SECTION FSU
FRONT SUSPENSION

CONTENTS

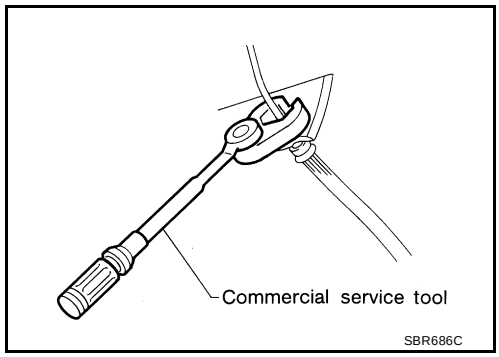
PRECAUTIONS

PFP:00001

Precautions

EES000D0

- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  Oil will shorten the life of rubber bushes. Be sure to wipe off any spilled oil.
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **After installing removed suspension parts, check wheel alignment and adjust if necessary.**
- **Use flare nut wrench when removing or installing brake tubes.**
- **Always torque brake lines when installing.**
- **Lock nuts are unreusable parts; always use new ones.**
  When replacing, do not wipe the oil off the new lock nut before tightening.



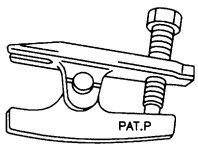
PREPARATION

PFP:00002

Special Service Tools

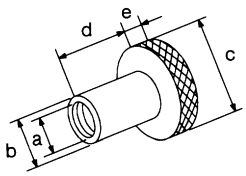
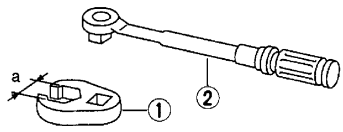
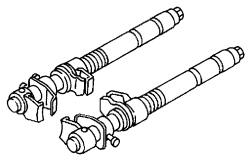
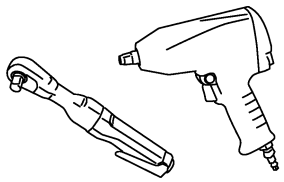
EES000D1

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

Tool number (Kent-Moore No.) Tool name		Description
HT72520000 (J25730-A) Ball joint remover	 NT146	Removing tie-rod outer end and lower ball joint

Commercial Service Tools

EES000D2

Tool name		Description
Attachment Wheel alignment	 NT148	Measure wheel alignment **a: Screw M24 x 1.5 pitch** **b: 35 mm (1.38 in) dia.** **c: 65 mm (2.56 in) dia.** **d: 56 mm (2.20 in)** **e: 12 mm (0.47 in)**
1 Flare nut crowfoot 2 Torque wrench	 NT360	Removing and installing each brake piping **a: 10 mm (0.39 in)**
Spring compressor	 NT717	Removing and installing coil spring
Power tool	 PBIC0190E	Loosening bolts and nuts

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EES000D3

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

		Reference page	FSU-5	FSU-9	FSU-10	—	FSU-10	FSU-5	FSU-6	FSU-11	WT-3	WT-4	WT-6	—	—	—	WT-6	FAX-4	FAX-4	Refer to SUSPENSION in this chart.	Refer to TIRES in this chart.	Refer to ROAD WHEEL in this chart.	BR-5	PS-5
		Possible Cause and SUSPECTED PARTS	Improper installation, looseness	Shock absorber deformation, damage or deflection	Bushing or mounting	Parts interference	Spring fatigue	Suspension looseness	Incorrect wheel alignment	Stabilizer bar fatigue	Out-of-round	Imbalance	Incorrect air pressure	Uneven tire wear	Deformation or damage	Non-uniformity	Incorrect tire size	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES	STEERING
Symptom	SUSPENSION	Noise	×	×	×	×	×	×										×	×		×	×	×	×
		Shake	×	×	×	×		×										×	×		×	×	×	×
		Vibration	×	×	×	×	×											×	×		×			×
		Shimmy	×	×	×	×			×										×		×	×	×	×
		Judder	×	×	×														×		×	×	×	×
		Poor quality ride or handling	×	×	×	×	×		×	×									×		×	×		
	TIRES	Noise	×								×	×	×	×	×	×		×	×	×		×	×	×
		Shake	×								×	×	×	×	×		×	×	×	×		×	×	×
		Vibration											×				×	×	×	×				×
		Shimmy	×								×	×	×	×	×	×	×		×	×		×	×	×
		Judder	×								×	×	×	×	×		×		×	×		×	×	×
		Poor quality ride or handling	×								×	×	×	×	×		×		×	×		×		
	ROAD WHEEL	Noise	×								×	×			×			×	×	×	×		×	×
		Shake	×								×	×			×			×	×	×	×		×	×
		Shimmy, Judder	×								×	×			×				×	×	×		×	×
		Poor quality ride or handling	×								×	×			×				×	×	×			

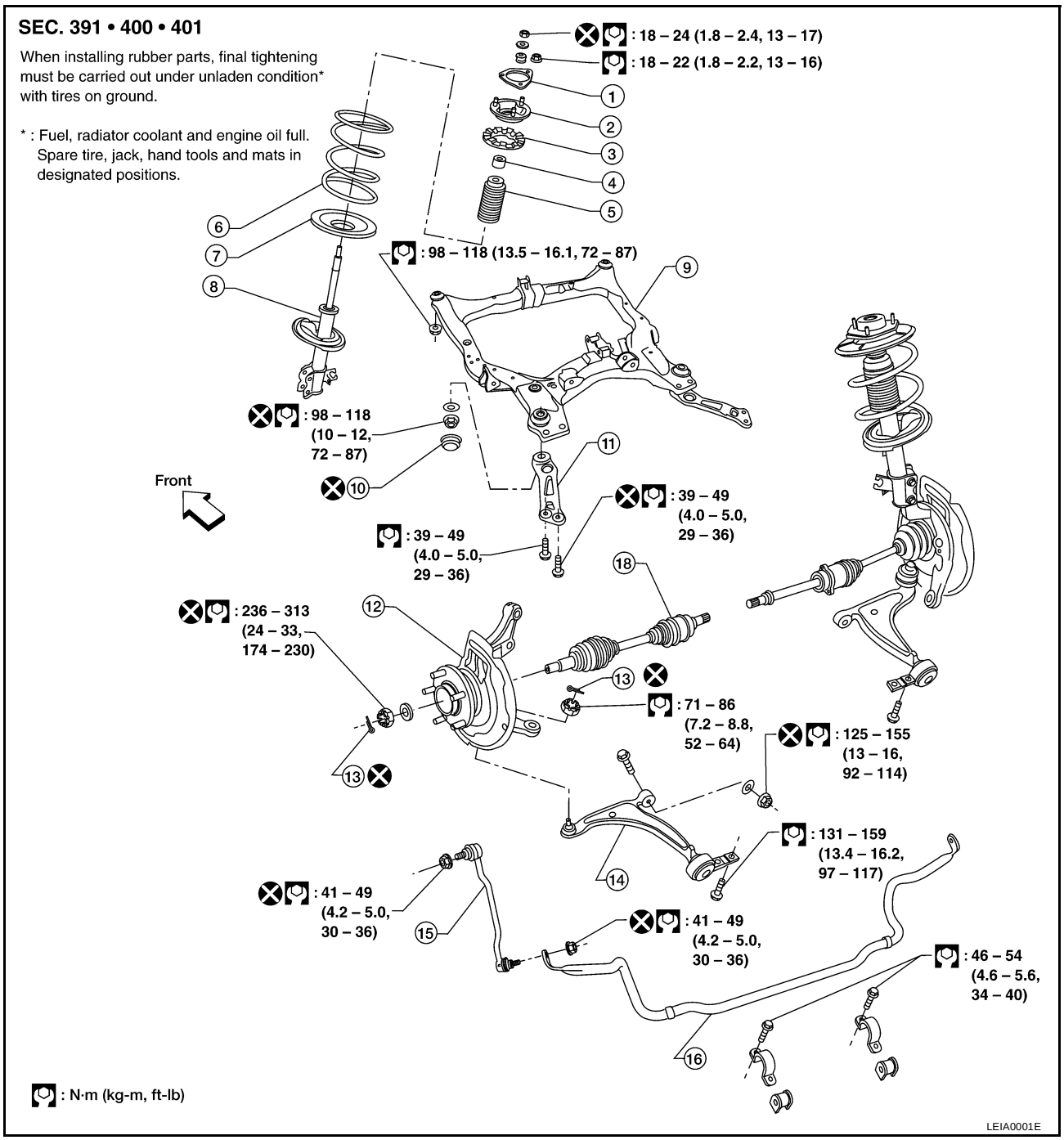
×: Applicable

FRONT SUSPENSION ASSEMBLY

PFP:54010

Components

EES000D4



1. Gasket
2. Shock absorber mounting insulator
3. Upper rubber seat
4. Shock absorber bushing
5. Dust cover
6. Coil spring
7. Lower rubber seat
8. Shock absorber
9. Front suspension member
10. Cap
11. Member pin stay
12. Wheel hub and steering knuckle assembly
13. Cotter pin
14. Transverse link
15. Connecting rod
16. Stabilizer bar

On-vehicle Service

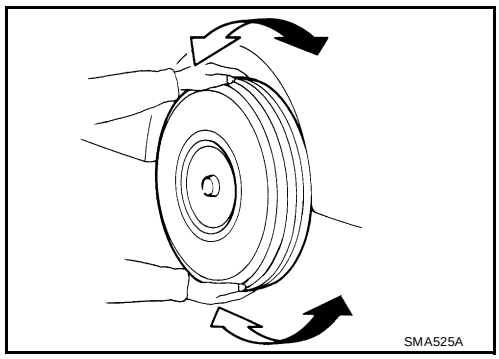
EES000D5

FRONT SUSPENSION PARTS

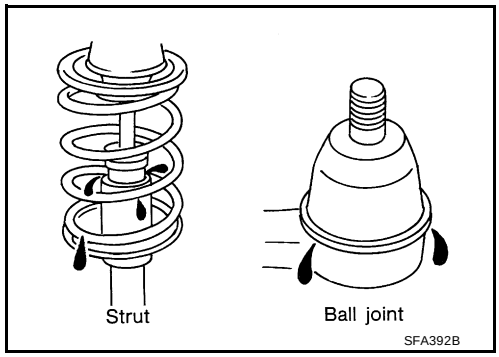
Check front axle and front suspension parts for excessive play, cracks, wear or other damage.

- Shake each front wheel to check for excessive play.
- Make sure that cotter pin is inserted.
- Retighten all axle and suspension nuts and bolts to the specified torque.

Tightening torque : Refer to FSU-5, "Components" .



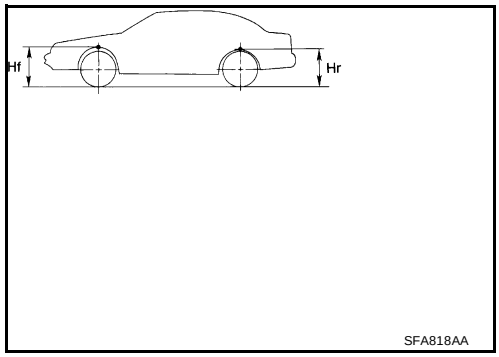
- Check strut (shock absorber) for oil leakage or other damage.
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.
  If ball joint dust cover is cracked or damaged, replace transverse link.



- Check spring height from top of wheelarch to the ground.
  - 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.
  - Bounce vehicle up and down several times before measuring.

Standard height : Refer to FSU-16, "Wheelarch Height (Unladen*)" .

  - Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.



Front Wheel Alignment

EES000D6

DESCRIPTION

Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

PRELIMINARY INSPECTION

- Check tires for wear and improper inflation.
- Check wheel runout.

Wheel runout : Refer to WT-3, "Inspection" .

- Check front wheel bearings for looseness.
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen).

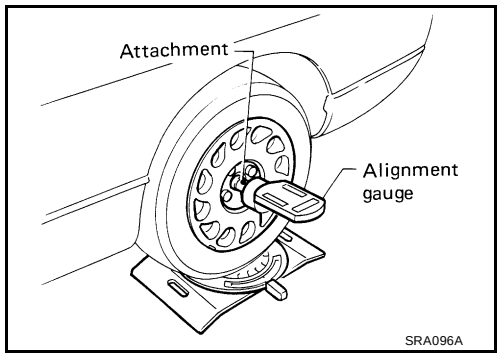
CAMBER, CASTER AND KINGPIN INCLINATION

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

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.

Camber, caster and kingpin inclination : Refer to FSU-15, "Front Wheel Alignment (Unladen*1)" .

2. If camber, caster or kingpin inclination is not within specification, inspect front suspension parts. Replace damaged or worn out parts.



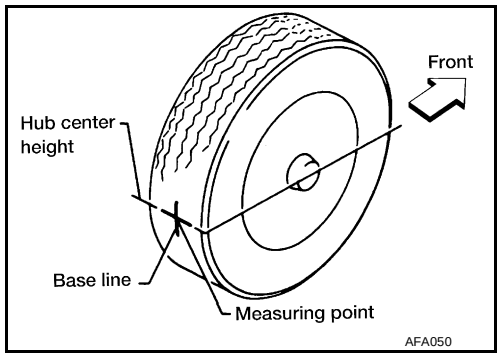
TOE-IN

Measure toe-in using the following procedure.

WARNING:

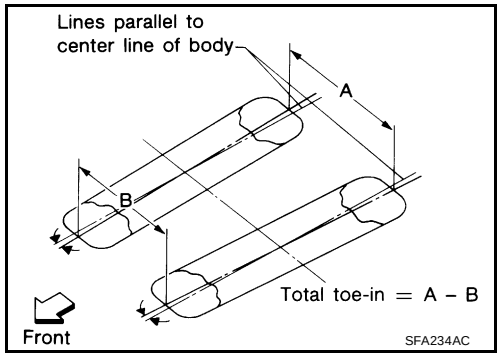
- **Always perform the following procedure on a flat surface.**
- **Make sure that no person is in front of the vehicle before pushing it.**

1. Bounce front of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead about 5 m (16 ft).
3. Put a mark on base line of tread (rear side) of both tires at the same height as hub center. These are measuring points.



4. Measure distance “A” (rear side).
5. Push the vehicle slowly ahead to rotate the wheels 180 degrees (1/2 turn).
   If the wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.
6. Measure distance “B” (front side).

Total toe-in : Refer to FSU-15, "Front Wheel Alignment (Unladen*1)" .



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

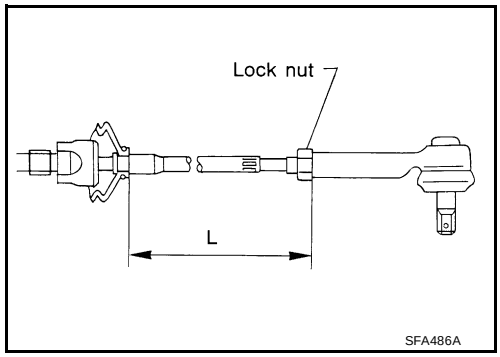
a. Loosen lock nuts.

b. Adjust toe-in by screwing tie-rods in and out.

Standard length “L” : Refer to PS-27, "Steering Gear and Linkage" .

c. Tighten lock nuts to specified torque.

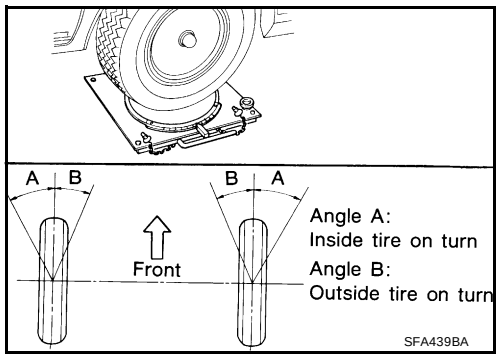
Lock nut tightening torque : Refer to PS-13, "Removal and Installation" .



FRONT WHEEL TURNING ANGLE

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

Wheel turning angle (Full turn) **: Refer to FSU-15, "Front Wheel Alignment (Unladen*1)" .**



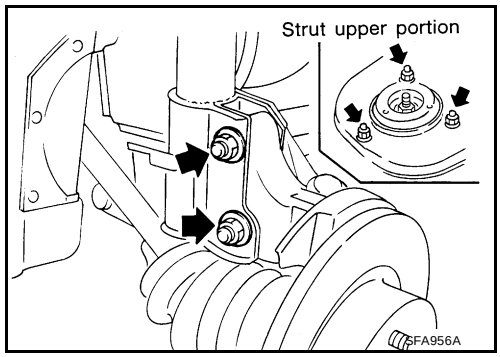
COIL SPRING AND SHOCK ABSORBER

PFP:56210

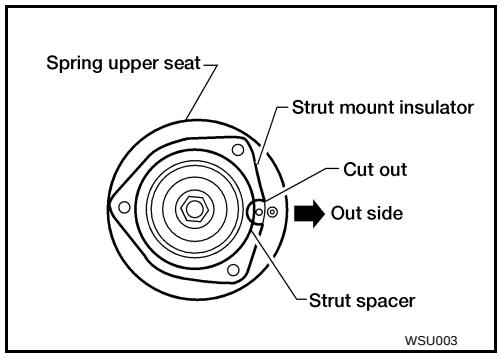
Removal and Installation

EES000D7

- Remove shock absorber fixing bolts and nuts, using power tool.
- **Do not remove piston rod lock nut on vehicle.**



- When installing strut spacer, it must be positioned as shown.



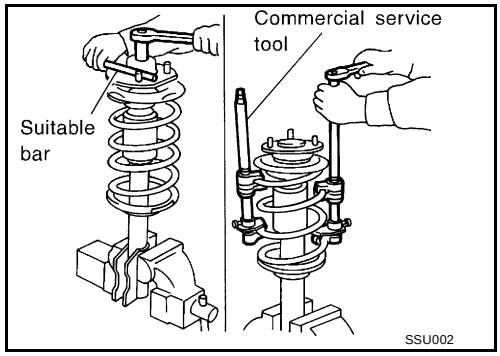
Disassembly

EES000D8

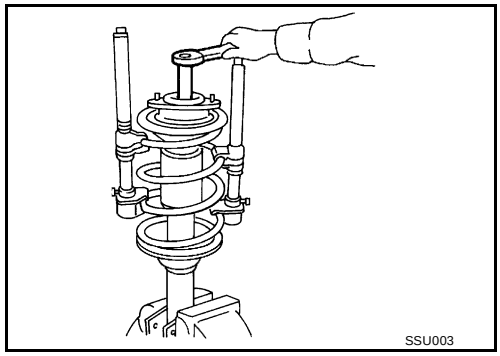
1. Set shock absorber on vise, then **loosen** piston rod lock nut.
   - **Do not remove piston rod lock nut at this time.**
2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.

   WARNING:

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



3. Remove piston rod lock nut.



Inspection

EES000D9

SHOCK ABSORBER ASSEMBLY

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

MOUNTING INSULATOR AND RUBBER PARTS

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

THRUST BEARING

- Check thrust bearing parts for abnormal noise or excessive rattle in axial direction and replace if necessary.

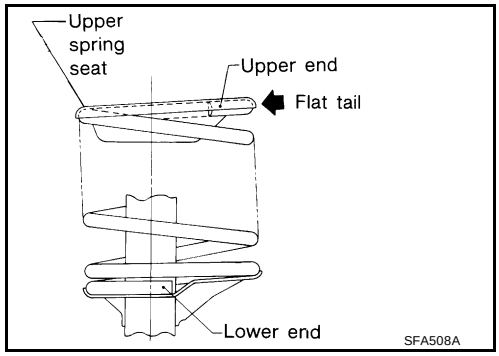
COIL SPRING

- Check for cracks, deformation or other damage and replace if necessary.

Assembly

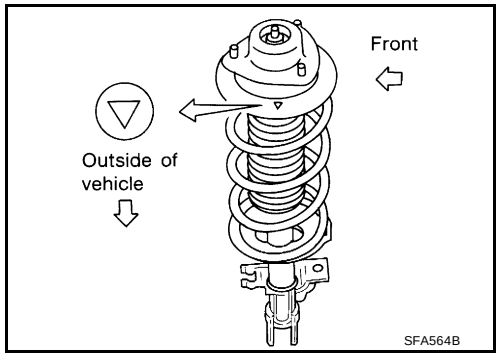
EES000DA

- When installing coil spring on strut, it must be positioned as shown.



- Install upper spring seat with alignment mark facing the outer side of vehicle, in line with strut-to-knuckle attachment points.
- **Replace strut lower mounting nuts.**
- **When installing strut to knuckle, be sure to hold bolts and tighten nuts.**

: 126 - 155 N·m (12.8 - 15.8 kg-m, 93 - 114 ft-lb)



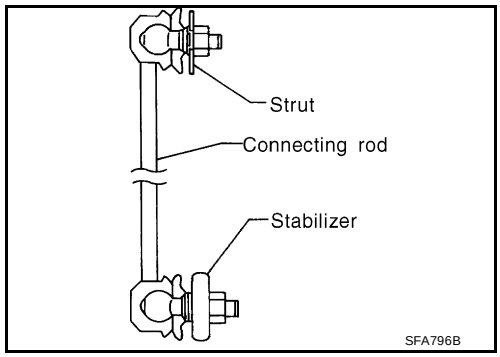
STABILIZER BAR

PFP:54611

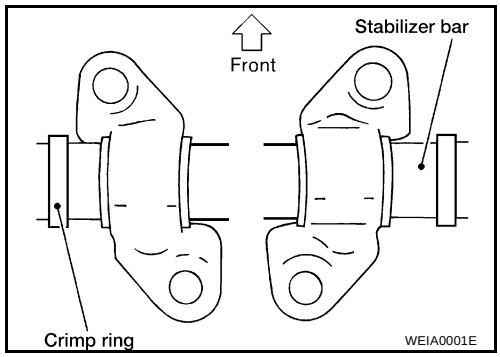
Removal and Installation

EES000DB

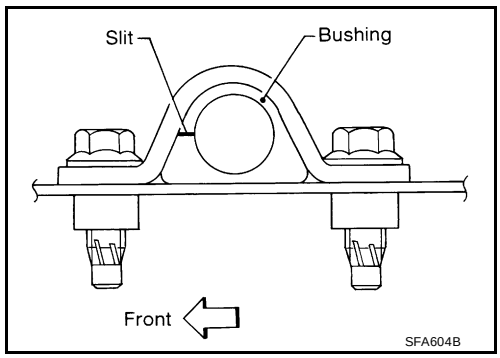
- Remove stabilizer bar, using power tool.
  - Prevent the stabilizer connecting rod from turning by inserting a hex wrench into the end of the ball stud, then remove nut.



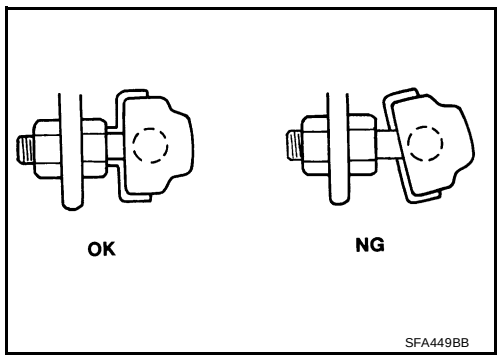
- When installing stabilizer, make sure that the clamps are facing in the correct direction as shown.



- Make sure that slit in bushing is in the position as shown.



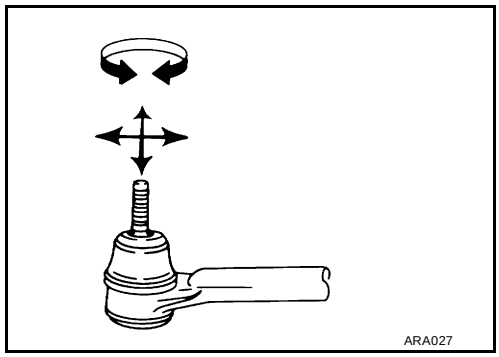
- Install stabilizer bar with ball joint socket properly placed.



Inspection

EES000DC

- Check stabilizer for deformation or cracks and replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.
- Check ball joint can rotate in all directions. If movement is not smooth and free, replace stabilizer bar connecting rod.



TRANSVERSE LINK

PFP:54500

Removal and Installation

EES000DD

REMOVAL

1. Remove the steering knuckle from the transverse link, using power tool. Refer to FAX-6, "Removal and Installation" .
2. Remove the mounting nuts using power tool, and washer and bushing from the lower side of the stabilizer connecting rod.
3. Loosen the transverse link mounting bolts a little, using power tool.
4. Remove mounting bolts from the compression rod bracket, using power tool.
5. Remove the mounting bolts and nuts from the transverse link, then remove it from the suspension member.

INSPECTION AFTER REMOVAL

Visual Check

- 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.

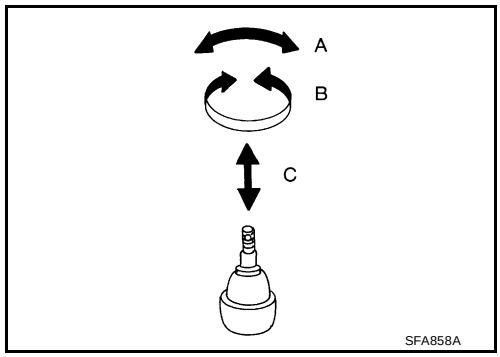
Lower Ball Joint

- Check ball joint for excessive play. Replace transverse link assembly if any of the following exists:
- Ball stud is worn.
- Joint is hard to swing.
- Play in axial direction is excessive.

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

Swinging Force

Swinging force “A” (measuring from cotter pin hole of ball stud)	**: 7.8 - 54.9 N (0.8 - 5.6 kg-f, 1.8 - 12.3 lb-f)**



Turning Force

Turning torque “B”	**: 0.49 - 3.43 N·m (5.0 - 35.0 kg-cm, 4.3 - 30.4 in-lb)**

Vertical End Play

Vertical end play “C”	**: 0 mm (0 in)**

- Check dust cover for damage. Replace it and cover clamp if necessary.

INSTALLATION

- Tighten transverse link mounting bolts to specified torque, refer to FSU-5, "Components" . During installation, final tightening must be carried out at curb weight with tires on ground.
- After installation, check wheel alignment. Refer to FSU-6, "Front Wheel Alignment" .

FRONT SUSPENSION MEMBER

PFP:54401

Removal and Installation

EES000DE

REMOVAL

1. Remove the engine under cover and splash shields using power tools.
2. Remove the transverse link from the front suspension member using power tools. Refer to FSU-13, "Removal and Installation" .
3. Remove the front exhaust tube from the vehicle using power tool. Refer to EX-3, "Removal and Installation" (QR25DE) or EX-6, "Removal and Installation" (VQ35DE).
4. Remove the power steering line bracket from the suspension member.
5. Remove the mounting bolts on the lower side of the steering gear.
6. Set a transmission jack on the suspension member, then remove mounting nuts from the suspension member using power tool.
7. Remove the mounting bolts from the front suspension member pin stay on the vehicle body side using power tool.
8. Remove the through bolts from the front and rear engine mounts.
9. Lower the transmission jack slowly, then remove the suspension member from the vehicle.
   - If necessary, remove the exhaust hanger bracket from the front suspension member.

INSTALLATION

Installation is in the reverse order of removal.

- Tighten the stabilizer bar and connecting rod nuts and bolts to specifications. Refer to FSU-5, "Components" .

  CAUTION:
  Tighten each part with vehicle on ground under complete curb condition.
- Install the stabilizer bar bushings and brackets in the specified orientation. Refer to FSU-11, "Removal and Installation" .
- Tighten the steering gear mounting bolts to specification. Refer to PS-13, "Removal and Installation" .
- Check the wheel alignment. Refer to FSU-6, "Front Wheel Alignment" .

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications (Front)

EES000DF

Suspension type	Independent MacPherson strut
Shock absorber type	Double-acting hydraulic
Stabilizer bar	Standard equipment

Front Wheel Alignment (Unladen*1)

EES000DG

Tire size			205/65R16	215/55R17
Camber Degree minute (Decimal degree)		Minimum	–1°00′ (–1.00°)	
		Nominal	–0°15′ (–0.25°)	
		Maximum	0°30′ (0.50°)	
		Left and right difference	45′ (0.75°) or less	
Caster Degree minute (Decimal degree)		Minimum	2°05′ (2.08°)	
		Nominal	2°50′ (2.83°)	
		Maximum	3°35′ (3.58°)	
		Left and right difference	45′ (0.75°) or less	
Kingpin inclination Degree minute (Decimal degree)		Minimum	13°50′ (13.83°)	
		Nominal	14°35′ (14.58°)	
		Maximum	15°20′ (15.33°)	
Total toe-in	Distance (A – B) mm (in)	Minimum	–0.5 (–0.02)	
		Nominal	0.5 (0.02)	
		Maximum	1.5 (0.06)	
	Angle (left plus right) Degree minute (Decimal degree)	Minimum	–4′ (–0.07°)	
		Nominal	2′ (0.03°)	
		Maximum	8′ (0.13°)	
Wheel turning angle Full turn*2	Inside Degree minute (Decimal degree)	Minimum	34°30′ (34.5°)	32°00′ (32.0°)
		Nominal	38°00′ (38.0°)	35°30′ (35.5°)
		Maximum	39°00′ (39.0°)	36°30′ (36.5°)
	Outside Degree minute (Decimal degree)	Nominal	30°30′ (30.5°)	29°00′ (29.0°)

*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.

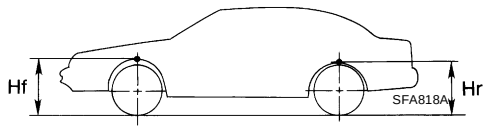
Lower Ball Joint

EES000DH

Swinging force “A” (Measuring point: cotter pin hole of ball stud) N (kg-f, lb-f)	7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3)
Turning torque “B” N·m (kg-cm, in-lb)	0.49 - 3.43 (5.0 - 35.0, 4.3 - 30.4)
Vertical end play “C” mm (in)	0 (0)

Wheelarch Height (Unladen*)

EES000DI



Engine	QR25DE	VQ35DE
Tire	205/65R16	215/55R17
Front (Hf) mm (in)	731 (28.78)	726 (28.58)
Rear (Hr) mm (in)	705 (27.75)	700 (27.56)

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