FRONT SUSPENSION

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PRECAUTION

PRECAUTION

Caution

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- When installing rubber bushings, the 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. A spare tire, a jack, hand tools and mats are in designated positions.
- After servicing suspension parts, be sure to check wheel alignment.
- Self-lock nuts are not reusable. Always use new ones when installing. Since new caulking nuts are preoiled, tighten as they are.

PREPARATION

PREPARATION Special Service Tools (SST)

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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.	C A C A C A C A C A C A C A C A C A C A	Measuring wheel alignment
ST35652000 (—) Strut attachment	ZZA0807D	Disassembling and assembling strut
ST3127S000 (See J25765-A) Preload gauge 1. GG91030000 Torque wrench (J25765) 2. HT62940000 (—) Socket adapter (1/2") 3. HT62900000 (—) Socket adapter (3/8")	1 2 3 6 NT124	Measuring rotating torque of ball joint
ommercial Service Too	ols	EES000TT
Tool name		Description
Spring compressor	S-NT717	Removing coil spring
Power tool	PBIC0190E	 Removing wheel nuts Removing undercover Removing brake caliper assembly Removing suspension components parts

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING NVH Troubleshooting Chart

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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	I	I	I	FSU-7	FSU-5	FSU-14	NVH in PR section	NVH in RFD section.	NVH in FAX and FSU sections.	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	FRONT AXLE AND FRONT SUSPENSION	TIRES	ROAD WHEELS	DRIVE SHAFT	BRAKES	STEERING	
		Noise	×	×	×	×	×	×			×	×	×	×	×	×	×	×
		Shake	×	×	×	×		×			×		×	×	×	×	×	×
		Vibration	×	×	×	×	×				×		×	×		×		×
Symptom	FRONT SUSPENSION	Shimmy	×	×	×	×			×				×	×	×		×	×
		Judder	×	×	×								×	×	×		×	×
		Poor quality ride or han- dling	×	×	×	×	×		×	×			×	×	×			

×: Applicable

FRONT SUSPENSION ASSEMBLY

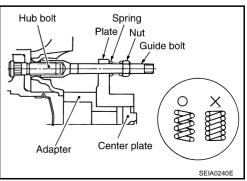
FF	RONT SUSPENSION ASSEMBLY PFP:54010
	n-Vehicle Inspection and Service
	ake sure the mounting conditions (looseness, back lash) of each component and component conditions ear, damage) are normal.
IN	SPECTION LOWER BALL JOINT END PLAY
1.	Set front wheels in a straight-ahead position. Do not depress brake pedal.
2.	Place an iron bar or similar tool between transverse link and steering knuckle.
3.	Measure axial end play by prying it up and down.
	Axial end play : 0 mm (0 in)
	CAUTION:
	Be careful not to damage ball joint boot.
ST	RUT INSPECTION
•	Check strut for oil leakage, damage and replace if there are. Refer to <u>FSU-8, "COIL SPRING AND</u> <u>STRUT"</u> .
	heel Alignment Inspection
•	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.
PR	RELIMINARY INSPECTION
Ch	neck the followings.
1.	Tires for improper air pressure and wear.
2.	Road wheels for runout.
3.	Wheel bearing axial end play.
4.	Suspension lower ball joint axial end play.
5.	Strut operation.
6.	Each mounting part of axle and suspension for looseness and deformation.
7.	Each of front suspension member, steering knuckle, strut and transverse link for cracks, deformation and other damage.
8.	Vehicle posture.
IN	SPECTION OF CAMBER, CASTER AND KINGPIN INCLINATION ANGLES.
•	Camber, caster, kingpin inclination angles cannot be adjusted.

- 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 the CCK gauge attachment (SST: KV991040S0 (--)) as following procedure on wheel, then measure wheel alignment.

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



5. 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 suspension member, steering knuckle, strut and transverse link for wear and damage. Replace suspect parts if there are.
- King pin inclination angles is reference value, no inspection is required.

Toe-in Inspection

Measure toe-in using the following procedure.

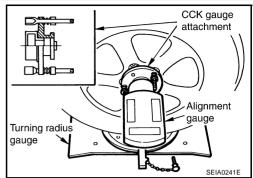
WARNING:

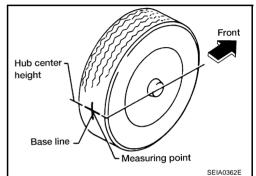
- Always perform the following procedure on a flat surface.
- Make sure that no person is in front of vehicle before pushing it.
- 1. Bounce the front of vehicle up and down to stabilize the posture.
- 2. Push vehicle straight ahead about 5 m (16ft).
- 3. Put a mark on base line of the tread (rear side) of both tires at the same height of hub center. These are measuring points.
- 4. Measure the distance "A" (rear side).
- 5. Push vehicle slowly ahead to rotate wheels 180 degrees (1/2 turn).

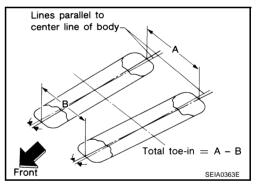
If wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.

6. Measure the distance "B" (front side).

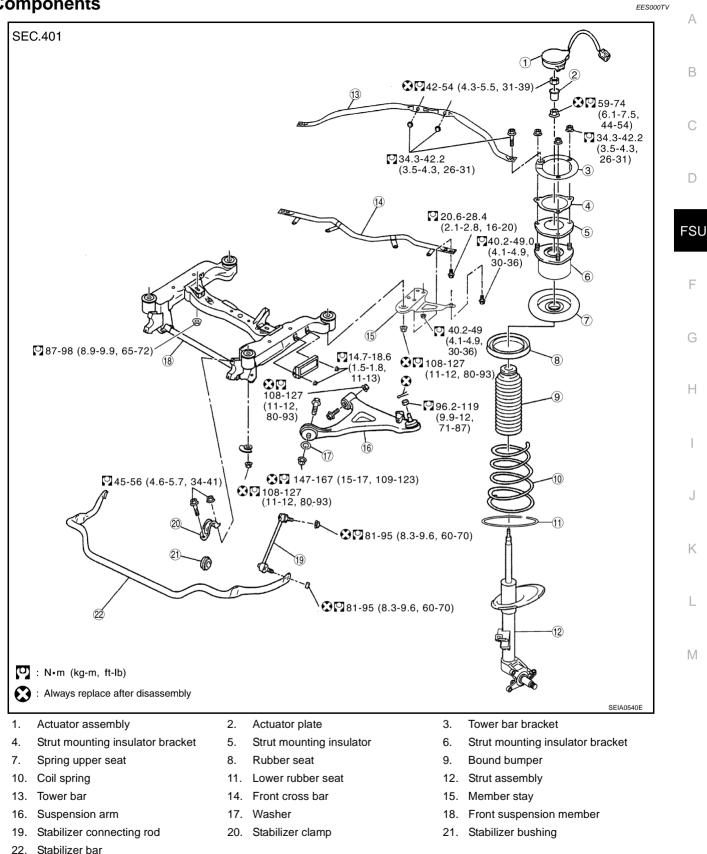
Total toe-in : Refer to FSU-16, "SERVICE DATA".







Components



COIL SPRING AND STRUT

Removal and Installation REMOVAL

1. Remove tire from vehicle with a power tool.

2. Remove brake caliper with a power tool. Hang it in a place where it will not interfere with work. Refer to <u>BR-23, "FRONT DISC BRAKE"</u>.

NOTE:

Avoid depressing brake pedal while brake caliper is removed.

- 3. Remove mounting nuts of brake hose from strut assembly.
- Remove harness of wheel sensor from strut assembly. Refer to <u>BRC-61, "WHEEL SENSORS"</u>. 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 steering knuckle, then loosen mounting nut.
- 7. Use a ball joint remover (suitable tool) to remove steering outer socket from steering knuckle. Be careful not to damage ball joint boot.

CAUTION:

Tighten temporarily mounting nut to prevent damage to threads and to prevent the 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 the 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.

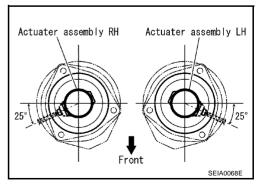
INSTALLATION

Refer to <u>FSU-7, "Components"</u> for tightening torque. Install in the reverse order of the 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 <u>FSU-5</u>, <u>"Wheel Alignment Inspection"</u>.
- After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to <u>BRC-6, "Adjust-ment of Steering Angle Sensor Neutral Position"</u>.
- 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 damage drop, do not use it.



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

Disassembly and Assembly DISASSEMBLY

CAUTION:

Do not damage piston rod on strut assembly when removing components from strut assembly.

1. Fix strut mounting insulator bracket 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 the strut attachment (SST) to strut assembly and secure it in a vice.

CAUTION:

Wrap a shop cloth around strut assembly to protect it from damage, when installing the strut attachment (SST) to strut assembly.

3. Compress coil spring using a spring compressor (commercial service tool) until coil spring is free.

CAUTION:

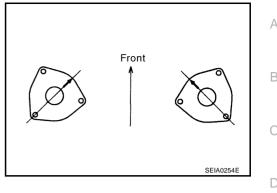
Be sure spring compressor (commercial service tool) is securely attached to coil spring before coil spring is compressed. Compress coil spring.

- 4. After making sure coil spring with a spring compressor 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 with spring compressor and bound bumper from strut assembly.
- 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.

FSU-9

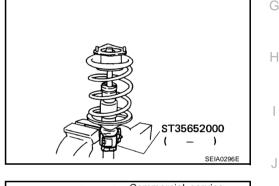
- 7. Remove lower rubber seat from strut assembly.
- 8. Remove the strut attachment (SST) from strut assembly.

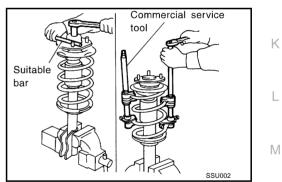


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INSPECTION AFTER DISASSEMBLY

Strut Inspection

Check the followings

- Strut assembly for deformation, cracks, damage, and replace if necessary.
- Piston rod for damage, uneven wear or distortion, and replace if necessary.
- Welded and sealed areas for oil leakage, and replace if necessary.

Strut Mounting Insulator and Rubber Parts Inspection

Check mounting insulator, 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:

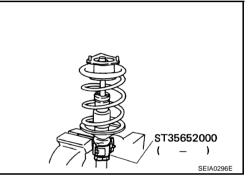
Make sure strut piston rod is not damaged when attaching components to strut assembly.

1. Install strut attachment (SST) to strut assembly and secure it in

a vise.

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

2. Install lower rubber seat to strut assembly.



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

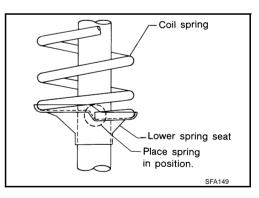
CAUTION:

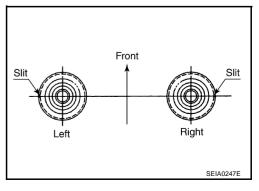
- Face the tube side of coil spring downward. Align lower end to spring seat as shown in the figure.
- Be sure spring compressor (commercial service tool) is securely attached to coil spring. And then compress coil spring.
- 4. Apply soapy water to bound bumper and insert into strut mounting insulator.

CAUTION:

Do not use machine oil.

- 5. Install rubber seat, spring upper seat, strut mounting bearing, strut mounting insulator.
 - Installation position of spring upper seat as shown in the figure.





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

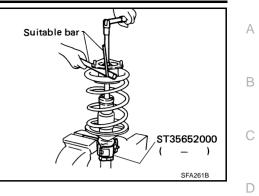
Be careful not to deform strut mounting insulator.

 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.

- 8. Remove strut attachment (SST) from strut assembly.
- 9. Install actuator plate onto strut assembly.
- 10. 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

SUSPENSION ARM

Removal and Installation REMOVAL

- 1. Remove tire from vehicle with a power tool.
- 2. Remove undercover with a power tool.
- 3. Remove cotter pin of lower ball joint, then loosen mounting nut.
- 4. Use the 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 the ball joint remover (suitable tool) 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 balance at cotter pin mounting hole. Confirm spring balance measurement value is within the specifications when ball stud begins moving.

Specified swing torque:

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

Specified value of spring balance:

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.

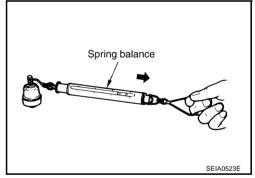
Rotating Torque Inspection

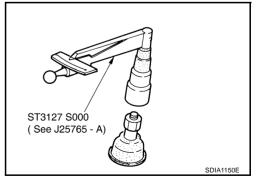
• Attach mounting nut to ball stud. Check that rotating torque is within the specifications with a preload gauge (SST).

Specified 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 the tip of ball joint in the axial direction to check for looseness.

Specified axial end play : 0 mm (0 in)

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

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SUSPENSION ARM

INSTALLATION

- Refer to <u>FSU-7, "Components"</u> for tightening torque. Install in the reverse order of the 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 <u>FSU-5</u>.
 <u>"Wheel Alignment Inspection"</u>.
- After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to <u>BRC-6, "Adjust-ment of Steering Angle Sensor Neutral Position"</u>.

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STABILIZER BAR

STABILIZER BAR

Removal and Installation REMOVAL

- 1. Remove tire from vehicle with a power tool.
- 2. Remove undercover with a power tool.
- 3. Remove mounting nut on upper position of stabilizer connecting rod with a power tool.
- 4. Remove stabilizer clamp mounting bolts and nuts with a 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 <u>FSU-7, "Components"</u> 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 <u>FSU-5</u>, <u>"Wheel Alignment Inspection"</u>.
- After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to <u>BRC-6, "Adjust-ment of Steering Angle Sensor Neutral Position"</u>.
- Stabilizer bar uses pillow ball type connecting rod.

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FRONT SUSPENSION MEMBER

	RONT SUSPENSION MEMBER PFP:54401	
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	emoval and Installation EESOOU2	
кс 1.	Remove tire from vehicle with power tool.	
2.	Remove undercover with power tool.	В
3.	Remove steering hydraulic piping bracket from front suspension member. Refer to <u>PS-31, "HYDRAULIC</u> <u>LINE"</u> .	С
4.	Remove steering gear and front suspension member attachment bolts and hang steering gear on vehicle. Refer to <u>PS-15, "POWER STEERING GEAR AND LINKAGE"</u>	0
5.	Remove suspension arm from front suspension member. Refer to FSU-12, "SUSPENSION ARM".	D
6.	Remove stabilizer bar mounting bolts and nuts from front suspension member then suspend a stabilizer on vehicle. Refer to <u>FSU-14, "STABILIZER BAR"</u> .	
7.	Remove cross bar from member stay. Refer to FSU-7, "Components".	FSU
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.	F
9.	Remove fixing bolts and nuts between engine mounting insulator and front suspension member. Refer to <u>EM-78, "ENGINE ASSEMBLY"</u> .	
10.	Remove member stay from front suspension member and body.	G
11.	Remove mounting nuts front suspension member and body.	
12.	Slowly lower jack to remove front suspension member from vehicle.	
INS	SPECTION AFTER REMOVAL	Н
Ch	eck front suspension member for deformation, cracks, or any other damage. Replace if necessary.	
INS	STALLATION	1
•	Refer to <u>FSU-7, "Components"</u> for tightening torque. Install in the reverse order of removal. NOTE:	
	Refer to component parts location and do not reuse non-reusable parts.	J
•	After removing/installing or replacing suspension components and steering components, check wheel alignment. Refer to <u>FSU-5</u> , "Wheel Alignment Inspection"	
•	After adjusting wheel alignment, adjust neutral position of steering angle sensor. Refer to <u>BRC-6, "Adjust-ment of Steering Angle Sensor Neutral Position"</u> .	К
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SERVICE DATA

SERVICE DATA Wheel Alignment (Unladen)

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Combox		Minimum	– 1°30′ (– 1.5°)
Camber Degree minute (Deci	imal degree)	Nominal	– 0°45′ (– 0.75°)
		Maximum	0°00′ (0.00°)
		Left and right difference	45′ (0.75°)
Caster		Minimum	5°25′ (5.42°)
Degree minute (Deci	imal degree)	Nominal	6°10′ (6.17°)
		Maximum	6°55′ (6.92°)
		Left and right difference	45′ (0.75°)
Kingpin inclination		Minimum	13°15′ (13.25°)
Degree minute (Dec	imal degree)	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)	Minimum	0′ (0°)
	Decimal degree	Nominal	3′ (0.05°)
	(Decimal degree)	Maximum	6′ (0.10°)

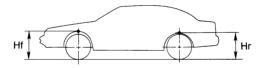
Ball Joint

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*)

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EES000U4



	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.