SECTION FSU
FRONT SUSPENSION

CONTENTS

PRECAUTIONS

PFP:00001

Caution

EES000TR

- When installing rubber bushings, final tightening must be carried out under unladen condition with tires on 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. Spare tire, jack, hand tools and mats 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.

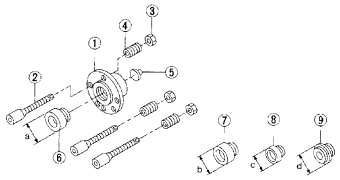
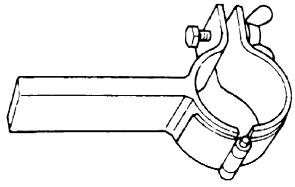
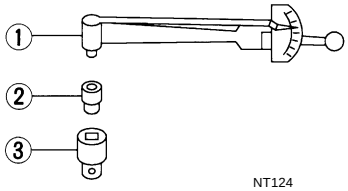
PREPARATION

PFP:00002

Special Service Tools

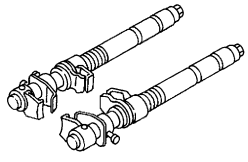
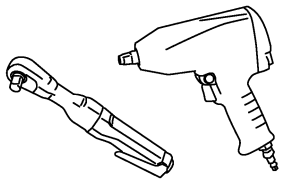
EES000TS

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.  S-NT498	Measuring wheel alignment
ST3565 2000 (—) Strut attachment  ZZA0807D	Disassembling and assembling shock absorber
ST3127 S000 (See J25742-A) Preload gauge 1. GC91030000 Torque wrench (J25765) 2. HT62940000 (—) Socket adapter (1/2″) 3. HT62900000 (—) Socket adapter (3/8″)  NT124	Measuring sliding torque of ball joint

Commercial Service Tools

EES000TT

Tool name	Description
Spring compressor  S-NT717	Removing coil spring
Power tool  PBIC0190E	● Removing wheel nuts ● Removing undercover ● Removing brake caliper ● Removing stabilizer assembly

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-5	FSU-10	—	—	—	FSU-5	FSU-6	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	×	×	×	×	×	×			×	×	×	×	×	×	×	×
		Shake	×	×	×	×		×			×		×	×	×	×	×	×
		Vibration	×	×	×	×	×				×		×	×		×		×
		Shimmy	×	×	×	×			×				×	×	×		×	×
		Judder	×	×	×								×	×	×		×	×
		Poor quality ride or handling	×	×	×	×	×		×	×			×	×	×			

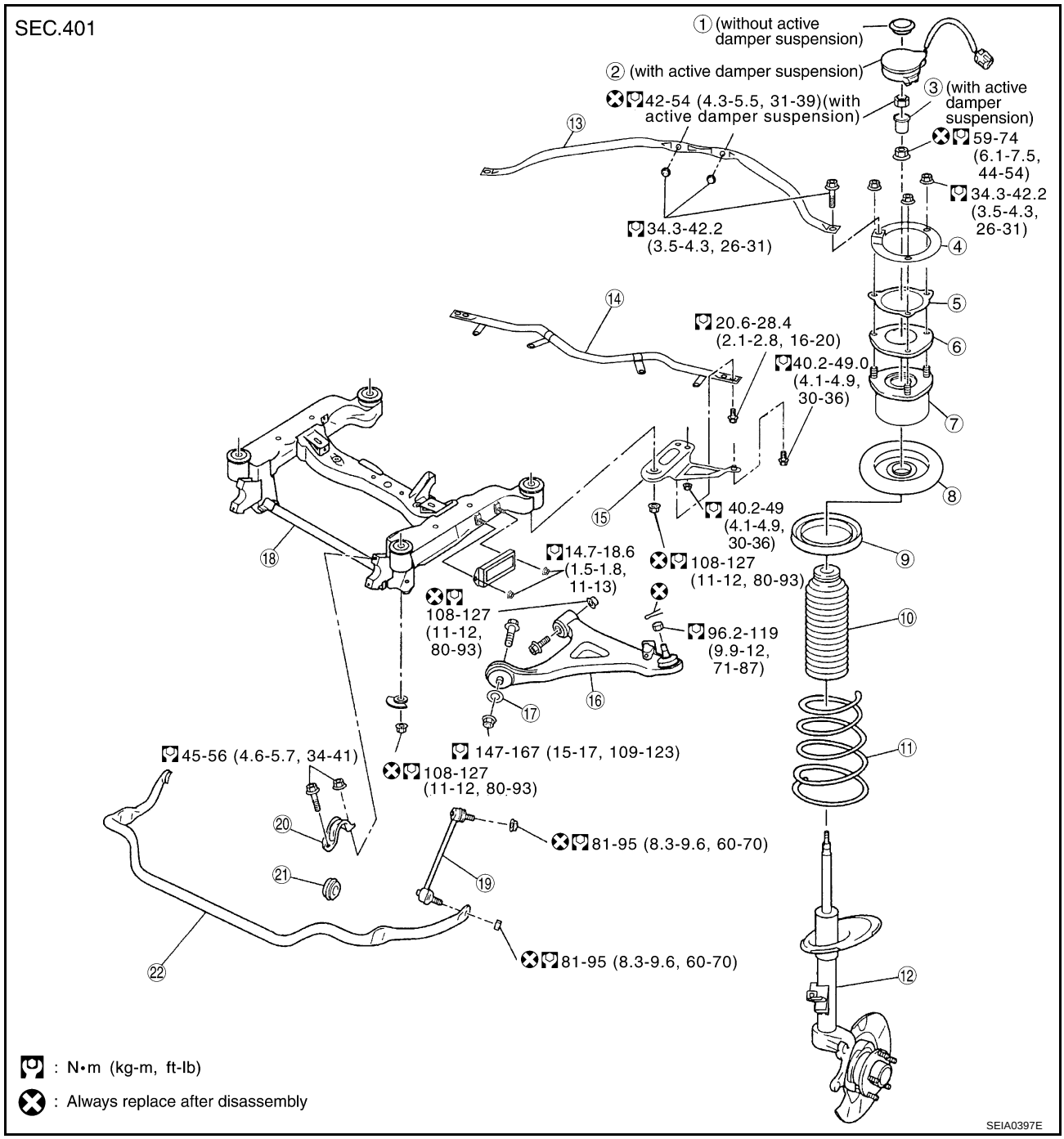
×: Applicable

FRONT SUSPENSION ASSEMBLY

PFP:54010

Components

EES000TV



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		

On-Vehicle Inspection and Service

EES000TW

Check that the mounting conditions (looseness, back lash) of each component and component statues (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 placing an iron pry bar or something similar between suspension arm and steering knuckle.

Standard value

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.

Wheel Alignment Inspection

EES000TX

DESCRIPTION

- Measure wheel alignment under unladen conditions. “Unladen conditions” means that fuel, coolant, and lubricant are full. Spare tire, jack, hand tools and mats in designated positions.

PRELIMINARY INSPECTION

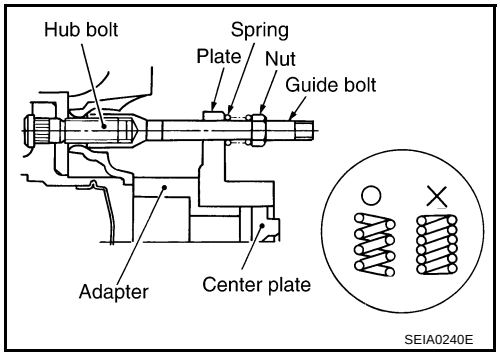
1. Check tires for improper air pressure and wear.
2. Check road wheels for runout.
3. Check wheel bearing axial end play.
4. Check suspension lower ball joint axial end play.
5. Check strut operation.
6. Check each mounting point of axle and suspension for looseness and deformation.
7. Check each link,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

INSPECTION OF CAMBER, CASTER AND KINGPIN INCLINATION ANGLES.

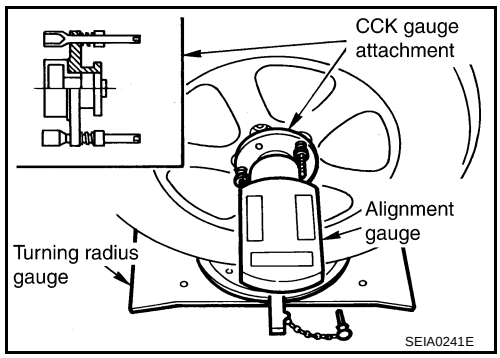
- Camber, caster, kingpin inclination angles cannot be adjusted.
- Before inspection, mount front wheels onto turning radius gauge. Mount rear wheels onto a stand that has same height so vehicle will remain horizontal.

Using a CCK Gauge

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



5. Place the dent of alignment gauge onto the projection of center plate (special service tool) and tightly contact them to measure.



Standard value

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.**

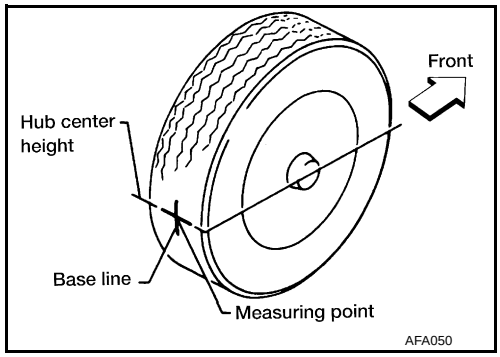
Toe-in Inspection

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.**

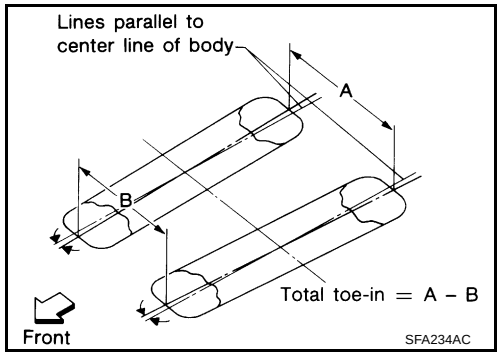
1. Bounce front of vehicle up and down to stabilize the posture.
2. Push vehicle straight ahead about 5 m (16ft).
3. Put a mark on base line of the tread (rear side) of both tires at the same height of hub center. These are measuring points.



4. Measure distance “A” (rear side).
5. 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.

6. Measure distance “B” (front side).



Standard value

Total toe-in : Refer to FSU-16, "SERVICE DATA" .

COIL SPRING AND STRUT

PFP:55302

Removal and Installation

EES000TY

REMOVAL

1. Remove tire 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" .

   CAUTION:
   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-67, "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:
   To prevent damage to threads and to prevent ball joint remover (suitable tool) from coming off, and temporarily tighten lock nuts.
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.

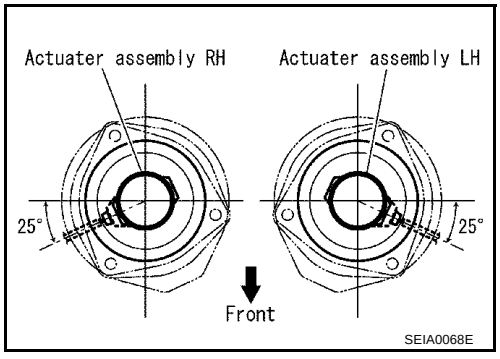
   CAUTION:
   To prevent damage to threads and to prevent ball joint remover (suitable tool) from coming off, and temporarily tighten lock nuts.
10. Turn actuator assembly to the left, and remove it from actuator plate.
11. Remove tower bar and strut mounting insulator bracket then remove strut mounting insulator bracket and strut assembly from vehicle.

INSTALLATION

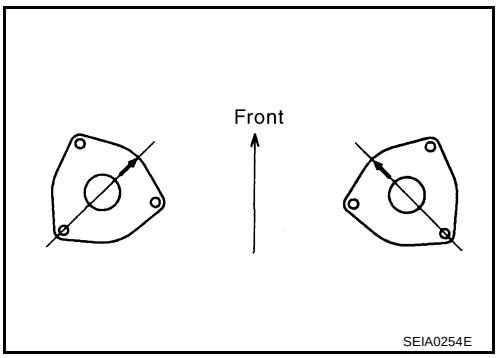
- Refer to FSU-5, "Components" for tightening torque. Tighten in the reverse order of removal.

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



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



Disassembly and Assembly

EES000TZ

DISASSEMBLY

CAUTION:

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.

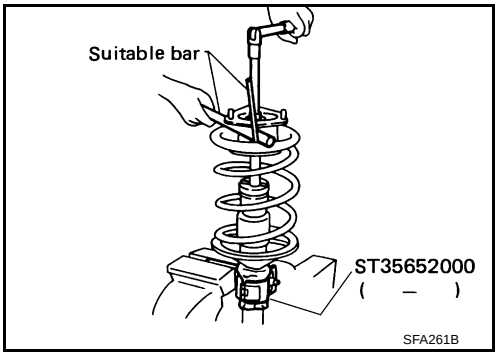
   CAUTION:

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

2. Install strut attachment (special service tool) to strut assembly and fix it in a vice.

   CAUTION:

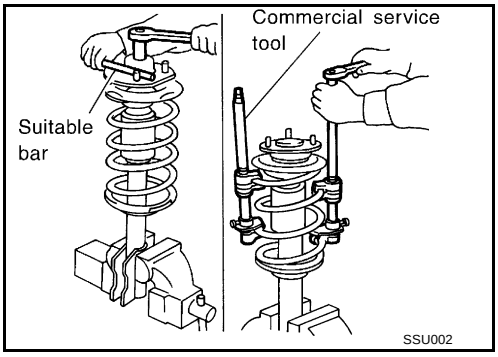
   When installing strut attachment (special service tool) to strut assembly, wrap a shop cloth around strut assembly to protect it from damage.



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

   CAUTION:

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

7. Remove strut attachment (special service too) from strut assembly.

INSPECTION AFTER DISASSEMBLY

Strut Inspection

- Check strut assembly for deformation, cracks, damage, and replace if necessary.
- Check piston rod for damage, uneven wear, 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, damage and replace if necessary.

ASSEMBLY

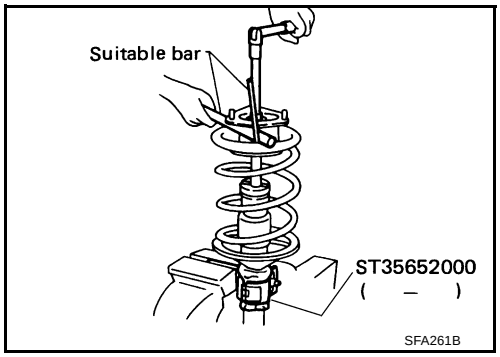
CAUTION:

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

1. Install strut attachment (special service tool) to strut assembly and fix it in a vise.

   CAUTION:

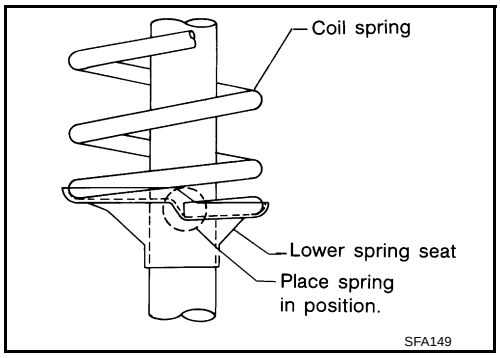
   When installing strut attachment (special service tool) to strut assembly, wrap a shop cloth around strut assembly to protect it from damage.



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.**



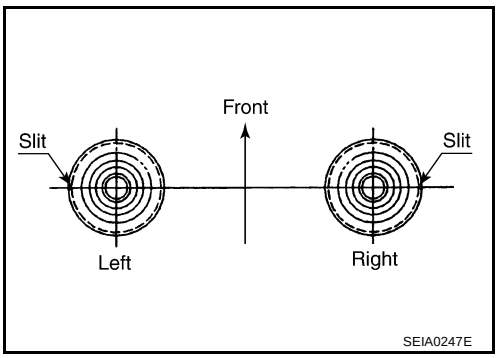
3. Apply soapy water to bound bumper and insert into strut mounting insulator.

   CAUTION:

   Do not use machine oil.

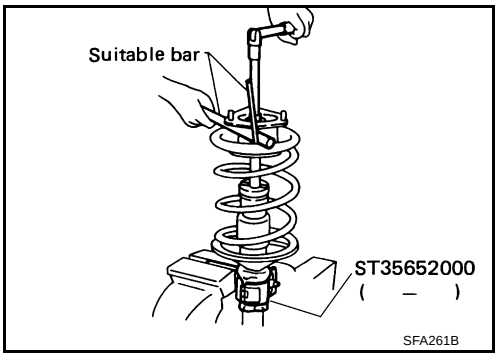
4. Install rubber seat, spring upper seat, strut mounting bearing, strut mounting insulator.

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



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 while making sure coil spring attachment position does not move.

7. Remove strut attachment (special service tool) 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.

SUSPENSION ARM

PFP:55501

Removal and Installation

EES000U0

REMOVAL

1. Remove tire 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:
   To prevent damage to threads and to prevent ball joint remover (suitable tool) from coming off, and temporarily tighten lock nuts.
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 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

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

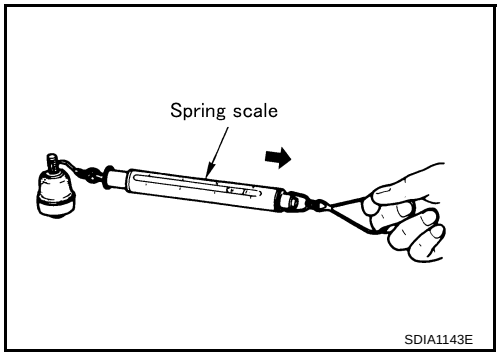
  Standard value

  Swing torque:

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

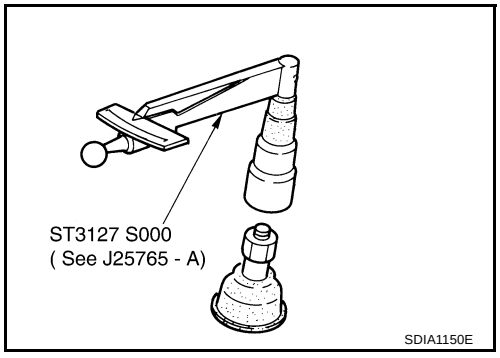
- Attach mounting nut to ball stud. Check that rotating torque is within specifications with a preload gauge (special service tool).

  Standard value

  Rotating torque:

  0.5 - 3.4 N·m (0.06 - 0.34 kg, 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.

  Standard value

  Axial end play : 0 mm (0 in)

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

INSTALLATION

- Refer to FSU-5, "Components" for tightening torque. Tighten in the reverse order of removal.

  CAUTION:
  Refer to component parts location and do not reuse non-reusable parts.
- After installing suspension arm, check wheel alignment and adjust if necessary. Refer to FSU-16, "SERVICE DATA" .

STABILIZER BAR

PFP:56230

Removal and Installation

EES000U1

REMOVAL

1. Remove tire 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.

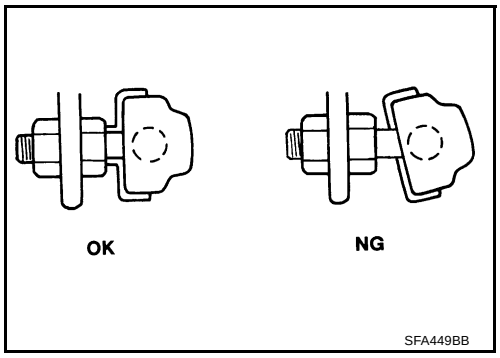
INSPECTION AFTER REMOVAL

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

INSTALLATION

- Refer to FSU-5, "Components" for tightening torque. Tighten in the reverse order of removal.

  CAUTION:
  Refer to component parts location and do not reuse non-reusable parts.
- Tighten bolts and nuts for tightening stabilizer clamp. Tightening order is Front LH, Rear RH, Front RH, Rear LH.
- Stabilizer bar uses pillow ball type connecting rod. Position ball joint with case on pillow ball head parallel to stabilizer bar.



FRONT SUSPENSION MEMBER

PFP:54401

Removal and Installation

EES000U2

REMOVAL

1. Remove tire with power tool.
2. Remove undercover with power tool.
3. Remove steering hydraulic piping bracket from front suspension member.
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.
7. Remove cross bar from member stay.
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-70, "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 deformed parts, cracks, or any other damage. Replace if necessary.

INSTALLATION

- Refer to FSU-5, "Components" for tightening torque. Tighten in the reverse order of removal.

  CAUTION:
  Refer to component parts location and do not reuse non-reusable parts.
- After installation, perform final tightening of each part under unladen conditions with tires on ground. Check wheel alignment. Refer to FSU-16, "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	0° (0°)
		Nominal	3° (0.05°)
		Maximum	6° (0.10°)

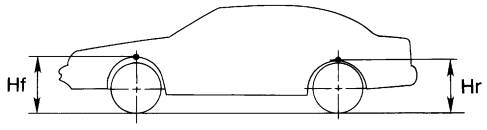
Ball Joint

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, 5 - 30 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] 705 mm (27.76 in) [Canada model]	707 mm (27.83 in) [USA model] 708 mm (27.87 in) [Canada model]	700 mm (27.56 in) [USA 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.