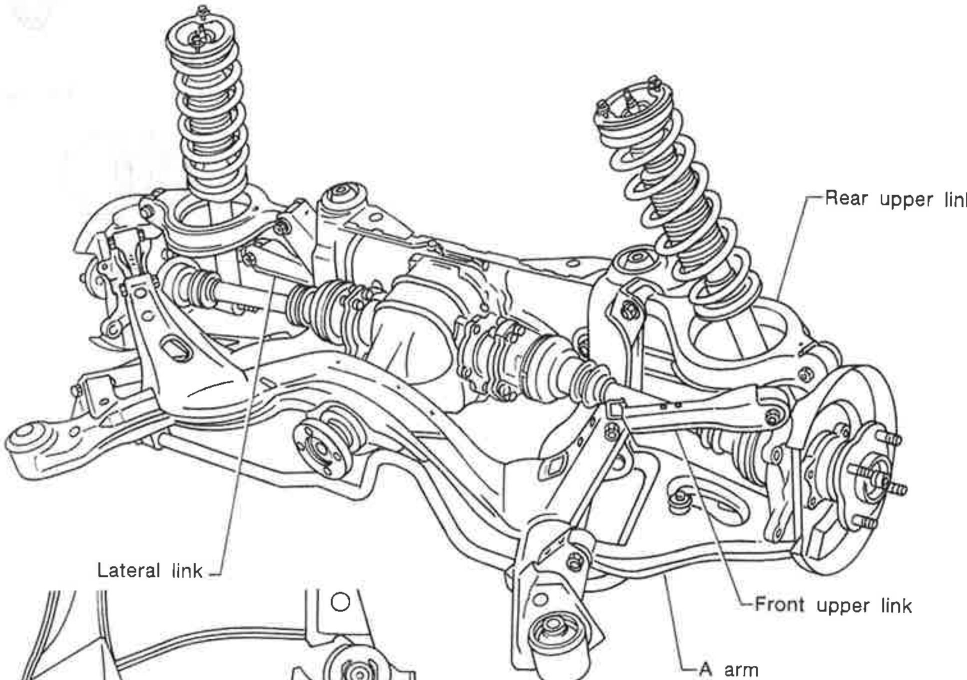
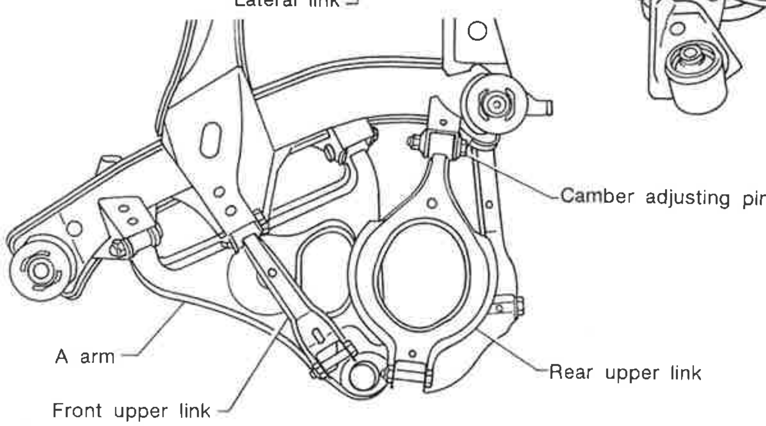
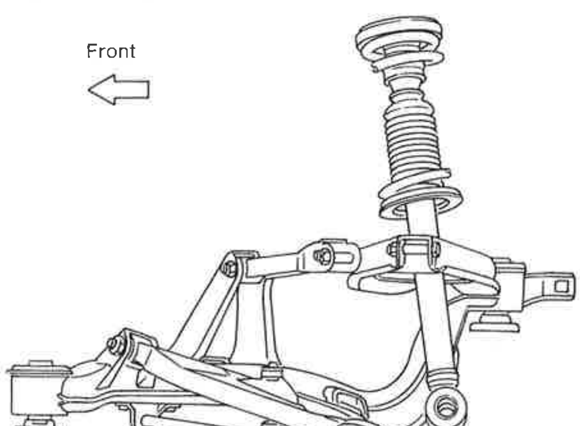
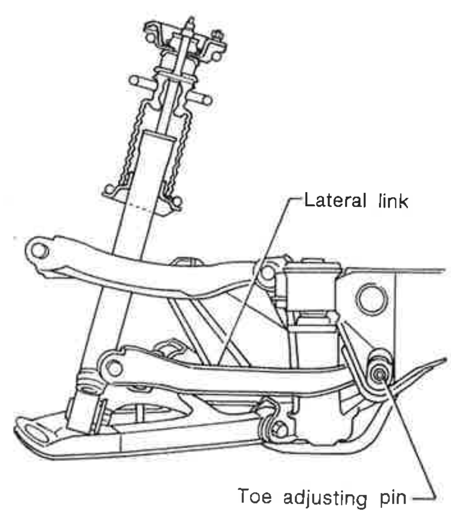
REAR AXLE AND REAR SUSPENSION
MAJOR FEATURES

- A newly designed multi-link rear suspension has been used to increase the stability of the steering operation. The new suspension is provided with a camber and toe adjustment mechanism to facilitate servicing.
- Camber and toe are adjusted by adjusting pin.
- A unit ball bearing type bearing has been used.





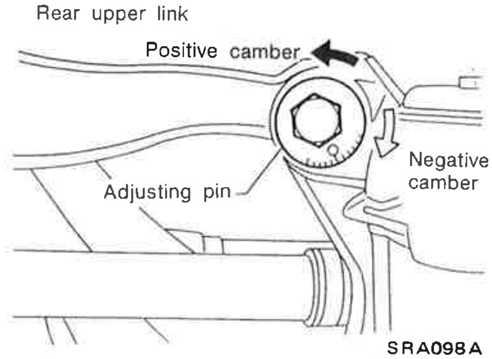




SERVICE POINT

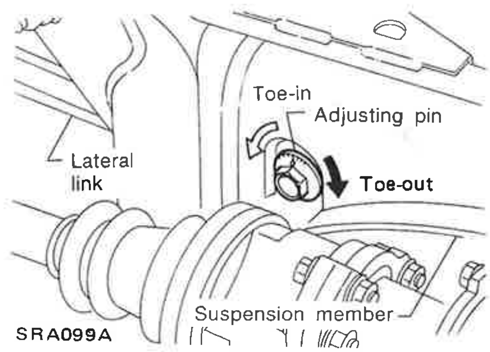
CAMBER ADJUSTMENT

An eccentric cam, adjusting mechanism has been located at the rear upper link-suspension member connection, facilitating camber adjustment by means of the adjusting pin.



TOE ADJUSTMENT

An eccentric cam, adjusting mechanism has been located at the lateral link-suspension member connection, facilitating toe adjustment by means of the adjusting pin.



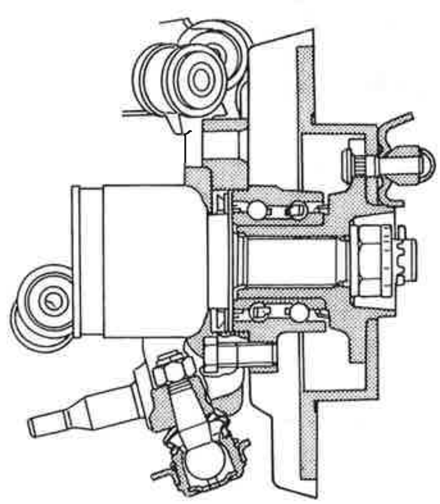
WHEEL BEARING INSPECTION

By employing the unit bearings mentioned above, the need for preload adjustment has been eliminated.

(1) Check that the wheel hub does not catch on anything and that it rotates smoothly.

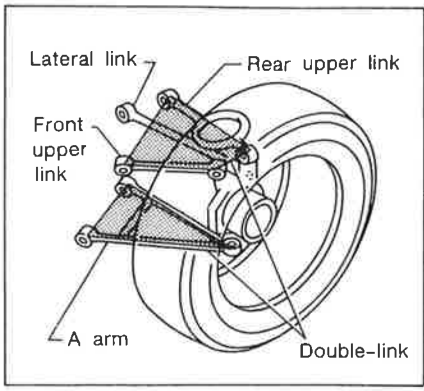
(2) Check that the axial end play is within the specified value [0.05 mm (0.0020 in) or less].

If, upon making these checks, there is some kind of abnormality, exchange the wheel bearing assembly as a unit.

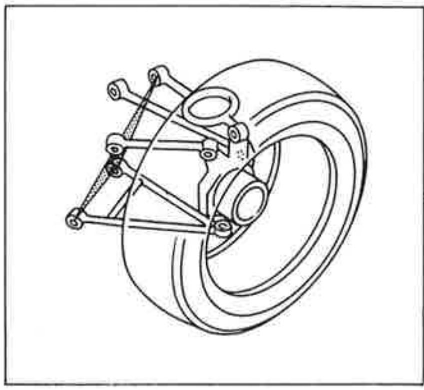


CONSTRUCTION AND FUNCTION OF MULTI-LINK SUSPENSION

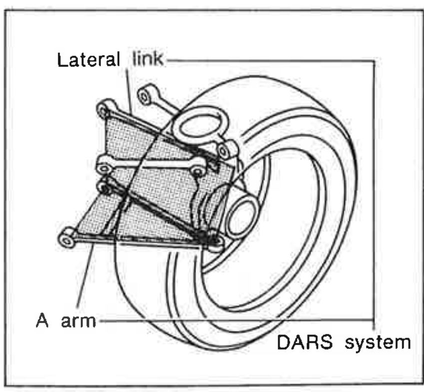
The multi-link suspension consists of an upper link, which is divided into two pieces, and a lower link, which is composed of an A arm and a lateral link. With this design, high steering stability detailed in the figure below is assured.



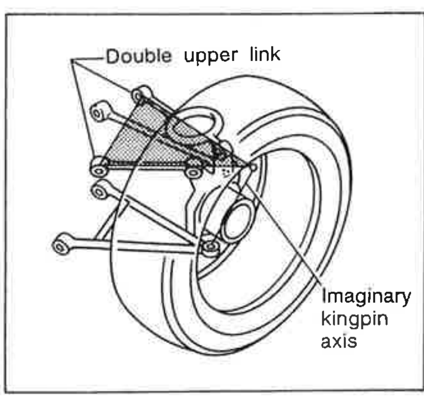
Use of double-link suspension design
- Optimization of camber angle to ground.
- Suppression of jacking effect



Optimization of link arrangement
- Use of anti-tail lift and anti-squat geometry



Use of DARS (Diagonal A arm Rear Suspension) system
- Compliance "toe-in" design
- Restriction of toe change during bump/rebound



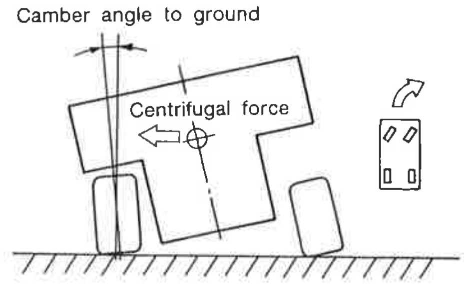
Use of double upper link design (Establishing an imaginary kingpin axis)
- Optimization of "toe-in/out" control during foot-brake or engine-brake operation

① USE OF DOUBLE-LINK SUSPENSION

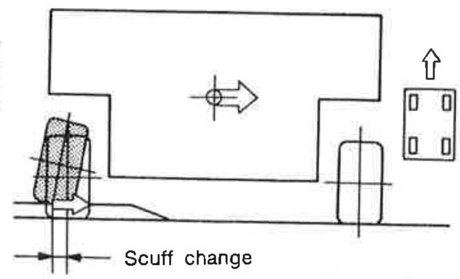
Two upper links and a lower link (that utilizes an A arm) form a double-link suspension design. This design optimizes the camber angle to the ground while suppressing the jacking effect.

Optimization of camber angle to ground

- The double-link suspension design constantly maintains the wheel ground contact when the vehicle rounds a curve or travels on bumpy road surfaces. As a result, the vehicle is subject to rolling due to centrifugal force. By virtue of a double-link design, however, camber changes to compensate for the amount of vehicle roll encountered. In other words, use of the double-link design makes the camber angle to the ground close to zero.

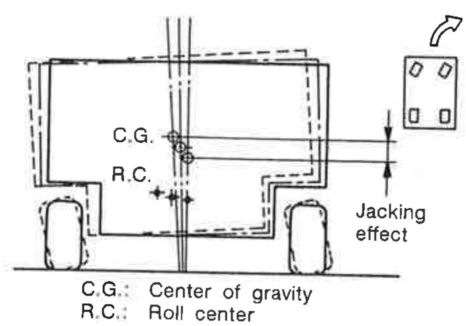


- When one side wheel operates on bumpy road surface during straight driving, that wheel bounces less. In such a case, changes in camber angle to the vehicle is minimized, making it possible to restrict deviations of the wheels (scuff change) while advancing.

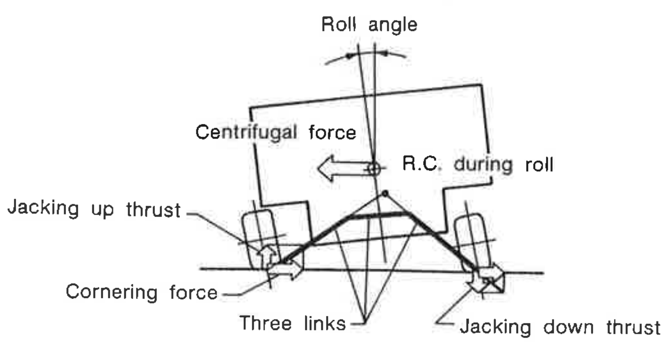


Suppression of jacking effect

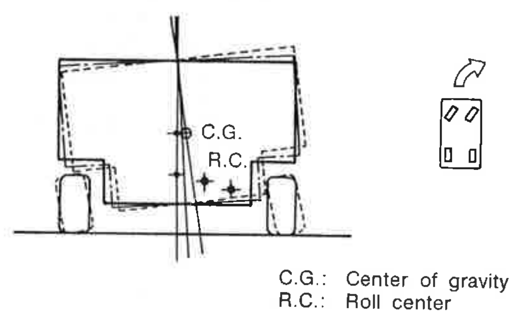
- When the vehicle makes a turn, centrifugal force causes the body to roll. This forces the body to lean both outward and upward ("Jacking effect").



3-link model



Roll behavior with zero jacking



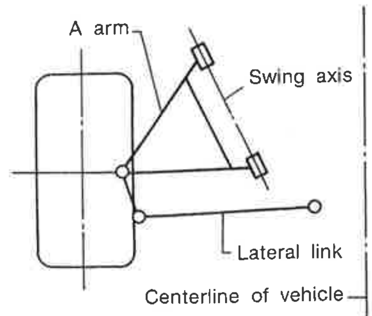
- In the multi-link suspension design, three links are utilized with the suspension and body to effectively restrict such a "jacking effect". In other words, when the body rolls as shown in the figure above, the three links move in directions so that "jacking up" and "jacking down" forces are offset from each other. As a result, "jacking up" symptoms are substantially reduced to a minimum.

② **OPTIMIZATION OF LINK ARRANGEMENT**

The upper links, shock absorbers and lower links are arranged in optimum locations to prevent changes in vehicle posture during rapid acceleration or braking.

③ **USE OF DARS (Diagonal A arm Rear Suspension) SYSTEM**

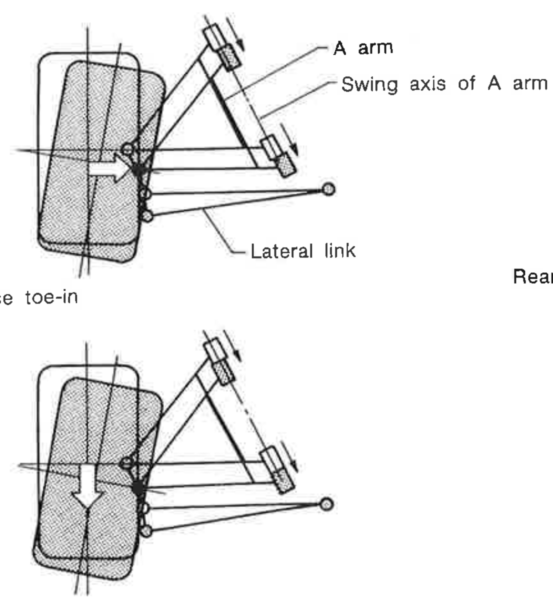
The DARS system consists of a swing axis, and an A arm, and a lateral link which are linked with the swing axis as shown. A arm is arranged so that the swing axis can move forward with respect to the centerline of the vehicle while the lateral link is located behind A arm.



Toe control with the DARS system (Compliance toe-in)

In the DARS system, the A arm bushing on the body side is designed so that its stiffness is softer in the direction of the swing axis than in a vertical direction with respect to the shaft. The lateral link is designed so that it does not move in the lateral direction. Accordingly, when lateral force (reaction of centrifugal force) is applied to the outer wheel while rounding a curve or while braking on a turn, as shown in the figure below, the outer wheel is moved in the "toe-in" direction (compliance toe-in) due to torsion of the bushing. As a result, a wheels' cornering force will increase, making it possible to stabilize steering during turns or braking.

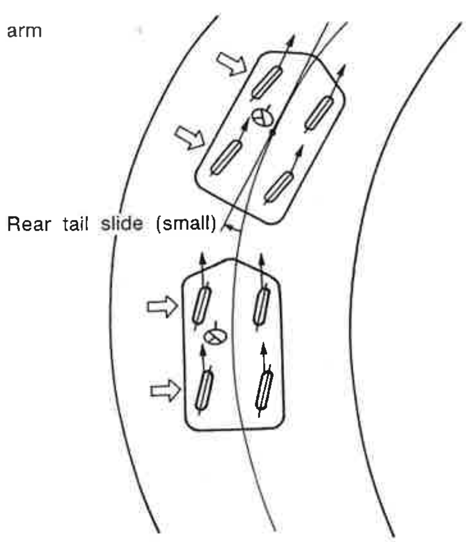
Compliance steering — DARS system



Side force toe-in

Braking force toe-in

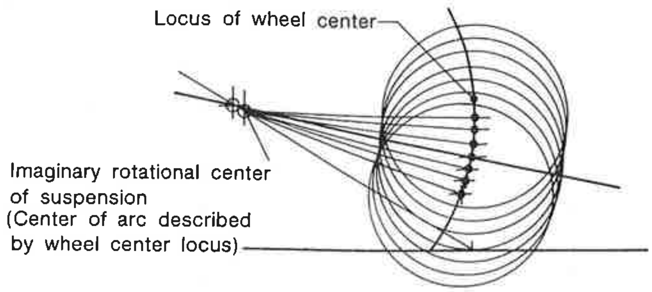
Vehicle behavior — DARS system suspension



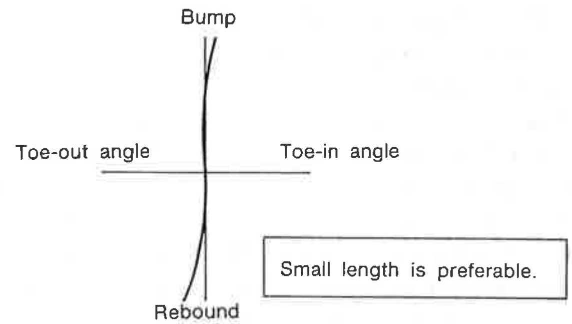
Restriction of toe angle change during bump/rebound

When wheels bump or rebound, the center of the wheel acts on an arm with the pivot point of the suspension utilized as a pivot through combined links. Through the arm movement, the toe angle tends to change. However, excessive toe angle change is restrained by the movement of each link with respect to the stroke length of bump or rebound.

The pivot point of the suspension



Toe angle changes with stroke.

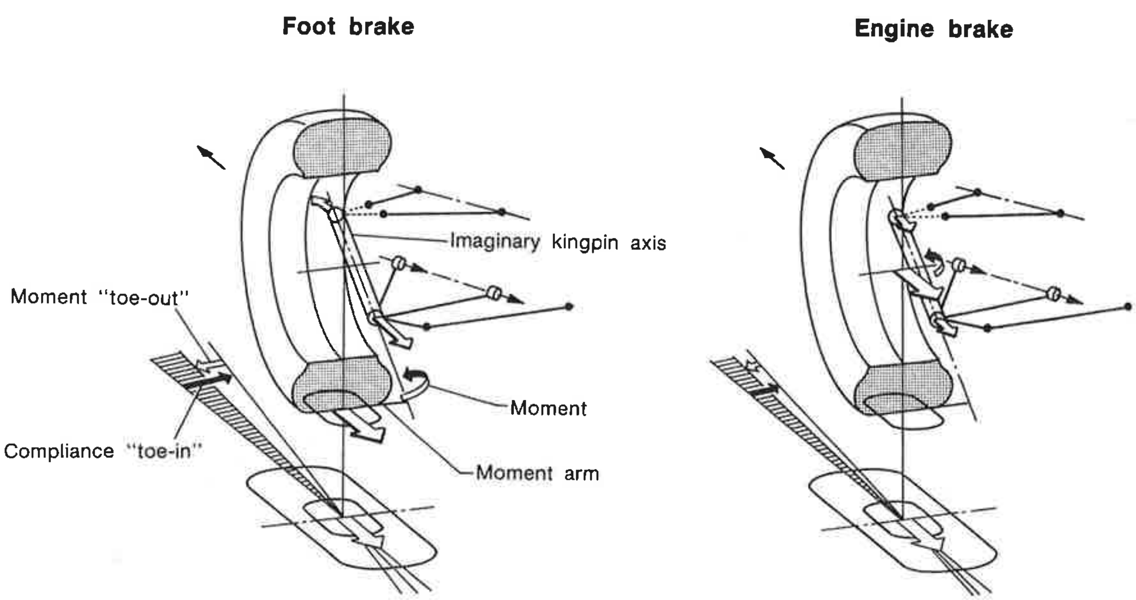


④ USE OF DOUBLE UPPER LINK DESIGN

The double upper link utilizes two separate upper links. This design makes it possible to locate an imaginary rotational center (or the intersection of the two upper links) on the outer side of the wheel. As a result, the shaft (imaginary kingpin axis) which connects the imaginary rotational center of the upper links and the ball joint is designed to tilt outward.

Optimization of "toe" control during foot-brake or engine-brake operation

When brakes are applied, both force applied to each link and the moment occurring in the center of the kingpin axis are applied to the corresponding wheel. The force applied to the link causes the bushing to deflect. This deflection of the bushing acts as a compliance "toe-in" which moves the wheel toward the "toe-in" direction. On the other hand, the small moment occurring around the kingpin axis tends to move the wheel toward the "toe-out" direction. However, the difference between the two forces is great resulting in a large "toe-in" during braking.
The point of braking force entering the suspension occurs at the ground-contact point of the wheel when the foot brake is applied while the input point occurs in the center of the wheel when the engine brake is utilized. Because of this, the magnitude of the moment occurring around the kingpin axis as well as input to each link differ depending on the two methods of brake application.
In the multi-link type suspension, equipped with two separate upper links, the imaginary kingpin axis is located so that it opens outwards. With this design, the total "toe-in" remains unchanged regardless of foot or engine brake application. As a result, steering stability is greatly improved while rounding a corner during braking.



	Compliance "toe-in"	Moment "toe-out"	Total "toe-in"
Foot brake	Large	Large	Remains the same
Engine brake	Small	Small	