

SECTION

FSU

FRONT SUSPENSION

A

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C

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# PRECAUTIONS

## PRECAUTIONS

PFP:00001

### Caution

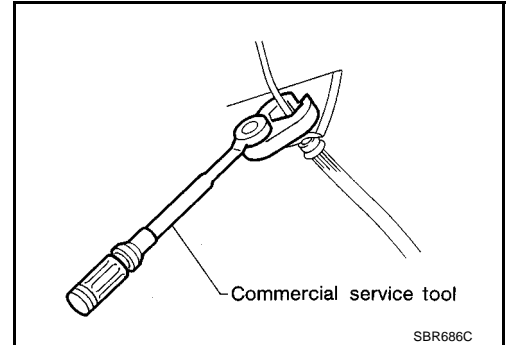
EES0013O

- When installing rubber bushings, final tightening must be carried out under unladen conditions with tires on flat, level ground. Oil will shorten the life of rubber bushings. Be sure to wipe off any spilled oil.
- "Unladen condition" means that fuel, coolant and lubricant are full and ready for drive. However, spare tire, jack, and hand tools should be unloaded.
- After installing the removed suspension parts, always check wheel alignment and adjust if necessary.
- Replace the caulking nut with a new one. Install a new nut without wiping the oil off before tightening.

### Precautions for Brake System

EES0013P

- 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.
- Use flare nut wrench when removing or installing brake tubes.
- After installing removed suspension parts, check wheel alignment and adjust if necessary.
- Always torque brake lines when installing.



# PREPARATION

## PREPARATION

PFP:00002

## Special Service Tools

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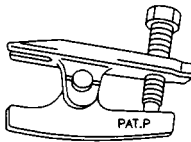
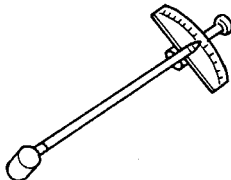
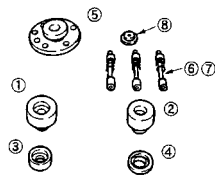
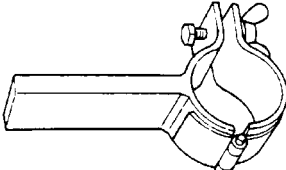
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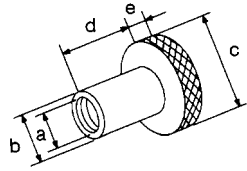
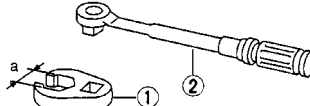
L

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Tool name Tool number	Description
HT7252000 Ball joint remover  S-NT146	Removing tie-rod outer and lower ball joint
Preload gauge ST3127S000  ZZA0806D	Measuring ball joint sliding torque
CCK gauge attachment KV991040S1 <ul style="list-style-type: none"> <li>1 KV99104020 Adapter A</li> <li>2 KV99104030 Adapter B</li> <li>3 KV99104040 Adapter C</li> <li>4 KV99104050 Adapter D</li> <li>5 KV99104060 Plate</li> <li>6 KV99104070 Guide bolt</li> <li>7 KV99104080 Spring</li> <li>8 KV99104090 Center plate</li> </ul>  ZZA1167D	Measuring wheel alignment
Strut attachment ST35652000  ZZA0807D	Disassembling and assembling strut

## Commercial Service Tools

EES0013R

Tool name	Description
Attachment 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) dia. e: 12 mm (0.47 in) dia.  S-NT148	Measure wheel alignment
1. Flare nut crowfoot 2. Torque wrench a: 10 mm (0.39 in)  S-NT360	Removing and installing brake piping

# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

## NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

### NVH Troubleshooting Chart

EES0013S

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

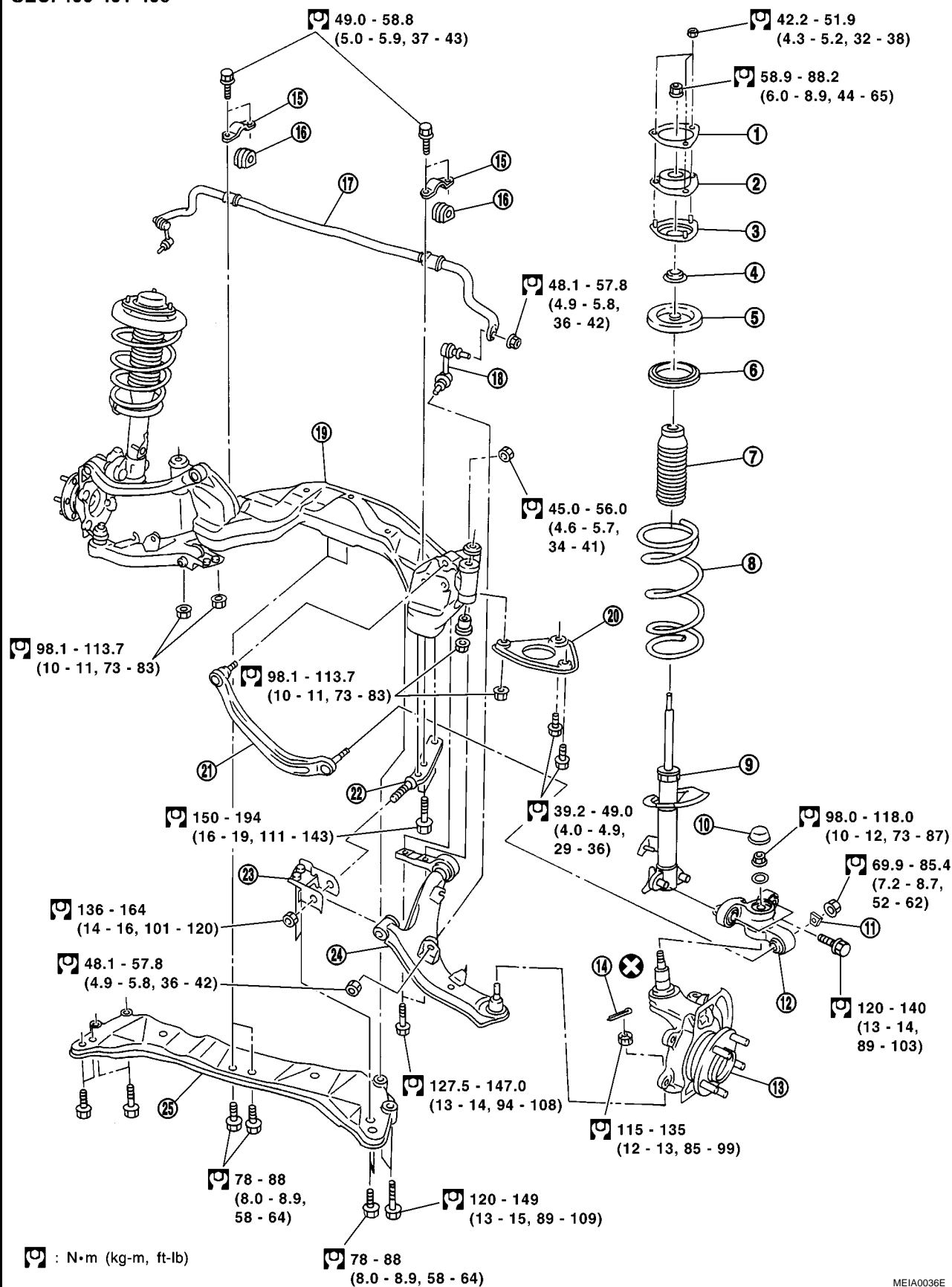
Reference page			Refer to <a href="#">FSU-5</a>	Refer to <a href="#">FSU-8</a>	—	—	—	Refer to <a href="#">FSU-5</a>	Refer to <a href="#">FSU-6</a>	Refer to <a href="#">FSU-11</a>	NVH in RAX and RSU section.	NVH in WT section.	NVH in WT section.	NVH in FAX section.	NVH in BR section.	NVH in PS section.
Possible cause and SUSPECTED PARTS			Improper installation, looseness	Shock absorber deformation, damage or deflection	Bushing or mounting deterioration	Parts interference	Spring fatigue	Suspension looseness	Incorrect wheel alignment	Stabilizer bar fatigue	REAR AXLE AND REAR SUSPENSION	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES	STEERING
Symptom	FRONT SUSPENSION	Noise	x	x	x	x	x	x			x	x	x	x	x	x
		Shake	x	x	x	x		x			x	x	x	x	x	x
		Vibration	x	x	x	x	x				x	x		x		x
		Shimmy	x	x	x	x			x		x	x	x		x	x
		Judder	x	x	x						x	x	x		x	x
		Poor quality ride or handling	x	x	x	x	x		x	x	x	x	x			

x: Applicable

## Components

EES0013T

SEC. 400•401•406



MEIA0036E

# FRONT SUSPENSION ASSEMBLY

- |                         |                             |                               |
|-------------------------|-----------------------------|-------------------------------|
| 1. Strut spacer         | 2. Strut mount insulator    | 3. Strut upper bracket        |
| 4. Thrust bearing       | 5. Spring upper seat        | 6. Upper rubber seat          |
| 7. Bound bumper         | 8. Coil spring              | 9. Shock absorber (and strut) |
| 10. Cap                 | 11. Washer                  | 12. Third link                |
| 13. Axle assembly       | 14. Cotter pin              | 15. Clamp                     |
| 16. Bushing             | 17. Stabilizer bar          | 18. Connecting rod            |
| 19. Suspension member   | 20. Member pin stay         | 21. Upper link                |
| 22. Bushing link pin    | 23. Transverse link bracket | 24. Transverse link           |
| 25. Suspension crossbar |                             |                               |

## On-Vehicle Inspection and Service

### LOOSENESS, BACKLASH AND DAMAGE OF MOUNTING PARTS AND CONNECTIONS

EES0013U

Lift vehicle and inspect the following:

- Check mounting point of each component for looseness, backlash and damage.
  - Check lower ball joint end play.
1. Attach a dial gauge so that the contact rests on the brake caliper.
  2. Set front wheels in a straight-ahead position. Do not depress brake pedal.
  3. Measure axial end play by placing an iron pry bar or something similar between transverse link and steering knuckle.

**Axial end play : 0 mm (0 in)**

#### CAUTION:

**Be careful not to damage ball joint boot.**

4. If axial end play is outside the standard, remove transverse link and check lower ball joint.

## Wheel Alignment DESCRIPTION

EES0013V

- Measure wheel alignment under unladen conditions. "Unladen conditions" means that fuel, coolant, and lubricant are full. However, spare tire, jack, and hand tools should be unloaded.

### PRELIMINARY INSPECTION

1. Check the tires for improper air pressure and wear.
2. Check road wheels for runout.
3. Check wheel bearing axial end play.
4. Check lower ball joint axial end play.
5. Check strut operation.
6. Check each mounting point of axle and suspension for looseness and deformation.
7. Check each link and arm for cracks, deformation, and other damage.
8. Check the vehicle posture.

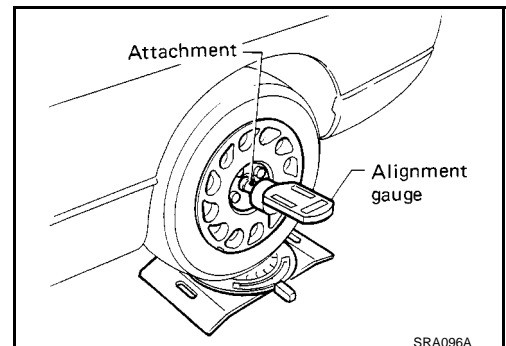
### INSPECTION OF CAMBER, CASTER, AND KINGPIN INCLINATION ANGLES

- Camber, caster, and kingpin inclination angles cannot be adjusted.
  - Before inspection, mount front wheels onto turning radius gauge. Mount rear wheels onto a stand that has same height so the vehicle will remain horizontal.
1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.

**Camber, caster and kingpin inclination:**

**FSU-15, "SERVICE DATA AND SPECIFICATIONS (SDS)"**

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



# FRONT SUSPENSION ASSEMBLY

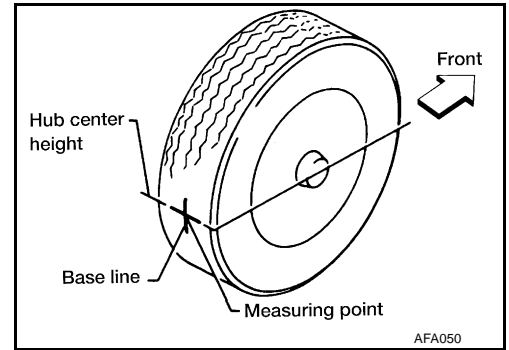
## Toe-in

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.



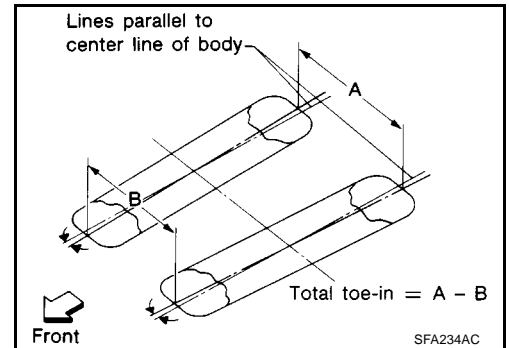
4. Measure distance "A" (rear side).
5. Push the vehicle slowly ahead to rotate the wheels 180degrees (1/2 turn).

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:**

**FSU-15, "SERVICE DATA AND SPECIFICATIONS (SDS)"**



## STEERING ANGLE INSPECTION

1. Set wheels in straight-ahead position. Move vehicle to set front wheels on turning radius gauge.
2. Turn steering wheel fully to right and left, and measure steering angle. Refer to **PS-18, "SERVICE DATA AND SPECIFICATIONS (SDS)"**.

# COIL SPRING AND SHOCK ABSORBER

## COIL SPRING AND SHOCK ABSORBER

PFP:54302

### Removal and Installation

#### REMOVAL

1. Remove tires. Remove brake caliper and hung it aside.

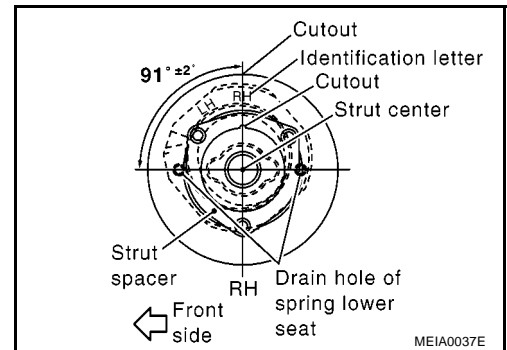
#### **CAUTION:**

**Avoid depressing brake pedal with brake caliper removed.**

2. Remove electrical wires of ABS wheel speed sensor from strut.
3. Remove brake hose lock plate.
4. Remove mounting bolts securing third link to strut.
5. Remove mounting nuts on top of strut and remove upper mounting plate and strut from vehicle.

#### INSTALLATION

- Refer to [FSU-5, "Components"](#) in "Front Suspension Assembly" for tightening torque. Tighten in the reverse order of removal.
- Be sure the identification letters on spring upper seat are positioned as shown. Also be sure cutout in strut spacer is positioned as shown. Then install strut.



### Disassembly and Assembly

#### DISASSEMBLY

1. Install strut attachment to strut and fix it in a vise.

#### **CAUTION:**

**When installing strut attachment, wrap a shop cloth around strut to protect it from damage.**

2. Slightly loosen piston rod lock nut.

#### **WARNING:**

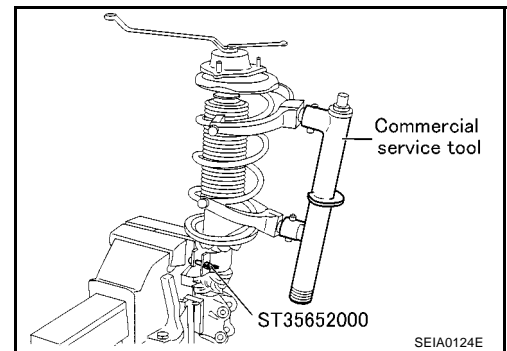
**Do not remove piston rod lock nut completely. If it is removed completely, coil spring jumps out and may cause serious damage or injury.**

3. Compress coil spring using a spring compressor.

#### **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.**

4. After making sure coil spring is free between upper and lower seats after Step 3. Remove piston rod lock nut.
5. Remove small parts on strut.
  - Remove strut spacer, strut mount insulator, thrust bearings, spring upper seat, and upper rubber seat. Then remove coil spring.
6. Remove bound bumper from spring upper seat.
7. Gradually release spring compressor, and remove coil spring.



#### INSPECTION AFTER DISASSEMBLY

##### Strut Inspection

- Check strut for deformation, cracks, and damage, and replace if necessary.
- Check piston rod for damage, uneven wear, and distortion, and replace if necessary.
- Check welded and sealed areas for oil leakage, and replace if necessary.



# COIL SPRING AND SHOCK ABSORBER

## Insulator and Rubber Parts Inspection

Check strut mount insulator for cracks and rubber parts for wear. Replace them if necessary.

## Coil Spring Inspection

Check for cracks, wear, and damage, and replace if necessary.

## ASSEMBLY

1. Compress coil spring using a spring compressor, and install it onto the strut.

### CAUTION:

Face the small diameter of coil spring downward. Align lower end to spring seat as shown in the figure.

### WARNING:

Be sure spring compressor is securely attached to coil spring. Compress coil spring.

2. Connect bound bumper to spring upper seat.

### CAUTION:

- Be sure to install bound bumper to spring upper seat securely.
  - When installing bound bumper, use soapy water. Do not use machine oil or other lubricants.
3. Install small parts to the strut.
    - Connect upper rubber seat, spring upper seat, thrust bearing, strut mount insulator, and strut spacer. Temporarily install piston rod lock nut.

### CAUTION:

Do not reuse piston rod lock nut.

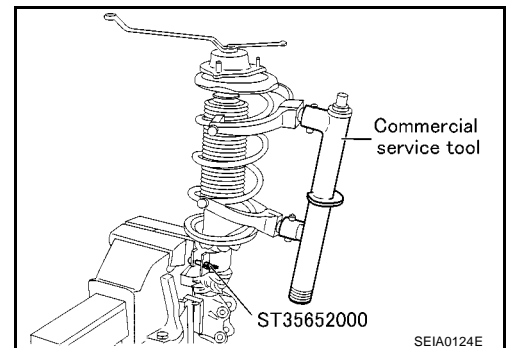
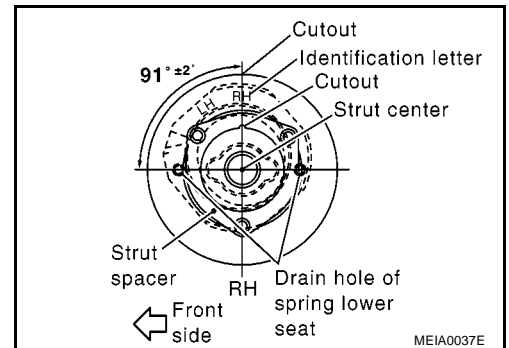
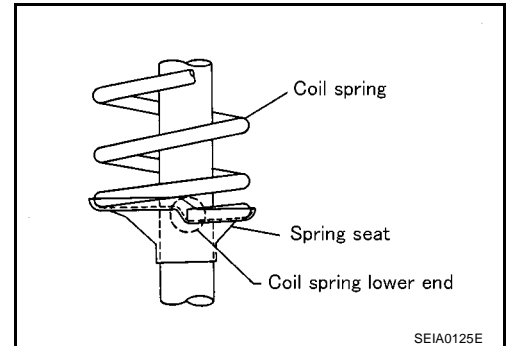
4. Be sure the identification letters on spring upper seat are positioned as shown. Also be sure cutout in the strut spacer is positioned as shown.
5. Be sure coil spring is properly set in spring rubber seat. Gradually release spring compressor.

### CAUTION:

Be sure upper rubber seat is properly aligned to spring upper seat and coil spring.

6. Tighten piston rod lock nut to the specified torque.

7. Remove strut attachment.



## TRANSVERSE LINK

PFP:54500

### Removal and Installation

EES0013Y

#### REMOVAL

1. Remove steering knuckle from transverse link. Refer to [FAX-7, "FRONT WHEEL HUB AND KNUCKLE"](#).
2. Remove mounting nut on lower portion of stabilizer connecting rod.
3. Remove electrical wires of wheel speed sensor.
4. Remove suspension crossbar.
5. Slightly loosen transverse link mounting bolts.
6. Remove bushing link pin mounting bolts.
7. Remove transverse link mounting bolts and nuts, and remove transverse link from suspension member.

#### INSPECTION AFTER REMOVAL

##### Visual Inspection

Check transverse link and bushing for deformation, cracks, and other damage. Replace the entire transverse link assembly if cracks, deformation or any other damage is found.

##### Ball Joint Inspection

##### CAUTION:

Before measurement, move the ball joint at least ten times by hand to check for smooth movement.

##### Oscillating Torque Inspection

- Hook spring scale at cotter pin mounting hole. Confirm spring scale measurement value is within specifications when ball stud begins moving.

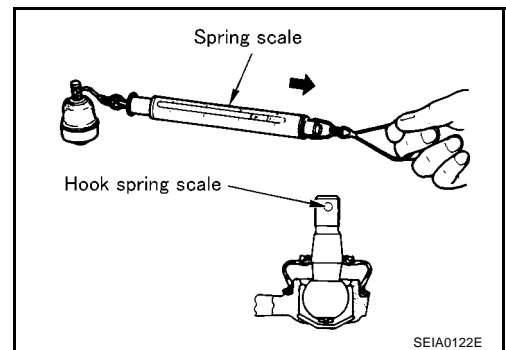
##### Tensile force:

**0.5 - 3.4 N·m (0.05 - 0.35 kg-m, 5 - 30 in-lb)**

##### Measurement on spring balance:

**7.94 - 53.97 N (0.81 - 5.50 kg, 1.79 - 12.2 lb)**

- If the value is outside the standard, replace transverse link.



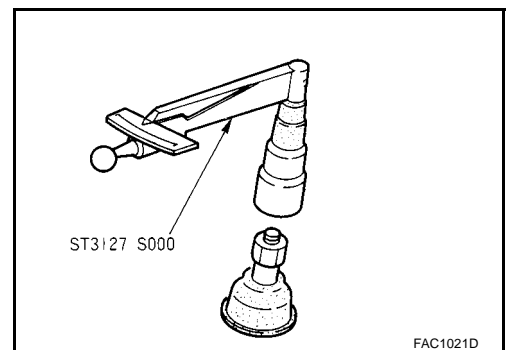
##### Sliding Torque Inspection

- Attach mounting nut to ball stud. Check that sliding torque is within specifications with a preload gauge.

##### Sliding torque:

**0.5 - 3.4 N·m (0.05 - 0.35 kg-m, 5 - 30 in-lb)**

- If the value is outside the standard, replace transverse link.



##### Axial End play Inspection

- Move tip of ball joint in axial direction to check for looseness.

**Axial end play : 0.1 mm (0.004 in) or less**

- If any looseness is noted, replace transverse link.

#### INSTALLATION

- Refer to [FSU-5, "Components"](#) for tightening torque. Tighten in the reverse order of removal.
- When installing transverse link, confirm stopper rubber is properly installed (behind front bushing collar).
- Tighten transverse link mounting bolts with vehicle unladen and all four tires on flat, level ground.
- After installation, check wheel alignment. Refer to [FSU-6, "Wheel Alignment"](#).

# STABILIZER BAR

## STABILIZER BAR

PFP:54611

### Removal and Installation

EES0013Z

#### REMOVAL

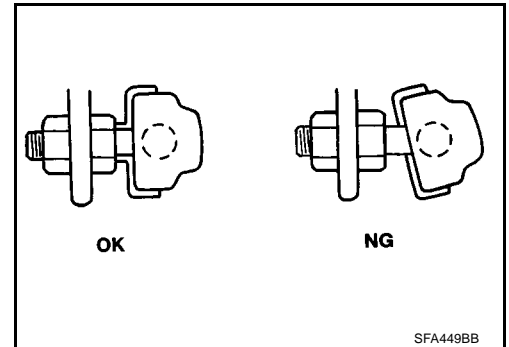
1. Remove mounting nuts on upper portion of stabilizer connecting rod.
2. Remove stabilizer clamp mounting bolts.
3. Remove steering gear from suspension member. Refer to [PS-12, "REMOVAL"](#).
4. Remove stabilizer from the vehicle.

#### INSPECTION AFTER REMOVAL

Check stabilizer, connecting rod, bushing and clamp for deformation, cracks and damage, and replace if necessary.

#### INSTALLATION

- Refer to [FSU-5, "Components"](#) in the reverse order of removal.
- Stabilizer uses pillow ball type connecting rod. Position ball joint with case on pillow ball head parallel to stabilizer.



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## FRONT SUSPENSION MEMBER

PFP:54401

### Removal and Installation

EES00140

#### REMOVAL

1. Remove tires. Raise vehicle.
2. Remove brake caliper and hang it in a place where it will not interfere with work.
3. Remove steering knuckle. Refer to [FAX-7, "FRONT WHEEL HUB AND KNUCKLE"](#) .
4. Remove suspension crossbar.
5. Remove front exhaust tube.
6. Remove power steering tube bracket.
7. Remove electrical wires of wheel sensor from transverse link.
8. Mark lower joint and steering gear with paint for easy installation. Remove pinch bolt from gear side of lower joint.
9. Remove high pressure-side tube and low pressure-side hose of hydraulic piping from steering gear.
10. Remove transverse link from suspension member. Refer to [FSU-10, "TRANSVERSE LINK"](#) .
11. Support engine or transmission with a transmission jack.
12. Remove center member from vehicle.
13. Remove body-side mounting bolts from member pin stay.
14. Set a transmission jack under suspension member, and remove suspension member mounting nuts and stopper (front side).
15. Slowly lower transmission jack to remove suspension member from vehicle.

#### INSTALLATION

- Refer to [FSU-5, "Components"](#) for tightening torque in the reverse order of removal.
- After installation, perform final tightening of each part under unladen conditions with tires on ground. Check wheel alignment. Refer to [FSU-6, "Wheel Alignment"](#) .

## UPPER LINK

PFP:54524

### Removal and Installation

EES00141

#### REMOVAL

1. Remove cotter pin and nut of upper link ball joint from suspension member.
2. Remove upper link mounting nut and washer from third link.
3. Remove ball joint stud and pin from suspension member and third link, detach upper link.

#### INSPECTION AFTER REMOVAL

##### Visual Inspection

Check upper link for deformation, cracks, and other damage. Replace upper link assembly if cracks, deformation or any other damage is found.

##### Ball Joint Inspection

##### CAUTION:

Before measurement, move the ball joint at least ten times by hand to check for smooth movement.

##### Oscillating Torque Inspection

- Hook spring scale at cotter pin mounting hole. Confirm spring scale measurement value is within specifications when ball stud begins moving.

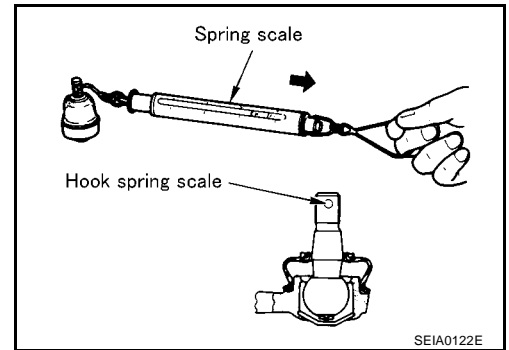
##### Tensile force:

**2.0 N·m (0.20 kg-m, 18 in-lb) or less**

##### Measurement on spring balance:

**34.8 N (3.55 kg, 7.82 lb) or less**

- If the value is outside the standard, replace transverse link.



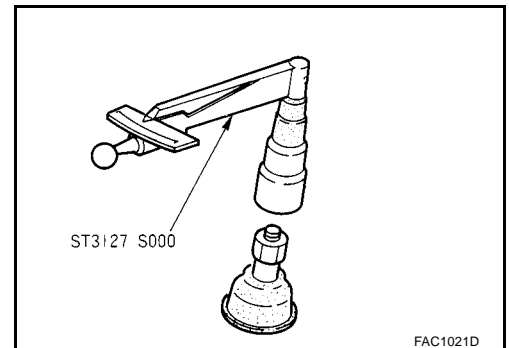
##### Sliding Torque Inspection

- Attach mounting nut to ball stud. Check that sliding torque is within specifications with a preload gauge.

##### Sliding torque:

**2.0 N·m (0.20 kg-m, 18 in-lb) or less**

- If the value is outside the standard, replace transverse link.



#### INSTALLATION

1. Tighten ball joint and nut on the installation part of suspension member to the specified torque. Then install cotter pin.

##### CAUTION:

**The cotter pin is not reusable. Always use a new one when installing.**

2. Temporarily tighten nut and washer on the installation part of third link. Then under unladen condition with tires on the ground, tighten them to the specified torque.

# THIRD LINK

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## THIRD LINK

PFP:54592

### Removal and Installation

EES00142

#### REMOVAL

1. Remove kingpin cap with a flat-bladed screwdriver.
2. Remove nut and washer securing steering knuckle and third link.
3. Remove nut and washer securing upper link and third link.
4. Remove mounting bolts, and remove third link from strut.

#### **CAUTION:**

**Do not disassemble kingpin part of third link.**

#### INSPECTION AFTER REMOVAL

##### Visual Inspection

Check third link and bushing for deformation, cracks, and other damage. Replace the entire third link assembly if cracks, deformation or any other damage is found.

#### INSTALLATION

1. Set third link to kingpin, install washer and nut. Tighten nut to the specified torque.

#### **CAUTION:**

**The nut is not reusable. Always use a new one.**

2. Pack kingpin cap with multi-purpose grease. Then install the cap to third link.

#### **CAUTION:**

**The kingpin cap is not reusable. Always use a new one.**

3. Install third link mounting bolts to strut. Tighten bolts to the specified torque.
4. Install upper link mounting nut and washer to third link. Tighten nut to the specified torque.

# SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

### General Specification

EES00143

Suspension type	Independent multi-link strut with coil spring
Shock absorber type	Double-acting hydraulic
Stabilizer bar	Standard equipment

### ★Wheel Alignment (Unladen)

EES00144

Drive type		2WD	
Camber Degree minute (Decimal degree)	Minimum	−0°55′ (−0.92°)	
	Nominal	−0°10′ (−0.17°)	
	Maximum	0°35′ (0.58°)	
	Left and right difference	45′ (0.75°)	
Caster Degree minute (Decimal degree)	Minimum	1°05′ (1.08°)	
	Nominal	1°50′ (1.83°)	
	Maximum	2°35′ (2.580°)	
	Left and right difference	45′ (0.75°)	
Kingpin offset Degree minute (Decimal degree)	Minimum	13°55′ (13.92°)	
	Nominal	14°40′ (14.67°)	
	Maximum	15°25′ (15.42°)	
Total toe-in	Distance (A - B)	Minimum	0 mm (0 in)
		Nominal	1 mm (0.04 in)
		Maximum	2 mm (0.08 in)
Wheel turning angel		Refer to <a href="#">PS-18, "Steering Angle"</a> .	

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

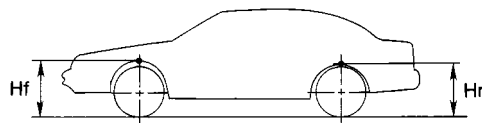
### Ball Joint

EES00145

Oscillating torque	0.5 - 3.4 N · m (0.05 - 0.35 kg-m, 5 - 30 in-lb)
Measurement on spring balance (cotter pinhole position)	7.94 - 53.97 N (0.81 - 5.50 kg, 1.79 - 12.2 lb)
Sliding torque	0.5 - 3.4 N · m (0.05 - 0.35 kg-m, 5 - 30 in-lb)
Axial end play	0.1 mm (0.004 in) or less

### ★Wheelarch Height (Unladen)

EES00146



SFA818A

Applied model	F9Q engine		YD22DDTi engine		F9Q engine		YD22DDTi engine	
	Sedan				Wagon			
	205/60R16	215/50R17	205/60R16	215/50R17	205/60R16	215/50R17	205/60R16	215/50R17

## SERVICE DATA AND SPECIFICATIONS (SDS)

Front (Hf) mm (in)	698 (27.48)	697 (27.44)	697 (27.44)	696 (27.40)	699 (27.52)	699 (27.52)	698 (27.48)	698 (27.48)
Rear (Hr) mm (in)	699 (27.52)	696 (27.40)	699 (27.52)	696 (27.40)	695 (27.36)	692 (27.24)	695 (27.36)	692 (27.24)

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