



Power steering has always seemed like an unhappy compromise to me. If the system has enough assist to make slow speed maneuvers relatively easy, the steering wheel ends up feeling like it has been disconnected from the front wheels at higher speeds. On the flip side of the coin, if you lower the system's level of power assist enough to regain some road feel, you're back to "Steering by Armstrong" at lower speeds. Like I said, an unhappy compromise.

Wouldn't it be great if you could have more power steering assist when you really needed it, and less the rest of the time when you didn't? The system would have to be fully automatic. I'm just guessing, but removing and reinstalling the power steering pump belt would probably get pretty tiresome after a while.

Honda engineers must not have been happy with traditional power steering systems either. They developed a fully automatic, (no power steering belt jockeying necessary) variable assist power steering system during the mid '80s. The system was first installed on Accords, but can now be found on many different Honda and Acura models.

Your initial exposure to the Honda variable assist system might have been the first time you needed to remove a Honda transaxle. When it came time to remove the speedometer cable or speed sensor wiring, you might have been surprised to find that a strange device with power steering hoses attached to it had taken up residence on top of the transaxle.

This strange device is called the speed sensor, and it's the key to the operation of the Honda variable assist system. The Honda engineers recognized that the need for power assist decreases as vehicle speed increases, so they made their variable assist power steering system speed sensitive. As the vehicle speed increases, the speed sensor reduces power assist by acting on the power steering system's fluid pressure.

While it may seem complicated at first glance, this system actually offers a very simple solution to a complicated problem. We'll use the following words and pictures to explain how the system works and point out several potential problem areas along the way.

— By Karl Seyfert

Service Information

Let's forget for a moment that we're working on a variable assist power steering system. It's still a power steering system, right? Before blaming the variable assist part of the system for traditional power steering problems like leaks, noises, and poor response, be sure to check the basics first. The following tips apply to Honda and Acura variable assist systems, but as you'll see, most of them deal with the conventional parts of the system.

Diagnosing Steering Rack Leaks

Don't automatically assume that a leaking Accord or Prelude steering rack needs new end seals, even if power steering fluid is spewing from both ends. The problem may be a leaking control unit that can be repaired without removing the rack. Many steering racks appear to leak from both ends because when one end leaks, fluid flows through the air transfer tube. This fills the opposite boot with fluid and makes it appear that both sides are leaking.

Before removing a leaking steering rack:

- Slide both boots back, clean the rack, gear housing, and cylinder.
- Start the engine and turn the steering wheel back and forth until you can see which end of the rack is leaking.
- If the right end is leaking, reseal the rack.
- If the leak is coming from the left end, reseal the valve body first.
- Check the valve body and control valve for scratches and scoring, and always replace the 11 mm o-ring on the control valve.
- Reinstall the valve body and retest the steering rack for leaks. If the leak is gone, the rack is okay. If not, then it must be resealed.

Poor Low Speed Assist

If a 1990 and later Accord owner complains of poor power steering assist at low speeds, he may be basing his judgement on other cars he's driven (including other Hondas). To regulate the power assist according to the speed of the car, the 1990 and later Accord power steering system has a Gain Control Valve instead of the more familiar Cut-off Valve used on earlier systems.

The result is better road feel than previous models, but also a little less low speed power assist. Compare the car's steering response to another like-model with about the same mileage before you assume that there is a problem.

Power Steering Moan

On some 1990 Honda Accords, a moaning noise may be noticed when the steering wheel is turned while driving at low speeds. The noise may be caused by an orifice in the power steering pump outlet hose that has slipped out of position. To

check the hose:

- Locate the bulge in the pump outlet hose, just in front of the master cylinder reservoir. The bulge contains the orifice.
- Bend the hose behind the bulge. If the orifice has slipped toward the control valve, the hose will be very stiff behind the bulge.
- If the orifice has slipped, replace the outlet hose with a new style hose.
- If the orifice has not slipped, the noise is probably normal. Some hydraulic noise will be noticed when the steering wheel is turned while the car is stationary or moving at slow speeds.

Use Approved Power Steering Fluid

Hondas and Acuras are very particular about the type of fluid that is used in their power steering systems. Automatic transmission fluid will not get the job done, and in many cases may actually cause problems that weren't there before.

On some 1990-93 Honda Accords, even the factory fluid may not be good enough. These cars may develop a squeaking noise that sounds like it's coming from the steering wheel or steering column area. The noise is usually heard while making a tight, low speed right hand turn.

Honda originally recommended spraying the right rack seal with penetrating oil to correct this problem. If that didn't work, the seal had to be replaced. A new, V-type power steering fluid (P/N 08206-9002) is now available to correct this problem.

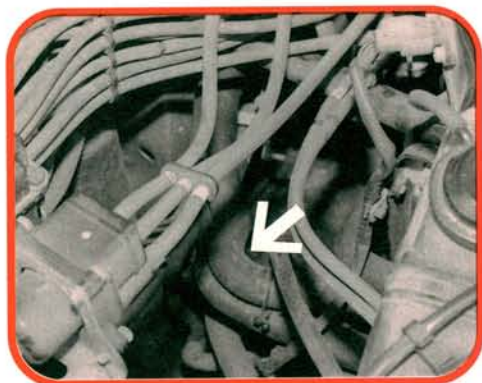
On 1991-92 models, a complete fluid flush and refill with the new fluid should correct the problem. To correct the noise on 1990 models, the steering rack must also be removed to replace the right cylinder housing end seal. Always coat the inside surface of the rack cylinder housing with V-type fluid before installing the new seal.

Noisy Power Steering Pumps

Noise from the power steering pump is rarely caused by the pump itself. Before replacing a noisy power steering pump, check the following items in the order that they are listed:

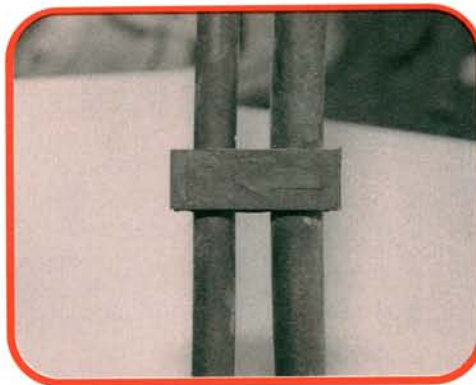
- A pressure or return line that is touching the body will make normal pump noise resonate through the body. Reposition the line and recheck.
- A contaminated cut-off or control valve can cause the pump to make excessive noise. Remove the valve body assembly from the rack, clean and inspect the cut-off and control valves, then reassemble with new seals. Reinstall the valve body and recheck.
- A problem in the pump's control valve will also cause excessive pump noise, but can also be corrected without replacing the pump. Remove and disassemble the pump, and check the control valve for contamination, wear, burrs, or leaks. Reinstall the pump and recheck its operation.

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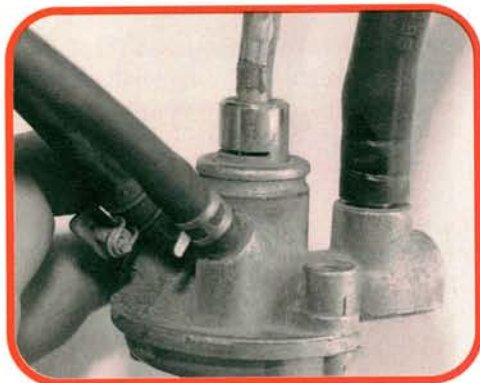
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This photo can only give you a general idea of where the speed sensor is located (arrow). To avoid hose confusion during a transmission removal, remove the speed sensor from the transmission without disconnecting its hoses. Prop the speed sensor out of the way until you're ready to reinstall it.



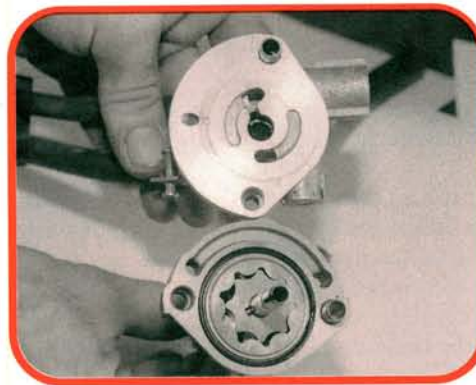
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Some models have a hose guide with the letter F and an arrow marked on it. If you must remove the speed sensor hoses for any reason, leave the hose guide in position to prevent a mix-up. When the hoses are properly installed, the arrow should face the front of the car.



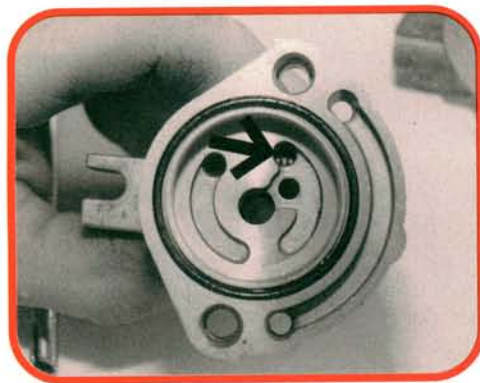
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We removed this early three hose speed sensor for a better look. The large hose returns fluid to the reservoir. The two smaller hoses supply fluid to the speed sensor pump from the cut-off valve and reaction chamber valves. The small hoses are different sizes, but can be accidentally switched.



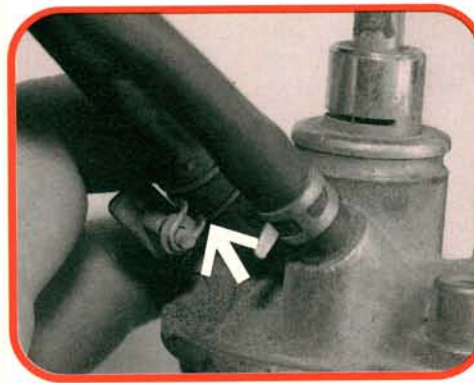
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We split the speed sensor to reveal the pump. When the vehicle is stopped, no fluid can flow through the pump and full power assist is available. As vehicle speed increases, the spinning speed sensor pump pulls fluid from the cutoff valve, and reaction chamber circuits and power assist is reduced.



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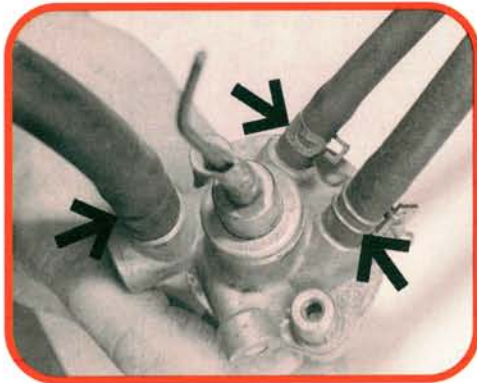
To prevent negative pump pressure at high speed, a one way check valve lets the fluid recirculate inside the speed sensor. When driving in reverse the speed sensor pump also turns in reverse. To prevent a loss of power assist in reverse, a second speed sensor relief valve recirculates the fluid.



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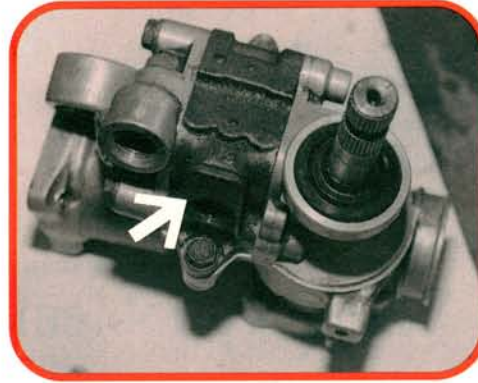
If the system has lower than normal power assist at low speeds, test the speed sensor by disconnecting, then plugging the larger of the two small speed sensor hoses and the speed sensor port. If steering effort is reduced, replace the speed sensor. If it stays the same, check the steering rack and pump.

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To simulate power assist at 30 MPH, disconnect all three hoses from the speed sensor, then connect all three hoses together. This dumps fluid straight to the reservoir and should reduce power assist. If 30 MPH assist was too high but is normal with the speed sensor bypassed, replace the speed sensor.



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The cast iron valve body is bolted to the top (or bottom) of the steering rack. The valve body meters high pressure fluid from the pump to the rack piston. The extra line fitting(s) bleed fluid from the cut-off valve to the speed sensor to reduce steering assist as vehicle speed increases.



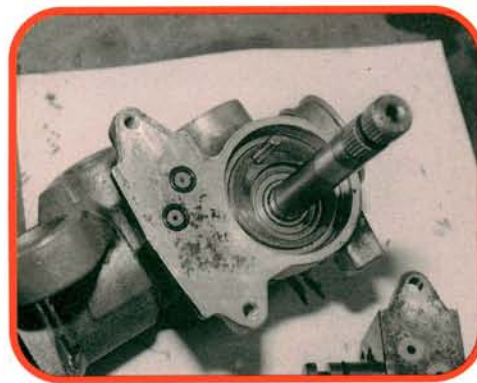
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Different years and models use similar rack components, but they may be arranged differently. This Integra rack has the valve body mounted on top of the rack, next to the pinion shaft. Gravity being what it is, water may sneak past this large o-ring seal (arrow), and get into the pinion housing.



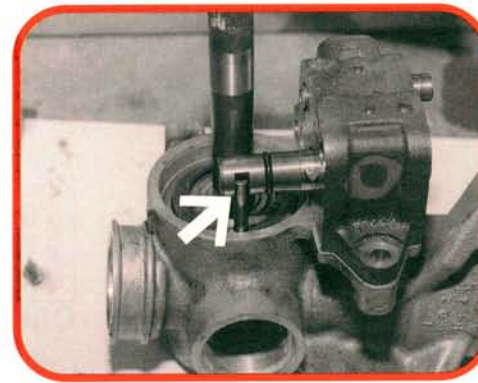
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Two small o-rings seal the fluid passages between the valve body and the rack housing. Judging by the amount of rust that's present, this is another area for water to accumulate. The valve body can usually be removed for repairs without removing the rack, but it's pretty cramped on some models.



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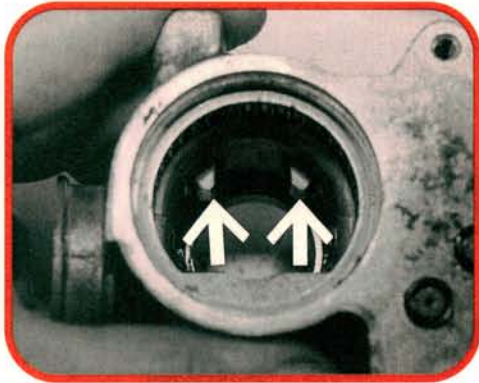
Many steering racks use a spool valve on the pinion to regulate power assist. Honda takes a different approach. The pinion is mounted off-center in a pair of bearings, which are mounted in a bearing supported pinion holder. As the pinion turns, its eccentric mounting causes it to move to the side.



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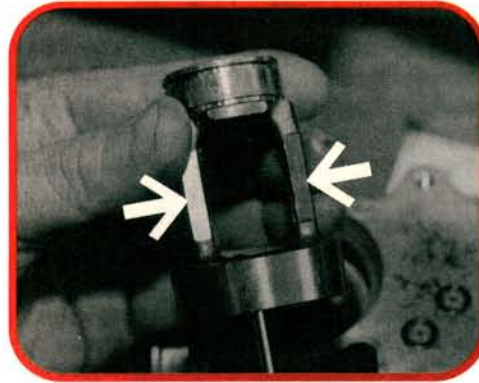
The pinion movement is transferred to the pinion holder. We've partially assembled the valve body and pinion assembly to show the pinion holder pin engaging the control valve. The wheels are harder to turn at slow speeds, so the pinion holder moves further as the pinion turns and more power assist is delivered.

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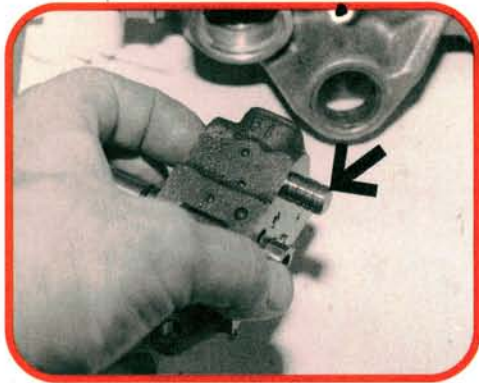
13

The pinion holder pin can move only a few millimeters in either direction. Tabs on the inside of the rack housing (arrows) limit the travel of the pinion holder. When the pinion holder hits a pin in either direction, the control valve is wide open and delivers maximum pressure to the rack piston.



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As the rack reaches full lock, machined notches on the back side of the pinion holder hit the end of the rack teeth. This causes the pinion holder to rotate back to the neutral position. This reduces pump pressure to keep the idle speed from dropping. The reduced assist also improves steering feel at full lock.



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Back to the speed sensitive part of the system. The cut-off valve on early systems used the speed sensor input to reduce power assist rather abruptly by about 30 MPH. The gain control valve on later systems uses inputs from the pressure control valve and the speed sensor for a more gradual transition.



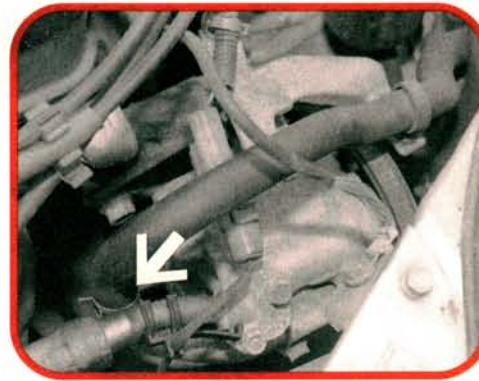
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The right side cylinder end seal may be a source of leaks and squeaks. Use your fingers or a piece of wood to remove the old seal to avoid damaging the cylinder. Coat the inside surface of the cylinder housing with power steering fluid, then install the new end seal with the groove facing out.



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Replace the one piece reservoir and filter assembly if the system has been contaminated. Drain all of the old fluid from the system too. Automatic transmission fluid should never be used in the system. For best performance and to avoid system damage, use the recommended Honda fluid.



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The power steering pump seldom causes problems on these systems. High pressure hoses and fittings are used on the supply side hoses. Weak spring clamps may cause fluid leaks on the return side, however. These clamps may begin to leak after they have been removed and reinstalled during service.