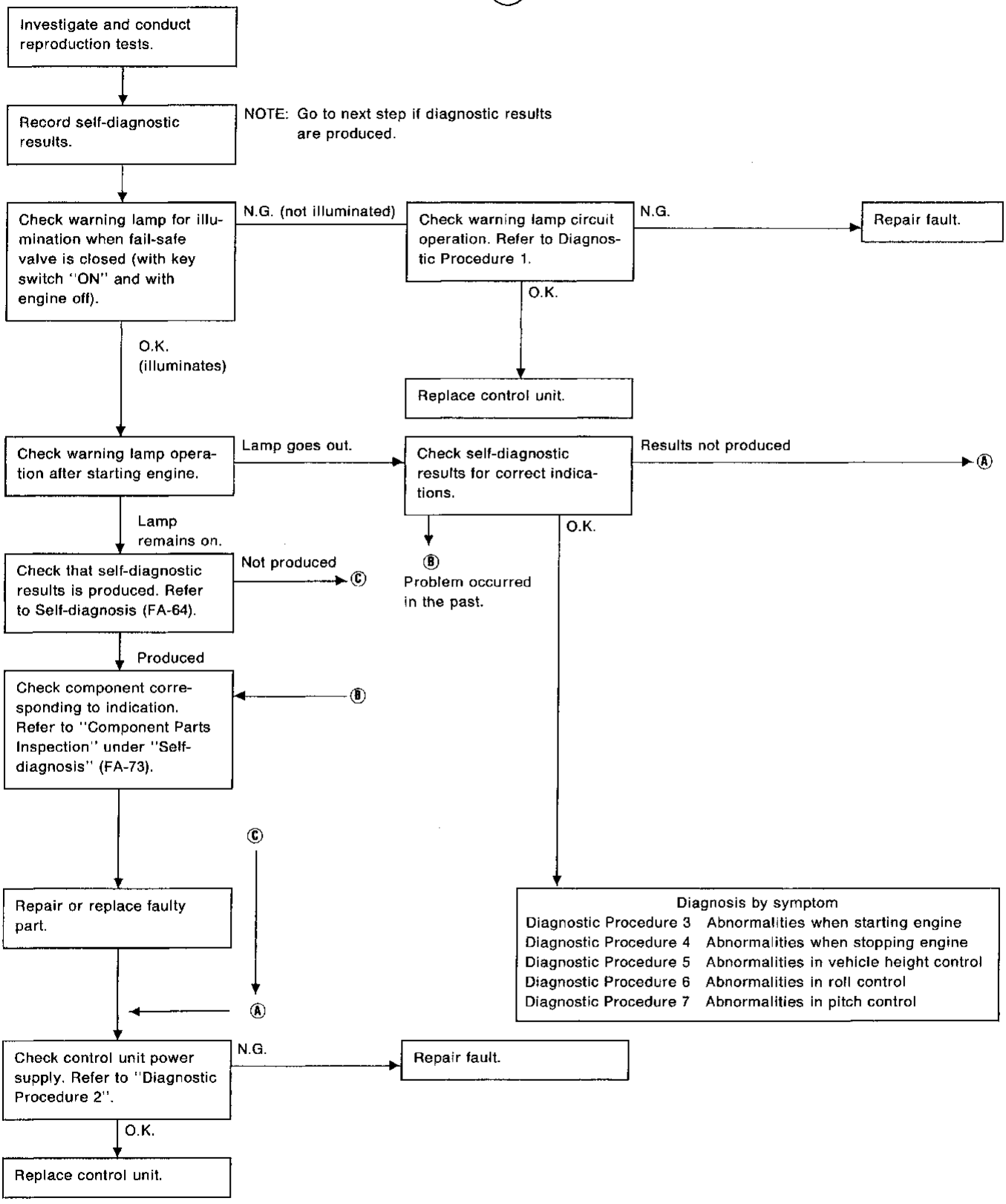


Note: Refer to foldout page for "FULL-ACTIVE SUSPENSION WIRING DIAGRAM."

MFA012A

Electrical System Diagnostic Procedures

Diagnose affected parts using flowcharts below:



NOTE

Items to Be Controlled in Relation to Abnormalities

Abnormalities	Items or parts to be controlled								
	Vehicle behavior during engine starts	Vehicle behavior when engine is off	Vehicle height control (Height maintained constantly)	Roll control (Vehicle posture control during turns)	Pitch control (Vehicle posture control during starts/ stoppage)	Bounce control (Damping of vertical vibration)	Variable pump control	Fan motor	Height indicator
Ignition signal	○								
Engine revolution signal	○	○	○ During engine operation	○ During engine operation	○ During engine operation	○ During engine operation	○	○	
Car speed sensor-1 (meter)			○	○		○	○		
Car speed sensor-2 (A/T)			○	○		○	○		
Fore-and-aft G sensor			○		○				
Lateral G sensor-1 (front)			○	○		○	○		
Lateral G sensor-2 (rear)			○	○		○	○		
Vertical G sensor (front)						○			
Vertical G sensor (rear right)						○			
Vertical G sensor (rear left)						○			
Vehicle height sensor (front right)			○				○		
Vehicle height sensor (front left)			○				○		
Vehicle height sensor (rear right)			○				○		
Vehicle height sensor (rear left)			○				○		
Stop lamp switch			○						
Parking switch			○						
Door switch			○						
Neutral range switch					○				
Height control switch			○						○
Oil temperature sensor							○	○	
Oil level switch									
Pressure switch									
Pressure control valve	○		○	○	○	○			
Flow control valve									

NOTE: All standard values (or indications) except those for vehicle height sensors, pressure control valves and flow control valve are shown on CONSULT display.

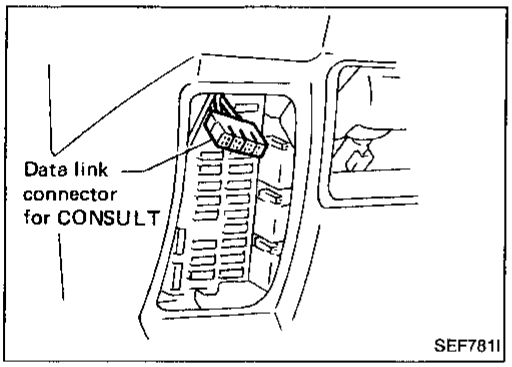
Items to Be Controlled in Relation to Abnormalities (Cont'd)

When to monitor			Parts operated upon detection of problem		Data monitor (monitor available or possible)	Standard values (or indication shown on display) under normal conditions
Key switch "OFF" with engine at rest	Key switch "ON" with engine at rest	During engine operation	Warning light "ON"	Fail-safe valve closed		
○		○	○			
		○	○		○	"RUN" (above 400 rpm); "STOP" (below 400 rpm)
		○	○		○	Same as speedometer reading
		○	○		○	Same as above
		○	○		○	±0.15G (with vehicle on a flat surface)
		○	○	○	○	Same as above
		○	○	○	○	Same as above
		○	○		○	Same as above
		○	○		○	Same as above
		○	○		○	Same as above
		○	○		○	385 ± 10 mm (15.16 ± 0.39 in) (wheel center-to-wheel arch distance with vehicle set at "N" (normal) height)
		○	○		○	Same as above
		○	○		○	361 ± 10 mm (14.21 ± 0.39 in) (wheel center-to-wheel arch distance with vehicle set at "N" (normal) height)
		○	○		○	Same as above
					○	"ON" (foot brake depressed); "OFF" (foot brake released)
					○	"ON" (parking brake applied); "OFF" (parking brake released)
					○	"OPEN" (any one of four doors opened); "SHUT" (all doors closed)
					○	"ON" is indicated when gear position N or P. "OFF" is indicated when gear position not N or P.
	○	○	○		○	"NORM" (vehicle set at normal position); "HI" (vehicle set at high position)
○	○	○	○		○	Oil temperature shown in one of the following indications: LOW, 50°C (122°F), 52°C (126°F) - [at increments of 2°C (3.6°F)] - 68°C (154°F), 70°C (158°F), 75°C (167°F), 90°C (194°F), 110°C (230°F) and HIGH.
	○	○	○		○	"OK" (correct oil level); "LOW" (replenishment required)
		○	○		○	"HI" [above 2,452 kPa (25 kg/cm^2, 356 psi) oil pressure]; "LOW" [below 2,452 kPa (25 kg/cm^2, 356 psi)]
○	○	○	○	○	○	4 - 7Ω (resistance)
		○	○	○	○	9 - 16Ω (resistance)

Self-diagnosis

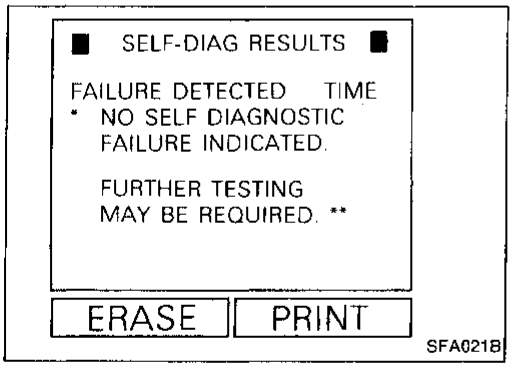
SELF-DIAGNOSTIC PROCEDURES

Two self-diagnostic methods can be used to check the condition of the various active suspension units or components. In one method, letters are shown on the display, with CONSULT set in the self-diagnostic mode designed, to accurately locate a problem. In the other method, the active suspension warning lamp flashes a trouble code when the height control switch (on floor console) is operated.
Except for some lateral G sensors, all other system lines can be basically checked using either of the two self-diagnostic methods. In addition, CONSULT can show on its display a numeral which indicates the number of times the ignition switch was turned "ON" after a problem occurred in the past. When using the active suspension warning lamp method, note that only one problem can be indicated even if two or more problems occurred. When performing diagnosis, use of the "self-diagnosis result" mode of CONSULT is therefore recommended.



When CONSULT is used:

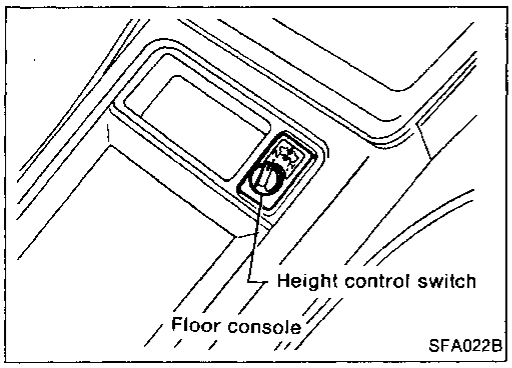
- Turn ignition switch "OFF".
- Connect CONSULT connector to data link connector located on fuse box, at lower left side of instrument panel.
- Start engine.
- Touch "START", "ACTIV SUS" and "SELF-DIAG RESULTS" on CONSULT display in that order.

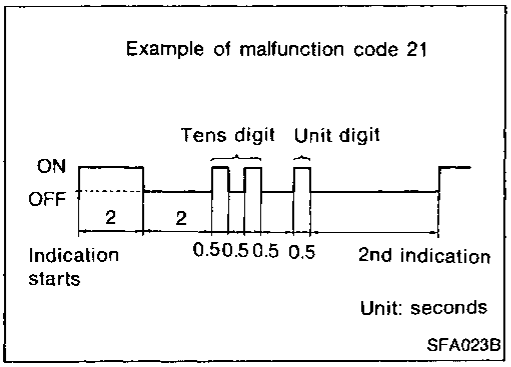


- A self-diagnostic result is shown on display.
  Refer to CONSULT operation manual "FULL-ACTIVE SUSPENSION" for details.

After a faulty system line has been repaired, be sure to clear self-diagnostic result memory.

Self-diagnosis (Cont'd)





When CONSULT is not used:

(1) Procedures

- Turn ignition switch "ON". (Do not start engine.)
- Set height control switch (on floor console) from "N" (normal) to "H" (high). Repeat above operation at least ten times within ten seconds after turning ignition switch "ON", and return height control switch to "N".
- After all self-diagnostic requirements are met, the active suspension warning lamp flashes and self-diagnosis starts.

If more than two system lines are faulty, only one of the faulty system lines is indicated in order of priority. The warning lamp may remain on depending upon types of abnormalities (such as those in control unit, etc.). In this case, conduct self-diagnosis using CONSULT.

(2) How to read self-diagnostic indications

- Read both ten's and unit digits from number of flashes on active suspension warning lamp. (Refer to figure at left.)
- Determine location of fault in accordance with Malfunction Code table below.

All fault detection requirements are the same as those outlined under "When CONSULT is used:".

Self-diagnosis (Cont'd)

(3) Malfunction code table

Malfunction code No.	Description
11	Car speedometer sensor system is faulty.
12	A/T output shaft revolution sensor system is faulty.
13	Fore and aft G sensor system is faulty.
14	Lateral G sensor system (1) or (2) is faulty.
15	Vertical G sensor system (front) is faulty.
16	Vertical G sensor system (rear right) is faulty.
17	Vertical G sensor system (rear left) is faulty.
21	Vehicle height sensor system (front right) is faulty.
22	Vehicle height sensor system (front left) is faulty.
23	Vehicle height sensor system (rear right) is faulty.
24	Vehicle height sensor system (rear left) is faulty.
25	Height control switch system is faulty.
26	Height sensor power supply system is faulty.
31	Pressure control valve (front right) is faulty.
32	Pressure control valve (front left) is faulty.
33	Pressure control valve system (rear right) is faulty.
34	Pressure control valve system (rear left) is faulty.
35	Flow control valve system is faulty.
36	Fail-safe valve system is faulty.
41	Pump or pressure switch system is faulty.
42	Oil temperature sensor system is faulty.
43	Oil temperature is too high.
44	Pump solenoid-1 system is faulty.
45	Oil level is too low.
46	Ignition power supply system is faulty.
51	Engine stops during driving.
52	G sensor power supply system is faulty.
53	Control unit is internally malfunctioning.
54	Pump solenoid-2 system is faulty.
55	NORMAL

(4) Clearing self-diagnostic mode

Self-diagnostic modes can be cleared using one of the following methods:

a. Set height control switch from "N" (normal) to "H" (high) while a self-diagnosis is being conducted.
b. Wait approximately five minutes after setting in the self-diagnosis mode.
c. Turn ignition switch "OFF".

(5) Clearing self-diagnostic results

A faulty system indication is not cleared even after the faulty system has been repaired. To clear the indication, use one of the following methods:

- Set the self-diagnostic mode. Refer to "(1) Procedures" above.
- Repeatedly depress and release (ON-OFF operation) foot brake at least five times within ten seconds.
- Self-diagnostic results will then be cleared.

In cases where more than two system lines are faulty, repaired system indications will be cleared. However, any other faulty system will be indicated when self-diagnosis is performed again.

Self-diagnosis (Cont'd)

FAIL-SAFE FUNCTION

When a malfunction occurs in the following parts, the fail-safe system activates to illuminate the active suspension warning lamp, cut off the current to the fail-safe valve and/or regulate the pressure control valve operation. This gradually changes the oil pressure (applied to the actuators for the four wheels) to a uniform pressure so that the vehicle can continue to be driven.

NOTES:

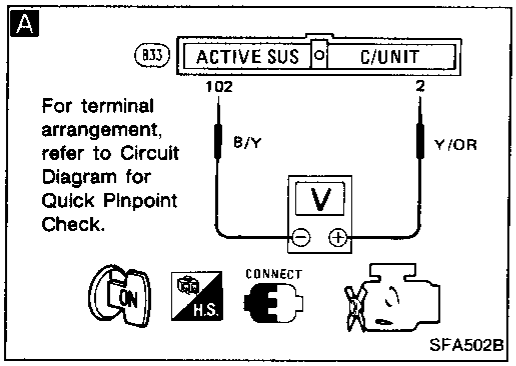
- A sound is produced when the fail-safe valve operates. This is not an indication of a problem since the fail-safe valve serves to close normal oil passages and, at the same time, link the supply pressure line [9,807 kPa (100 kg/cm^2, 1,422 psi)] with the return pressure line [0 kPa (0 kg/cm^2, 0 psi)].
- When the pressure control valve function stops, the control current flowing to the solenoid is cut off (0 amperes), so vehicle height might change briefly.

Major malfunctioning parts and fail-safe operations

Malfunctioning parts	Fail-safe operation		
	Active suspension warning lamp (ON)	Fail-safe valve closed (No current flow)	Other control functions
Internal parts of control unit	○	○	Control stopped
Engine stalls while driving	○	○	—
Car speed sensor	○	—	Control is accomplished by signal sent from any sensor which detects higher car speeds than the other sensors.
Fore and aft G sensor	○	—	—
Lateral G sensor	○	○	Control stopped
Vertical G sensor	○	—	Vertical G sensor control is stopped.
Pressure control valve	○	○	Control stopped
Flow control valve	○	○	Control stopped
Fail-safe valve	○	○	Control stopped
Insufficient oil level	○	—	Normal control
Height control switch	○	—	Vehicle is set to normal height.
Power supply to G sensors	○	○	Control stopped
Power supply to height sensors	○	○	Control stopped
Height sensor	○	—	Height control stopped
Pump	○	—	Normal control
Oil temperature sensor	○	—	Normal control

Self-diagnosis (Cont'd)

CAR SPEED SENSOR 1 (METER) CIRCUIT CHECK



Check speedometer indication.
- N.G. → Check speedometer itself.
- O.K. ↓

Jack up rear wheels.

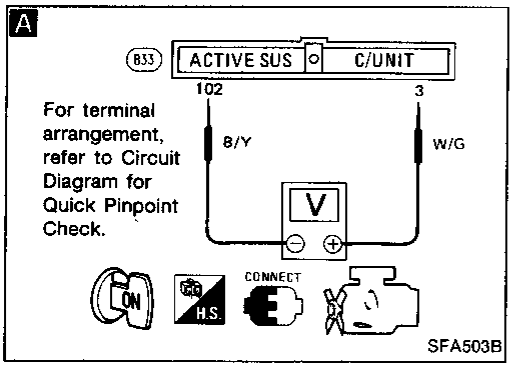
A

CHECK INPUT SIGNAL.
Measure voltage across control unit terminals ② and (102) while slowly rotating rear wheels with ignition switch "ON". Do not start engine.
Voltage must change between 0 and 5V.

- N.G. (Does not change from 5V) → Open harness circuit or faulty speedometer.
- N.G. (Does not change from 0V) → Shorted harness circuit or faulty control unit.
- O.K. ↓

Replace control unit.

CAR SPEED SENSOR 2 (A/T) CIRCUIT CHECK



Check A/T control unit operation.
- N.G. → Check A/T control unit. Refer to "A/T TROUBLE DIAGNOSES".
- O.K. ↓

Jack up rear wheels.

A

CHECK INPUT SIGNAL.
Measure voltage across control unit terminals ③ and (102) while slowly rotating rear wheels with ignition switch "ON". Do not start engine.
Voltage must change between 0 and 5V.

- N.G. (Does not change from 5V) → Open harness circuit.
- N.G. (Does not change from 0V) → Shorted harness circuit or faulty control unit.
- O.K. ↓

Replace control unit.

Self-diagnosis (Cont'd)

FORE AND AFT G SENSOR CIRCUIT CHECK

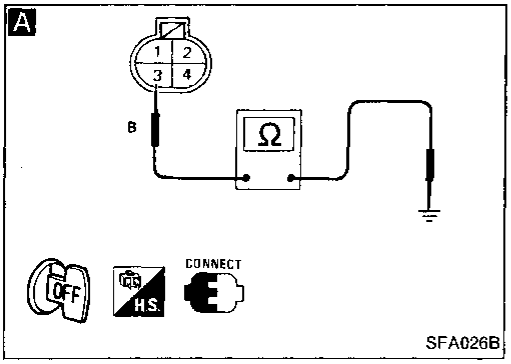
A

☆ MONITOR	★ FAILURE
SPEED SE1•MTR	0km/h
SPEED SE2	0km/h
LATER G SE1	RO.01G
LATER G SE2	LO.01G
FOR&AFT G SEN	–0.01G
VERTI G SE F	U0.03G
VERTI G SE RR	0.00G
VERTI G SE RL	D0.01G
HEIGHT SEN FR	–2mm

RECORD

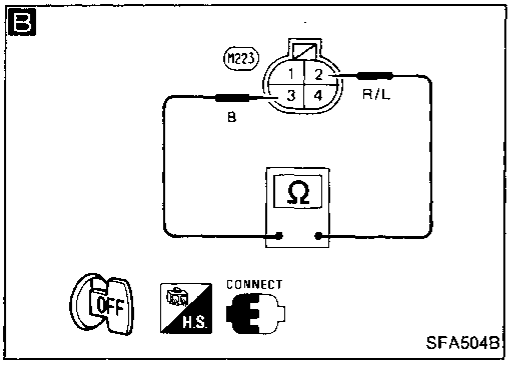
SFA063B

A



SFA026B

B



SFA504B

- Start engine and wait for at least 2 seconds.
- Move vehicle to a flat surface and stop engine.
- Connect CONSULT and turn ignition switch "ON". Do not start engine.

A Check fore and aft G sensor's output with CONSULT set in data monitor mode.

Greater than 1.0G → B CHECK GROUND CIRCUIT. Check continuity between G sensor connector terminal ③ and GND (body metal) with ignition switch "OFF". **Continuity should exist.**

- O.K. → Replace fore and aft G sensor.
- N.G. → Open harness circuit. Check and repair harness between control unit and fore and aft G sensor.

Less than 1.0G

Check fore and aft G sensor output with CONSULT set in data monitor mode.

Less than –1.0G → C CHECK CONTINUITY. Turn ignition switch "OFF" and check continuity between fore and aft G sensor connector terminals ② and ③. **Continuity should exist.**

- N.G. → Open harness circuit or fore and aft G sensor.
- O.K. → Shorted harness circuit. Check and repair harness between control unit and fore and aft G sensor.

Less than –1.0G

Check fore and aft G sensor output with CONSULT set in data monitor mode.

Outside ±0.15G → Faulty fore and aft G sensor. Replace.

Within ±0.15G → O.K. (See NOTE below.)

NOTE: Also check with CONSULT set in field test mode as needed.

Self-diagnosis (Cont'd)

LATERAL G SENSOR 1·2 CIRCUIT CHECK

When "LATERAL G SEN 1·2" appears on the display with CONSULT set in the self-diagnostic mode, it indicates that both lateral G sensor 1 and 2 deviate from the specified output characteristics. Output characteristic deviations are measured both staticially and dynamically. Static characteristics occur while the vehicle is at a standstill and dynamic characteristics occur while the vehicle is operating. It is therefore necessary to investigate the cause, when the active suspension warning lamp is illuminated, by determining how the vehicle was being driven when the lamp activated. Reproduction tests should also be conducted to double-check the results.

With CONSULT set in the self-diagnostic mode, a numeral which indicates when a problem occurred appears on the display. It refers to the number of times the ignition switch was turned ON and OFF after a problem occurred and is helpful in pinpointing the time when it occurred.

A

☆ MONITOR	★ FAILURE
SPEED SE1•MTR	0km/h
SPEED SE2	0km/h
LATER G SE1	RO.01G
LATER G SE2	LO.01G
FOR&AFT G SEN	–0.01G
VERTI G SE F	U0.03G
VERTI G SE RR	0.00G
VERTI G SE RL	D0.01G
HEIGHT SEN FR	–2mm

RECORD

SFA063B

B

	SPEED SEN2	LATER G SEN 1	LATER G SEN 2
13:57	(km/h)	(G)	(G)
01"33	0	R0.00	0.00
00"89	0	R0.00	0.00
00"44	0	L0.01	L0.01
00"00	0	R0.00	0.00
**** VERTI G SE F ****			
00"46	0	L0.01	L0.01
**** VERTI G SE F ****			

PRINT | GRAPH

SFA029B

Check lateral G sensors 1 and 2 for loose bolts or interference with adjacent parts.

N.G. → Check and repair.

O.K.

A

- Connect CONSULT and start engine.
- Check lateral G sensors 1 and 2 using data monitor. (Set CONSULT in auto record mode.)

Check indication difference between two sensors.

N.G. (Difference greater than 0.6G) → Replace both sensors.

O.K. (Difference less than 0.6G)

Conduct reproduction tests.

B

Check if G sensor(s) are judged to be "faulty" during reproduction tests. (Check difference in indications between two sensors.)

N.G. (Difference greater than 0.6G) → Replace both sensors.

O.K. (Judgment is O.K.)

O.K. (See NOTE below).

NOTE: Also check with CONSULT set in field test mode as needed.

Self-diagnosis (Cont'd)

LATERAL G SENSOR 1 (OR 2) CIRCUIT CHECK

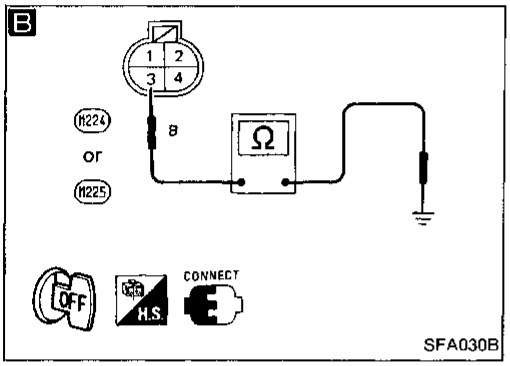
A

☆ MONITOR	★ FAILURE
SPEED SE1•MTR	0km/h
SPEED SE2	0km/h
LATER G SE1	RO.01G
LATER G SE2	LO.01G
FOR&AFT G SEN	–0.01G
VERTI G SE F	U0.03G
VERTI G SE RR	0.00G
VERTI G SE RL	D0.01G
HEIGHT SEN FR	–2mm

RECORD

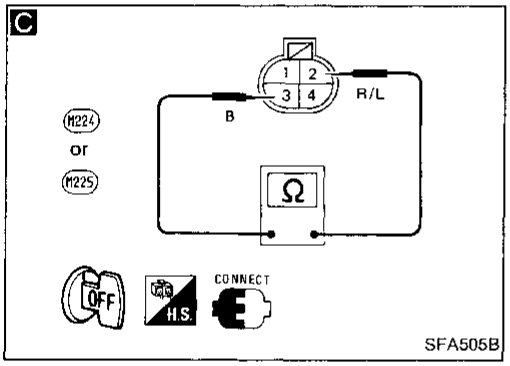
SFA063B

B



SFA030B

C



SFA505B

- Place vehicle on a flat surface and stop engine.
- Connect CONSULT and turn ignition switch "ON". (Do not start engine.)

↓

A Check output of lateral G sensor 1 or 2 using CONSULT data monitor.

→ Greater than 1.5G → B CHECK GROUND CIRCUIT. Turn ignition switch "OFF". Check continuity between lateral sensor 1 (or 2) connector ③ and GND (body metal). **Continuity should exist.**

- O.K. → Replace lateral sensor 1 (or 2). See Note 1 below.
- N.G. → Open harness circuit. Check and repair harness between control unit and lateral G sensor.

↓ Less than 1.5G

Check output of lateral G sensor 1 (or 2) using CONSULT data monitor.

→ Less than –1.5G → C CHECK CONTINUITY. Turn ignition switch "OFF". Check resistance between lateral G sensor 1 (or 2) connector terminals ② and ③. **Continuity should exist.**

- N.G. → Open harness circuit or faulty lateral G sensor 1 (or 2). Replace. See NOTE 1 below.
- O.K. → Shorted harness circuit Check and repair harness between control unit and lateral G sensor.

↓ Greater than –1.5G

Check output of lateral G sensor 1 (or 2) using CONSULT data monitor.

→ Outside ±0.15G → Replace lateral G sensor 1 (or 2). See NOTE 1 below.

↓ Within ±0.15G

O.K. See NOTE 2.

NOTES:

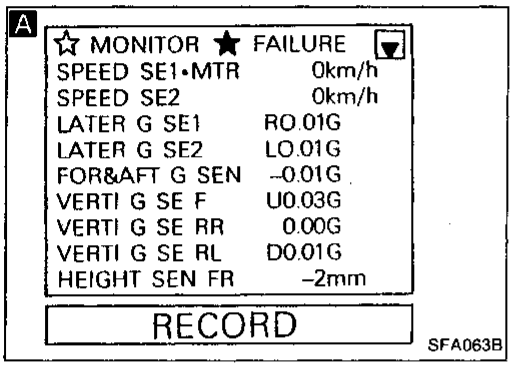
(1) When one lateral G sensor is found to be "faulty", replace both G sensors.

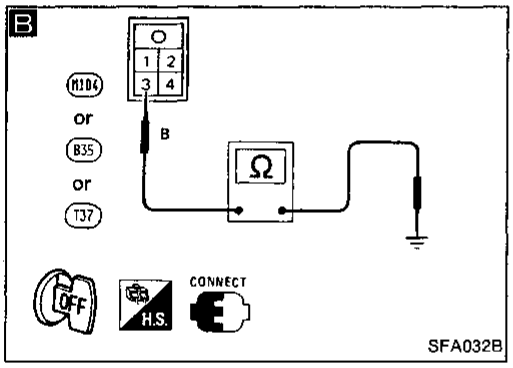
(2) Also check with CONSULT set to field test mode as needed.

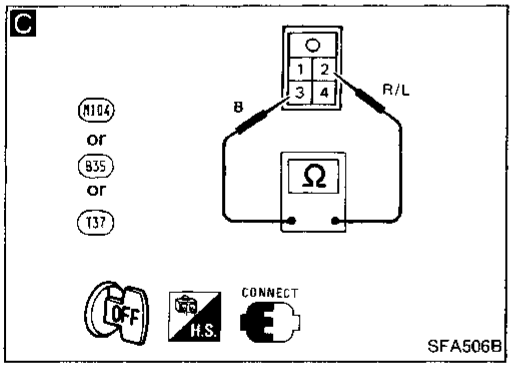
Self-diagnosis (Cont'd)

VERTICAL G SENSOR CIRCUIT CHECK

When "VERTI G SENSOR (F, R/R, R/L)" appears on the display with CONSULT set to the self-diagnostic mode, the problem may be due to either abnormal sensor output or no-output variation from "0G". No-output variation can only be determined while the vehicle is driven.







- Start engine and wait for at least two seconds.
- Place vehicle on a flat surface and stop engine.
- Connect CONSULT and turn ignition switch "ON". (Do not start engine.)

A

Check vertical G sensor output using CONSULT data monitor.

Greater than 1.5G → B

Less than 1.5G

B

CHECK GROUND CIRCUIT.
Turn ignition switch "OFF".
Check continuity between vertical G sensor connector ③ and GND (body metal).
Continuity should exist.

O.K. → Replace vertical G sensor.

N.G. → Open harness circuit. Check and repair harness between control unit and vertical G sensor.

Check vertical G sensor output using CONSULT data monitor.

Less than −1.5G → C

Greater than −1.5G → Ⓐ

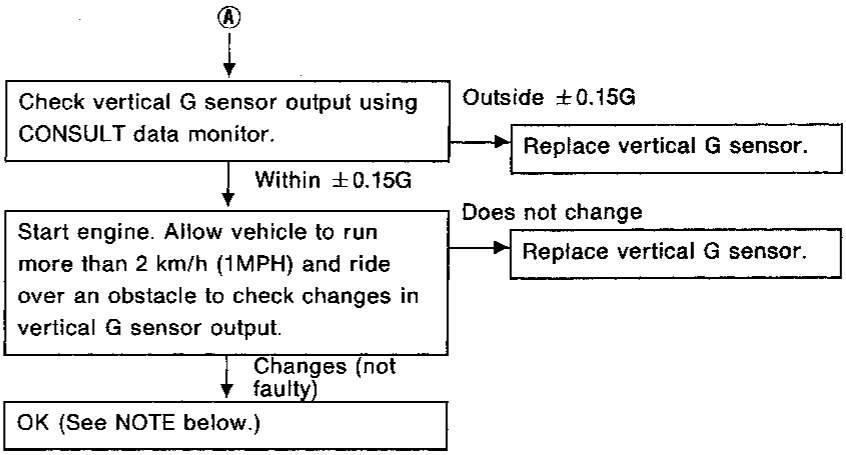
C

CHECK CONTINUITY.
Turn ignition switch "OFF".
Check continuity between vertical G sensor connectors ② and ③.
Continuity should exist.

N.G. → Open harness circuit or vertical G sensor.

O.K. → Shorted harness circuit Check and repair harness between control unit and vertical G sensor.

Self-diagnosis (Cont'd)



NOTE: Also check with CONSULT set to field test mode as needed.

A

☆MONITOR	☆NO FAIL
SPEED SE1•MTR	0km/h
SPEED SE2	0km/h
LATER G SEN 1	0.00G
LATER G SEN 2	L0.01G
FOR & AFT G SEN	+0.01G
VERTI G SE F	U0.01G
VERTI G SE RR	0.00G
VERTI G SE RL	D0.01G
HEIGHT SEN FR	−1mm

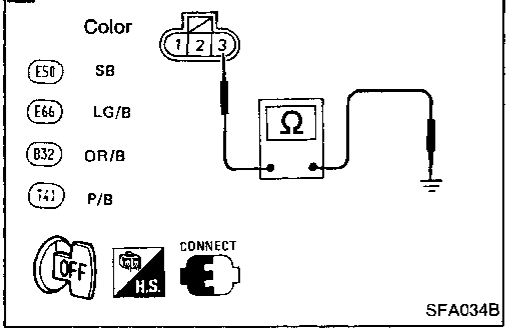
RECORD

☆MONITOR	☆NO FAIL
HEIGHT SEN FL	−7mm
HEIGHT SEN RR	16mm
HEIGHT SEN RL	17mm
OIL TEMP SEN	LOW°C
HEIGHT SWITCH	NORM
STOP LAMP SW	OFF
PRES SW•PUMP	LOW
OIL LEVEL SW	OK
DOOR SW	SHUT

RECORD

SFA124B

B



SFA034B

HEIGHT SENSOR CIRCUIT CHECK

- Start engine and wait for at least 1 second.
- Place vehicle on a flat surface and stop engine.
- Connect CONSULT and turn ignition switch "ON". (Do not start engine.)

A

Greater than 100 mm (3.94 in)

Check height sensor output using CONSULT data monitor.

B

CHECK GROUND CIRCUIT.
Turn ignition switch "OFF".
Check continuity between height sensor connector ③ and GND (body metal).
Continuity should exist.

O.K.

Replace height sensor.

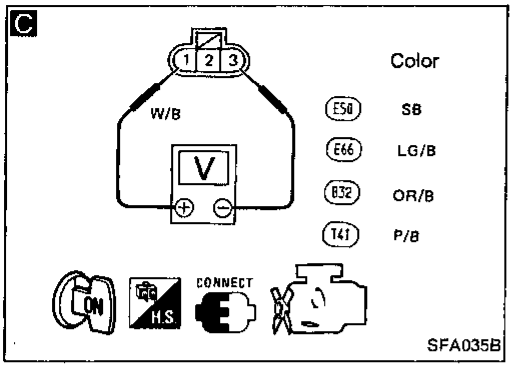
N.G.

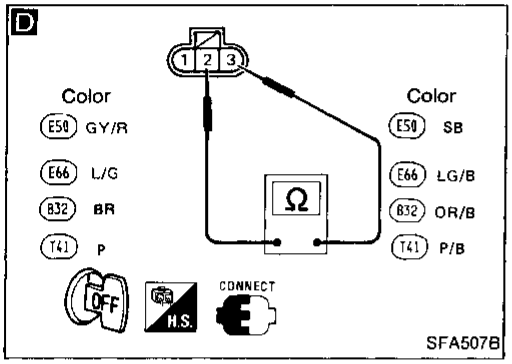
Open harness circuit.
Check and repair harness between control unit and height sensor.

Less than 100 mm (3.94 in)

Ⓐ

Self-diagnosis (Cont'd)





Ⓐ

Check height sensor output using CONSULT data monitor.

Less than −100 mm (−3.94 in)

Greater than −100 mm (−3.94 in)

O.K. (See NOTE below.)

C

CHECK OUTPUT SIGNAL.
Measure voltage across positive terminal ① and ground terminal ③ of height sensor connector.
Voltage: Approx. 5V

O.K.

N.G.

Open harness circuit
Check and repair harness between control unit and height sensor.

D

CHECK CONTINUITY.
Turn ignition switch "OFF".
Check continuity between height sensor connector terminals ② and ③.
Continuity should exist.

N.G.

O.K.

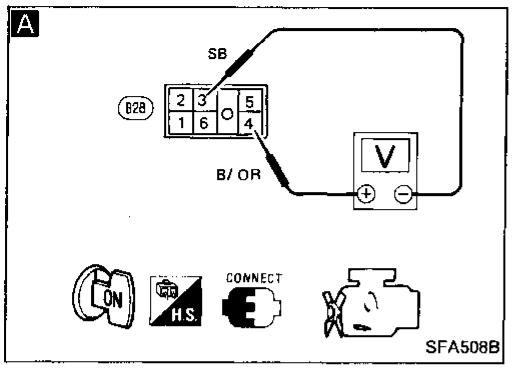
Open harness circuit or faulty height sensor.

Shorted harness circuit
Check and repair harness between control unit and height sensor.

NOTE: Also check with CONSULT set to field test mode.

Self-diagnosis (Cont'd)

HEIGHT CONTROL SWITCH CIRCUIT CHECK

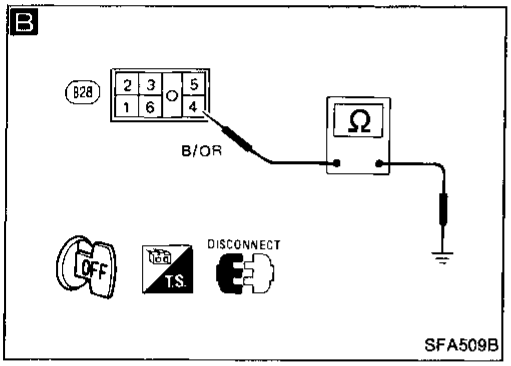


A

CHECK POWER SUPPLY.
Turn ignition switch "ON". Measure voltage across height control switch terminals ③ and ④.
Battery voltage should exist.

N.G. → Check height control switch power supply

O.K. ↓

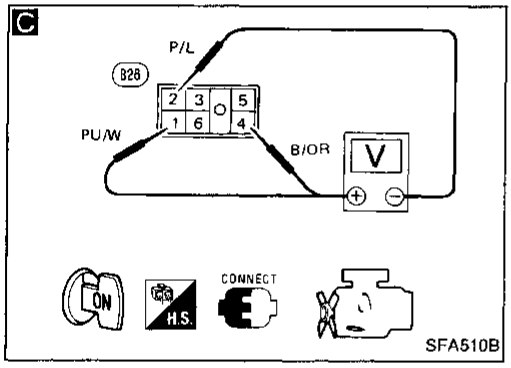


B

CHECK GROUND CIRCUIT.
Turn ignition switch "OFF". Disconnect height control switch connector, and check continuity between connector ④ (body side) and GND (body metal).
Continuity should exist.

N.G. → Open harness circuit. Check and repair harness between control unit and height control switch.

O.K. ↓



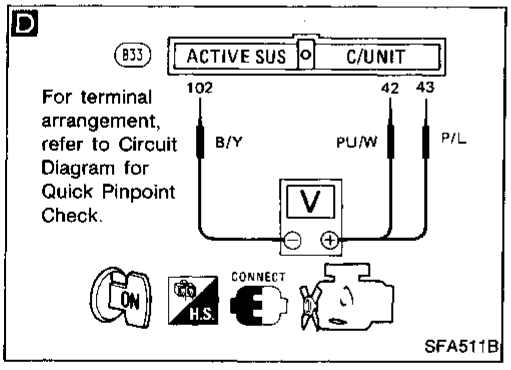
C

CHECK CONTINUITY IN HEIGHT CONTROL SWITCH CIRCUIT.
Turn ignition switch "ON". Measure voltage across switch terminals ① and ④ or ② and ④.

Switch position	① - ④	② - ④
Normal (N)	Battery voltage	0V
High (H)	0V	Battery voltage

N.G. → Replace height control switch.

O.K. ↓



D

CHECK HEIGHT CONTROL SWITCH CIRCUIT.
Turn ignition switch "ON". Measure voltage across control unit terminals ㊷ and (102) or ㊸ and (102).

Switch position	㊷ - (102)	㊸ - (102)
Normal (N)	Battery voltage	0V
High (H)	0V	Battery voltage

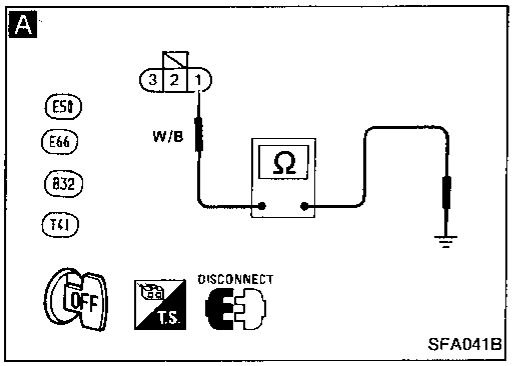
N.G. → Open harness circuit. Check and repair harness between control unit and height control switch.

O.K. ↓

O.K.

Self-diagnosis (Cont'd)

HEIGHT SENSOR POWER SUPPLY CIRCUIT CHECK



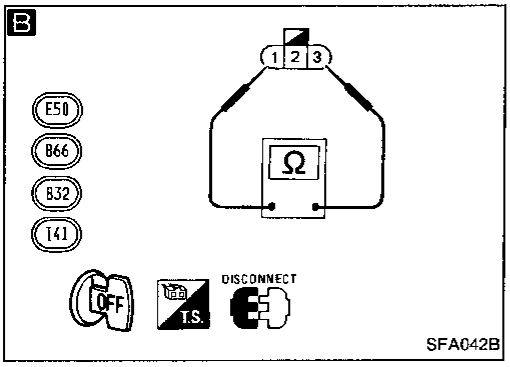
- Turn ignition switch "OFF".
- Disconnect four height sensor connectors and control unit connector.

A

CHECK GROUND CIRCUIT.
Check continuity between height sensor connector ① and ground.
Continuity should exist.

O.K. → Shorted harness circuit
Check and repair harness between control unit and height sensor.

N.G.



B

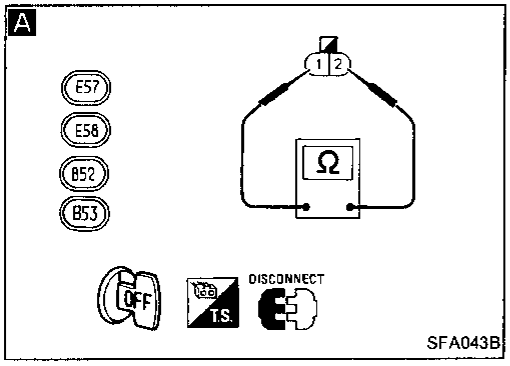
CHECK HEIGHT SENSOR.
Disconnect height sensor connector and check continuity between sensor terminal ① and ③. (Check all four sensors.)
Resistance: Approx. 2 kΩ

N.G. (when any one of the sensors shows approx. 0Ω) → Replace sensors.

O.K. (All sensors)

Replace control unit.

PRESSURE CONTROL VALVE CIRCUIT CHECK

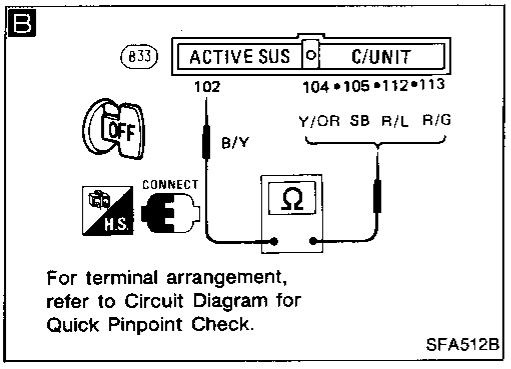


A

CHECK PRESSURE CONTROL VALVE.
Turn ignition switch "OFF". Disconnect affected pressure control valve connector, and measure resistance between terminals ① and ②.
Resistance: 4 - 7Ω

0Ω or infinity → Faulty control valve.
Replace pressure control unit.

O.K.



B

CHECK PRESSURE CONTROL VALVE CIRCUIT.
Turn ignition switch "OFF". Measure resistance between control unit terminal (102) and either terminal (104), (105), (112) or (113).
Resistance: 4 - 7Ω

0Ω or infinity → Check and repair harness between control unit and pressure control valve.

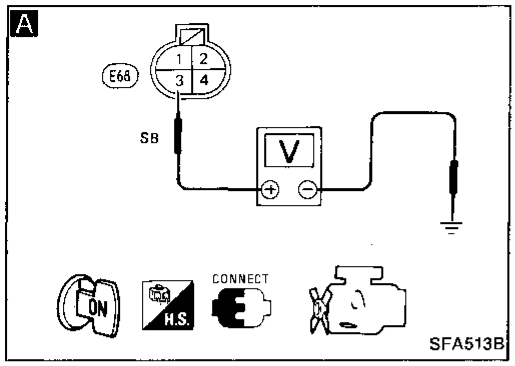
(104) : Pressure control valve (front right)
(105) : Pressure control valve (front left)
(112) : Pressure control valve (rear right)
(113) : Pressure control valve (rear left)

O.K.

Replace control unit.

Self-diagnosis (Cont'd)

FLOW CONTROL VALVE CIRCUIT CHECK



A

CHECK POWER SUPPLY.
Turn ignition switch "ON". Measure voltage across multivalve connector terminal ③ and ground.
Battery voltage should exist.

N.G. → Check and repair harness between battery and flow control valve.

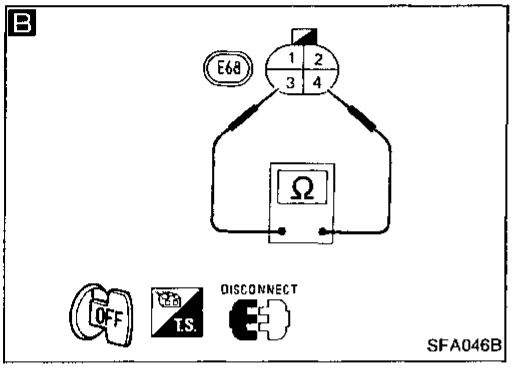
O.K. ↓

B

CHECK FLOW CONTROL VALVE.
Turn ignition switch "OFF". Disconnect multivalve unit connector and measure resistance between connector terminals ③ and ④.
Resistance: 9 - 16Ω

N.G. (0Ω or infinity) → Faulty flow control valve. Replace multivalve unit.

O.K. ↓



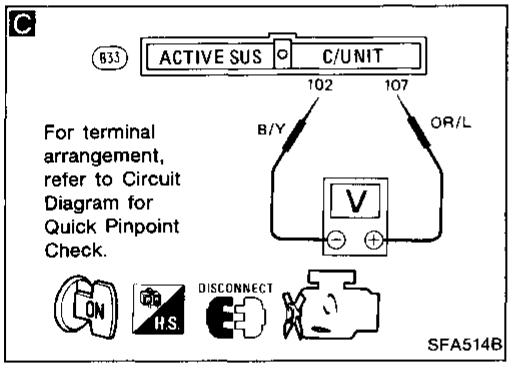
C

CHECK CIRCUIT FLOW CONTROL VALVE
Disconnect control unit connector. Turn ignition switch "ON". Measure voltage across control unit's connector terminals (107) and (102).
Battery voltage should exist.

N.G. → Check and repair harness between control unit and flow control valve.

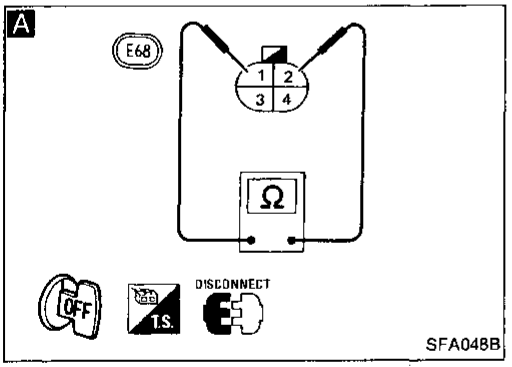
O.K. ↓

Replace control unit.



FAIL-SAFE VALVE CIRCUIT CHECK

When "FAIL-SAFE VALVE" appears on the display with CONSULT set to the self-diagnostic mode, the fail-safe valve circuit may be open or shorted. Fail-safe valve self-diagnosis is performed when the ignition switch is "ON" with the engine at rest.



A

CHECK FAIL-SAFE VALVE.
Turn ignition switch "OFF". Disconnect multivalve unit connector and measure resistance between terminals ① and ②.
Resistance: 9 - 16Ω

N.G. (0Ω or infinity) → Replace fail-safe valve.

O.K. ↓

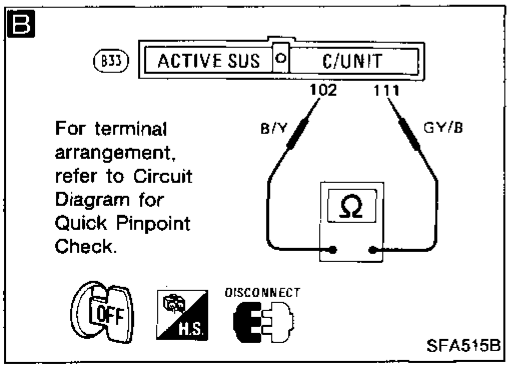
B

CHECK FAIL-SAFE VALVE CIRCUIT.
Turn ignition switch "OFF". Measure resistance between terminals (111) and (102) of control unit connector.
Resistance: 9 - 16Ω

N.G. (0Ω or infinity) → Check and repair harness between control unit and fail-safe valve.

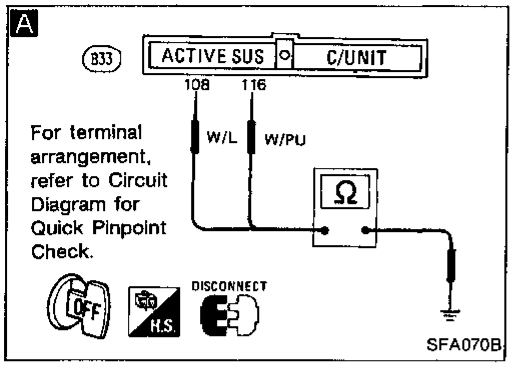
O.K. ↓

Replace control unit.



Self-diagnosis (Cont'd)

PUMP SOLENOID CIRCUIT CHECK

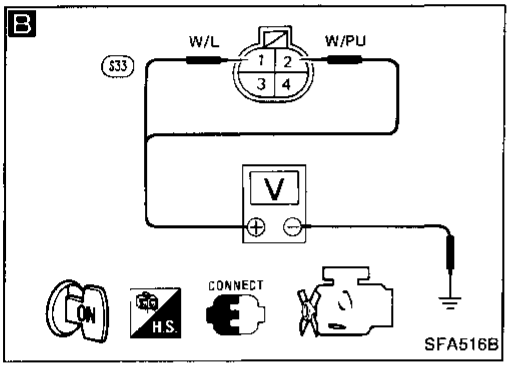


A

CHECK PUMP SOLENOID.
Disconnect C/U connector.
Check resistance between terminal (108) and ground, and between terminal (116) and ground.
Resistance: 6 - 20Ω

No (0Ω or infinity) → Check and repair harness between control unit and pump solenoid.

O.K. ↓



B

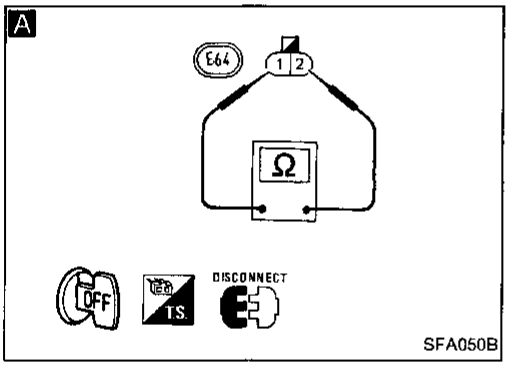
CHECK PUMP SOLENOID.
Connect C/U connector.
Measure voltage across pump solenoid terminals ① and ② by energizing solenoid in active test mode.
Using monitor, make sure that fail-safe valve is not operating.
Battery voltage should exist.

N.G. → Replace control unit.

O.K. ↓

Normal

OIL TEMPERATURE SENSOR CIRCUIT CHECK

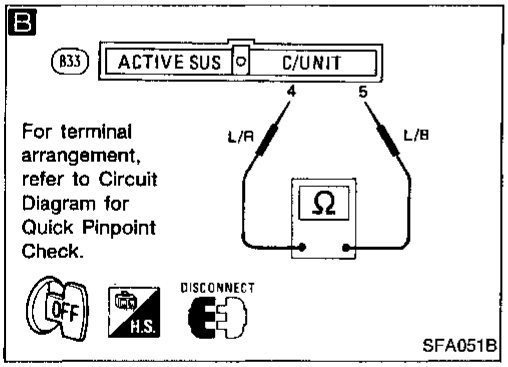


A

CHECK OIL TEMPERATURE SENSOR.
Turn ignition switch "OFF". Disconnect oil temperature sensor connector. Measure resistance between connector terminals ① and ②.
Resistance: 100Ω - 50 kΩ

N.G.
(Less than 100Ω or greater than 50 kΩ) → Replace oil temperature sensor.

O.K. ↓



B

CHECK OIL TEMPERATURE SENSOR CIRCUIT.
Turn ignition switch "OFF". Disconnect control unit connector, and measure resistance between body connector terminals ④ and ⑤.
Resistance: 100Ω - 50 kΩ

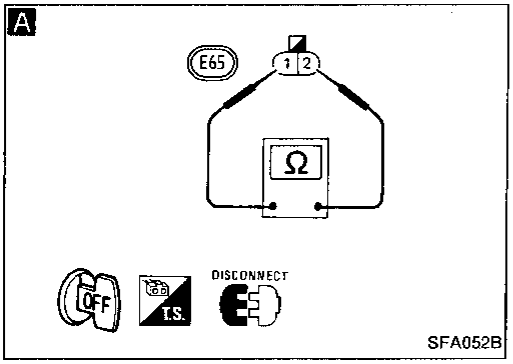
N.G.
(Less than 100Ω or greater than 50 kΩ) → Check and repair harness between control unit and oil temperature sensor.

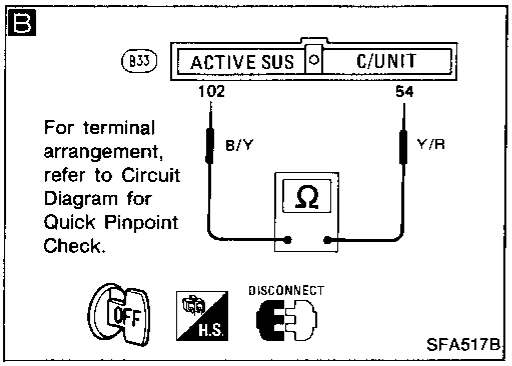
O.K. ↓

Replace control unit.

Self-diagnosis (Cont'd)

OIL WARNING CIRCUIT CHECK





Check fluid level in reservoir tank. → N.G. → Add fluid.

O.K. ↓

A

CHECK CONTINUITY IN OIL LEVEL SWITCH CIRCUIT.
Turn ignition switch "OFF". Disconnect oil level switch connector, and check continuity between terminals ① and ② (switch side).
Continuity should exist.

→ N.G. → Replace oil level switch.

O.K. ↓

B

CHECK OIL LEVEL SWITCH CIRCUIT.
Turn ignition switch "OFF". Disconnect control unit connector and check continuity between terminals ⑭ and ⑩②.
Continuity should exist.

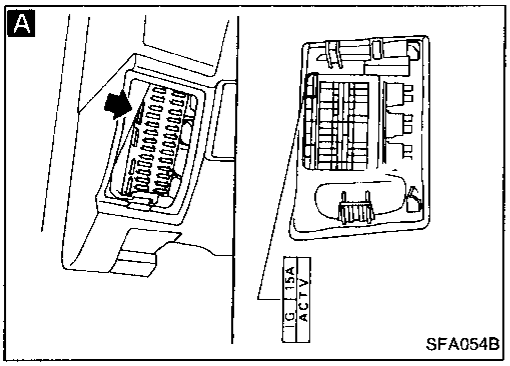
→ N.G. → Check and repair harness between control unit and oil level switch.

O.K. ↓

Replace control unit.

IGNITION POWER SUPPLY CIRCUIT CHECK

When "IGN·ON PWR SUPPLY" appears on the display with CONSULT set to the self-diagnostic mode, either the 15-ampere IGN fuse (#27) may be burned out or the control unit may be faulty.



A

Check 15A IGN fuse (#27) condition. → N.G. → Replace fuse.

O.K. ↓

Turn ignition switch "OFF" and wait for at least 3 minutes. Then disconnect battery terminal and leave it disconnected for at least 30 seconds.*

↓

Connect battery terminal. Start engine and check again. → N.G. → Replace control unit.

O.K. ↓

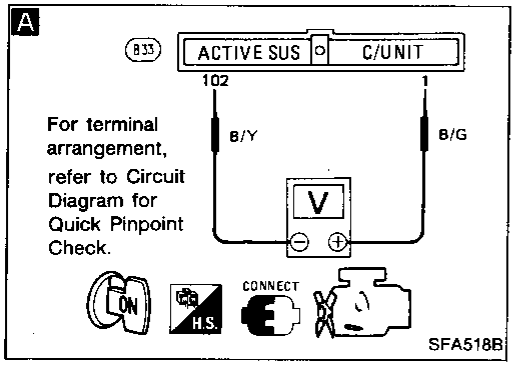
Normal

- **Be careful since vehicle height abruptly changes when battery terminal is disconnected immediately after ignition switch is turned "OFF".**
- **After fuse is replaced, always perform operation marked "*" since active suspension warning lamp remains on although system is in good order. (Auto "turn-off" function does not activate.)**

Self-diagnosis (Cont'd)

ENGINE STALL WARNING CIRCUIT CHECK

When "WARN ENGINE STALL" appears on the display with CONSULT set in the self-diagnostic mode, it indicates that the engine is running at speeds less than 400 rpm while the vehicle is operating, it is at rest with the ignition "ON" or the engine revolution signal line to the ECCS control unit is open. If CONSULT judges the problem to be an "engine stall", the active suspension warning lamp will illuminate and, at the same time, the fail-safe valve will be deenergized. The result is a fail-safe condition (control is stopped) which may cause vehicle posture to change while vehicle is operating.



Start engine and check for rotation. — N.G. → Damaged engine system

O.K. ↓

Check active suspension warning lamp. It should illuminate. — N.G. → Poor harness and/or connector connection

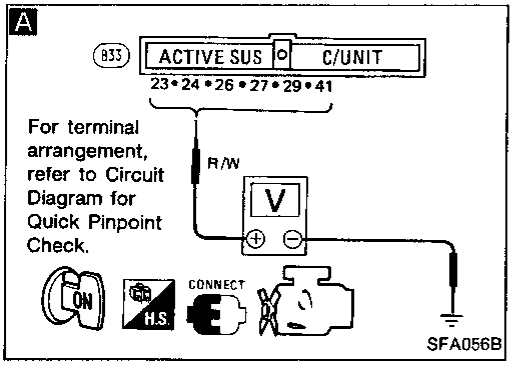
O.K. ↓

A

CHECK INPUT SIGNAL.
Turn ignition switch "ON". (Do not start engine.) Measure voltage across control unit connector terminals ① and (102).
Voltage: Approx. 5V — N.G. → Shorted harness circuit or shorted/damaged control unit

O.K. ↓

Open harness circuit or damaged E.C.C.S. control unit



G SENSOR POWER SUPPLY CIRCUIT CHECK

A

CHECK INPUT SIGNAL TO G SENSOR.
Turn ignition switch "ON". Measure voltage across any one of the control unit connector terminals ㉓, ㉔, ㉖, ㉗, ㉙ or ㊶ and ground.
Voltage: 0V — N.G. (Almost no voltage.) → Disconnect connectors from sensors, one at a time, starting with the one most easily accessible.

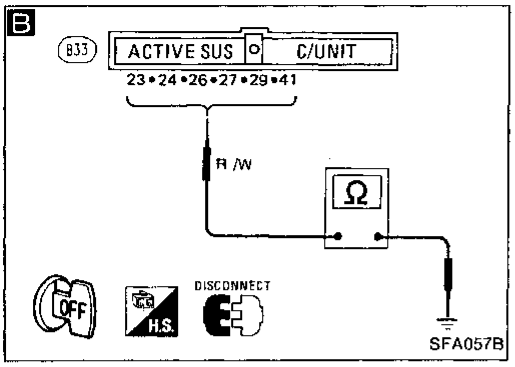
O.K. ↓

Check for presence of normal 8 volts. — O.K. → Replace G sensor.

Check for presence of normal 8 volts. — N.G. → Disconnect connectors from sensors, one at a time, starting with the one most easily accessible.

Ⓐ

Self-diagnosis (Cont'd)



Ⓐ

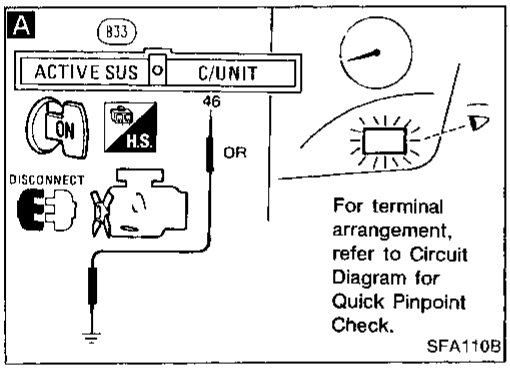
B

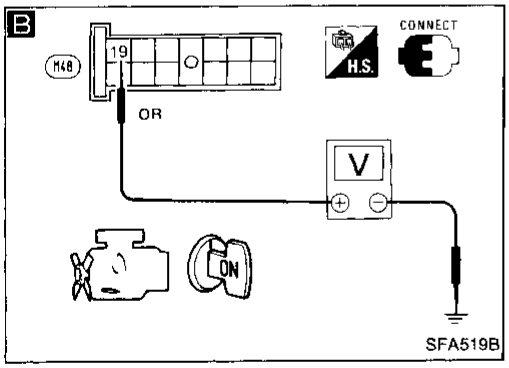
CHECK G SENSOR CIRCUIT.
Disconnect control unit connector. Measure resistance between one of the connector terminals ㉓, ㉔, ㉖, ㉗, ㉙ or ㊶ and GND (body metal).
Resistance: Greater than 8Ω

N.G. → Shorted harness circuit or faulty G sensor.

O.K. ↓

Replace control unit.





Diagnostic Procedure 1

SYMPTOM:
No warning lamp comes on when ignition switch is turned "ON".

A

CHECK WARNING LAMP INPUT SIGNAL.
Disconnect C/U connector, and ground terminal ㊻ of vehicle side connector with ignition switch ON. Check whether active suspension warning lamp is ON.
Lamp ON when grounded

O.K. → Replace control unit.

N.G. ↓

B

CHECK WARNING LAMP CIRCUIT.
Remove combination meter, and check voltage between vehicle side connector terminal ⑲ and body ground with ignition switch ON.
Battery voltage should exist.

N.G. → Check and repair harness between control unit and combination meter.

O.K. ↓

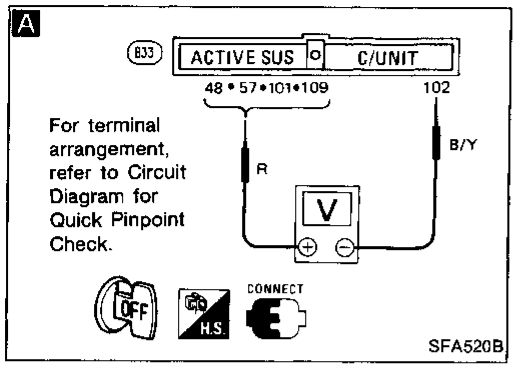
CHECK WARNING LAMP BULB.
Check if active suspension warning lamp is burned out.

N.G. → Replace bulb.

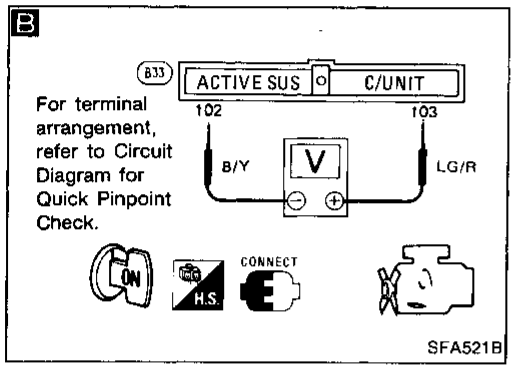
O.K. ↓

Check harness or meter board for open-circuit.

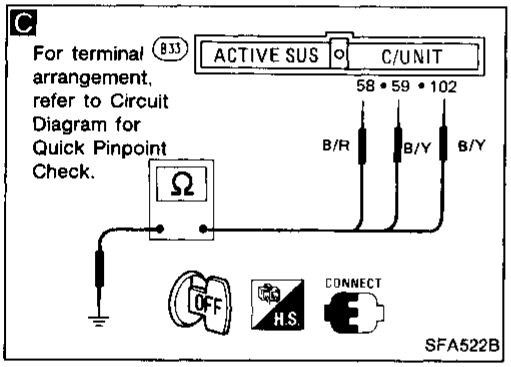
A



B



C



Diagnostic Procedure 2

SYMPTOM:

System is not set in self-diagnosis mode.

A

CHECK POWER SUPPLY (BATTERY).
With ignition switch OFF, check voltage between each C/U connector terminal (48), (57), (101), (109) and terminal (102).
Battery voltage should exist.

N.G. → Damaged battery power supply harness

O.K. ↓

B

CHECK POWER SUPPLY (IGNITION)
With ignition switch ON, check voltage between C/U connector terminals (103) and (102).
Battery voltage should exist.

N.G. → Damaged ignition power supply harness

O.K. ↓

C

CHECK GROUND CIRCUIT
With ignition switch OFF, check continuity between each C/U connector terminal (58), (59), (102) and body ground.
Continuity should exist.

N.G. → Check and repair harness between control unit and ground.

O.K. ↓

Replace control unit.

Diagnostic Procedure 3

SYMPTOM:

Abnormalities when starting engine

Note:

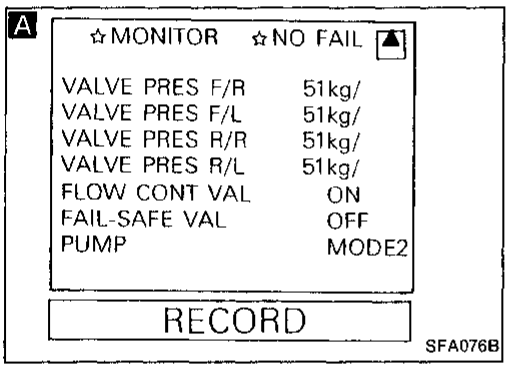
When engine is started, the flow control valve is energized for approx. 10 seconds changing the vehicle height gradually. After this period, the flow control valve is de-energized, and the vehicle height is gradually controlled to a level according to the signals from the G sensor and vehicle height sensor. Accordingly, possible troubles when starting the engine include 1) abrupt rise in vehicle height (malfunctioning flow control valve), 2) tilting of vehicle (difference in outputs of G sensors), and 3) abnormal control signal from control unit.

1) ABRUPT RISE IN VEHICLE HEIGHT

Note:

If the flow control valve is seized in the de-energized position, the vehicle may raise immediately after starting the engine. This indicates that, because the control level of the pressure control valve is set at 5,002 kPa (51 kg/cm^2, 725 psi) for about 10 seconds after starting up the engine, a sudden change in the supply pressure also causes the control pressure to be increased abruptly to 5,002 kPa (51 kg/cm^2, 725 psi).

Similar behavior may occur if a disconnection occurs in the flow control valve circuit. In this case, however, the fail-safe function prevents the trouble from occurring.



- Park vehicle on level ground, and stop engine.
- Connect CONSULT, and set ignition switch to ON. (Engine is OFF.)

A

- Set CONSULT data monitor to flow control valve position.
- Start engine, and check that flow control valve display turns from ON to OFF about 10 seconds after engine starts.

N.G. → Check flow control valve circuit. Refer to self-diagnosis FLOW CONTROL VALVE CIRCUIT CHECK FA-77.

O.K. ↓

Flow control valve is seized. Replace multi-valve unit.

Diagnostic Procedure 3 (Cont'd)

2) TILTING OF VEHICLE

Note:
If outputs from front and rear G sensors or lateral G sensors are different, the vehicle position may tilt approx. 10 seconds after starting the engine. After some time, the vehicle may recover its level position. This is because, if the outputs of the G sensors are not equal, the difference in output causes a change in vehicle position after which the amount of control is increased gradually to bring the vehicle to the normal level.

a) Tilting in fore and aft direction

- Park vehicle on level ground, and stop engine.
- Connect CONSULT, and set ignition switch to ON. (Engine OFF)

A

On CONSULT data monitor screen, check whether fore and aft G sensor output value is within ±0.15G.

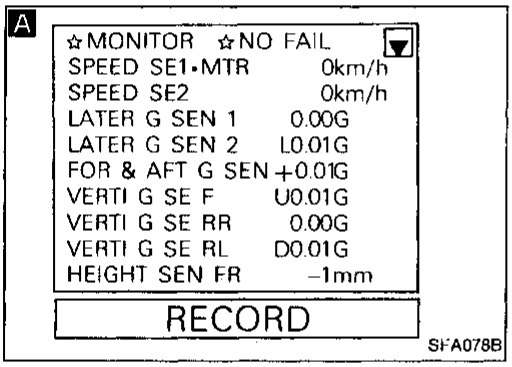
No → Is fore and aft G sensor installed correctly?

Yes → Faulty fore and aft G sensor (Replace)

No → Repair.

Yes (within ±0.15G)

A



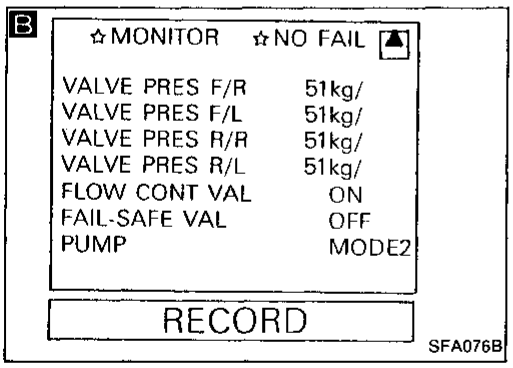
B

On CONSULT data monitor screen, check whether the value indicated for pressure control valve is corresponding to the movement of vehicle on front side and rear side.

No → Go to Hydraulic System Diagnostic Procedures. FA-94

Yes

B



This phenomenon may also be caused by prolonged cranking. Re-charge battery, and check again.

Problem still exists. → Faulty control unit (Replace)

Problem resolved.

Normal

Diagnostic Procedure 3 (Cont'd)

b) Tilting in lateral direction

A

☆MONITOR	☆NO FAIL
SPEED SE1•MTR	0km/h
SPEED SE2	0km/h
LATER G SEN 1	0.00G
LATER G SEN 2	L0.01G
FOR & AFT G SEN	+0.01G
VERTI G SE F	U0.01G
VERTI G SE RR	0.00G
VERTI G SE RL	D0.01G
HEIGHT SEN FR	−1mm

RECORD

SFA078B

B

☆MONITOR	☆NO FAIL
VALVE PRES F/R	51kg/
VALVE PRES F/L	51kg/
VALVE PRES R/R	51kg/
VALVE PRES R/L	51kg/
FLOW CONT VAL	ON
FAIL-SAFE VAL	OFF
PUMP	MODE2

RECORD

SFA076B

- Park vehicle on level ground, and stop engine.
- Connect CONSULT, and set ignition switch to ON. (Engine OFF)

A

On CONSULT data monitor screen, check whether outputs of lateral G sensor 1 (front) and lateral G sensor 2 (rear) are within ±0.15G.

One is not within ±0.15G.

Is lateral G sensor installed correctly?

Yes

No

Repair.

Faulty lateral G sensor (Replace both lateral G sensors as a set.)

Within ±0.15G

B

On CONSULT data monitor screen, check whether the value indicated for pressure control valve is corresponding to vehicle movement on both left and right sides.

No

Go to "Hydraulic System Diagnostic Procedures". FA-94

Yes

This phenomenon may be caused by prolonged cranking. Re-charge battery, and check again.

Problem still exists.

Faulty control unit (Replace)

Problem resolved.

Normal

Diagnostic Procedure 4

SYMPTOM:

Abnormalities when stopping engine

Note:

When engine is stopped, the system operates to maintain system pressure at a fixed level (charged balancing pressure). First, the pump stops, eliminating the pump discharge pressure, which causes the main check valve to close. At the same time, the control level of the pressure control valve is gradually changed to the neutral pressure [5,002 kPa (51 kg/cm^2, 725 psi)]. Because no oil is fed from the pump, the supply pressure flows out to the return pressure side via the pressure control valve. As a result, the supply pressure lowers gradually. When the pressure lowers to 5,002 kPa (51 kg/cm^2, 725 psi), the operation check valve closes, shutting off the return pressure outlet. After the operation check valve closes, the supply pressure and return pressure gradually become equal (charged balancing pressure). Approximately 3 minutes after stopping the engine, the fail-safe valve and pressure control valve are de-energized, and no longer operational.

During the above-mentioned operation, some mismatching may occur between the operation of the hydraulic system and the electrical units due to the ambient temperature, and the status of control existing at the time the engine stopped. Such a minor mismatching should not be regarded as a problem. It is requested to fully understand the conditions and situations under which such mismatch occurs.

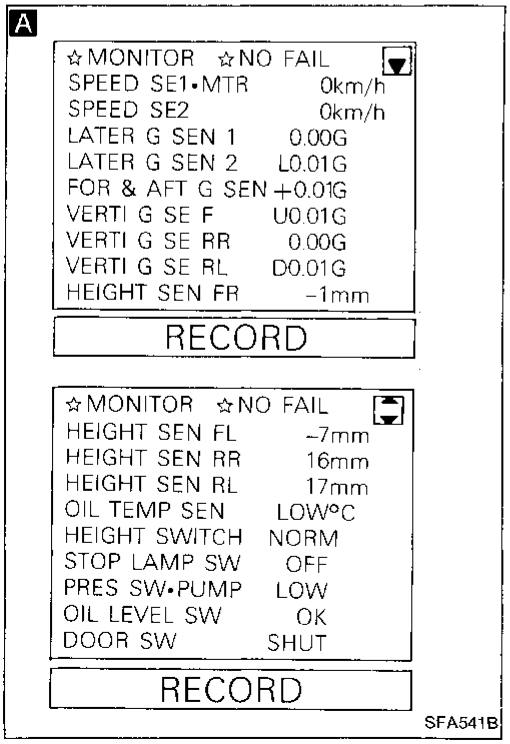
(1) If either battery terminal is disconnected or the active suspension fuse (No. 17) is removed within 3 minutes after stopping the engine, the vehicle height may change. This is normal. However, care should be taken when performing maintenance near the vehicle.

(2) Depending on the ambient temperature and pressure control valve status when the engine was stopped, some mismatching may occur between the operation of the hydraulic system and the electrical units, creating a jerk of the vehicle body. This is normal.

(3) When ambient temperature is very low, vehicle height may drop a little about 3 minutes after stopping the engine. This is normal.

(4) When jacking up the vehicle, be sure to wait about 3 minutes after stopping the engine. The vehicle body may jerk a little after stopping the engine.

(5) If the engine is started again soon after stopping, the vehicle body may jerk a little depending on the ambient temperature and loaded condition of the vehicle. This, however, is normal.



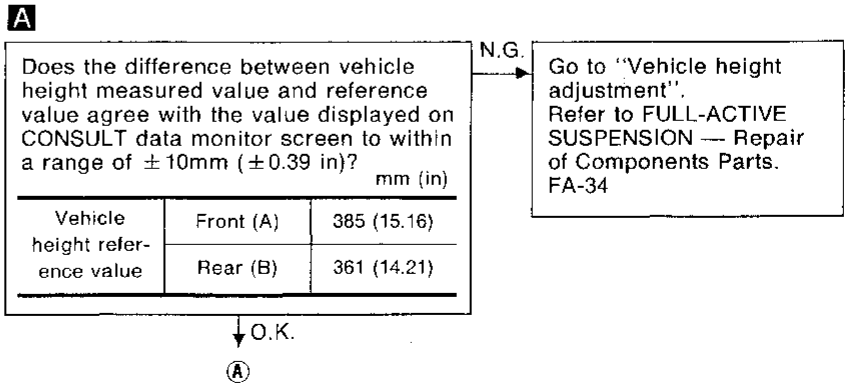
Diagnostic Procedure 5

SYMPTOM:

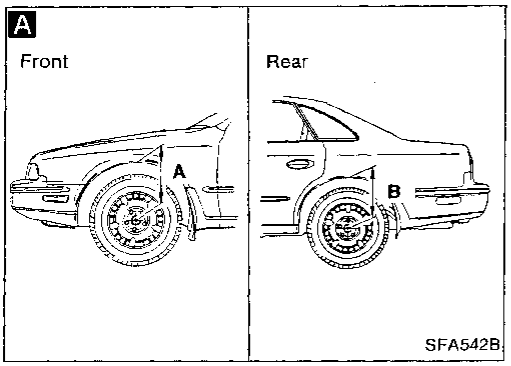
Abnormalities in vehicle height control

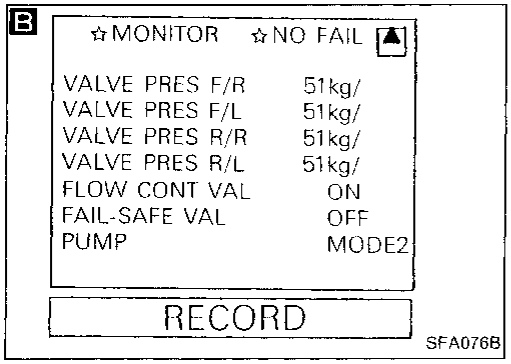
Note:

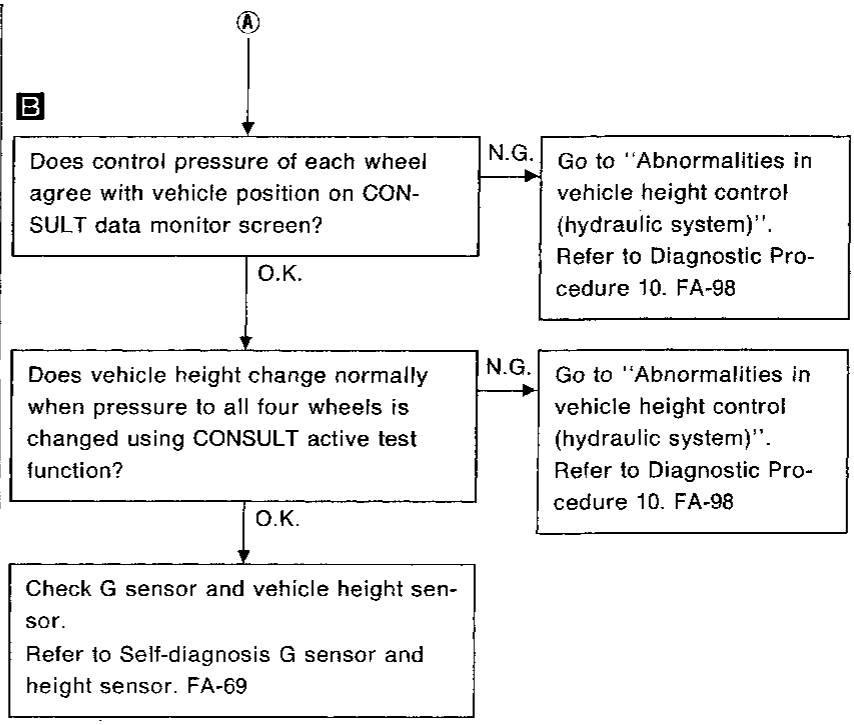
The vehicle height controller causes the vehicle height to change, but its changing speed [2 to 3 mm (0.08 to 0.12 in)/sec] is slower than that caused by the G sensor. If the vehicle height changes at an abnormally slow speed, it is attributable to a malfunction of the vehicle height controller.



Diagnostic Procedure 5 (Cont'd)







1) FAULTY PHENOMENA AND SENSORS REQUIRING INSPECTION

Symptom	Sensors requiring inspection
Vehicle will not level even if parked on level ground for a long time.	Vehicle height sensors (for four wheels) (Note 1) Stop lamp switch (Note 2) Parking brake switch (Note 2) Door switch (Note 2)
Vehicle tilts while driving.	
Vehicle height will not change even if height control switch is operated.	Above-listed items and height control switch (Note 3)

The following phenomena are related to a normal system.

- When the parking brake or foot brake is applied, the braking force creates a stress in the suspension system. In this condition, the height of all four wheels may not change uniformly when the height control switch is operated.
- If a wheel is mounted on the shoulder of a road or on a large curb [approx. 100 mm (3.94 in) in height], the system automatically stops its vehicle height control function, hence the vehicle remains in the tilted position.
- As long as the active suspension warning lamp is ON, the vehicle height control function is inactive, and the vehicle may not level itself.

Notes:

(1) A vehicle height sensor is connected to each wheel. If any one of them should fail, or its neutral position become incorrect, height change will occur not only in the affected wheel but in the other wheels also. To adjust vehicle height using the vehicle height sensor, refer to "Full-active suspension — Repair of Components: Vehicle height adjustment", and use the vehicle height adjustment mode of the CONSULT work support mode.

(2) For inspection of the stop lamp switch, parking brake switch and door switch, refer to "2) Inspection of other sensors".

(3) For inspection of the height control switch, refer to "Self- diagnosis HEIGHT CONTROL SWITCH CIRCUIT CHECK. FA-75".

Diagnostic Procedure 5 (Cont'd)

2) INSPECTION OF OTHER SENSORS

ⓐ Stop lamp switch

Turn OFF ignition switch.
Connect CONSULT, and set ignition switch to ON.

A

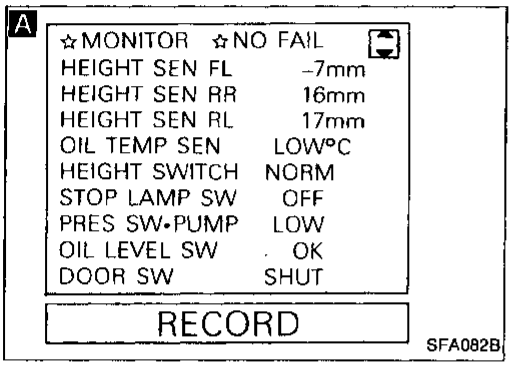
CHECK ON-OFF OPERATION OF STOP LAMP SWITCH.
Depress and release foot brake pedal several times. Check whether stop lamp switch display is normal on CONSULT data monitor screen.

Foot brake operation	CONSULT display
Depressed	ON
Released	OFF

O.K. → Normal

N.G.

A

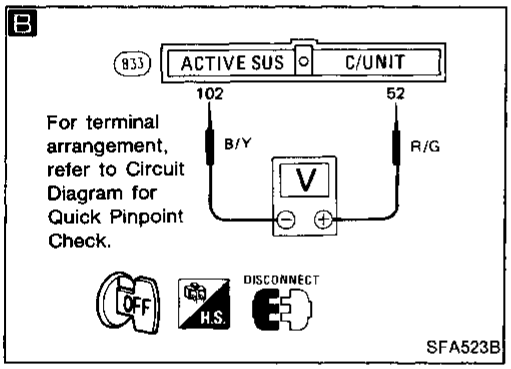


Set ignition switch to OFF.
Depress and release foot brake pedal several times. Check whether brake lamp operation is normal.

N.G. → Check brake lamp circuit.

O.K.

B



B

CHECK STOP LAMP CIRCUIT.
Disconnect C/U connector, and depress and release foot brake pedal several times. Check whether voltage between vehicle side connector terminals ⑤② and ⑩② is normal (ignition switch: OFF).

Foot brake operation	Voltage
Depressed	Battery voltage
Released	0 V

N.G. → Check and repair harness between control unit and stop lamp switch.

O.K.

Damaged control unit
(Replace)

Diagnostic Procedure 5 (Cont'd)

ⓑ Parking brake switch

Turn OFF ignition switch.
Connect CONSULT, and set ignition switch to ON.

A

CHECK ON-OFF OPERATION OF PARKING BRAKE LAMP SWITCH.
Apply and release parking brake several times. Check whether parking brake lamp switch display is normal on CONSULT data monitor screen.

Parking brake operation	CONSULT display
Applied	ON
Released	OFF

O.K. → Normal

N.G.

Set ignition switch to OFF.
Apply and release parking brake several times. Check whether brake warning lamp operation is normal.

N.G. → Check and repair brake warning lamp circuit.

O.K.

B

CHECK PARKING BRAKE LAMP CIRCUIT.
Disconnect C/U connector, and apply and release parking brake several times. Check whether voltage between vehicle side connector terminals ⑤⑥ and (102) is normal (ignition switch: OFF).

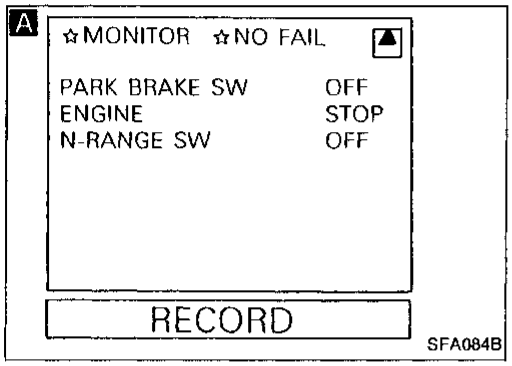
Parking brake operation	Voltage
Applied	0 V
Released	Battery voltage

N.G. → Check and repair harness between control unit and parking brake switch.

O.K.

Damaged control unit
(Replace)

A



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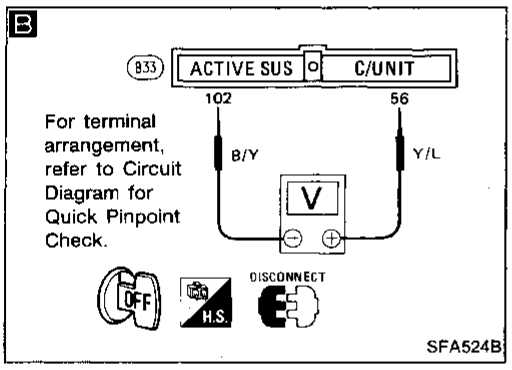
B



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GI MA EM LC EF & EC FE AT PD FA RA BR ST BF HA EL

Diagnostic Procedure 5 (Cont'd)

ⓒ Door switch

Turn OFF ignition switch.
Connect CONSULT and set ignition switch to ON.

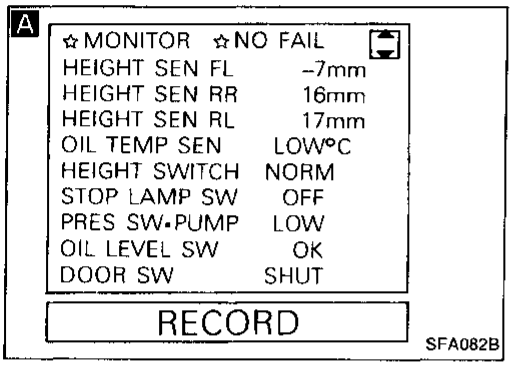
A

CHECK ON-OFF OPERATION OF DOOR SWITCH.
Open and close doors several times.
Check whether door switch displayed is normal on CONSULT data monitor screen.
(Room lamp switch: DOOR)

Door position	CONSULT display
All doors are closed	SHUT
One or more doors are open	OPEN

O.K. → Normal

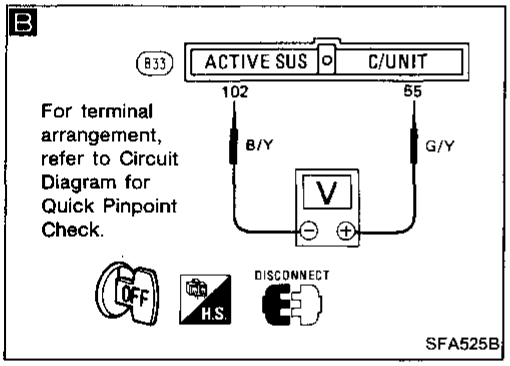
N.G.



Set ignition switch to OFF.
Open and close doors several times.
Check whether room lamp lights normally. (Room lamp switch: DOOR)

N.G. → Check and repair room lamp circuit.

O.K.



B

Disconnect C/U connector, and open and close doors several times. Check whether voltage between vehicle side connector terminal ⑮ and terminal ⑩② is normal. (Room lamp switch: DOOR, ignition switch: OFF)

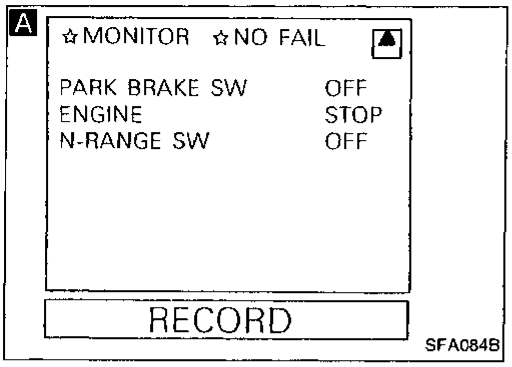
Door position	Voltage
All doors are closed	0 V
One or more doors are open	Approx. 12 V

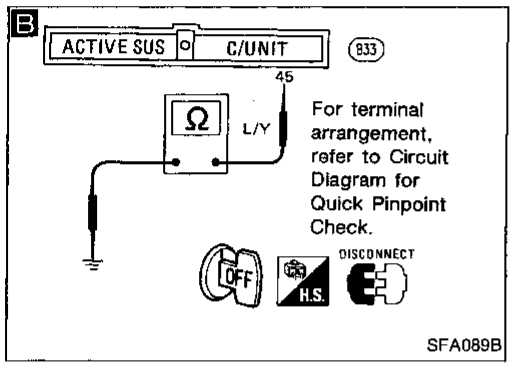
N.G. → Check and repair harness between control unit and door switch.

O.K.

Damaged control unit
(Replace)

Diagnostic Procedure 5 (Cont'd)





ⓓ Neutral position switch

A

Observe neutral position switch ON-OFF operation displayed on CONSULT data monitor screen.
Display should agree with operation.

N.G. → Refer to "TROUBLE DIAGNOSES" in AT section.

O.K. ↓

B

CHECK HARNESS BETWEEN NP RELAY AND C/U.
Check whether resistance between C/U connector terminal ㊺ and GND changes in NP range.

N.G. → Check and repair harness between control unit and NP relay.

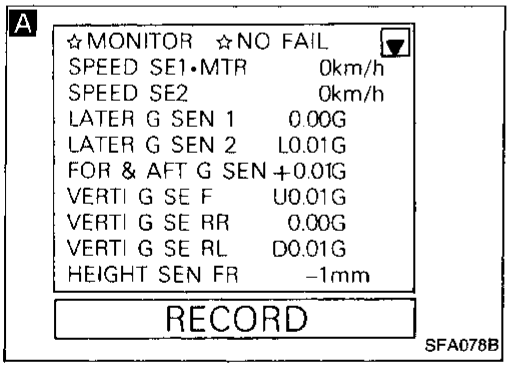
O.K. ↓

Replace control unit.

Diagnostic Procedure 6

SYMPTOM:
Abnormalities in roll control

1) The vehicle body moved in the roll direction while parking. The vehicle body rolled (moved sideways) after starting the engine, but it gradually returned level.



- Park vehicle on level ground, and stop engine.
- Connect CONSULT, and set ignition switch to ON. (Engine OFF)

A

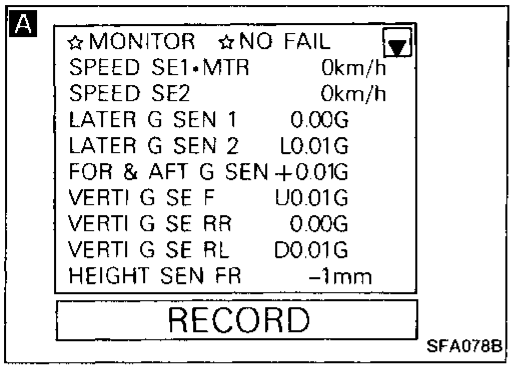
Check output signal on CONSULT data monitor screen. Are output values of lateral G sensors 1 and 2 within ±0.15G?
Gravity ±0.15G

N.G. → Damaged lateral G sensor 1 or 2 (Replace both sensors as a set.)

O.K. ↓

Go to "Hydraulic System Diagnostic Procedures".
Refer to Diagnostic Procedures 8 to 12.
FA-94

Diagnostic Procedure 6 (Cont'd)



2) The vehicle body moved in the roll direction while driving. The vehicle body rolled, but gradually returned level.

- Park vehicle on level ground, and stop engine.
- Connect CONSULT, and set ignition switch to ON. (Engine OFF)

↓

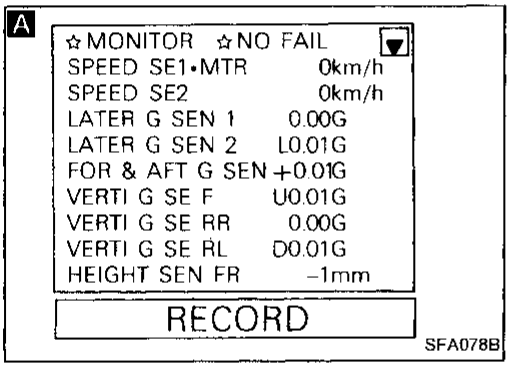
A

Check output signal on CONSULT data monitor screen. Are output values of lateral G sensors 1 and 2 and vertical G sensors (rear right and rear left) within ±0.15G?
Gravity ±0.15G

N.G. → Damaged G sensor (Replace)

↓ O.K.

Go to "Hydraulic System Diagnostic Procedures".
Refer to Diagnostic Procedures 8 to 12.
FA-94



Diagnostic Procedure 7

SYMPTOM:
Abnormalities in pitch control

1) The vehicle body moved in the pitch direction while parked. After starting the engine, the vehicle body moved in the pitch direction (tilted forward or backward), but it gradually returned level.

- Park vehicle on level ground, and stop engine.
- Connect CONSULT, and set ignition switch to ON. (Engine OFF)

↓

A

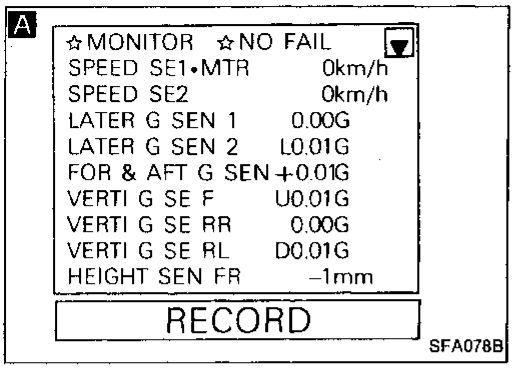
Check output signal on CONSULT data monitor screen.
Is output of fore and aft G sensor within ±0.15G?
Gravity ±0.15G

N.G. → Damaged fore and aft G sensor (Replace)

↓ O.K.

Go to "Hydraulic System Diagnostic Procedures"
Refer to Diagnostic Procedures 8 to 12.
FA-94

Diagnostic Procedure 7 (Cont'd)



2) While driving, the vehicle body moved in the pitch direction. The vehicle body moved in the pitch direction, but it gradually returned level.

- Park vehicle on level ground, and stop engine.
- Connect CONSULT, and set ignition switch to ON. (Engine OFF)

↓

A

Check output signal on CONSULT data monitor screen.
Are outputs of fore and aft G sensor and vertical G sensor (front) within ±0.15G?
Gravity ±0.15G

N.G. → Damaged fore and aft G sensor or vertical G sensor (Replace)

↓ O.K.

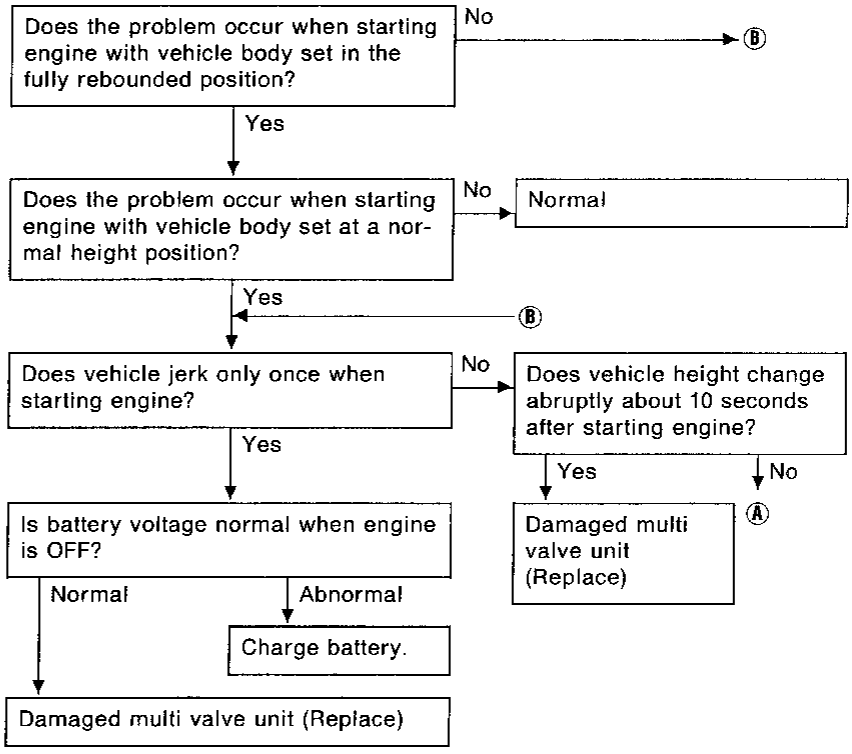
Go to "Hydraulic System Diagnostic Procedures"
Refer to Diagnostic Procedures 8 to 12.
FA-94

Hydraulic System Diagnostic Procedures

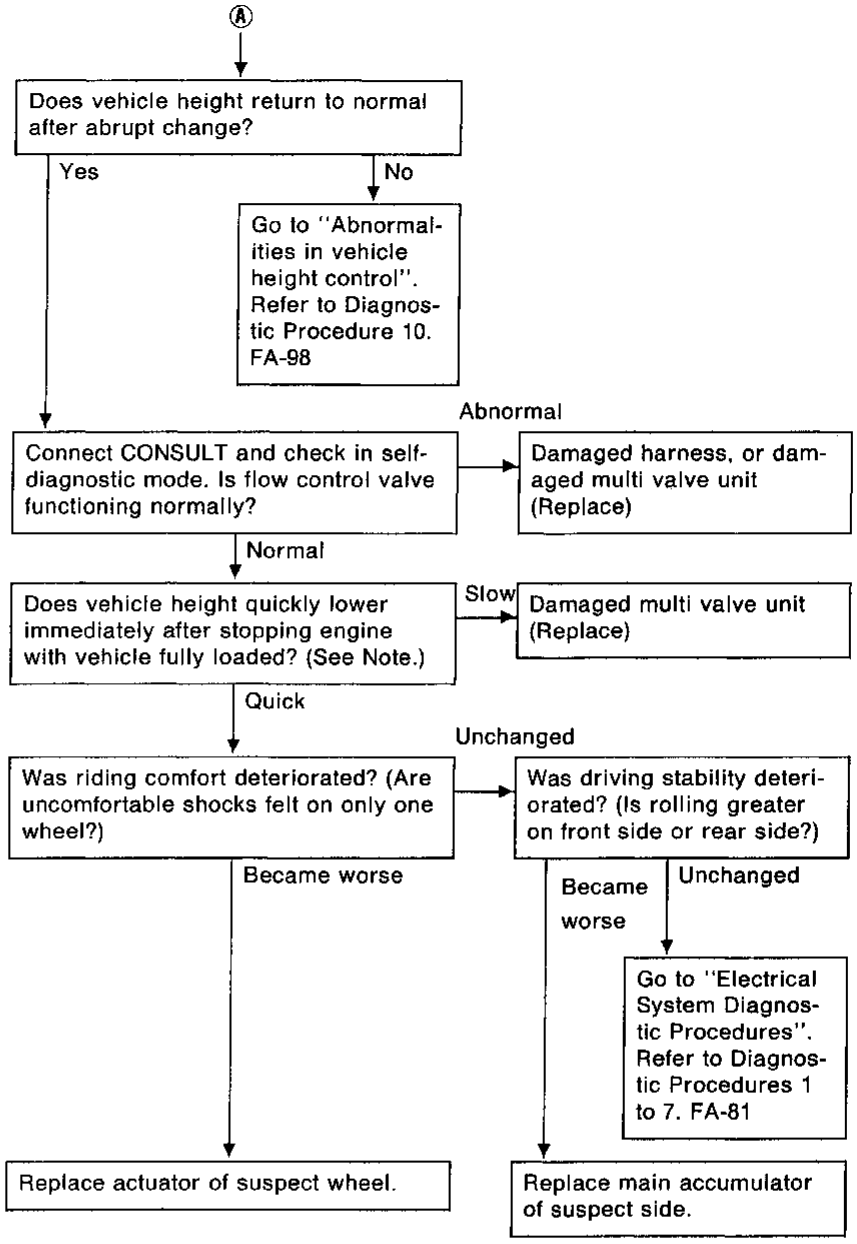
Troubleshooting of the hydraulic system must be started after solving electrical system problems, referring to "Electrical System Diagnostic Procedures".

Diagnostic Procedure 8

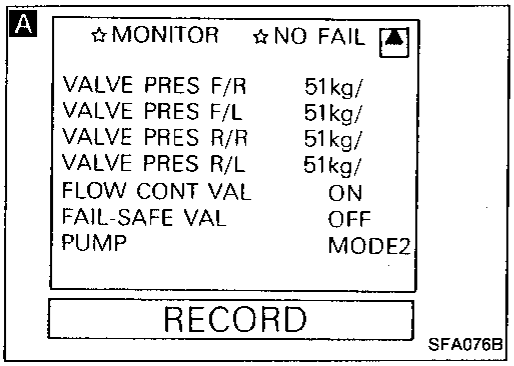
SYMPTOM:
Abnormalities when starting engine



Diagnostic Procedure 8 (Cont'd)



Note: Fully loaded state means five adults [68 kg (150 lb) each] and cargo [68 kg (150 lb)].



Diagnostic Procedure 9

SYMPTOM: Abnormalities when engine is off.

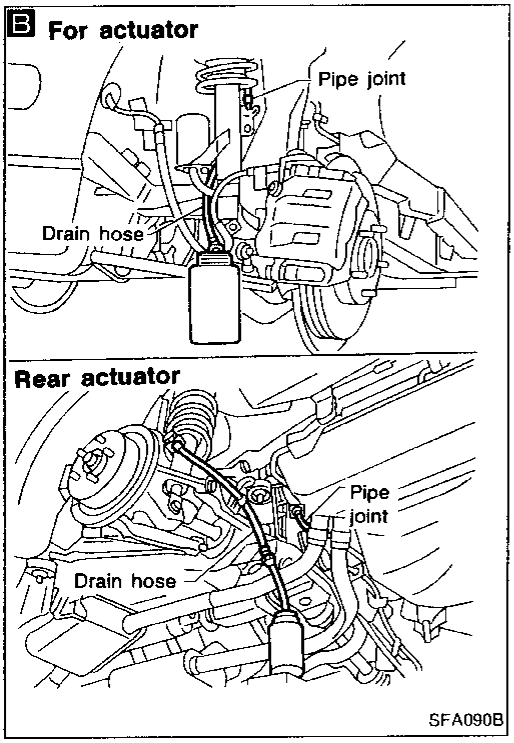
Does vehicle height drop within 3 minutes after stopping engine?
- No → Does vehicle height lower within scores of minutes after stopping engine?
  - Yes → Ⓑ
  - No → Ⓐ
- Yes → Does vehicle height drop abruptly about 3 minutes after stopping engine?
  - No → Is heavy cargo loaded on vehicle?
    - Not loaded → Ⓐ
    - Loaded → Is normal vehicle height recovered when unloaded?
      - No → Ⓐ
      - Yes → Normal
  - Yes → Ⓑ → Is bypass valve tightened to specified torque [11 to 13 N·m (1.1 to 1.3 kg-m, 8 to 9 ft-lb)]?
    - Yes → Damaged multi valve unit (Replace)
    - No → Ⓒ → Is problem corrected when bypass valve is tightened to specified torque?
      - No (Unchanged) → Damaged multi valve unit (Replace)
      - Yes → Normal

Ⓐ → CHECK VALVE PRESSURE. Connect CONSULT, and start engine. Read control pressure indicated on data monitor screen after vehicle height stabilizes. (Unladen vehicle with gasoline tank full).

Valve pressure:
Front
Below 4,904 kPa (50 kg/cm², 711 psi)
Rear
Below 4,609 kPa (47 kg/cm², 668 psi)

- O.K. → Damaged multi valve unit (Replace).
- N.G. → Weak coil spring (Replace).

Diagnostic Procedure 9 (Cont'd)



Ⓐ

Does vehicle height lower more than 30 mm (1.18 in) in a week?
- No → Ⓓ
- Yes ↓

Was any operation causing an abnormal rise in oil temperature made before stopping engine?
- No → Is oil leaking?
  - No → Ⓔ
  - Yes ↓
- Yes ↓

Ⓓ

Does vehicle height rise when starting engine?
- Yes → Normal
- No → Go to "Abnormalities in vehicle height control". Refer to Diagnostic Procedure 10. FA-98

Is oil leaking?
- No → Ⓔ
- Yes ↓

Is any oil-charged unit leaking?
- No (Repair) → Ⓔ
- Yes → Repair or replace leaking unit. → Ⓔ

Ⓔ

Was riding comfort deteriorated? (Are uncomfortable shocks felt on only one wheel?)
- No (Unchanged) → Was driving stability deteriorated? (Is rolling greater on front side or rear side?)
  - Yes (Deteriorated) → Replace main accumulator of suspect side.
  - No (Unchanged) → B
- Yes (Deteriorated) → Oil leakage is large. → Replace actuator of affected wheel.

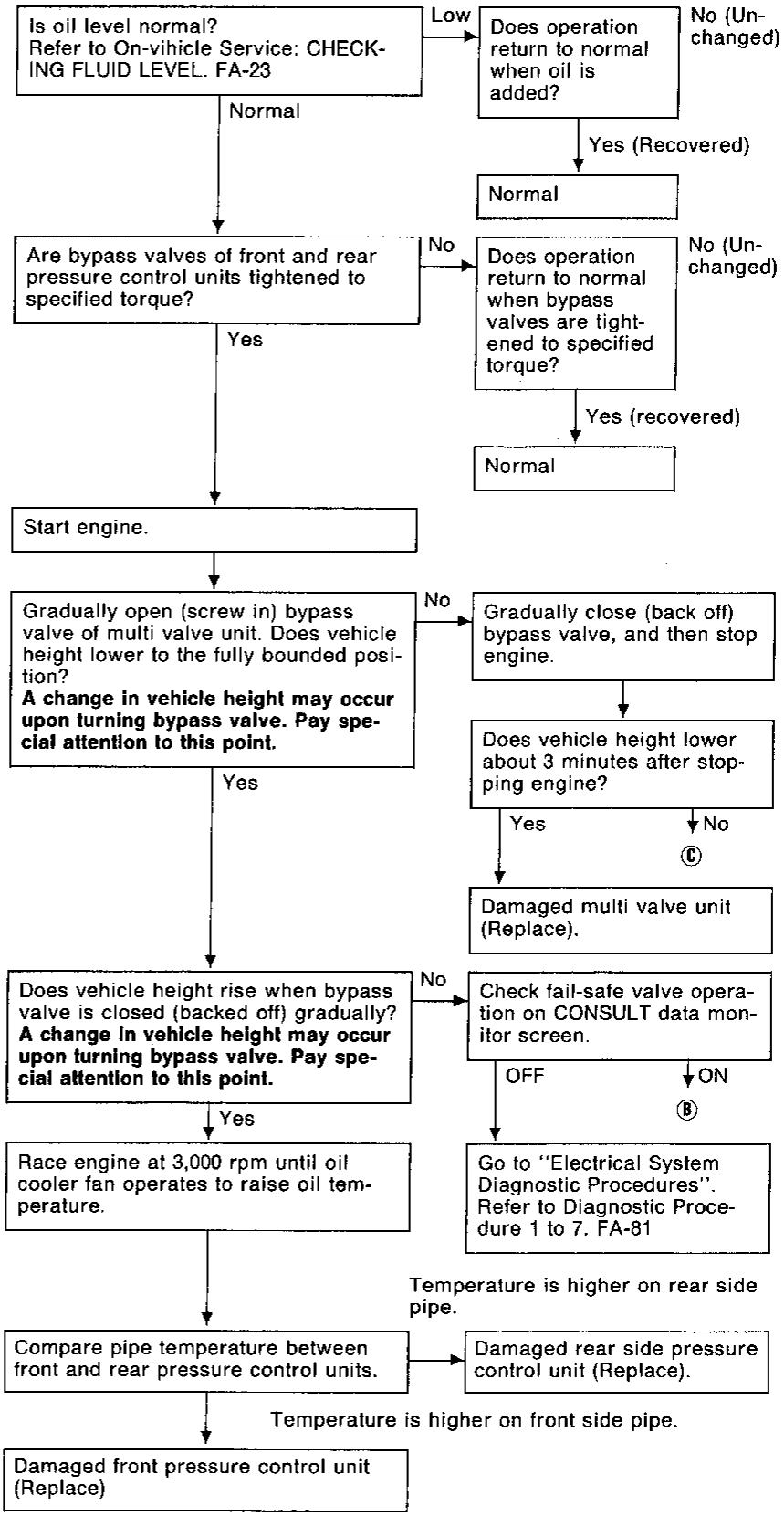
B

Is oil leak from actuator drain hose normal? Check amount of oil leakage from actuator power cylinder seal.
- Park vehicle on level ground, and stop engine.
- Separate front and rear actuator drain hoses from four wheels at positions.
- Hang open end of actuator side drain hose down, and leave it for more than 5 minutes to thoroughly drain oil.
- Put open end of hose in a can, and leave overnight, then check the amount of oil leakage.
- If oil leakage of an actuator is very large, the actuator seal must be judged as faulty; replace the actuator.

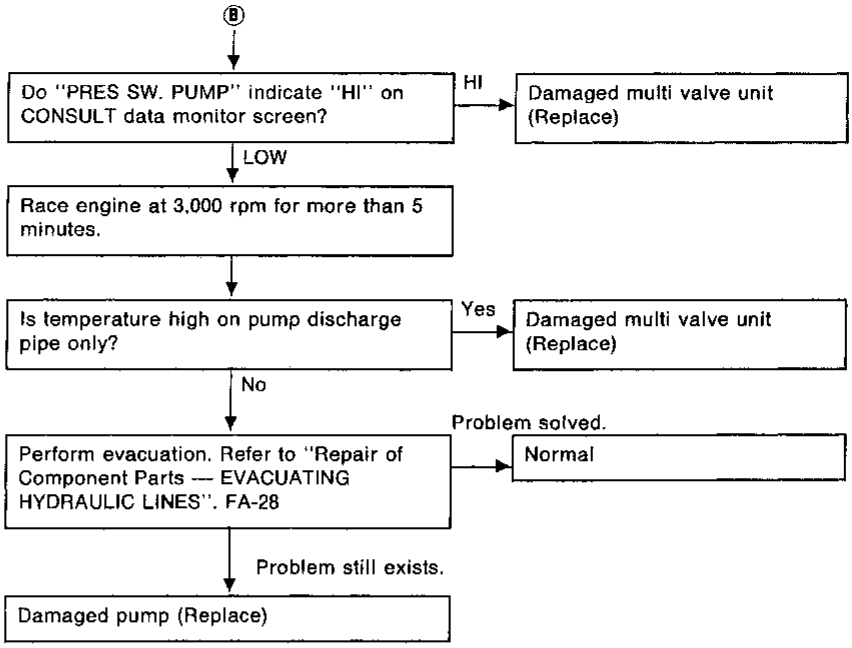
Oil leakage is small. → Damaged multi valve unit (Replace)

Diagnostic Procedure 10

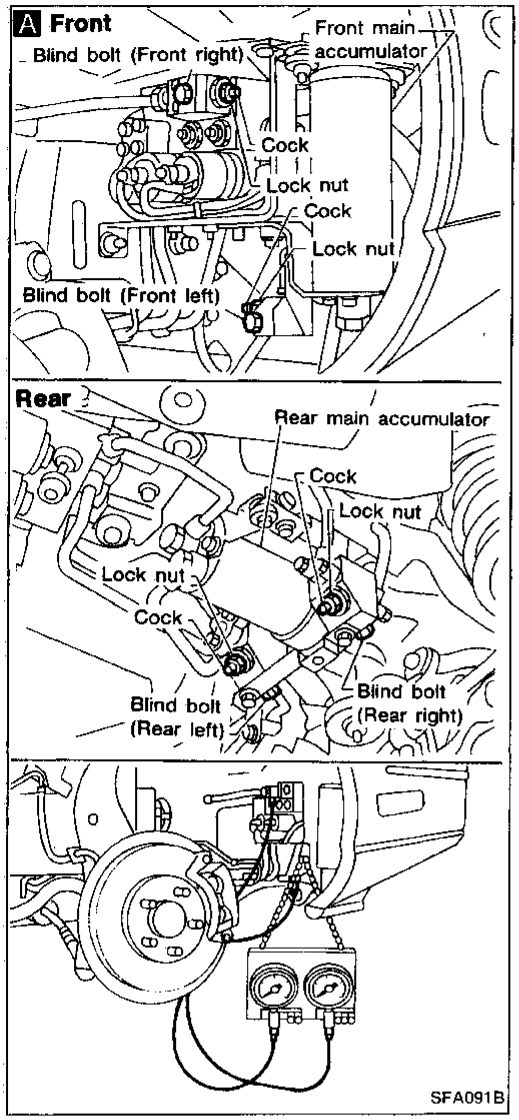
SYMPTOM:
Abnormalities in vehicle height control



Diagnostic Procedure 10 (Cont'd)



Diagnostic Procedure 10 (Cont'd)



Ⓒ

Using CONSULT active test mode, change control pressure of four wheels from 1,765 to 9,807 kPa (18 to 100 kg/cm^2, 256 to 1,422 psi). Do all four wheels move smoothly up and down?

Movement of some wheels is not smooth.

→ Pressure control unit of affected wheel is faulty (Replace).

All four wheels move smoothly.

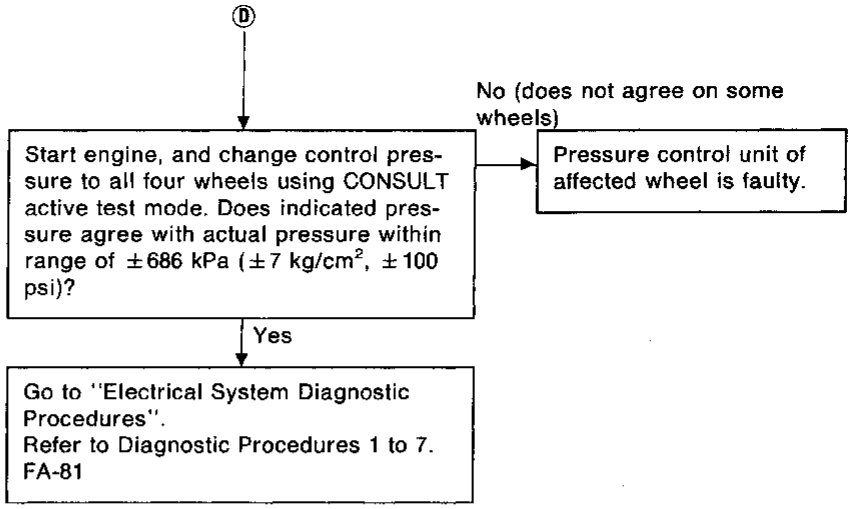
Ⓐ

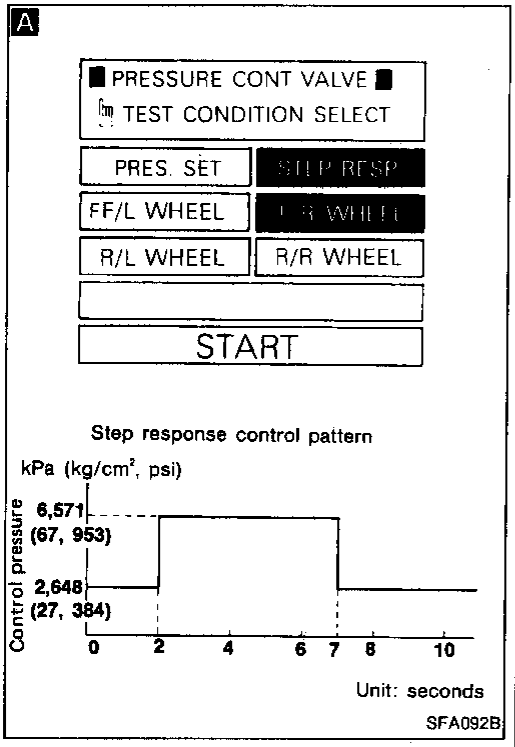
MEASURE CONTROL PRESSURE:

- With engine stopped, lift up vehicle until all four wheels are completely off the ground.
- Remove front right fender protector and rear pressure control unit protector.
- Loosen lock nut on each pressure detection port cock, and check that each cock is tightened to specified torque. Temporarily tighten each lock nut.
- Remove blind bolt.
  Be sure to loosen this bolt very carefully. Oil may spout out if cock is faulty.
- Install oil pressure gauge adapter (special tool) and brake pressure tester to each wheel.
  Securely tighten each joint. Do not forget to fit copper washer to adapter joint.
- Gradually loosen pressure detection port cock to the fully open position while making sure no oil is leaking out from any joint.
- Connect vinyl tube to air bleeder of brake fluid pressure tester. Loosen air bleeder gradually to allow air to bleed out completely, then tighten air bleeder.
  (1) Take care to prevent oil from getting on vehicle body when bleeding air.
  (2) After completing measurement, securely tighten each cock, and release residual pressure from air bleeder tester before disconnecting joints.
  (3) Do not forget to install blind bolts.

Ⓓ

Diagnostic Procedure 10 (Cont'd)





Diagnostic Procedure 11

SYMPTOM:

Abnormalities in driving stability and riding comfort

Driving stability or riding comfort deteriorated.

Any problem in vehicle height control? — Yes → Go to "Abnormalities of vehicle height control". Refer to Diagnostic Procedure 10. FA-98

No

Stop engine, and connect brake fluid pressure tester to pressure detection port.
For connection of brake fluid pressure tester, refer to Diagnostic Procedure 10. FA-98

A

CHECK CONTROL PRESSURE STEP RESPONSE.

- Connect CONSULT, and start engine. After vehicle height stabilizes, select "PRESSURE CONTROL VALVE STEP RESPONSE" mode of CONSULT active test. This will cause actuator control pressure to be regulated to 2,648 kPa (27 kg/cm^2, 384 psi) for all wheels.
- Under this condition, touch "START" key on CONSULT screen. This will cause control pressure of selected wheel to vary as shown at left. Check whether actual oil pressure follows this change in control value.

Normal → Go to "Electrical System Diagnostic Procedures". Refer to Diagnostic Procedures 1 to 7. FA-81

Oil pressure change is abnormal on only one wheel.

Oil pressure change is abnormal on both front wheels, or on both rear wheels. → Replace affected pressure control unit.

Oil pressure change is abnormal on all four wheels. → Ⓔ

Was problem solved?

Yes → END

No (Problem still exists). → Replace affected actuator.

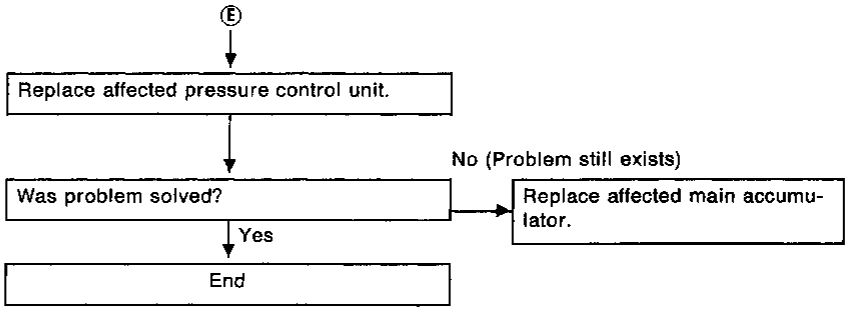
Is flow control valve operation normal on CONSULT data monitor screen?

No (Abnormal) → Go to "Electrical System Diagnostic Procedures". Refer to Diagnostic Procedures 1 to 7. FA-81

Yes (Normal)

Replace multi valve unit.

Diagnostic Procedure 11 (Cont'd)



Diagnostic Procedure 12

SYMPTOM: Noise

No.	Noise and features	Occurrence	Phenomenon accompanying noise	Check method and remedy
1	Thudding noise As if vehicle floor is being hit with a boulder	Heard directly after starting engine, or during cranking, or directly after cranking. Sometimes heard within 3 minutes after stopping engine.	Warning lamp illuminates due to drop in voltage	Open and close fail-safe valve using CONSULT. → Similar noise is not heard. → Check other causes. Similar noise is heard. → Charge or replace battery. → Re-check for noise. → No noise is heard. → END Noise is heard. → Replace multi valve.
2	Clicking noise As if floor is being hit with pebbles	1.5 to 2 seconds after starting engine		Re-start engine more than 3 minutes after stopping. → No noise is heard. → Check other causes. Noise is heard after starting engine. → Check return pipes of front and rear pressure control valves for vibration when noise is heard. → Replace unit where the greater vibration is felt.
3	Booming noise Like a steam whistle of a steamboat	Heard when driving on bad roads at low speeds and low engine rpm, or when suspension is continuously caused to oscillate largely. (When oil temperature is high)	Vibration of floor	Check by using method (a) or (b), preferably method (a). a Drive vehicle with CONSULT set in fail-safe mode. → *1 Noise is heard. → Check other causes. No noise is heard. → Replace pump accumulator. Noise is heard when wheels are moving up. b When oil temperature rises to 60°C (140°F) or higher, simultaneously move all four wheels up and down using CONSULT active test mode. → No noise is heard. → Check other cause. Re-check for noise during driving. → No noise is heard. → END Noise is heard. → Replace pump assembly.

Notes: *1: Note that the maximum vehicle speed is less than 30 km/h (19 MPH) when fail-safe valve is closed by CONSULT.
*2: This noise resembles A/T pump noise, but pitch is lower than that of A/T pump noise.
*3: Note that rattling noise can also be heard from engine. Rattling noise originating from pump will be heard distinctly at the inner side of front left tire house.
*4: The term "re-check" means inspection under normal condition (not in the CONSULT fail-safe mode, etc.).

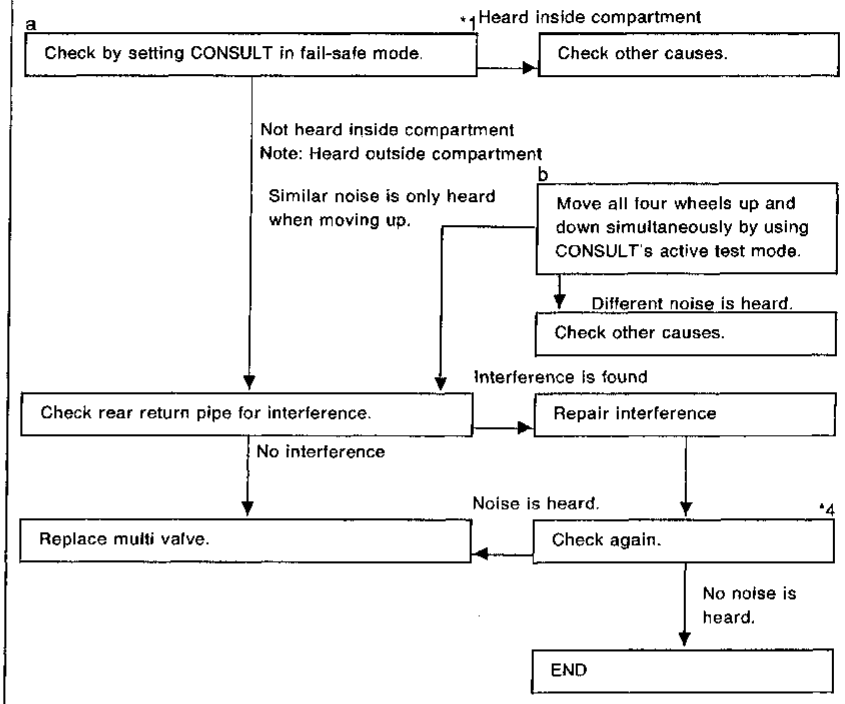
Diagnostic Procedure 12 (Cont'd)

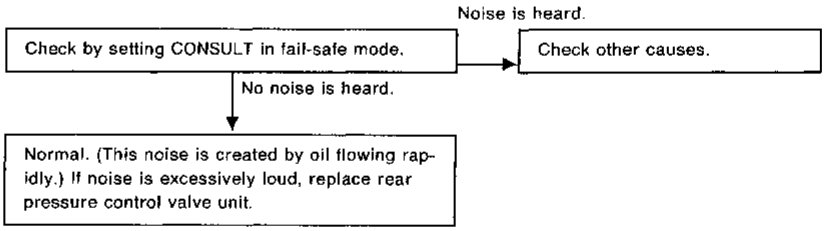
No.	Noise and features	Occurrence	Phenomenon accompanying noise	Check method and remedy
4	Creaking noise Like the noise heard when underfloor plumbing is vibrating	Heard when suspension oscillates slowly and broadly up and down, particularly during its compression stroke. Front side or rear side is the source of noise.	Often accompanied by noise of No. 5	Check by using methods (a) or (b), preferably method (a). a Drive vehicle with CONSULT set in fail-safe mode. *1 → Noise is heard. → Check other causes. No noise is heard. Bleed air from suspect pressure control unit. b Move all four wheels up and down simultaneously using CONSULT's active test mode. → Noise is heard. No noise is heard. → Check other causes. Check again during driving. → No noise is heard. → END Noise is heard. Replace pressure control unit.
5	Squeaking noise Like short, abrupt repetition of a whistle	Heard when suspension is abruptly caused to oscillate up and down during driving. Front side or rear side is the source of noise.	Accompanied by noise No. 4	Drive vehicle with CONSULT set in fail-safe mode. *1 → Noise is heard. → Check other causes. No noise is heard. Replace suspect pressure control unit.

Notes: *1: Note that the maximum vehicle speed is less than 30 km/h (19MPH) when fail-safe valve is closed by CONSULT.
*2: This noise resembles A/T pump noise, but pitch is lower than that of A/T pump noise.
*3: Note that rattling noise can also be heard from engine. Rattling noise originating from pump will be heard distinctly at the inner side of front left tire house.
*4: The term "re-check" means inspection under normal condition (not in the CONSULT fail-safe mode, etc.).

Diagnostic Procedure 12 (Cont'd)

No.	Noise and features	Occurrence	Phenomenon accompanying noise	Check method and remedy
6	Hissing noise (Heard from multi valve and surrounding portion) Like a breath escaping from between the teeth	Continuously heard while parked with engine idling, or when driving on a smooth road at low speeds.	—	Check by using method (a) or (b), preferably method (a).
7	Intermittent hissing noise Like short, intermittent version of (6)	Heard while parked with engine idling and vehicle is oscillated up and down (by passenger getting on or out of rear seat, or other reason). Heard particularly on rear right side outside vehicle.	—	





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Diagnostic Procedure 12 (Cont'd)

No.	Noise and features	Occurrence	Phenomenon accompanying noise	Check method and remedy
8	Whining noise A noise like a rotating motor sound	Intermittently heard at intervals of one to two minutes while parked with engine idling. This noise is heard only when oil temperature is high. It is heard from front left side on outside of vehicle.	Air is sucked from opening on left side of front bumper.	Turn oil cooler fan ON and OFF using CONSULT active test mode. → No noise is heard when turning ON. → Check other causes. ↓ Noise is heard when turning ON. Normal (Oil cooler fan operating noise)
9	Clacking noise A noise like the one emitted when a relay is broken	Heard only once from rear side of rear seat about 1 to 3 minutes after stopping engine.	—	Is noise accompanied by large change in vehicle height when oil temperature is normal? → No → Normal (Relay noise) ↓ Yes Replace multi valve.
10	Crashing noise A big bang as if the body bottom is hitting the ground	Heard when front wheel drives down a curb of 100 mm (3.94 in) or higher at speeds of 15 km/h (9 MPH) or higher.	—	Check by setting CONSULT in active test mode, with 9,807 kPa (100 kg/cm^2, 1,422 psi) applied to all four wheels. → Noise is heard. → Check other causes. ↓ No noise is heard. • Normal, if this noise is heard when driving down from a height of 100 mm (3.94 in) or higher at speeds of 15 km/h (9 MPH) or higher. • If this noise is heard when the curb height is lower than 100 mm (3.94 in) and speed is lower than 15 km/h (9 MPH), then replace front actuator.

Notes: *1: Note that the maximum vehicle speed is less than 30 km/h (19MPH) when fail-safe valve is closed by CONSULT.
*2: This noise resembles A/T pump noise, but pitch is lower than that of A/T pump noise.
*3: Note that rattling noise can also be heard from engine. Rattling noise originating from pump will be heard distinctly at the inner side of front left tire house.
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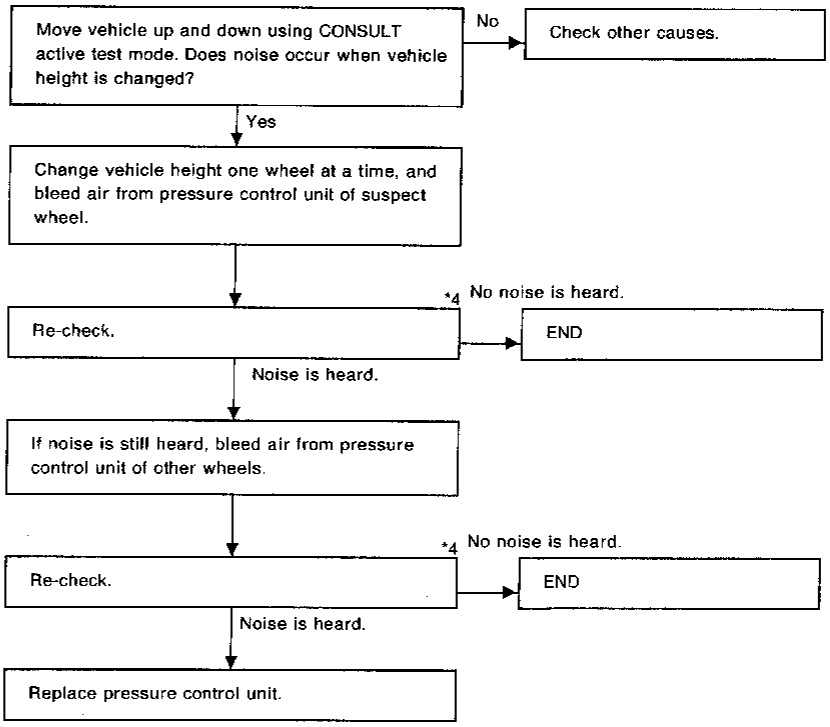
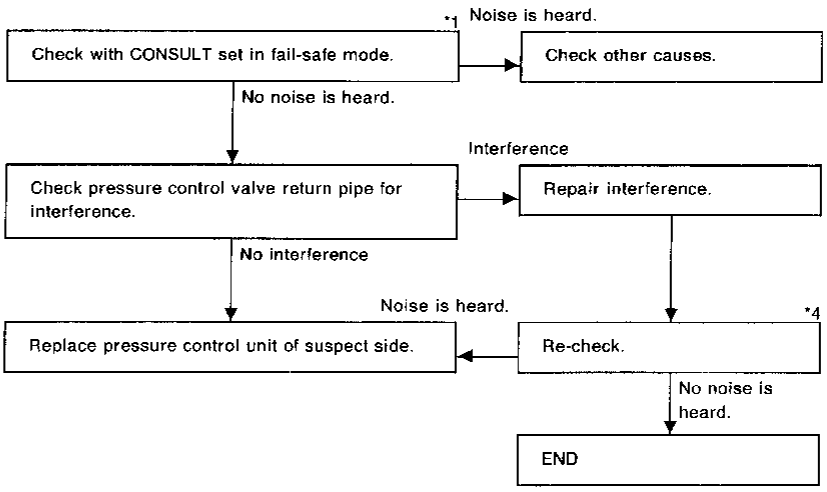
Diagnostic Procedure 12 (Cont'd)

No.	Noise and features	Occurrence	Phenomenon accompanying noise	Check method and remedy
11	Groaning noise Whirring sound like a fuel pump operating	Heard when vehicle body is swung back while braking at low speeds (especially when oil temperature is high)	—	
12	Tapping noise, or vibrating noise As if the suspension is being hit and vibrated	Heard from front or rear part of vehicle directly after driving over a small step or while driving on a bad road.	—	

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*3: Note that rattling noise can also be heard from engine. Rattling noise originating from pump will be heard distinctly at the inner side of front left tire house.
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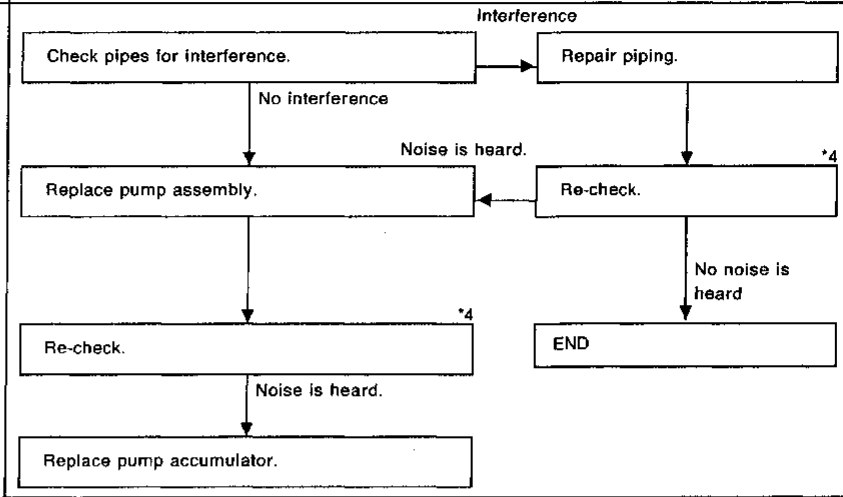
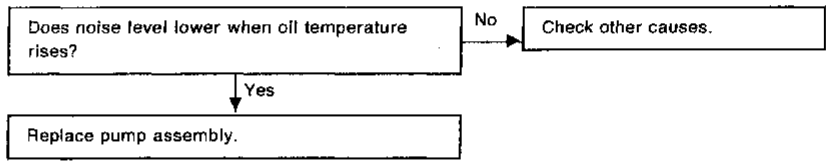
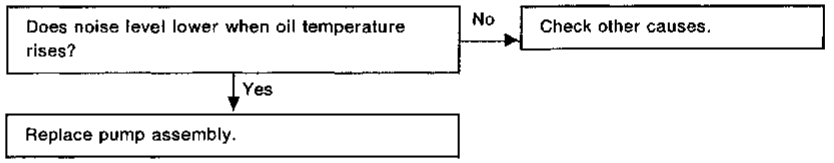
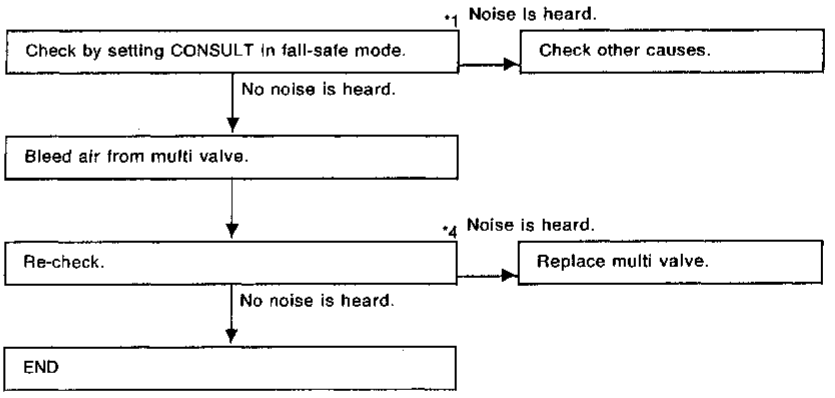
Diagnostic Procedure 12 (Cont'd)

No.	Noise and features	Occurrence	Phenomenon accompanying noise	Check method and remedy
13	Humming*2 noise Pumping noise like when power steering is operated with the vehicle stopped	Heard in compartment when engine speed is within range from idling to 1,300 rpm.	Sometimes accompanied by floor vibration	
14	Rattling*3 noise	Heard in compartment when engine is idling and still cold.	—	
15	Buzzing noise	Heard on outside of vehicle (left front part) when engine is still cold	—	
16	Creaking noise	Heard when starting engine, or when driving on a bad road at low engine rpms, or when suspension oscillates largely while driving (especially when oil temperature is low).	—	

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*3: Note that rattling noise can also be heard from engine. Rattling noise originating from pump will be heard distinctly at the inner side of front left tire house.
*4: The term "re-check" means inspection under normal condition (not in the CONSULT fail-safe mode, etc.).

Diagnostic Procedure 12 (Cont'd)

No.	Noise and features	Occurrence	Phenomenon accompanying noise	Check method and remedy
17	Heavy creaking noise	Heard when suspension oscillates largely.	—	Apply grease to rear active suspension upper side spring seat. ↓ Re-check. → (*4 Noise is heard.) Check other causes. ↓ No noise is heard. END
18	Rumbling noise	Heard when engine is idling or running at 1,500 rpm or higher.	—	Apply grease to rear active suspension upper side spring seat. ↓ Re-check. → (*4 Noise is heard.) Check other causes. ↓ No noise is heard. END
19	Whizzing or rushing noise	Heard on left outside of vehicle for a few seconds after stopping engine.	—	Check operation during suspect period indicated at left. → (No noise is heard.) Check other causes. ↓ Noise is heard during indicated period. • Normal (noise caused by rapid oil flow) • If noisy, even in compartment, replace multi valve.

Notes: *1: Note that the maximum vehicle speed is less than 30 km/h (19MPH) when fail-safe valve is closed by CONSULT.
*2: This noise resembles A/T pump noise, but pitch is lower than that of A/T pump noise.
*3: Note that rattling noise can also be heard from engine. Rattling noise originating from pump will be heard distinctly at the inner side of front left tire house.
*4: The term "re-check" means inspection under normal condition (not in the CONSULT fail-safe mode, etc.).

General Specifications

COIL SPRING

Applied model	Conventional suspension	Full-active suspension
Identification color	Yellow x 2	White

SHOCK ABSORBER

Applied model	Conventional suspension	Full-active suspension
Piston rod diameter mm (in)	12.5 (0.492)	25 (0.98)

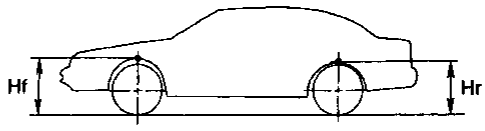
FRONT STABILIZER BAR

Applied model		With HICAS and full-active suspension	Without HICAS
Stabilizer diameter	mm (in)	28 (1.10)	29 (1.14)

TENSION ROD

Applied model		All
Rod diameter	mm (in)	20.0 (0.787)

WHEELARCH HEIGHT (Unladen*1)



SFA818A

Applied model		Conventional suspension	Full-active suspension	
			Engine running *2	Reference (Engine stopped*3)
Front (Hf)	mm (in)	706 (27.80)	687 (27.05)	694 (27.32)
Rear (Hr)	mm (in)	696 (27.40)	667 (26.26)	679 (26.73)

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
*2: Unladen, engine running and height control switch in normal (N) position.
*3: • The data obtained when engine is stopped are reference values. For standard values, use the data obtained by running engine.
• Conditions when engine is stopped:
Unladen, full-active fluid temperature 60 ± 4°C (140 ± 7.2°F).
Ignition switch "OFF" after driver gets out of the vehicle.
• For wheelarch height measurement, wait at least 3 minutes after engine has stopped:

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Applied model	Conventional suspension	Full-active suspension	
		Engine running*3	Reference (Engine stopped*4)
Camber degree	–1°35′ to –0°05′	–1°40′ to –0°10′	–1°35′ to –0°05′
Caster degree	5°45′ - 7°15′	6°10′ - 7°40′	5°55′ - 7°25′
Kingpin inclination degree	12°00′ - 13°30′	12°10′ - 13°40′	
Toe-in			
A – B mm (in)	0 - 2 (0 - 0.08)	–1 to 1 (–0.04 to 0.04)	
Total angle 2θ degree	0′ - 10′	–5′ to 5′	
Front wheel turning angle			
Full turn*2 degree			
Inside	35°30′ - 39°30′	35° - 39°	
Outside	32°	32°	

*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.
*3: Unladen, engine running and height control switch in normal (N) position.
*4: • The data obtained when engine is stopped are reference values. For standard values, use the data obtained by running engine.
• Conditions when engine is stopped:
Unladen, full-active fluid temperature 60 ± 4°C (140 ± 7.2°F).
Ignition switch "OFF" after driver gets out of the vehicle.
• For alignment measurement, wait at least 3 minutes after engine has stopped:

WHEEL BEARING

Wheel bearing axial end play limit mm (in)	0.05 (0.0020)
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	206 - 284 (21 - 29, 152 - 210)

LOWER BALL JOINT

Swing force (Measuring point: cotter pin hole of ball stud) N (kg, lb)	7.8 - 53.0 (0.8 - 5.4, 1.8 - 11.9)
Turning torque N·m (kg-cm, in-lb)	0.49 - 3.43 (5.0 - 35, 4.3 - 30.4)
Vertical end play mm (in)	0 (0)

WHEEL RUNOUT (Radial and lateral)

Unit: mm (in)

Wheel type	Aluminum wheel
Radial runout limit	0.3 (0.012)
Lateral runout limit	0.3 (0.012)