

SECTION **FSU**
FRONT SUSPENSION

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FSU

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PRECAUTIONS

PRECAUTIONS

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Caution

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- When installing rubber bushings, final tightening must be carried out under unladen conditions with tires on ground. Oil will shorten the life of rubber bushings. Be sure to wipe off any spilled oil.
- Unladen conditions mean that fuel, engine coolant and lubricant are full. Spare tire, jack, hand tools and mats are in designated positions.
- After servicing suspension parts, be sure to check wheel alignment.
- Caulking nuts are not reusable. Always use new ones when installing. Since new caulking nuts are pre-oiled tighten as they are.

PREPARATION

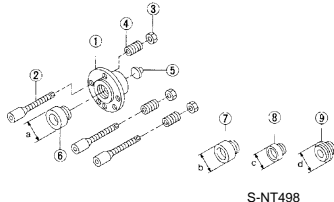
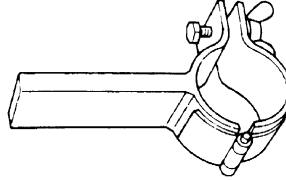
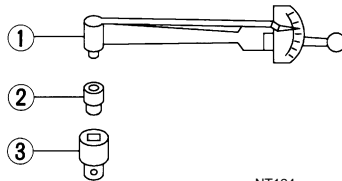
PREPARATION

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Special Service Tools (SST)

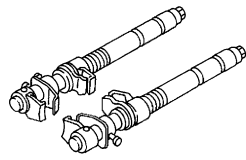
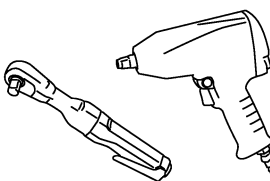
EES000TS

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
KV991040S0 (—) CCK gauge attachment 1. Plate 2. Guide bolts 3. Nuts 4. Springs 5. Center plate 6. KV99104020 Adapter A a: 72 mm (2.83 in) dia. 7. KV99104030 Adapter B b: 65 mm (2.56 in) dia. 8. KV99104040 Adapter C c: 57 mm (2.24 in) dia. 9. KV99104050 Adapter D d: 53.4 mm (2.102 in) dia.	 <p style="text-align: center;">S-NT498</p> <p>Measuring wheel alignment</p>
ST3565 2000 (—) Strut attachment	 <p style="text-align: center;">ZZA0807D</p> <p>Disassembling and assembling strut</p>
ST3127 S000 (See J25765-A) Preload gauge 1. GG91030000 Torque wrench (J25765) 2. HT62940000 (—) Socket adapter (1/2") 3. HT62900000 (—) Socket adapter (3/8")	 <p style="text-align: center;">NT124</p> <p>Measuring rotating torque of ball joint</p>

Commercial Service Tools

EES000TT

Tool name	Description
Spring compressor	 <p style="text-align: center;">S-NT717</p> <p>Removing coil spring</p>
Power tool	 <p style="text-align: center;">PBIC0190E</p> <ul style="list-style-type: none"> ● Removing wheel nuts ● Removing undercover ● Removing brake caliper assembly ● Removing suspension components parts

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EES000TU

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

Reference page			FSU-7	FSU-10	—	—	—	FSU-7	FSU-5	FSU-14	NVH in PR section	NVH in RFD section.	NVH in RAX and RSU section.	NVH in WT section.	NVH in WT section.	NVH in RAX section.	NVH in BR section.	NVH in PS section.			
Possible cause and SUSPECTED PARTS			Improper installation, looseness	Strut deformation, damage or deflection	Bushing or mounting deterioration	Parts interference	Spring fatigue	Suspension looseness	Incorrect wheel alignment	Stabilizer bar fatigue	PROPELLER SHAFT	DIFFERENTIAL	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	x	x	x		
		Shake	x	x	x	x			x			x		x	x	x	x	x	x	x	
		Vibration	x	x	x	x	x					x		x	x		x			x	x
		Shimmy	x	x	x	x				x				x	x	x			x		x
		Judder	x	x	x									x	x	x			x		x
		Poor quality ride or handling	x	x	x	x	x			x	x			x	x	x					

x: Applicable

FRONT SUSPENSION ASSEMBLY

FRONT SUSPENSION ASSEMBLY

PFP:54010

On-Vehicle Inspection and Service

EES000TW

Make sure the mounting conditions (looseness, back lash) of each component and component statuses (wear, damage) are normal.

INSPECTION LOWER BALL JOINT END PLAY

1. Set front wheels in a straight-ahead position. Do not depress brake pedal.
2. Measure axial end play by installing and moving up/down between suspension arm and steering knuckle with an iron pry bar or something similar.

Axial end play : 0 mm (0 in)

CAUTION:

Be careful not to damage ball joint boot.

STRUT INSPECTION

- Check strut for oil leakage, damage and replace if necessary. Refer to [FSU-8, "COIL SPRING AND STRUT"](#).

Wheel Alignment Inspection DESCRIPTION

EES000TX

- Measure wheel alignment under unladen conditions.

NOTE:

Unladen conditions mean that fuel, engine coolant, and lubricant are full. Spare tire, jack, hand tools and mats are designated positions.

PRELIMINARY INSPECTION

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

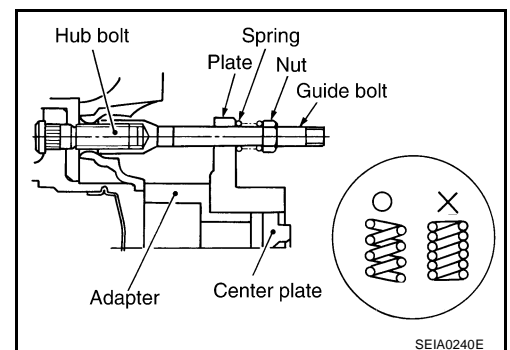
INSPECTION OF CAMBER, CASTER AND KINGPIN INCLINATION ANGLES.

- Camber, caster, 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 vehicle will remain horizontal.

Using a CCK Gauge

Install CCK gauge attachment (SST): KV991040S0 as following procedure in wheel, then measure wheel alignment.

1. Remove wheel nuts (2), and install a guide bolt to hub bolt.
2. Screw adapter into plate body until it contacts body tightly.
3. Screw center plate into plate.
4. Insert plate on guide bolt. Put spring in, and then evenly screw both guide bolt nut. When fastening guide bolt nut, do not completely compress spring.



FRONT SUSPENSION ASSEMBLY

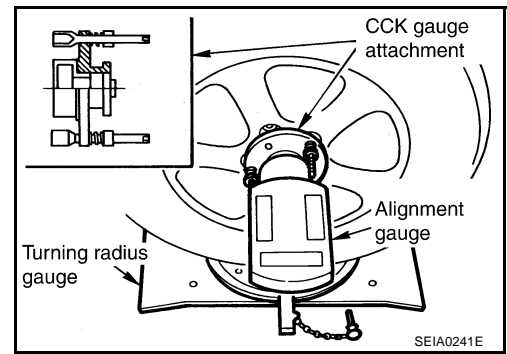
- Place the dent of alignment gauge onto the projection of center plate and tightly contact them to measure.

Camber, caster, kingpin inclination angles:

Refer to [FSU-16, "SERVICE DATA"](#) .

CAUTION:

- If camber, caster, or kingpin inclination angle is outside the standard, check front suspension parts for wear and damage, and replace suspect parts if necessary.
- King pin inclination angles is reference value, no inspection is required.

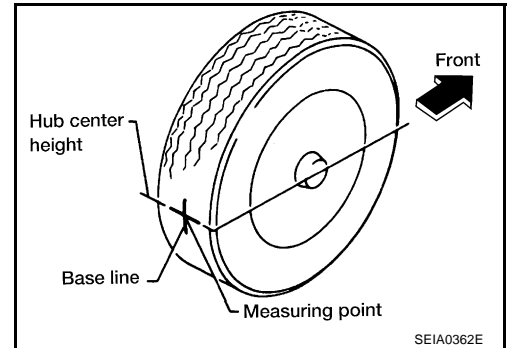


Toe-in Inspection

Measure toe-in using the following procedure.

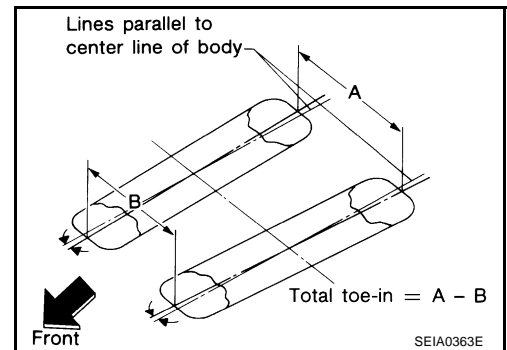
WARNING:

- Always perform the following procedure on a flat surface.
 - Make sure that no person is in front of vehicle before pushing it.
- Bounce front of vehicle up and down to stabilize the posture.
 - Push vehicle straight ahead about 5 m (16ft).
 - Put a mark on base line of the tread (rear side) of both tires at the same height of hub center. These are measuring points.



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

Total toe-in : Refer to [FSU-16, "SERVICE DATA"](#) .

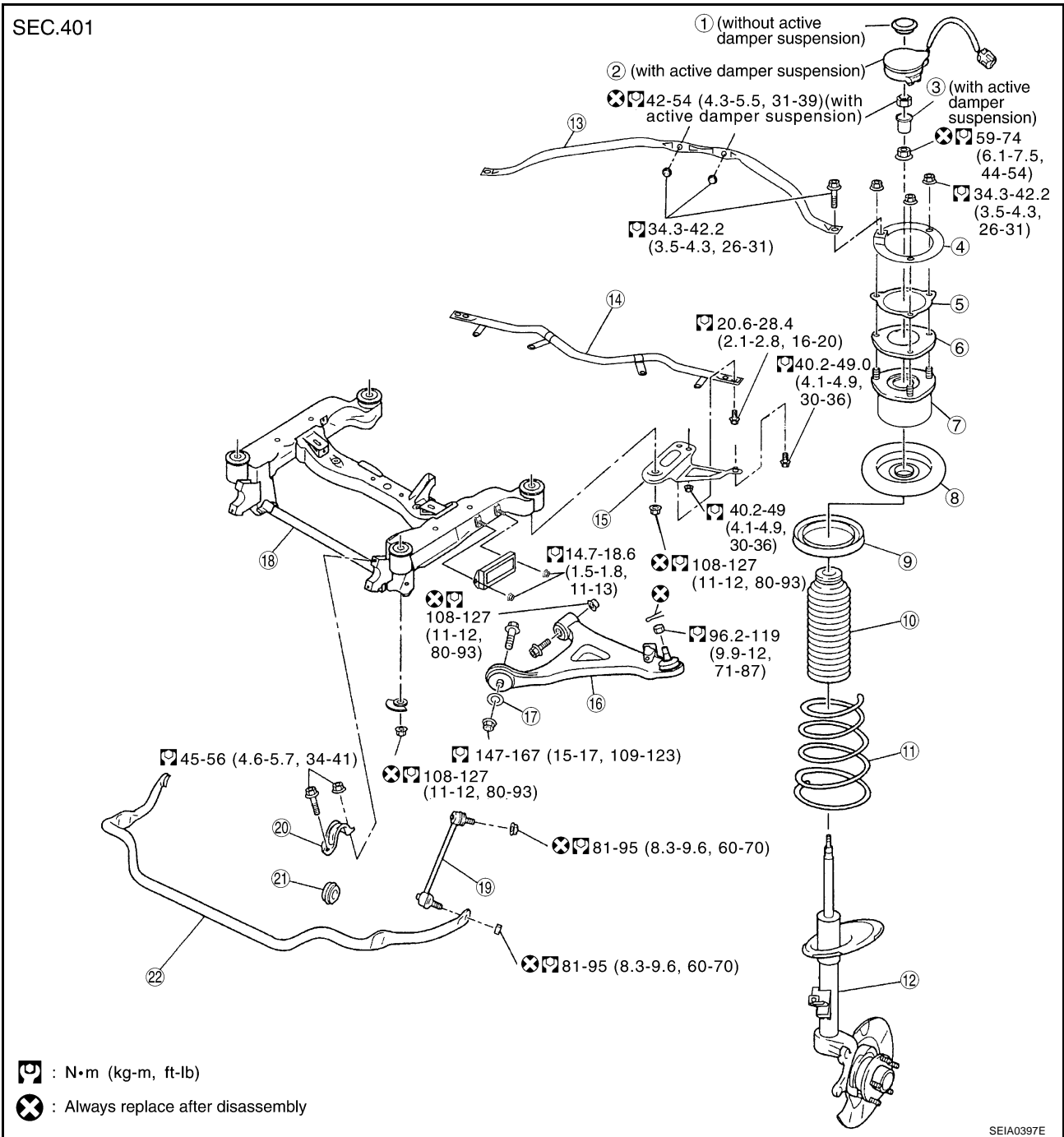


FRONT SUSPENSION ASSEMBLY

Components

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|-------------------------------|-------------------------------------|-----------------------------|
| 1. Cap | 2. Actuator assembly | 3. Actuator plate |
| 4. Tower bar bracket | 5. Strut mounting insulator bracket | 6. Strut mounting insulator |
| 7. Strut mounting bearing | 8. Spring upper seat | 9. Rubber seat |
| 10. Bound bumper | 11. Coil spring | 12. Strut assembly |
| 13. Tower bar | 14. Front cross bar | 15. Member stay |
| 16. Suspension arm | 17. Washer | 18. Front suspension member |
| 19. Stabilizer connecting rod | 20. Stabilizer clamp | 21. Stabilizer bushing |
| 22. Stabilizer bar | | |

COIL SPRING AND STRUT

PFP:55302

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COIL SPRING AND STRUT

Removal and Installation

REMOVAL

1. Remove tire from vehicle with power tool.
2. Remove brake caliper with power tool. Hang it in a place where it will not interfere with work. Refer to [BR-23, "FRONT DISC BRAKE"](#).

NOTE:

Avoid depressing brake pedal while brake caliper is removed.

3. Remove mounting nuts of brake hose from strut assembly.
4. Remove harness of wheel sensor from strut assembly. Refer to [BRC-64, "WHEEL SENSORS"](#).

CAUTION:

Do not pull on wheel sensor harness.

5. Remove stabilizer connecting rod upper nut, separate strut assembly and stabilizer connecting rod.
6. Remove steering outer socket and cotter pin at strut assembly, then loosen mounting nut.
7. Use a ball joint remover (suitable tool) to remove steering outer socket from strut assembly. Be careful not to damage ball joint boot.

CAUTION:

Tighten temporarily mounting nut to prevent damage to threads and to prevent ball joint remover (suitable tool) from coming off.

8. Remove cotter pin of suspension arm ball joint, then loosen mounting nut.
9. Use a ball joint remover (suitable tool) to remove strut assembly from suspension arm. Be careful not to damage ball joint boot.

CAUTION:

Tighten temporarily mounting nut to prevent damage to threads and to prevent ball joint remover (suitable tool) from coming off.

10. Turn actuator assembly to the left, and remove it from actuator plate.
11. Remove tower bar and strut mounting insulator bracket then remove strut mounting insulator bracket and strut assembly from vehicle.

INSTALLATION

- Refer to [FSU-7, "Components"](#) for tightening torque. Install in the reverse order of removal.

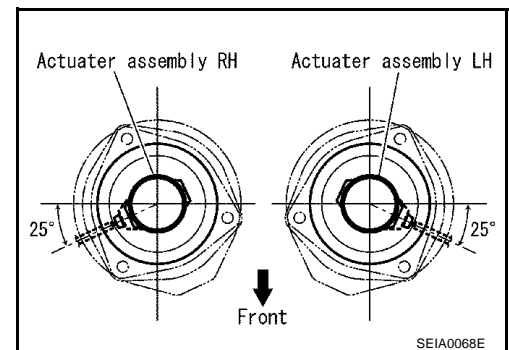
NOTE:

Refer to component parts location and do not reuse non-reusable parts.

- After removing/installing or replacing suspension components, check wheel alignment. Refer to [FSU-5, "Wheel Alignment Inspection"](#).
- After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to [BRC-6, "Adjustment of Steering Angle Sensor Neutral Position"](#).
- Make sure actuator plate fits tightly into actuator assembly.
- Make sure actuator assembly is installed as shown in the figure.

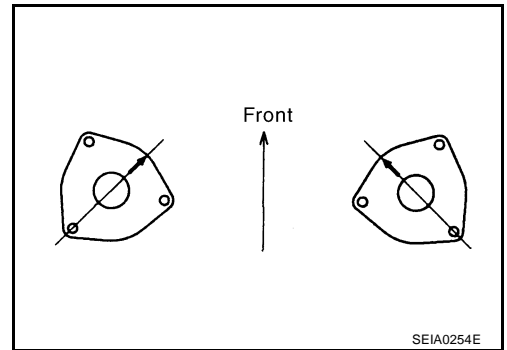
CAUTION:

If actuator assembly is subjected to impact or drop, do not use it.



COIL SPRING AND STRUT

- Attach strut mounting insulator bracket as shown in the figure.



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Disassembly and Assembly DISASSEMBLY

NOTE:

Make sure piston rod on strut assembly is not damaged when removing components from strut assembly.

1. Fix strut mounting insulator and remove actuator fixing nut, then remove actuator plate from strut assembly.

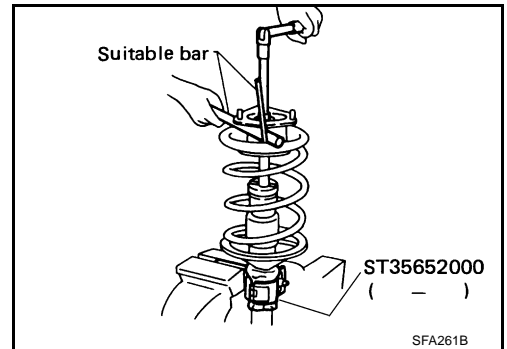
CAUTION:

Be careful not to deform actuator plate and strut mounting insulator.

2. Install strut attachment (SST) to strut assembly and fix it in a vice.

CAUTION:

When installing strut attachment (SST) to strut assembly, wrap a shop cloth around strut assembly to protect it from damage.



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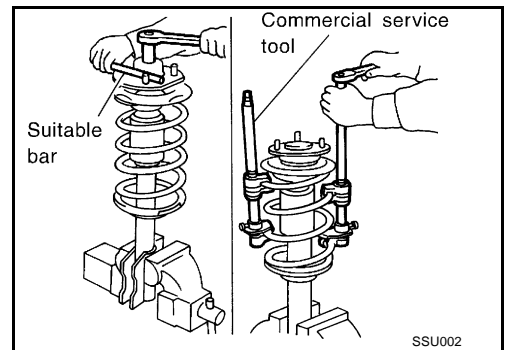
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3. Using a spring compressor (commercial service tool), compress coil spring between spring upper seat and spring lower seat (on strut) until coil spring is free.

CAUTION:

Be sure spring compressor (commercial service tool) is securely attached to coil spring. Compress coil spring.

4. After making sure coil spring is free between spring upper seat and spring lower seat of strut assembly. Remove piston rod lock nut.
5. Remove strut mounting insulator, strut mounting bearing, spring upper seat, rubber seat, coil spring and bound bumper from strut assembly.



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6. Gradually release spring compressor (commercial service tool), and remove coil spring.

CAUTION:

Loosen spring compressor while making sure coil spring attachment position does not move.

7. Remove strut attachment (SST) from strut assembly.

COIL SPRING AND STRUT

INSPECTION AFTER DISASSEMBLY

Strut Inspection

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

Strut Mounting Insulator and Rubber Parts Inspection

Check strut mounting insulator, strut mounting insulator bracket for cracks and rubber parts for wear. Replace them if necessary.

Coil Spring Inspection

Check coil spring for cracks, wear or damage and replace if necessary.

ASSEMBLY

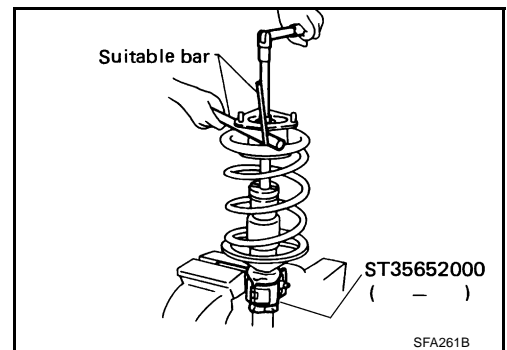
NOTE:

Make sure piston rod on strut assembly is not damaged when attaching components to strut assembly.

1. Install strut attachment (SST) to strut assembly and fix it in a vise.

CAUTION:

When installing strut attachment (SST) to strut assembly, wrap a shop cloth around strut assembly to protect it from damage.



2. Compress coil spring using a spring compressor (commercial service tool), and install it onto strut assembly.

CAUTION:

● **Face tube side of coil spring downward. Align lower end to spring seat as shown in the figure.**

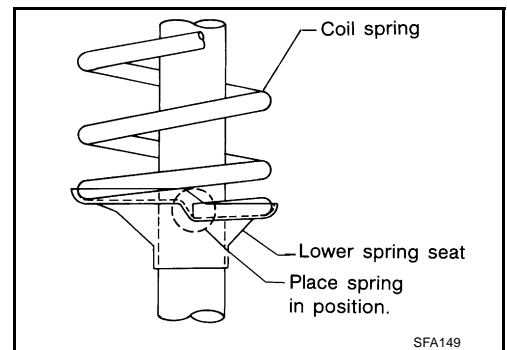
● **Be sure spring compressor (commercial service tool) is securely attached to coil spring. Compress coil spring.**

3. Apply soapy water to bound bumper and insert into strut mounting insulator.

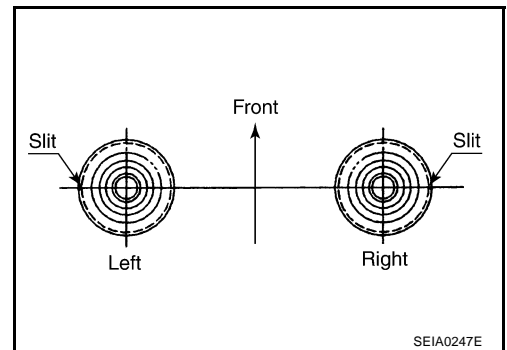
CAUTION:

Do not use machine oil.

4. Install rubber seat, spring upper seat, strut mounting bearing, strut mounting insulator.



- Installation position of spring upper seat as shown in the figure.



COIL SPRING AND STRUT

5. Fix strut mounting insulator, then tighten piston rod lock nut with the specified torque.

CAUTION:

Be careful not to deform strut mounting insulator.

6. Gradually release spring compressor (commercial service tool), and remove coil spring.

CAUTION:

Loosen spring compressor while making sure coil spring attachment position does not move.

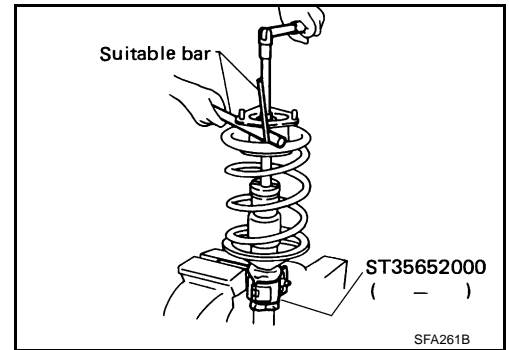
7. Remove strut attachment (SST) from strut assembly.

8. Install actuator plate onto strut assembly.

9. Fix strut mounting insulator, then tighten actuator plate fixing nut with the specified torque.

CAUTION:

Be careful not to deform actuator plate and strut mounting insulator.



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SUSPENSION ARM

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EES000U0

SUSPENSION ARM

Removal and Installation

REMOVAL

1. Remove tire from vehicle with power tool.
2. Remove undercover with power tool.
3. Remove cotter pin of lower ball joint, then loosen mounting nut.
4. Use a ball joint remover (suitable tool) to remove suspension arm from strut assembly. Be careful not to damage ball joint boot.

CAUTION:

Tighten temporarily mounting nut to prevent damage to threads and to prevent ball joint remover (SST) from coming off.

5. Remove fixing bolts and nuts then remove suspension arm from vehicle.

INSPECTION AFTER REMOVAL

Visual Inspection

- Check suspension arm and bushing for deformation, cracks, or damage. If any non-standard condition is found, replace it.
- Check boot of ball joint for cracks, or other damage, and also for grease leakage. If any non-standard condition is found, replace it.

Ball Joint Inspection

- Manually move ball stud to confirm it moves smoothly with no binding.

Swing Torque Inspection

NOTE:

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

- Hook spring scale at ball stud. Confirm spring scale measurement value is within the specifications when ball stud begins moving.

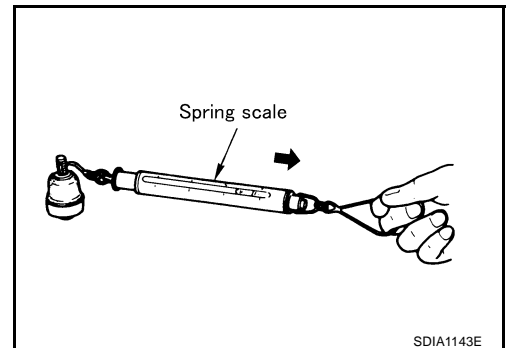
Swing torque:

0.5 - 3.4 N·m (0.06 - 0.34 kg·m, 5 - 30 in·lb)

Measured value of spring scale:

8.8 - 59.6 N (0.90 - 6.08 kg, 1.98 - 13.41 lb)

- If it is outside the specified range, replace suspension arm assembly.



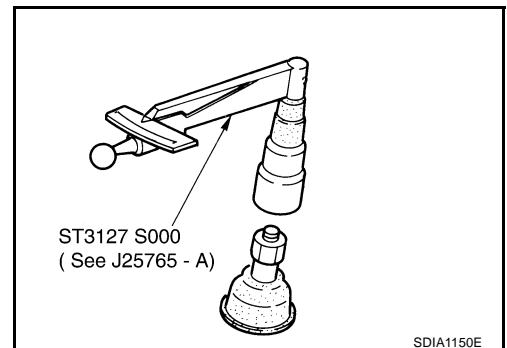
Rotating Torque Inspection

- Attach mounting nut to ball stud. Check that rotating torque is within the specifications with a preload gauge (SST).

Rotating torque:

0.5 - 3.4 N·m (0.06 - 0.34 kg·m, 5 - 30 lb)

- If it is outside the specified range, replace suspension arm assembly.



Axial End Play Inspection

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

Axial end play : 0 mm (0 in)

- If it is outside the specified range, replace suspension arm assembly.

SUSPENSION ARM

INSTALLATION

- Refer to [FSU-7, "Components"](#) for tightening torque. Install in the reverse order of removal.

NOTE:

Refer to component parts location and do not reuse non-reusable parts.

- After removing/installing or replacing suspension components, check wheel alignment. Refer to [FSU-5, "Wheel Alignment Inspection"](#) .
- After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to [BRC-6, "Adjustment of Steering Angle Sensor Neutral Position"](#) .

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STABILIZER BAR

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STABILIZER BAR

Removal and Installation

REMOVAL

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1. Remove tire from vehicle with power tool.
2. Remove undercover with power tool.
3. Remove mounting nut on upper position of stabilizer connecting rod with power tool.
4. Remove stabilizer clamp mounting bolts and nuts with power tool.
5. Remove stabilizer bar from vehicle.

INSPECTION AFTER REMOVAL

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

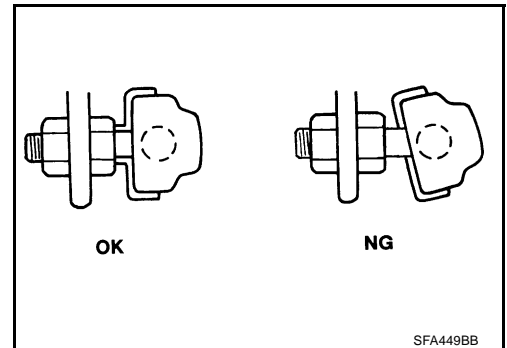
INSTALLATION

- Refer to [FSU-7, "Components"](#) for tightening torque. Install in the reverse order of removal.

NOTE:

Refer to component parts location and do not reuse non-reusable parts.

- After removing/installing or replacing suspension components, check wheel alignment. Refer to [FSU-5, "Wheel Alignment Inspection"](#).
- After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to [BRC-6, "Adjustment of Steering Angle Sensor Neutral Position"](#).
- Stabilizer bar uses pillow ball type connecting rod. Position ball joint with case on pillow ball head parallel to stabilizer bar.



FRONT SUSPENSION MEMBER

FRONT SUSPENSION MEMBER

PFP:54401

Removal and Installation

EES000U2

REMOVAL

1. Remove tire from vehicle with power tool.
2. Remove undercover with power tool.
3. Remove steering hydraulic piping bracket from front suspension member. Refer to [PS-31, "HYDRAULIC LINE"](#) .
4. Remove steering gear and front suspension member attachment bolts and hang steering gear on vehicle. Refer to [PS-15, "POWER STEERING GEAR AND LINKAGE"](#)
5. Remove suspension arm from front suspension member. Refer to [FSU-12, "SUSPENSION ARM"](#) .
6. Remove stabilizer bar mounting bolts and nuts from front suspension member then suspend a stabilizer on vehicle. Refer to [FSU-14, "STABILIZER BAR"](#) .
7. Remove cross bar from member stay. Refer to [FSU-7, "Components"](#) .
8. Set jack under front suspension member and engine.

CAUTION:

When setting jack to engine, use a wooden block or an equivalent for the setting.

9. Remove fixing bolts and nuts between engine mounting insulator and front suspension member. Refer to [EM-72, "ENGINE ASSEMBLY"](#) .
10. Remove member stay from front suspension member and body.
11. Remove mounting nuts front suspension member and body.
12. Slowly lower jack to remove front suspension member from vehicle.

INSPECTION AFTER REMOVAL

Check front suspension member for deformation, cracks, or any other damage. Replace if necessary.

INSTALLATION

- Refer to [FSU-7, "Components"](#) for tightening torque. Install in the reverse order of removal.
NOTE:
Refer to component parts location and do not reuse non-reusable parts.
- After removing/installing or replacing suspension components and steering components, check wheel alignment. Refer to [FSU-5, "Wheel Alignment Inspection"](#) .
- After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to [BRC-6, "Adjustment of Steering Angle Sensor Neutral Position"](#) .

SERVICE DATA

SERVICE DATA

PFP:00030

Wheel Alignment (Unladen)

EES000U3

Camber Degree minute (Decimal degree)	Minimum		- 1°30' (- 1.5°)
	Nominal		- 0°45' (- 0.75°)
	Maximum		0°00' (0.00°)
	Left and right difference		45' (0.75°)
Caster Degree minute (Decimal degree)	Minimum		5°25' (5.42°)
	Nominal		6°10' (6.17°)
	Maximum		6°55' (6.92°)
	Left and right difference		45' (0.75°)
Kingpin inclination Degree minute (Decimal degree)	Minimum		13°15' (13.25°)
	Nominal		14°00' (14.00°)
	Maximum		14°45' (14.75°)
Total toe-in	Distance (A - B)	Nominal	1 mm (0.04 in)
		Angle (left plus right) Decimal degree (Decimal degree)	Minimum
		Nominal	3° (0.05°)
		Maximum	6° (0.10°)

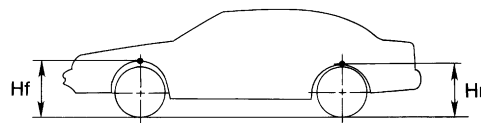
Ball Joint

EES000U4

Swing torque	0.5 - 3.4 N·m (0.06 - 0.34 kg·m, 5 - 30 in·lb)
Measurement on spring balance (cotter pinhole position)	8.8 - 59.6 N (0.90 - 6.08 kg, 1.98 - 13.41 lb)
Rotating torque	0.5 - 3.4 N·m (0.06 - 0.34 kg·m, 5 - 30 in·lb)
Axial end play	0 mm (0 in)

Wheelarch Height (Unladen*)

EES000U5



SFA818A

Tire	225/55R17	225/55R17 (Runflat tire)	245/45R18
Front (Hf)	730 mm (28.74 in) [USA model]	734 mm (28.90 in)	726 mm (28.58 in)
Rear (Hr)	704 mm (27.72 in) [USA model]	707 mm (27.83 in) [USA model]	700 mm (27.56 in) [USA model]
	705 mm (27.76 in) [Canada model]	708 mm (27.87 in) [Canada model]	701 mm (27.60 in) [Canada model]

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