

1997 ACURA INTEGRA TYPE R

TECHNICAL INFORMATION GUIDE

ACURA
Advantage

Introduction and General Information



Engine



Fuel and Emissions



Transaxle



Chassis/Suspension



Brakes



Body Electrical



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■ Introduction

For the 1997 model year, Acura has introduced a special high-performance, limited-edition Integra Sport Coupe, the Integra Type R.

Like the new 1997 NSX, the Integra Type R features numerous technological innovations that maximize performance and handling, and provide high levels of safety, durability and efficiency.



■ Overview of Changes from Integra GS-R

The Integra Type R is powered by a special B18C5, 195-horsepower, 1.8-liter, dual over-head cam, 16-valve, VTEC inline 4-cylinder engine. This engine puts out more horsepower per liter than any other normally aspirated mass-produced car in the U.S.

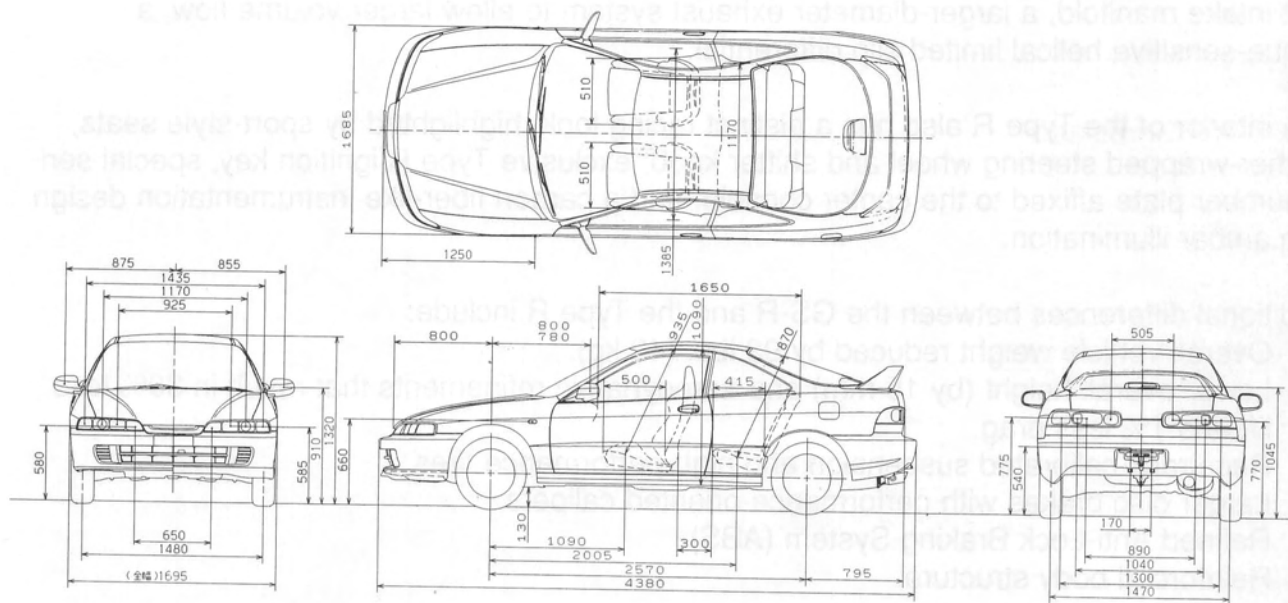
Features unique to the Type R are: hand-polished intake and exhaust ports and a single-port intake manifold, a larger-diameter exhaust system to allow larger volume flow, a torque-sensitive helical limited slip differential.

The interior of the Type R also has a distinct racing look, highlighted by sport-style seats, leather-wrapped steering wheel and shifter knob, exclusive Type R ignition key, special serial number plate affixed to the center console, and a carbon fiber-like instrumentation design with amber illumination.

Additional differences between the GS-R and the Type R include:

- Overall vehicle weight reduced by 93 lbs. (42 kg).
- Lower overall height (by 15 mm) and aerodynamic refinements that result in 30% less lift and 1% less drag.
- Racetrack-calibrated suspension and high-performance tires.
- Larger disc brakes with performance-oriented calipers.
- Refined Anti-Lock Braking System (ABS).
- Reinforced body structure.

■ Specifications



1	Length	4380 mm
2	Width	1695 mm
3	Height	1320 mm
4	Wheelbase	2570 mm
5	Front tread	1480 mm
6	Rear tread	1475 mm



■ Introduction

The Integra Type R features an advanced 1.8-liter, 195-horsepower, dual overhead cam, 16-valve in-line 4-cylinder engine equipped with the VTEC system pioneered in the Acura NSX.

Here's how the engine in the Type R compares to the engine in the current GS-R:



Engine Comparison

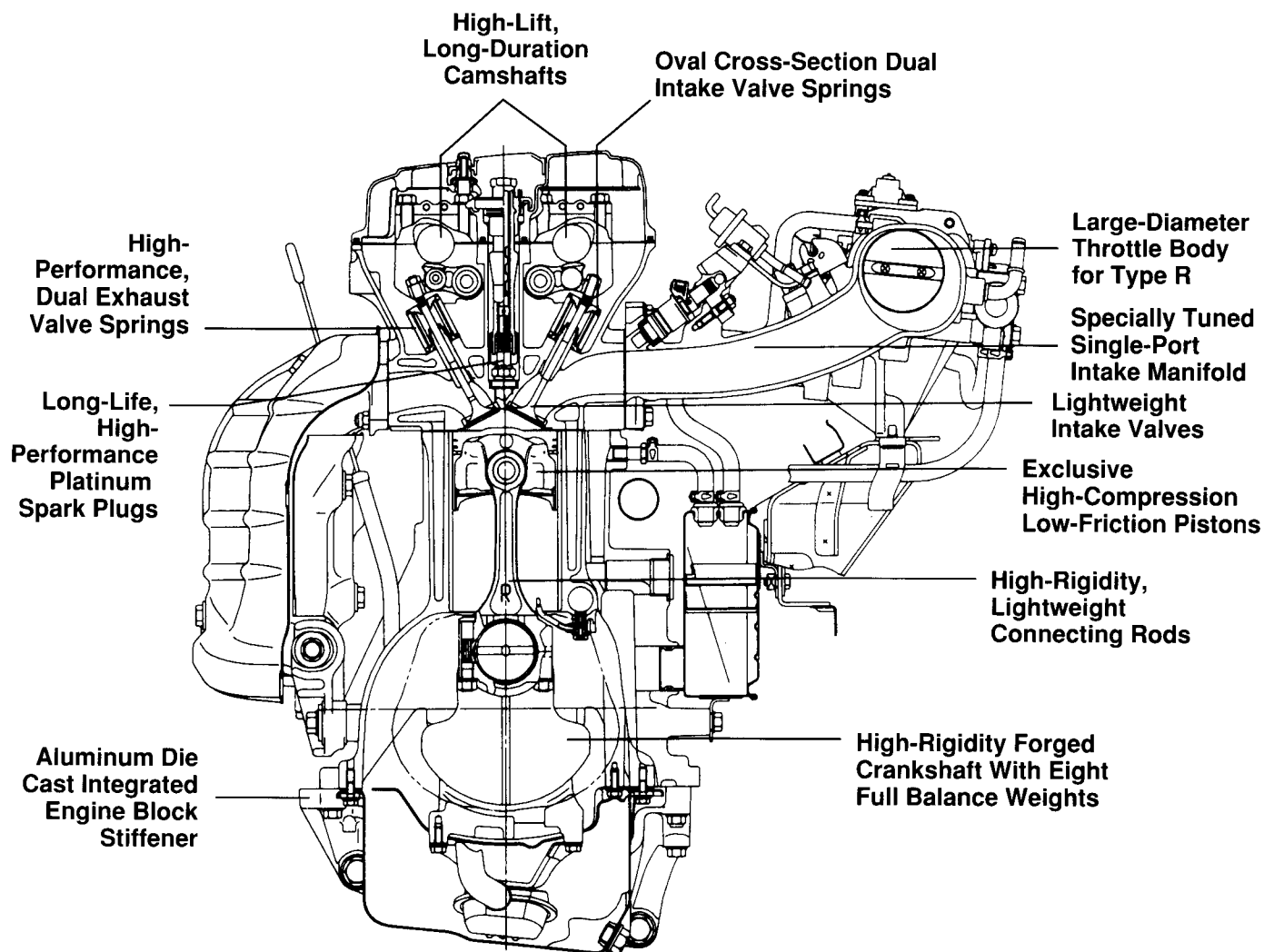
	1997 Integra Type R	1997 Integra GS-R
Designation	B18C5	B18C1
Displacement	1797 cc	1797 cc
Valvetrain	Dual-overhead-cam	Dual-overhead-cam
Horsepower	195 hp @ 8000 rpm	170 hp @ 7600 rpm
Torque	130 lbs-ft @ 7500 rpm	128 lbs-ft @ 6200 rpm
Compression Ratio	10.6:1	10.0:1

Major new features of the Type R engine contributing to the increase in horsepower include:

- High-compression, low-friction pistons.
- Higher-performance camshafts and valve gear.
- Larger throttle body and single-port intake manifold.
- Hand-polished intake and exhaust ports.
- New high-volume exhaust manifold.



■ Introduction (cont'd.)

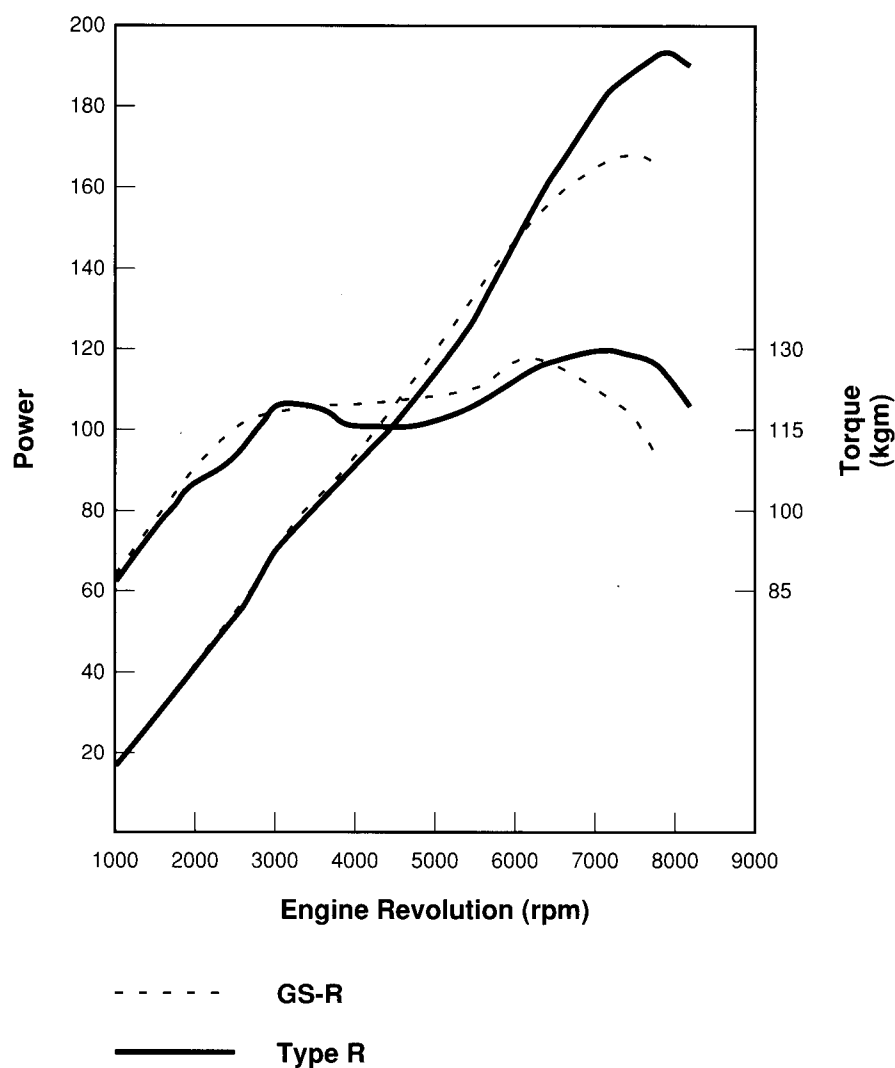


Bore: 81mm
Stroke: 87.2mm
Actual Displacement: 1797cc



■ Introduction (cont'd.)

Putting out 195 horsepower at 8000 rpm, and 130 lbs-ft of torque at 7300 rpm, the Type R engine is the most powerful normally-aspirated mass-produced automobile engine per liter ever produced (108 horsepower per liter) for the United States. And its relatively long stroke and high redline gives it the highest piston speed of any automobile engine in the world, even faster than the legendary World Championship Honda Formula One and IndyCar engines.



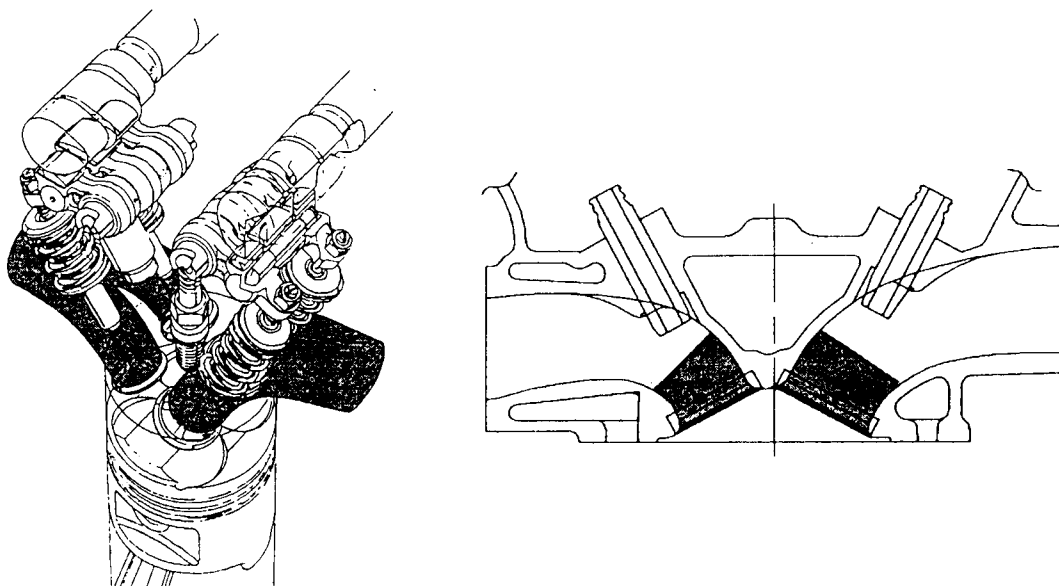


■ Camshaft/Valve Timing

Because of the low surface-to-volume area of the combustion chamber, minimal surface area is exposed to the heat of combustion and more heat is retained in the expanding gases, resulting in increased thermal efficiency.

The generous “squish” area around the combustion chamber yields increased gas turbulence, faster flame propagation, and even better efficiency.

Extensive modifications of the cylinder head were undertaken to improve performance. This includes hand-polishing of the intake and exhaust ports near the valve seat area.



Camshafts fitted to the Integra Type R are longer in duration with higher lift to help increase engine breathing and top-end performance.

- At high engine speeds, valve lift on the intake side is increased by 0.9 mm and on the exhaust side by 1.1 mm as compared to the GS-R.

The valve timing is extended an additional 10° on the intake side and 8° on the exhaust side.

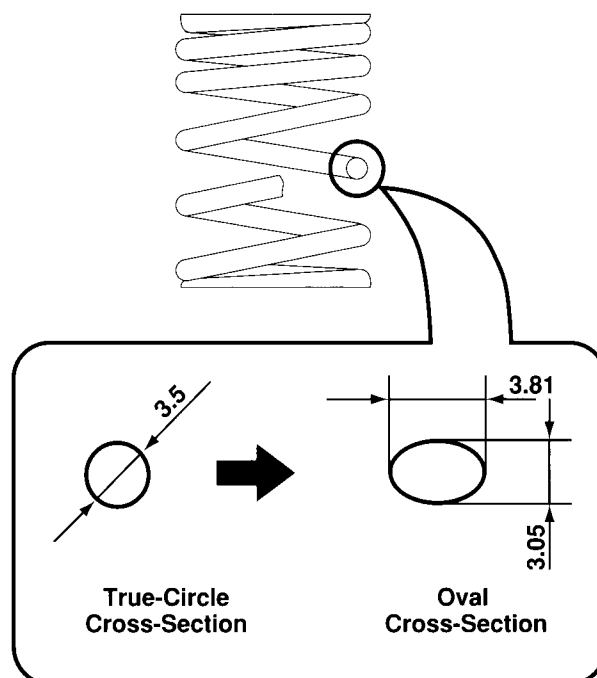


■ Valve Springs

Special high-performance dual intake valve springs with an oval-shaped cross section are utilized to allow the use of high-performance camshafts for increased flow at high rpm.

The unique oval shape allows a stronger valve spring to be fitted in the same area as a conventional spring.

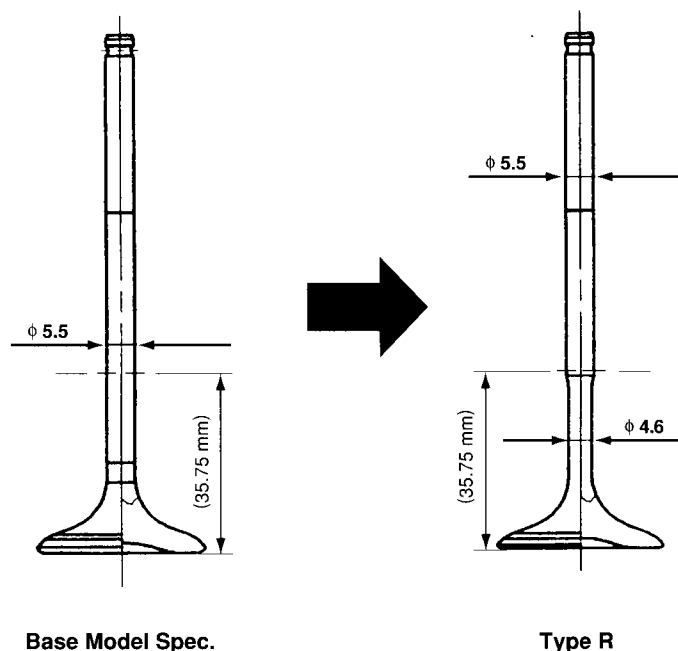
Conventional dual high-performance valve springs are used on the exhaust valves.



■ Intake Valves

In addition to hand polishing the ports to improve flow, special lightweight intake valves were also fitted. These valves feature a thinner stem in the intake port area to reduce weight and increase flow. The head of the valve is also lightened to further reduce valvetrain weight.

- These modifications net a 12% weight reduction of the intake valves, allowing the engine to rev higher.
- These lighter intake valves help extend the rpm range of the Type R engine by an additional 200 rpm.





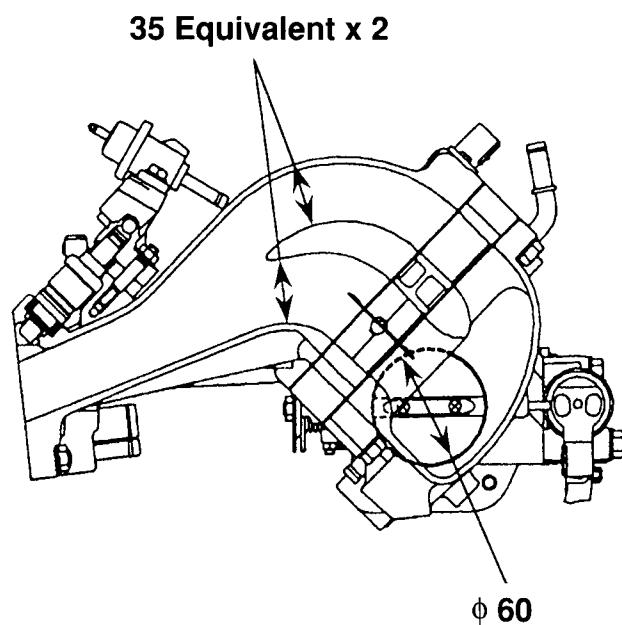
■ Single-Port Tuned Intake Manifold

In the interests of high rpm, high output and weight reduction, the Type R utilizes a larger-diameter throttle body and exclusive single-port intake manifold.

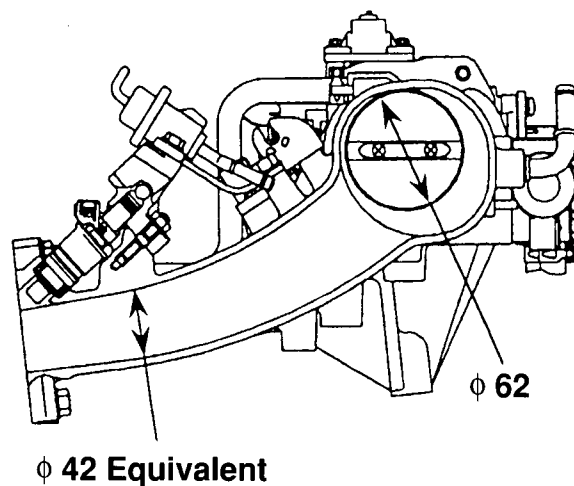
- The throttle bore has been increased by 2 mm to 62 mm to allow for increased intake flow.

The cast aluminum intake manifold features a larger diameter, single intake runner for each cylinder with a short, direct path to the cylinder head for maximum high-rpm efficiency.

- The single port design also results in a 7.0 lbs. (3.2 kg) weight savings.
- To substantially increase flow, intake runners have been increased 7 mm in diameter from 35 mm to 42 mm.
- The fuel injectors now point almost directly toward the center of the intake valves, helping to reduce fuel condensation on the intake port walls and improving driveability and engine response.



Dual Port Intake Manifold (GS-R)

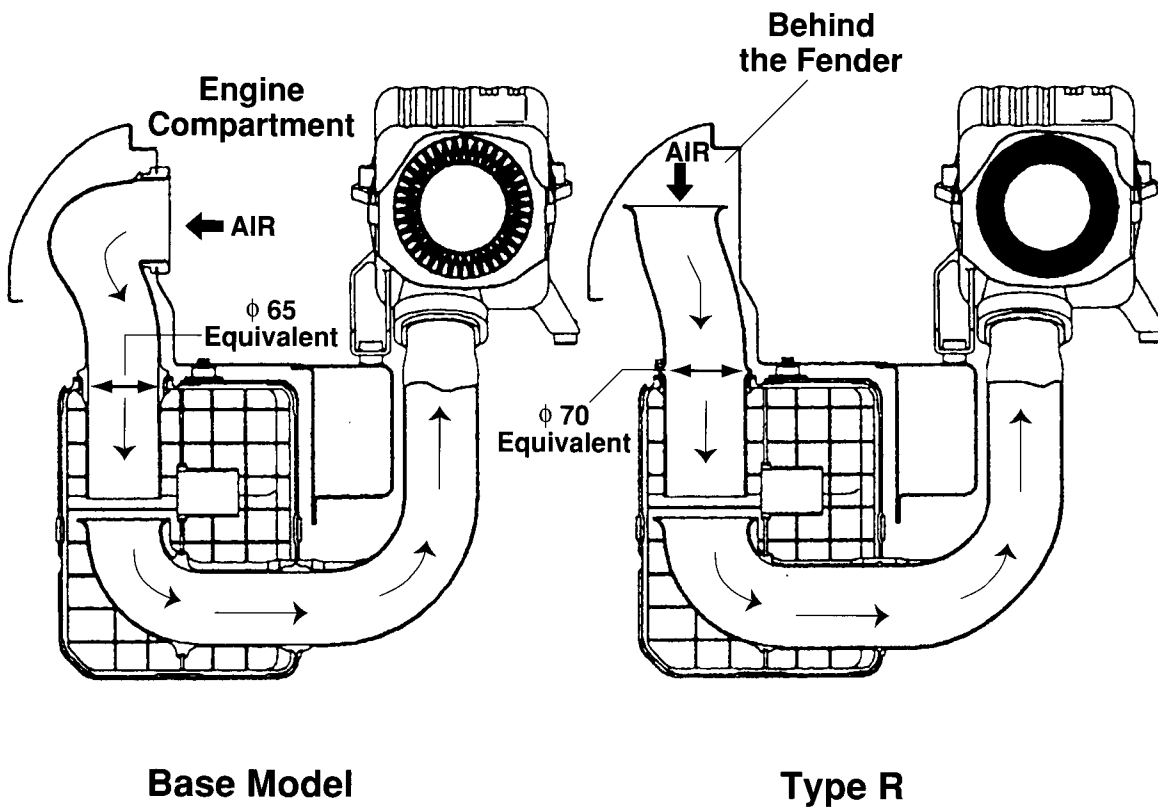


Single Intake Manifold (Type R)



■ Single-Port Tuned Intake Manifold (cont'd.)

To ensure a large amount of cool, fresh intake air, the air inlet has been moved from the engine compartment to an area behind the left-front fender.

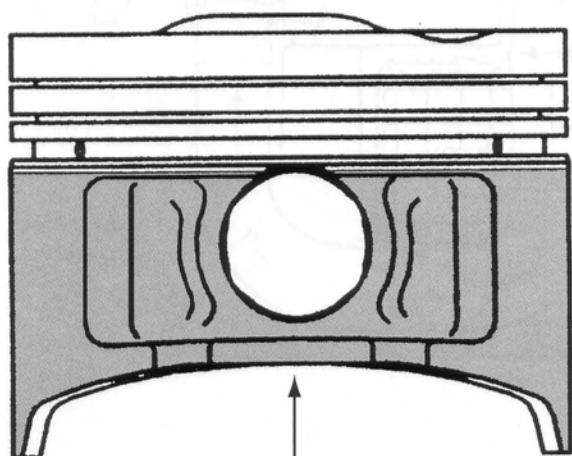




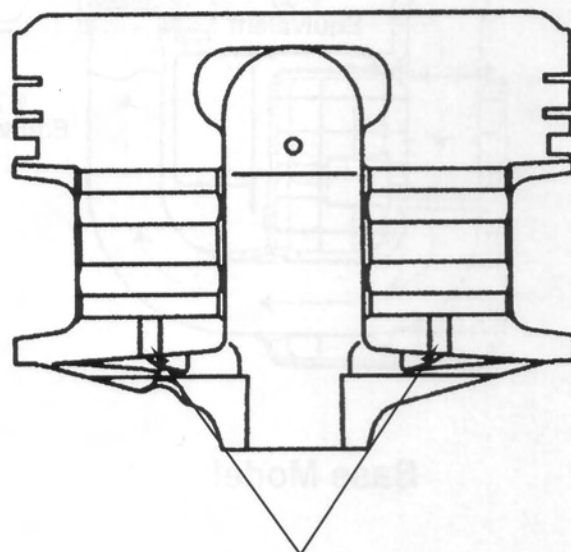
■ Pistons

Exclusive pistons have been developed for the Type R. The high-pressure die cast piston crown has been reshaped to increase the compression ratio to 10.6:1 and the valve pockets deepened to accommodate the increased valve lift and duration of the Type R.

The piston skirt is coated with molybdenum to minimize friction and allow it to withstand high-rpm operation, while specially designed oil paths have been machined into the underside of the piston to provide additional lubrication to the piston pin.



Molybdenum Coating (5 μ m thick)



Oil Feed Port For Piston Pin Bearing



■ Connecting Rods

Extreme care was taken in the forging and machining of the connecting rods to ensure each engine of a precisely matched set of connecting rods.

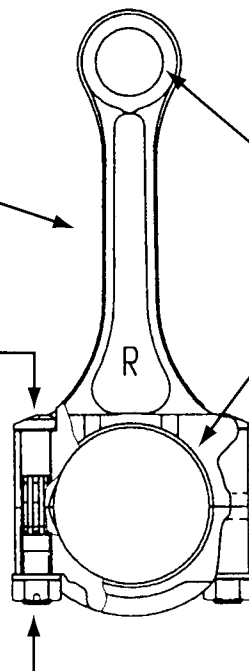
- As in the GS-R, the rods are constructed of special high-strength steel for a rigid yet light-weight component.
- Connecting rod bolt elongation has been strictly controlled for uniform fastening force. This is achieved through manual assembly of every connecting rod for the Type R. The result is a significant reduction of fastening force variance.

**For Uniform Strength,
Accuracy of the Cross-
Section To Be Improved**

**For Uniform Strength,
Accuracy of the Inner
Diameter To Be Improved**

**For Uniform Fastening
Force, Bolt Elongation
Strictly Controlled**

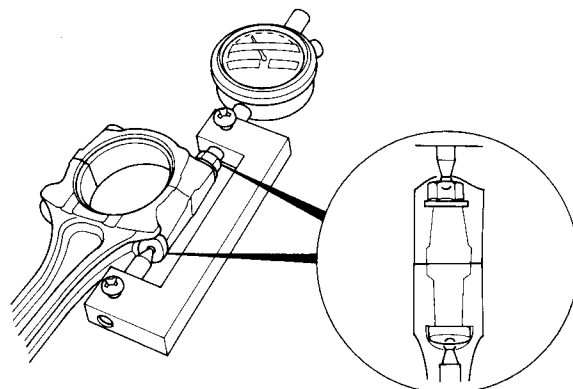
**Accuracy of the Machined
Surface To Be Improved by 33%**





Tightening Connecting Rod Bolts

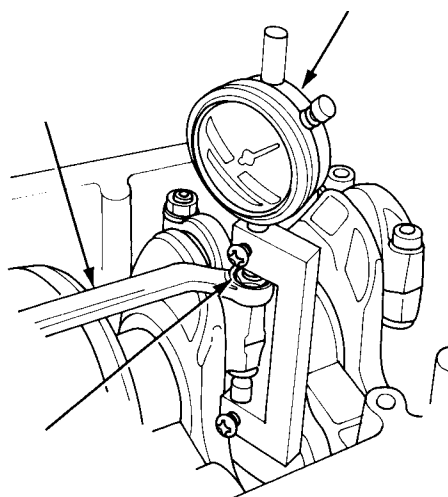
A special tool is required to tighten the connecting rod bolts. The crankshaft rotates at speeds over 8000 rpm, so the connecting rods must be tightened with specified axial tension by using the special tool – this method is more accurate than a torque wrench.



Connecting Rod Gauge Tool No. ACKKR-DA2-0100

NOTE: Because of the very low projected sales volume, this tool is not being shipped automatically to your dealership. If you need to perform this procedure, contact the American Honda Special Tools Department (Phone# 1-800-346-6327). They will provide you with this tool. (Note that this phone number is for Acura dealer usage)

- ① Install a wrench and the gauge as shown.
- ② Set gauge at zero.
- ③ Tighten the nut until the bolt is stretched the specified length. Specified axial stretched amount: 0.13 – 0.15 mm.



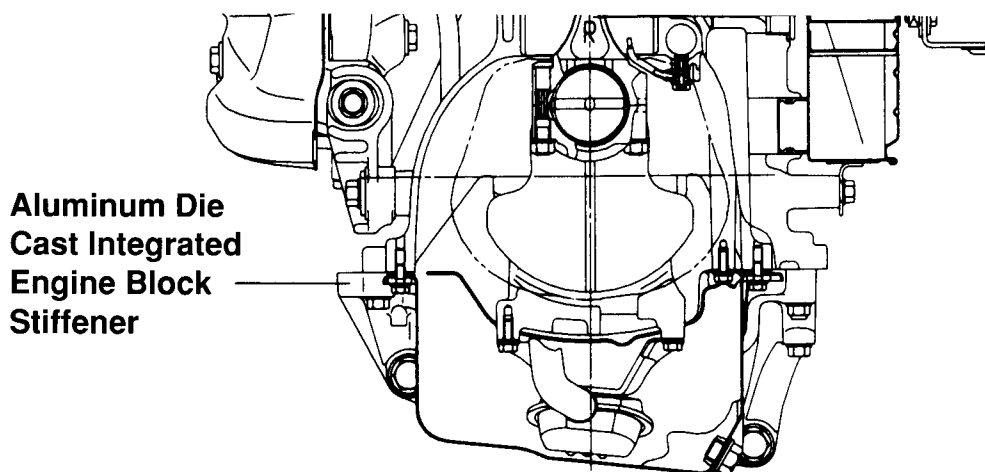
Connecting Rod Gauge Set Position



■ Engine Stiffener

The Type R features a uniquely integrated aluminum die-cast engine stiffener for improved engine-to-transmission fastening rigidity to cope with additional engine output and high rpm.

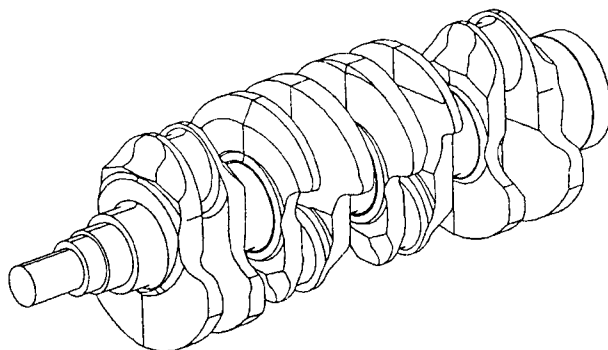
- Vibration is reduced 22% compared to the traditional separate fore and aft fastening systems.



■ Crankshaft

The Type R's highly rigid crankshaft is made of forged, high-strength steel with eight full balance weights to reduce vibration at high rpm by 20%.

The journals of the crankshaft also feature a special micro-polished surface finish for reduced friction and increased durability.





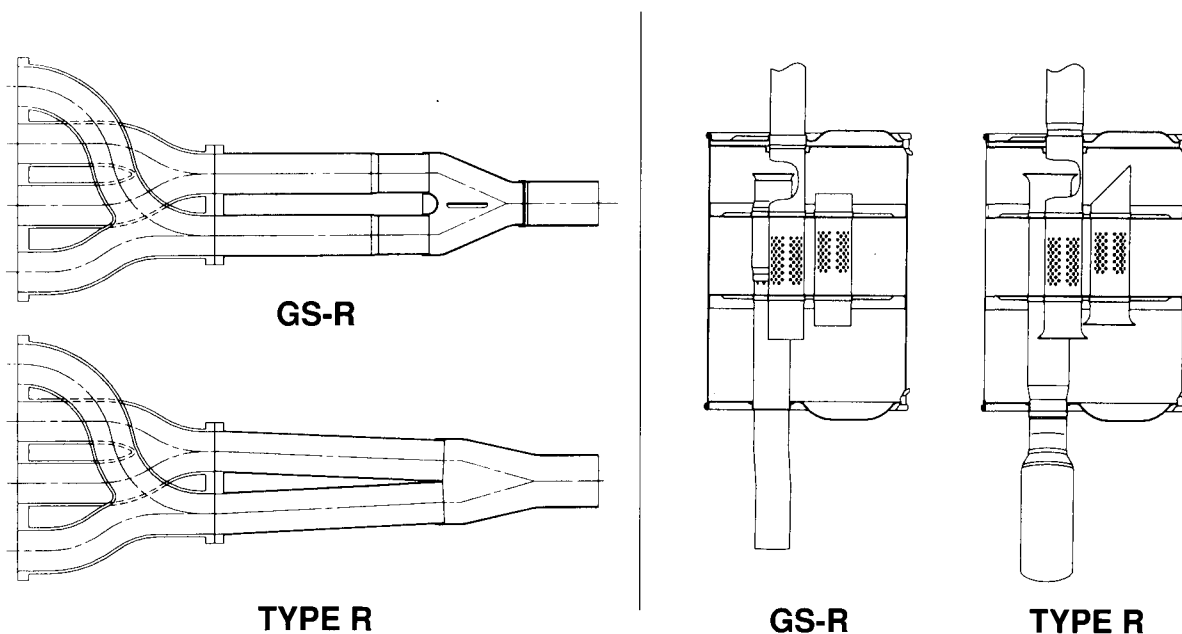
■ Exhaust System

The Type R features a highly efficient exhaust system.

This exhaust system starts with a large-diameter header systems; the individual head pipes converge into a tapered collector, providing smooth flow with minimum obstruction.

The stainless steel header connects to the exhaust system with significantly increased pipe diameters, the addition of a third exhaust chamber, and a performance-oriented muffler with a large NSX-style exhaust tip.

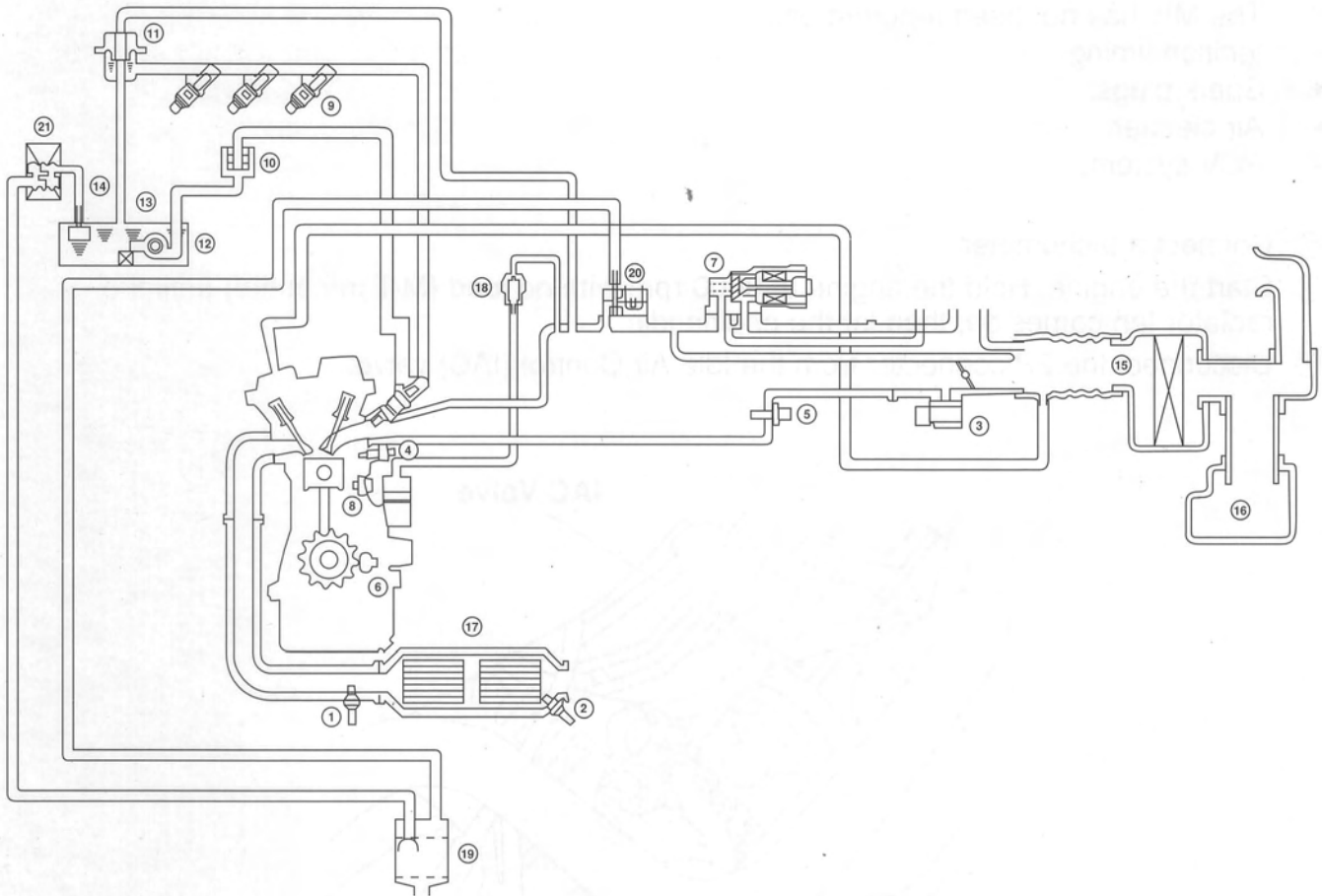
- The exhaust flow has been increased by 30% over the Integra GS-R.



■ Engine Oil Cooler

To maintain optimum engine oil temperature, the Type R features an aluminum oil cooler for maximum heat dissipation and thermal efficiency.

- The aluminum cooler is mounted on the engine block.



- | | |
|---|--|
| ① Primary Heated Oxygen Sensor (primary HO ₂ S) (Sensor 1) | ⑪ Fuel pressure regulator |
| ② Secondary Heated Oxygen Sensor (primary HO ₂ S) (Sensor 2) | ⑫ Fuel Pump (FP) |
| ③ Manifold Absolute Pressure (MAP) sensor | ⑬ Fuel tank |
| ④ Engine Coolant Temperature (ECT) sensor | ⑭ Fuel tank Evaporative Emission (EVAP) valve |
| ⑤ Intake Air Temperature (IAT) sensor | ⑮ Air cleaner |
| ⑥ Crankshaft Speed Fluctuation (CKF) sensor | ⑯ Resonator |
| ⑦ Idle Air Control (IAC) valve | ⑰ Three-way Catalytic Converter (TWC) |
| ⑧ Knock Sensors (KS) | ⑱ Positive Crankcase Ventilation (PCV) valve |
| ⑨ Fuel injector | ⑲ Evaporative Emission (EVAP) control canister |
| ⑩ Fuel filter | ⑳ Evaporative Emission (EVAP) purge control |
| | ㉑ Evaporative Emission (EVAP) two-way valve |

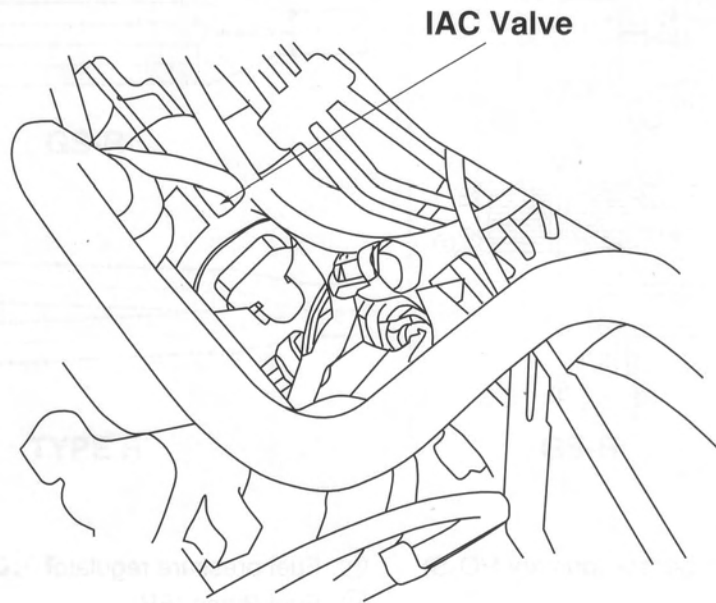


■ Idle Speed Adjustment

Following are the inspection and adjustment procedures for setting the idle speed on the Type R.

NOTE: Before setting the idle speed, check the following items:

- The MIL has not been reported on.
 - Ignition timing.
 - Spark plugs.
 - Air cleaner.
 - PCV system.
- ① Connect a tachometer.
 - ② Start the engine. Hold the engine at 3000 rpm with no load (M/T in neutral) until the radiator fan comes on, then let the engine idle.
 - ③ Disconnect the 2P connector from the Idle Air Control (IAC) valve.



- ④ If the engine stalls, restart the engine with the accelerator pedal slightly depressed.
- ⑤ Stabilize the rpm at 1000, then slowly release the pedal until the engine idles.



■ Idle Speed Adjustment (cont'd.)

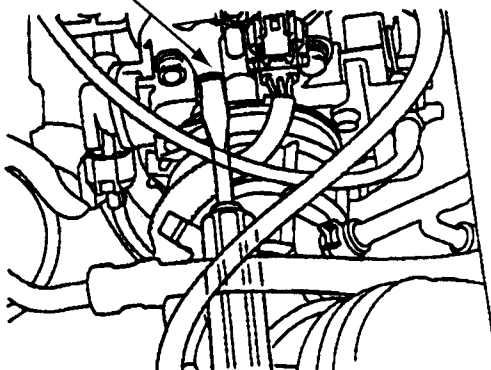
- ⑥ Check idle in no-load conditions: headlights, blower fan, rear defogger, radiator fan, and air conditioner are all switched off.

- Idle speed should be 550 ± 50 rpm

Adjust the idle speed, if necessary, by turning the idle adjusting screw.

NOTE: After adjusting the idle speed in this step, recheck the ignition timing. If it is out of spec, go back to step ⑤

Idle
Adjusting
Screw



- ⑦ Turn ignition switch off.
- ⑧ Reconnect the 2P connector from the IAC valve, then remove the back-up (7.5 A) fuse in the underhood fuse/relay box for 10 seconds to reset the ECM.
- ⑨ Restart and idle the engine with no-load conditions for one minute, then check the idle speed.
- Idle speed should be 800 ± 50 rpm
- ⑩ Idle the engine for one minute with headlights on (low setting), and check idle speed.
- Idle speed should be 800 ± 50 rpm
- ⑪ If the car is equipped with air conditioning, turn the headlights off, idle engine for one minute with the heater fan switch at HI and air conditioner on, then check idle speed.
- Idle speed should be $1,050 \pm 50$ rpm

NOTE: If the idle speed is not within specification, see symptom chart in Service Manual.



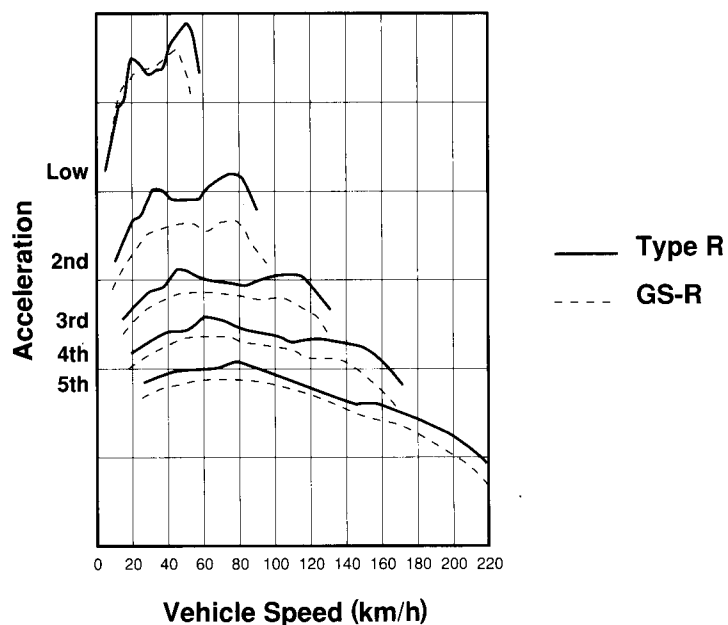
■ Introduction

The Type R features a close-ratio transmission to take full advantage of the additional high-rpm power and provide smooth, seamless shifting.

The transmission in the Type R features different ratios, bearing design, and clutch than the GS-R. The differences were necessary to handle the higher output of the Type R engine and to deliver smooth, progressive acceleration.

Like other Integra models, the Type R features a short-stroke shift linkage. This system approaches the feel and short stroke of the Acura NSX shift linkage system.

- For improved throttle response, the Type R utilizes a special lightweight flywheel coupled with a heavy-duty, hydraulically actuated clutch.



■ Gear Ratio Comparison

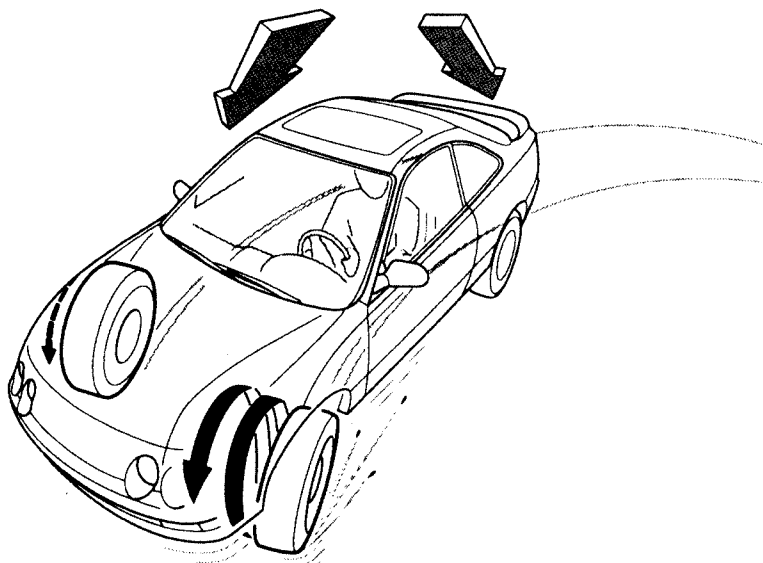
Gear Ratio	1997 Type R	1997 GS-R
Low	3.230	3.230
2nd	2.105	1.900
3rd	1.458	1.360
4th	1.107	1.034
5th	0.848	0.787
Final	4.400	4.400



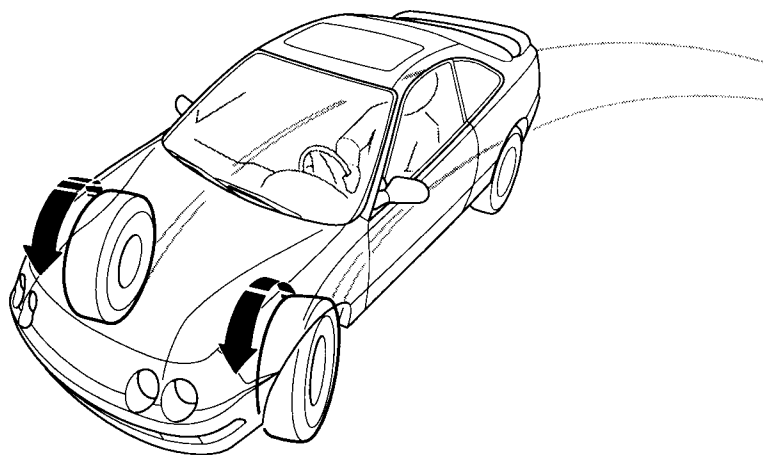
■ Helical Gear Type Limited Slip Differential

Purpose

When a front wheel drive car is accelerating through a turn, the combination of rearward weight shift (from acceleration) and lateral weight shift (from centrifugal force) can greatly reduce the traction available to the inside front tire. Under racing conditions it is not unusual for the inside front tire to be lifted completely off of the road surface. Under these circumstances, a standard differential will transfer most of the torque to the freewheeling inside wheel, and very little torque to the outside front wheel. This condition limits the car's ability to accelerate through a turn.



The limited slip differential counteracts this tendency by transferring torque to the wheel that has traction.





■ Helical Gear Type Limited Slip Differential (cont'd.)

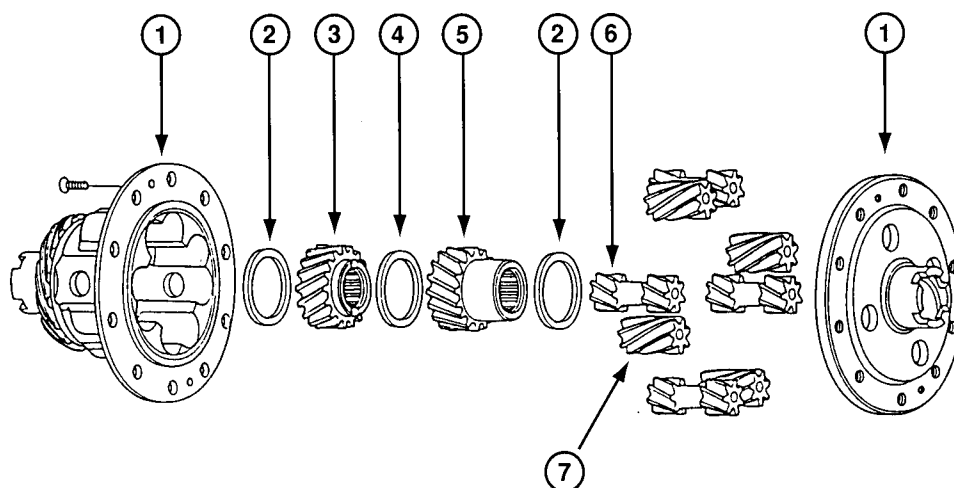
Most limited slip differentials are not appropriate for front wheel drive cars because they limit the differential action at normal cornering speeds. On a front wheel drive car this would interfere with steering under normal driving conditions. The helical type limited slip differential, however, only limits slip under high torque application, so it does not interfere with normal steering.

Construction

The unit consists of the two side gears, four short pinion gears, four long pinion gears, two thrust washers, a center washer, and a carrier that houses the gears and washers.

- The side gears are linked to the left and right drive shafts and mesh with the pinion gears.

One short and one long pinion gear are in mesh with each other and are allowed to “walk” around the side gears.



- ① Differential carrier
- ② Thrust washer
- ③ Left side gear
- ④ Center washer

- ⑤ Right side gear
- ⑥ Pinion gear (long)
- ⑦ Pinion gear (short)



■ Helical Gear Type Limited Slip Differential (cont'd.)

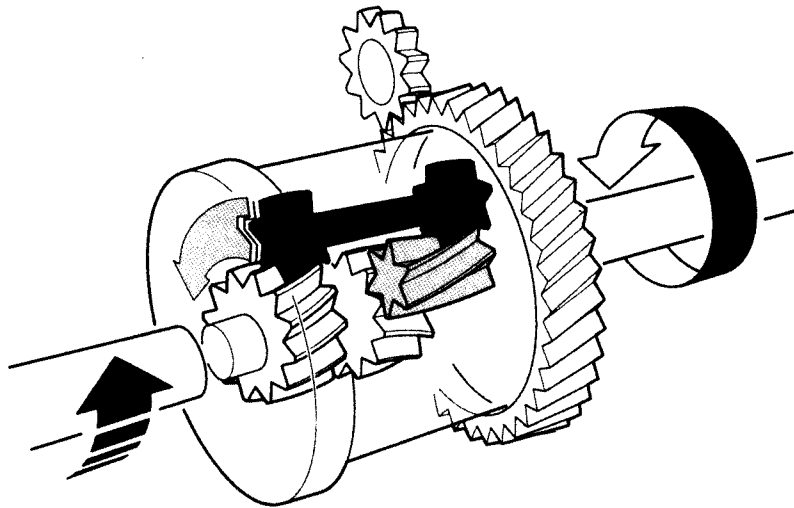
Function

During normal speed cornering

While cornering at normal speeds, the helical pinion gears allow normal differential action. The illustration below shows the differential action in a very tight left hand turn, such as you might make in a parking lot.

- The left side gear is nearly stationary
- The long pinion gears “walk” around the nearly stationary left side gear, rotating inside the case
- The long pinion gears drive the short pinion gears which also rotate inside the case, but in the opposite direction
- The short pinion gears drive the right side gear at a speed that is faster than the rotation speed of the ring gear.

The ability of the pinion gears to rotate inside the differential case is what allows this normal differential action.

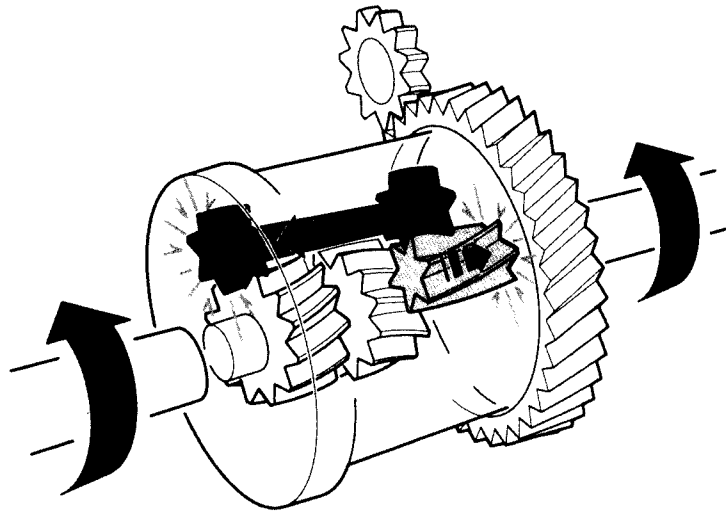




■ Helical Gear Type Limited Slip Differential (cont'd.)

During Hard Cornering

As high engine torque is applied to the differential and to the wheels during cornering, the rearward and lateral weight shift reduces the traction available to the inside front tire. The normal differential action allows the inside wheel to spin as it loses traction. However, because the side and pinion gear teeth are cut at an angle to gear axis, they try to push apart sideways as torque is applied. The pinion gears are pushed against the differential housing, and the friction between the end of the gear and the housing limits the ability of the pinion gear to rotate. This has the effect of causing the differential to try and 'lock-up,' thus limiting the amount of slip between the right and left side gears. The amount of side force generated in the pinion gears is determined by the angle of the gear teeth (which is fixed) and the amount of torque applied.



The illustration below shows differential operation during a hard right hand turn with high engine torque applied.

- As the right tire begins to lose traction, the right side gear begins to turn faster than the left side gear.
- The long pinion gears begin to walk around the left side gear, rotating inside the differential housing.
- The short pinion gears rotate inside the differential housing, allowing the right side gear to turn faster than the left side gear.
- The high torque forces the pinion gears to push apart from each other and to bind against the housing, limiting their ability to rotate inside the housing.
- The differential begins to "lock-up," limiting slip and transferring more torque to the left wheel.

This same limited slip action can occur when one front tire is on a low traction surface (such as ice) and engine torque is applied.



■ Helical Gear Type Limited Slip Differential (cont'd.)

Operational Check

CAUTION: The helical gear type limited slip differential distributes optimum power between the two driving axles according to the difference in torque, as required by the driving wheels. Under no circumstances should the engine be started with either wheel raised off the ground, such as when adjusting wheel balance with an on-the-car wheel balancer, or when transporting the vehicle in the event of an accident.

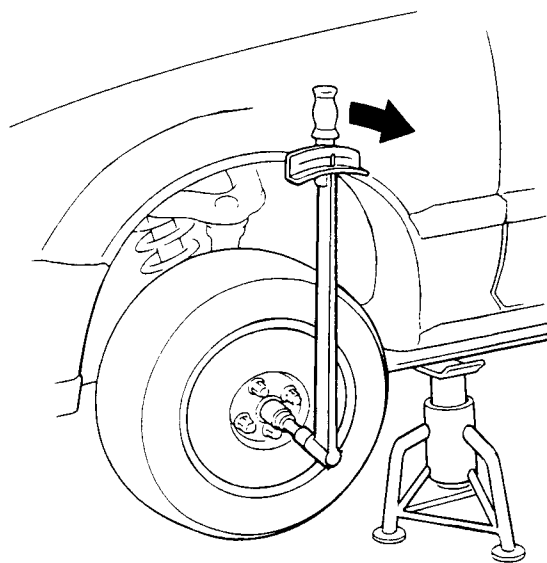
- ① With the engine off, raise the right and left front wheels and place the vehicle on a safety stand.
- ② Block the rear wheels and apply the parking brake.
- ③ Shift the transmission into first gear. Next, rotate either wheel by hand. Then, check to make sure that the other wheel is turning in the opposite direction.
- ④ Repeat the procedure on the other wheel.



■ Helical Gear Type Limited Slip Differential (cont'd.)

Limit Torque Check

- ① With the engine off, raise the right and left front wheels and place the vehicle on a safety stands.
- ② Block the rear wheels and apply the parking brake.
- ③ With the transmission in neutral, measure limit torque in the direction shown in the illustration using a torque wrench. Rotate the torque wrench more than two complete turns. Take the maximum reading
- ④ Shift the transmission into first gear and measure the limit torque again.
- ⑤ Calculate the limit torque:
Service Limit:
$$\frac{\text{Measurement ④}}{\text{Measurement ③}} \geq 2.5$$
- ⑥ Repeat procedure on the other wheel.
- ⑦ Replace the limited slip differential as a unit if the limit torque is lower than the service limit.





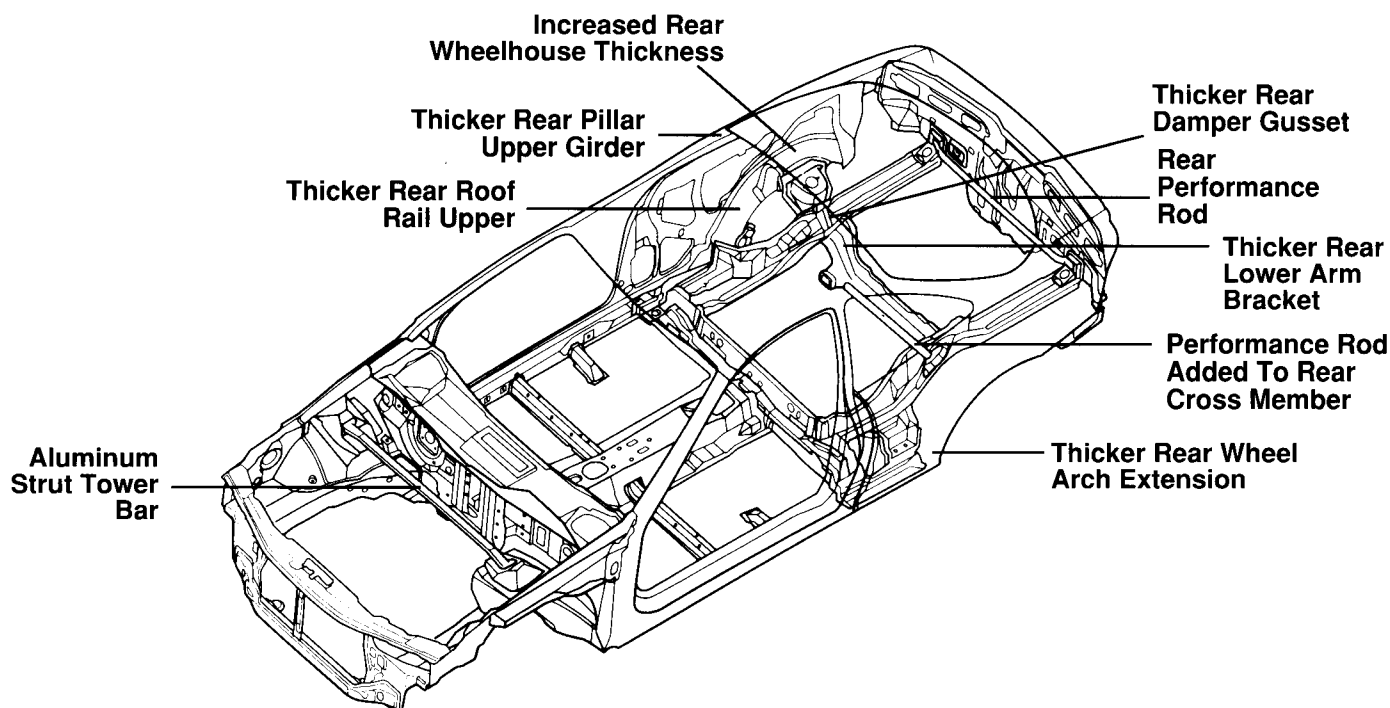
■ Body Rigidity

The Type R body structure provides a strong, rigid platform to ensure a long, durable service life, create a stable base for the suspension, and to provide carefully designed front and rear crumple zones to minimize cabin intrusion in a collision.

The ultimate focus for the Type R was to minimize weight while enhancing the rigidity of the body structure.

Key improvements include:

- A new, larger aluminum front strut tower bar replaces the steel bar found on the GS-R.
- Performance rods have been added to the rear frame end and rear suspension lower arm.
- Body reinforcements have been made in several key areas, including the rear wheel housing, rear pillar upper garter, rear roof rail upper, rear wheel arch extension, rear lower arm bracket, and rear damper gusset.



■ Center of Gravity

A larger percentage of the vehicle mass is near the center of the vehicle for enhanced transient response and handling.

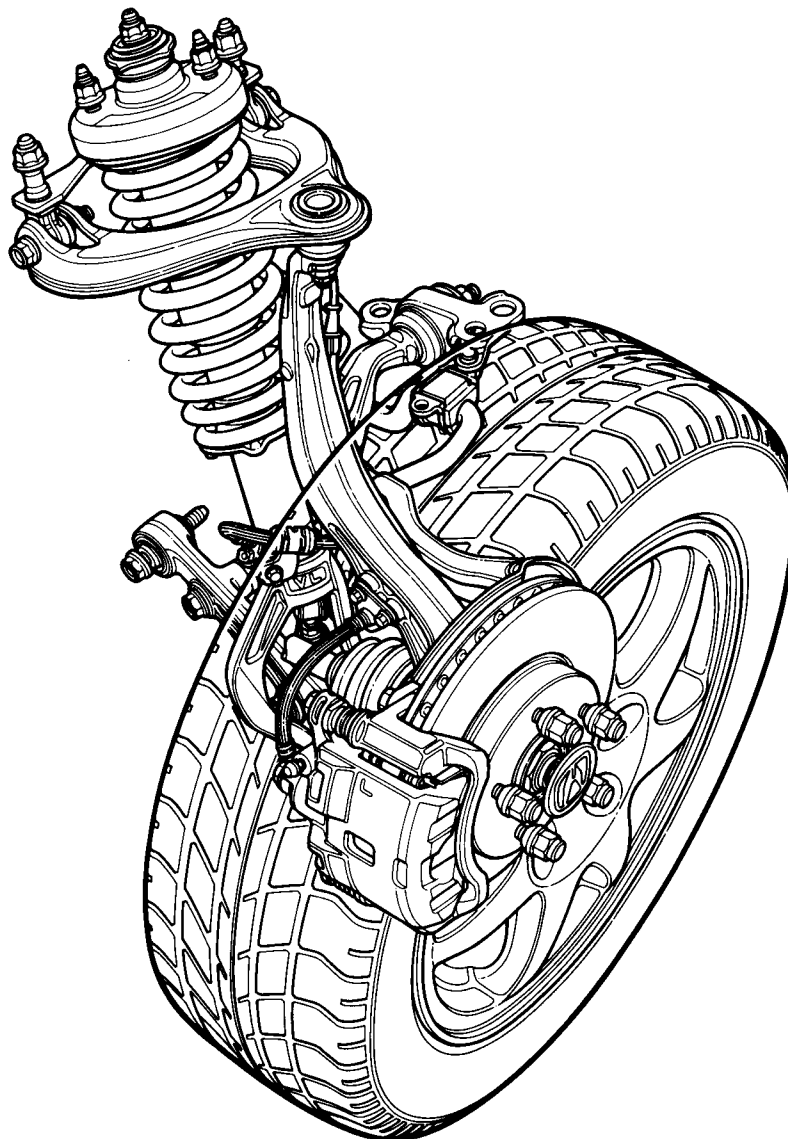


■ Suspension Tuning

The Type R was developed with all-out performance in mind when it comes to cornering, braking and overall handling. The Type R suspension has been tuned to deliver highly responsive handling characteristics and was refined on the race track.

The following modifications have been made to the Type R's front suspension:

- A new aluminum shock tower bar complements the 24mm stabilizer bar that is now equipped with ball joints instead of rubber bushings.
- The spring and damping rates have been greatly increased to improve performance handling.
- Front spring rate has been increased by 22%, with a 115% increase in compression damping, and a 70% increase in rebound damping.
- Damper mounting bushing stiffness has been increased five-fold.

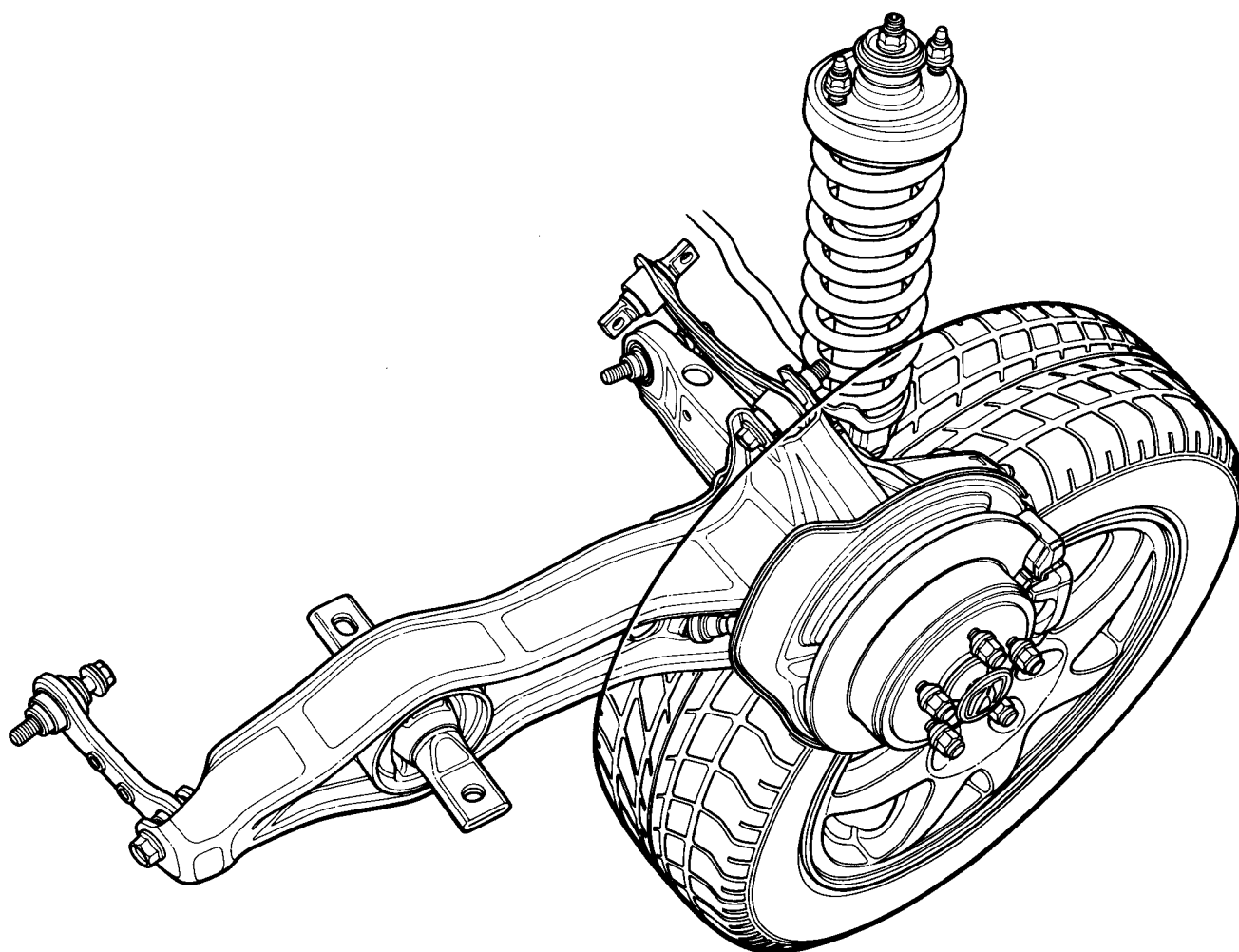




■ Suspension Tuning (cont'd.)

The following modifications have been made to the Type R's rear suspension:

- The spring has been changed from a straight-rate to a progressive-rate spring, increasing force across the entire range.
- Damping rates have been increased with compression damping settings in the progressive-valve unit increasing by 66%, and rebound damping going up 31%.
- The diameter of the stabilizer bar has been greatly increased from 13mm to 22mm to reduce body roll.





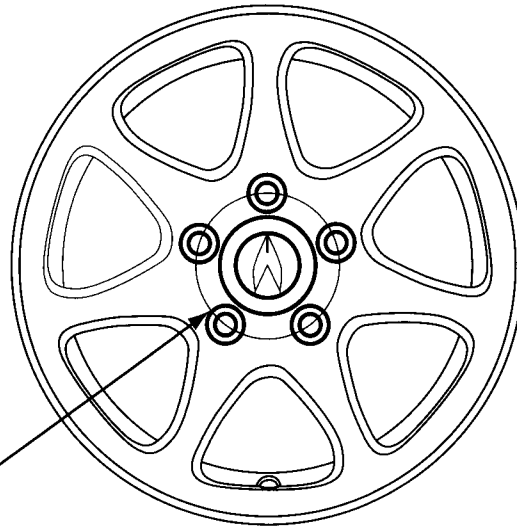
■ Wheels

The Type R features exclusive white, aluminum wheels. They have a 5 mm greater offset than the GS-R.

- The 15x6JJ alloy wheels feature a larger, five-bolt lug pattern for increased rigidity.

Aluminum Wheel

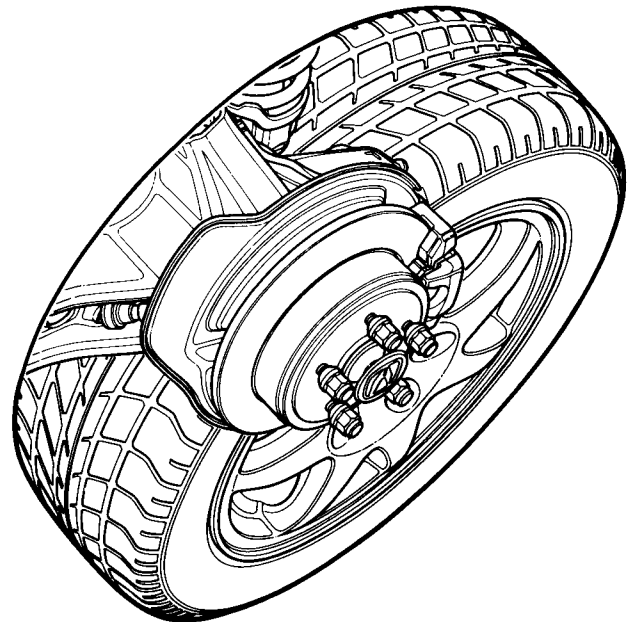
PCD: 100 mm x 4 → 114.3 mm x 5
(offset: 45 mm → 50 mm)



■ Tires

The Type R is equipped with exclusive Bridgestone Potenza RE010 performance tires, similar to those found on the NSX. These tires allow for greater cornering forces, better response, and excellent road feel.

- These tires have been specifically developed to work in concert with the Type R's suspension calibrations to provide excellent traction, stability, controllability, and predictable handling behavior.



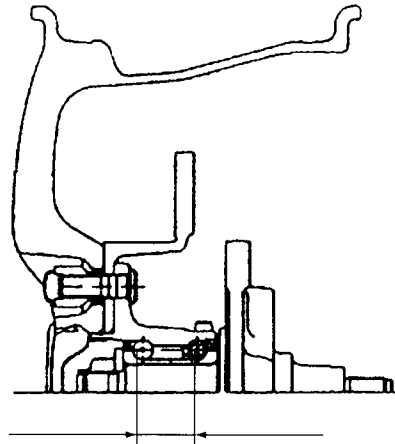


■ Rear Wheel Bearings

To enhance rear wheel stability, the rear bearing span within the rear-wheel hub has been increased by 10 mm (from 19.2 mm to 29.2 mm).

- These larger bearings increase bearing rigidity by 30%, and improve camber rigidity by 10%.
- The number of ball bearings has been increased from 11 x 2 rows to 12 x 2 rows.

Rear Bearings



Bearing Ball Span: 19.2 mm → 29.2 mm
No. of Bearing Balls: 11 x 2-rows → 12 x 2-rows

■ Weight Reduction Measures

In the true spirit of high performance, a select number of comfort and convenience features on the Type R have been eliminated in an effort to minimize the vehicle's overall weight. These items include:

- Sunroof
- Vanity mirrors
- Cruise control
- Rear window wiper/washer
- Dashboard insulator
- Transmission mount
- Driveshaft and shifter dynamic damper
- Melt-sheet for the floor stamping

Air conditioning is now an option.

- This system is equipped with a lightweight aluminum condenser core which also helps enhance corrosion resistance.

■ Increased Diameter

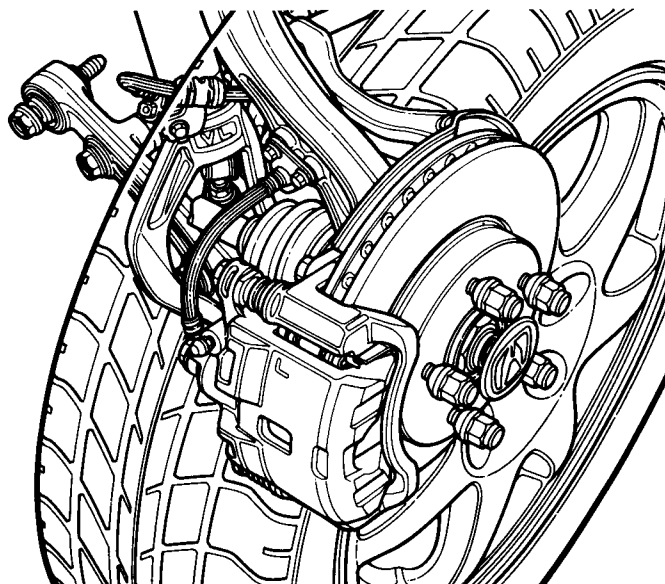
In response to the increased performance of the 1997 Integra Type R, the braking system has also been revised to improve its performance.

The diameter of both the front and rear discs has been increased:

	1997 Type R	1997 GS-R
Front	282 mm	262 mm
Rear	260 mm	239 mm

The larger disc brakes also use larger calipers.

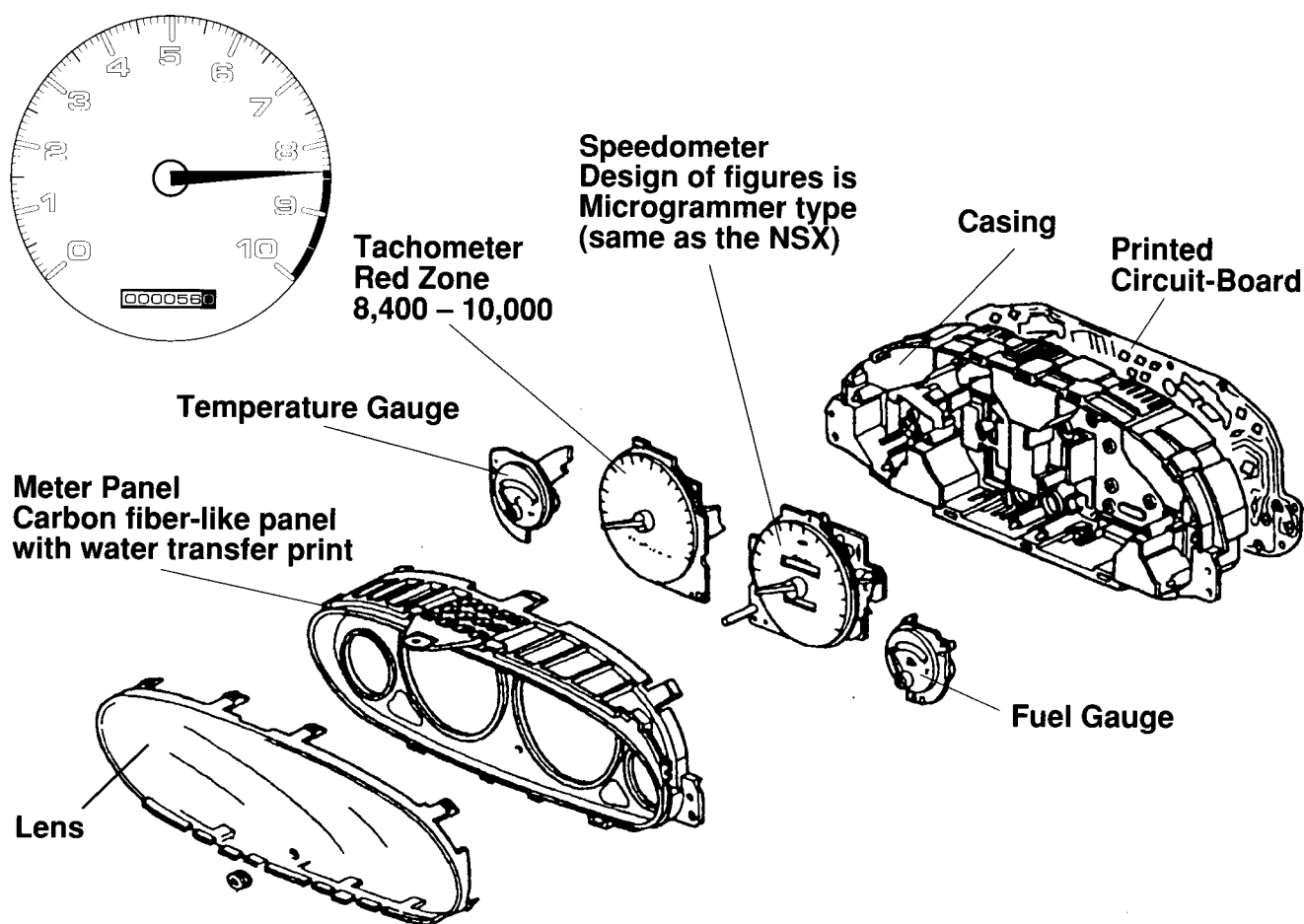
The ABS has been refined and is now 12.3 lbs. (5.6 kg) lighter than the GS-R. This light-weight system functions with minimal pedal kickback during ABS operation in hard braking situations.



■ Special Type R Combination Meter

In order to enhance readability, the Type R features a combination meter with analog instrumentation on an exclusive carbon fiber-like texture with amber illumination.

- The large white-on-black instruments are recessed in a binnacle that helps block out glare.





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