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Super Handing All-Wheels Drive

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Everyone who knows something about vehicle have heard about AWD or 4WD systems. Almost every manufacture has its own all-wheel drive system. For example, Mercedes Benz – 4Matic, BMW – XDrive, Audi – Quattro, Lexus – ATS and etc.

But what about Honda? Honda is known for its valves per cylinder system VTEC (system also known as REDHEAD). But Japanese manufacture also has smart AWD system called SH-AWD (Super Handing All Wheels Drive). And in my article, I'd like to explain you how this system works. Also, I would like to pay attention to the difference between Quattro and SH-AWD. Why it is called one of the smartest all-wheel drive system all over the word. Let's get started.

Technically, SH-AWD is a new generation all-wheel drive system. It includes technologies early Honda's systems: VTM-4 all-wheel drive and ATTS (Active Torque Transfer System) in 1997 in the Honda Prelude Type SH model, but this system was front-wheel drive. Then, by the end 2000, the VTM-4 (Variable Torque Management 4WD, all-wheel drive traction control system) was developed, which was installed on the Acura MDX 2001 model year, and then on the Honda Pilot SUV 2002.

The difference between the VTM-4 system and other all-wheel drive systems is that it is developed with a completely different concept in mind. A slip of one of the wheels is

considered not possible, but probable, and the system does its best to prevent loss of control and straight-line stability by controlling the torque, and not just providing constant traction without taking into account the current road condition.

VTM-4 consists of a computer module working with a "wet" clutch on the rear axle, that works in conjunction with the front drive and redistributes the torque from the front to the rear axle, taking into account road conditions.

In dry conditions, the car behaves like a front-wheel drive. On wet, slippery surfaces or in mud, the system tries to minimize slipping and connects the rear axle to transmission if the front begins to slip, distributing the moment proportionally to the slip. At the same time, the system has a special mode of forced blocking, which allows you to escape from deep mud or snow. This mode is automatically activated at low speeds and works up to 30 km/h (18 mph) when the rear axle traction is completely removed.

ATTS, in turn, distributes torque between the wheels on the same axis, increasing handling and minimizing slipping. The SH-AWD system is a combination of these two technologies - the moment distribution between the axes and on the inside of the same axis. Now, let's have a look how this system works.

Super Handling All Wheels Drive System is full-time, fully automatic AWD. Transmission starts its work from front axle in block with gear box to torque transmission device. This device is connected with cardan shaft that is made of light and strong material (carbon fiber). At the same time cardan shaft is connected with rear differential accelerator, which allows rear wheels to rotate with speed under 5.7 percent exceeding rotation speed front wheels. After that torque is provided to hypoid gear through the planetary gear, which rotates shaft at an angle 90 degrees for gearing rear half-axes. In every half-axle electromagnetic coupling is located. Thanks to this

couplings torque is distributed between axles in the range from 10 to 90 percent per wheel depending on situation. In short, when you pass turns on high speed, the vehicle distributes 70 percent torque on rear wheels and of that 70 percent 100 percent can be pushed to either the left or wheel in order to assist the vehicle through the corner. Thanks to that it gives you better understeering. Couplings begin to work when electromagnetic coil provides current to them. It is important to note that the more current is supplied to coupling, the slower the wheel rotates.

But how this system understands, which wheel should have more rotation speed in compare with the others three?

Control block (ECU) SH-AWD is connected with ECU engine to transmit data about position of throttle, torque, gear ratio and compression in collectors. Also, it is connected with ECU stabilization system (VCA). VCA presents data about rotation speed of the wheel, steering angle and course deviation. Thanks to that information ECU distributes torque on wheels. And then couplings correct rotation wheel speed.

So, I have already explained performance Honda's AWD. But how does car behave on the road?

Not all Acura and Honda's vehicle have SH-AWD, because it is very expensive and difficult system. Only business class vehicles are equipped with super handing all-wheel drive, such as Acura RL (Honda Legend), Acura ZDX, Acura MDX, TL and TLX. In every vehicle this system is different from others vehicle. So, let's have a look at Acura RL or Honda Legend. When driving around the town torque is distributed the following way: 90 percent on front axle and 10 percent on rear axle. When throttle is fully open on highway 40 percent is distributed on rear axle. On turns torque is divided as follows: 70 percent on front axle and 30 percent on rear for better handing. During very sharp turns thanks to 2 planetary gears system rotates rear external wheel faster than front wheel. So,

if you turn off stabilization system VSA, you take even extra handing. In this case, you may have the feeling of steering rear-wheel drive vehicle.

Also, on slip surface every wheel has 25 percent torque. And SH-AWD always works. Even on rear gear.

At different time this system was equipped with 5 gear transmission, but since 2010 SH-AWD works with 6 gear transmission. Nowadays Honda had created new hybrid electronic SH-AWD on new 3.5 V6 engines and 3 electric drives. The main engine works in a combination with 30 kilowatts electro engine. The other 2 give wheels additional torque when turning.

I have already mentioned about SH-AWD system. AWD Quattro works completely different. Audi's system is easier than Honda's. Quattro also is full-time AWD. It has center differential. When front or rear wheels begin to spin, the central differential transfers torque to the other pair of wheels. In urban conditions 60 percent is distributed on rear axle and 30 percent is distributed on front axle.

Well, we see that the main difference is that Quattro cannot distribute more torque per wheel than the other three, but SH-AWD can.