

2002 STEERING

Power Rack & Pinion - MDX & 3.2CL

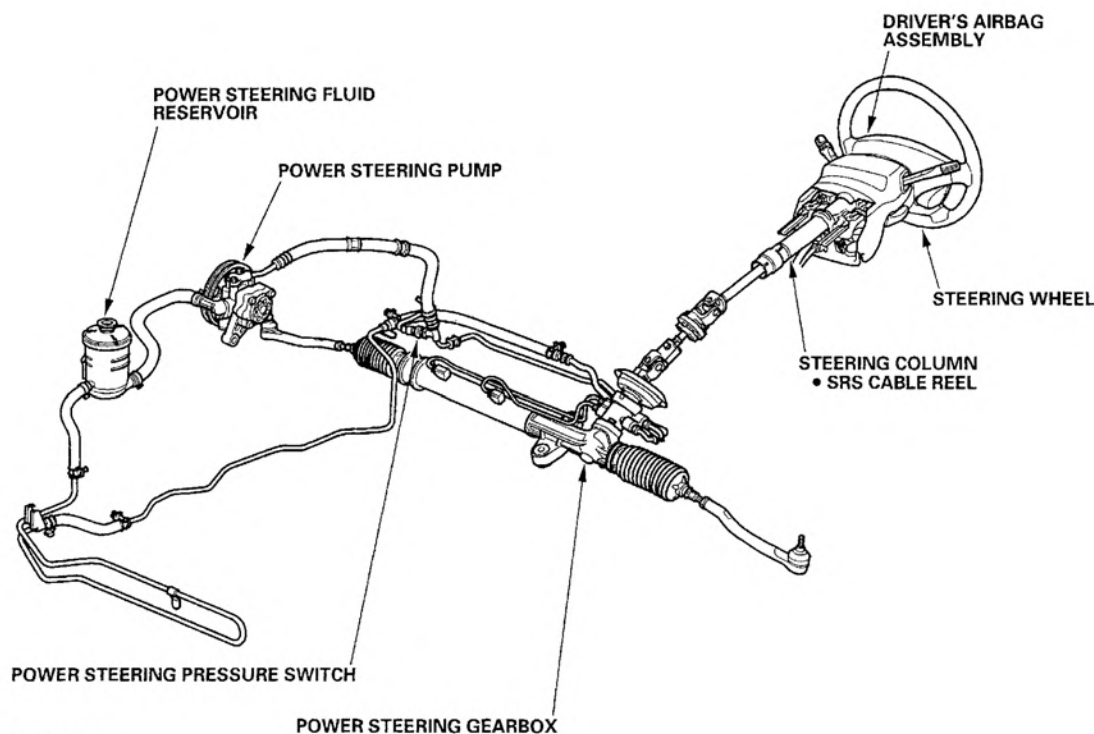
DESCRIPTION

NOTE: The 3.2TL, Type-S Model is the same as the 3.2CL.

The power steering system is rack and pinion type. Power assist is high at low vehicle speeds and low at high vehicle speeds.

On the Premium 3.2TL, the speed sensor is pump driven by the speedometer gear shaft, driven by a gear in the differential. When vehicle is in motion, the speed sensor pump relieves a portion of the hydraulic pressure, reducing power assist.

On all models, the system consists of a power rack and pinion steering gear, steering pump, fluid filter/reservoir, and cooler lines and hoses. See **Fig. 1** or **Fig. 2** for exploded views of component locations.



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Fig. 1: Locating Components (3.2TL Type-S shown, 3.2CL & MDX Are Similar)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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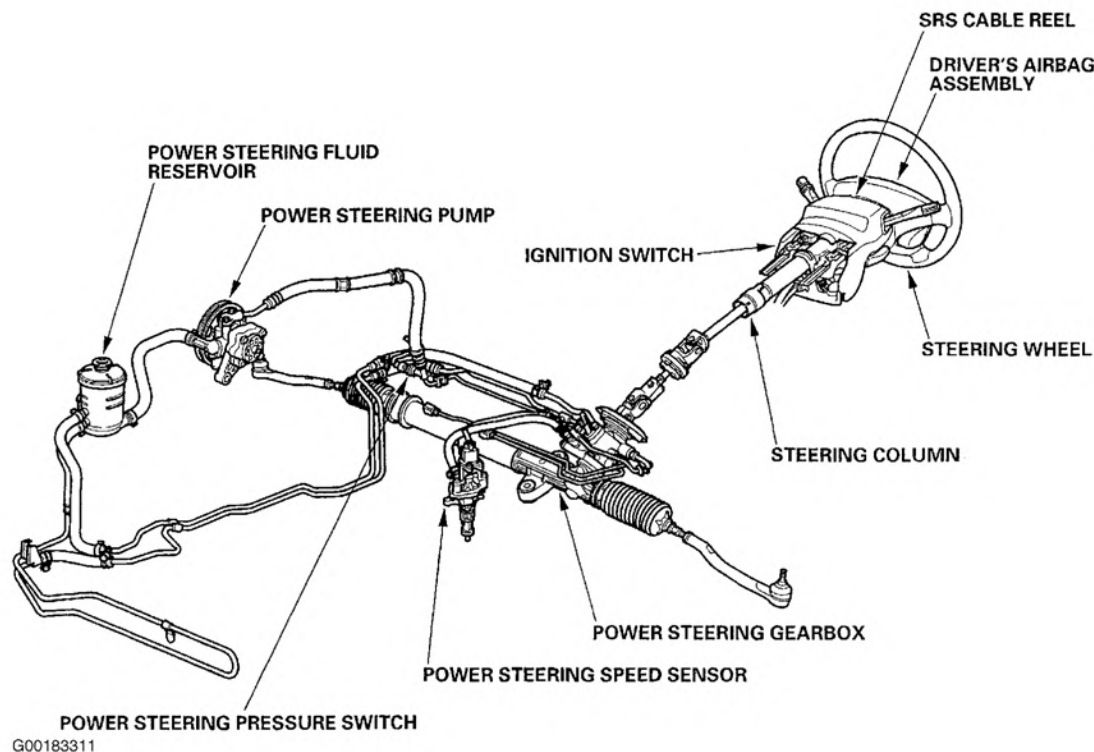


Fig. 2: Locating Components (3.2TL)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

LUBRICATION

FLUID REPLACEMENT

CAUTION: Always use Honda Power Steering Fluid. Using any other type of power steering fluid or automatic transmission fluid can cause increased wear and poor steering in cold weather.

1. Check the reservoir at regular intervals, and add the recommended fluid as necessary.

System Capacity (3.2TL & 3.2CL)

1.1 liters at disassembly

System Capacity (MDX)

1.22 liters

System Capacity With Accessory Power Steering Cooler (MDX)

1.26 liters

Reservoir Capacity (All Models)

0.4 Liters

CAUTION: Take care not to spill the fluid on the body and parts. Wipe off any spilled fluid at once.

2. Raise the reservoir, then disconnect the return hose to drain the reservoir.
3. Connect a hose of suitable diameter to the disconnected return hose, and put the hose end in a suitable container. Start engine, let it run at idle, and turn the steering wheel from lock-to-lock several times. When fluid stops running out of the hose, shut off the engine. Discard the fluid.
4. Reinstall the return hose on the reservoir. Fill the reservoir to the upper level line. Start the engine and run it at fast idle, then turn the steering from lock-to-lock several times to bleed air from the system. Recheck the fluid level and add more if necessary. Do not fill the reservoir beyond the upper level line.

ADJUSTMENTS & INSPECTIONS**BELT TENSION****Gauge Method Inspection**

1. Attach Belt Tension Gauge Set (07JGG-001000A or 07JGG-001010A) to belt with the gauge facing toward the engine, and measure the tension of the belt. Follow the manufacturer's instructions. If the belt is worn or damaged, replace it.

NOTE: Remove the belt tension gauge carefully to avoid hitting the gauge reset lever.

Used Belt Tension Standard

88-121 Ft. Lbs. (390-540 N.m)

New Belt Tension Standard

165-198 Ft. Lbs. (740-880 N.m)

2. If you installed a new belt, run the engine for 5 minutes, then readjust the belt to the used belt specifications.

Gauge Method Adjustment

- Loosen power steering pump mounting nut and bolt. Turn the adjusting nut to get the proper belt tension, then retighten the mounting nut and bolt. Start engine and turn steering wheel from lock-to-lock several times, then stop the engine and recheck the tension of the belt.

Deflection Method Inspection

1. Apply a force of 22 Lbs. (10 kg) and measure the deflection between the power steering pump pulley and the crankshaft pulley.

Used Belt Tension Standard

0.51-0.65" (13.0-16.5 mm)

New Belt Tension Standard

0.33-0.43" (8.5-11.0 mm)

2. If you installed a new belt, run the engine for 5 minutes, then readjust the belt to the used belt specifications.

Deflection Method Adjustment

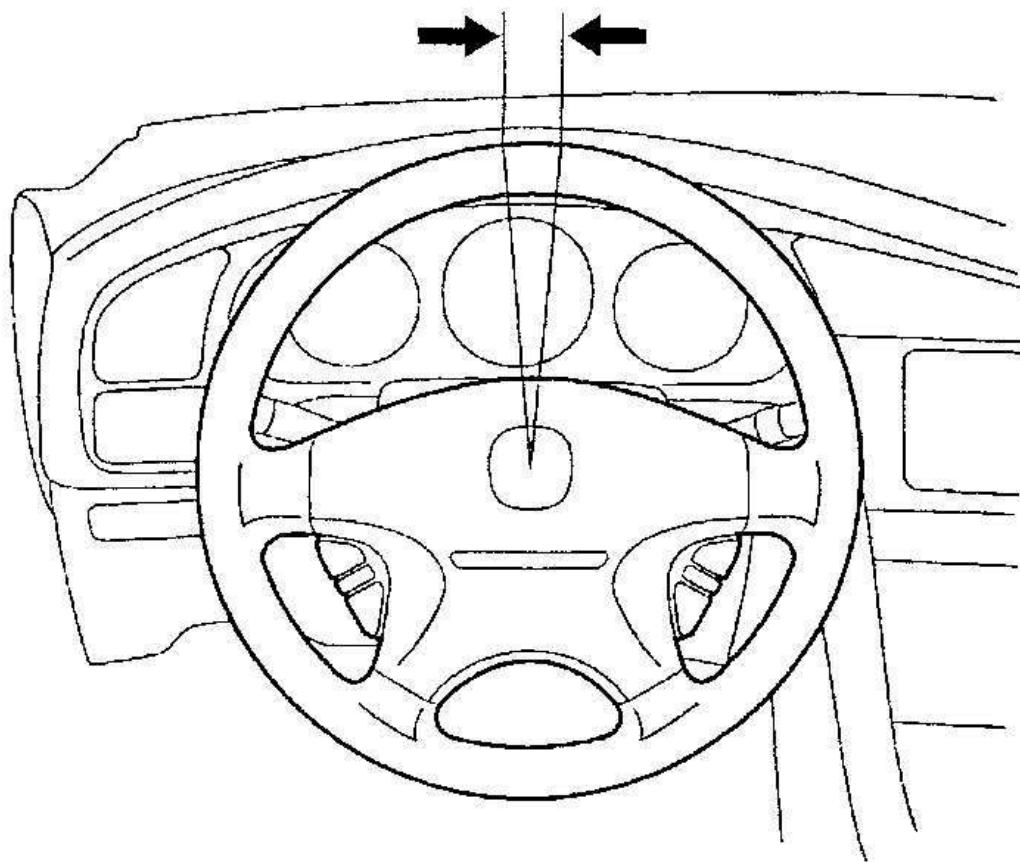
- Loosen the power steering pump mounting nut and bolt. Turn the adjusting nut to get the proper belt tension, then retighten the mounting nut and bolt. Start the engine and turn the steering wheel from the lock-to-lock several times, then stop the engine and recheck the tension of the belt.

STEERING WHEEL ROTATIONAL PLAY

1. Turn the front wheels to the straight ahead position. Measure how far you can turn steering wheel left and right without moving front wheels. If play is within limit, the power rack and pinion and linkages are okay. See [Fig. 3](#) . If play exceeds the limit, adjust rack guide. See **RACK GUIDE** . If the play is still excessive after rack guide adjustment, inspect steering linkage and power rack and pinion.

Rotational Play

0-0.39" (0-10 mm)



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Fig. 3: Measuring Steering Wheel Rotational Play (Typical)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

STEERING WHEEL FORCE

Power Assist Check With Vehicle Parked

1. Check power steering fluid level and pump belt tension. See **BELT TENSION** under ADJUSTMENTS and INSPECTIONS. See **FLUID REPLACEMENT** under LUBRICATION.
2. Start the engine, let it idle and turn steering wheel from lock-to-unlock several times to warm up fluid. Attach a commercially available spring scale to the steering wheel. With the engine idling and the vehicle on a clean, dry floor, pull the scale and read it as soon as the tires begin to turn. If the scale reads no more than the standard, the power rack and pinion and pump are okay. If the scale reads more than the standard force, go on to next step.

Standard Steering Wheel Force

5.5 Lbs. (2.5 kg)

3. Stop engine. Disconnect the sensor inlet hose from power steering speed sensor and plug the hose and sensor fitting. (The VSS connector is only on vehicles equipped with the navigation system). See **Fig. 4**.
4. Start and let idle. If the scale reads still more than standard the power steering speed sensor is okay.
5. The problem may be the pump or power rack and pinion.
 - Measure the pump pressure with T/N 07406-0010001 or with T/N 07406-001000A. See **PUMP PRESSURE TEST WITH T/N 07406-0010001** or **PUMP PRESSURE TEST WITH T/N 07406-001000A** under DIAGNOSIS & TESTING.
 - Check the Rack Guide adjustment. See **RACK GUIDE** under ADJUSTMENTS & INSPECTIONS.
 - If the scale reads the standard or less, check for fluid leaks at the speed sensor inlet hose. If there are no leaks in the hose, the power steering speed sensor is leaking internally. Replace the Speed Sensor. See **POWER STEERING SPEED SENSOR (3.2TL)** under REMOVAL & INSTALLATION.

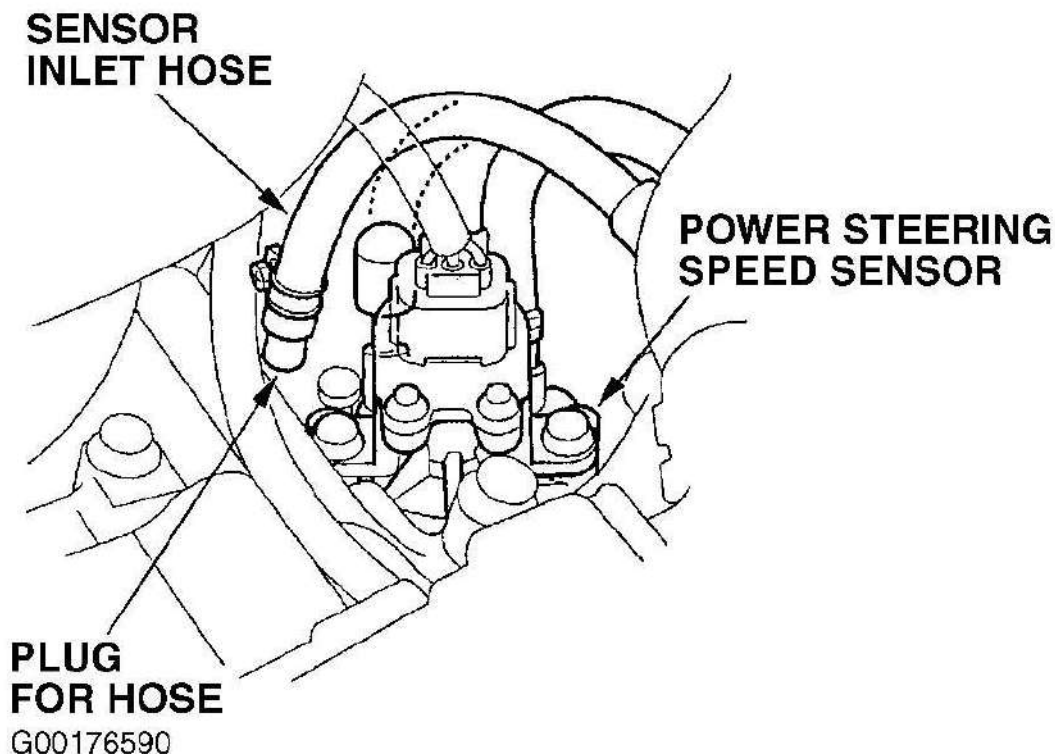
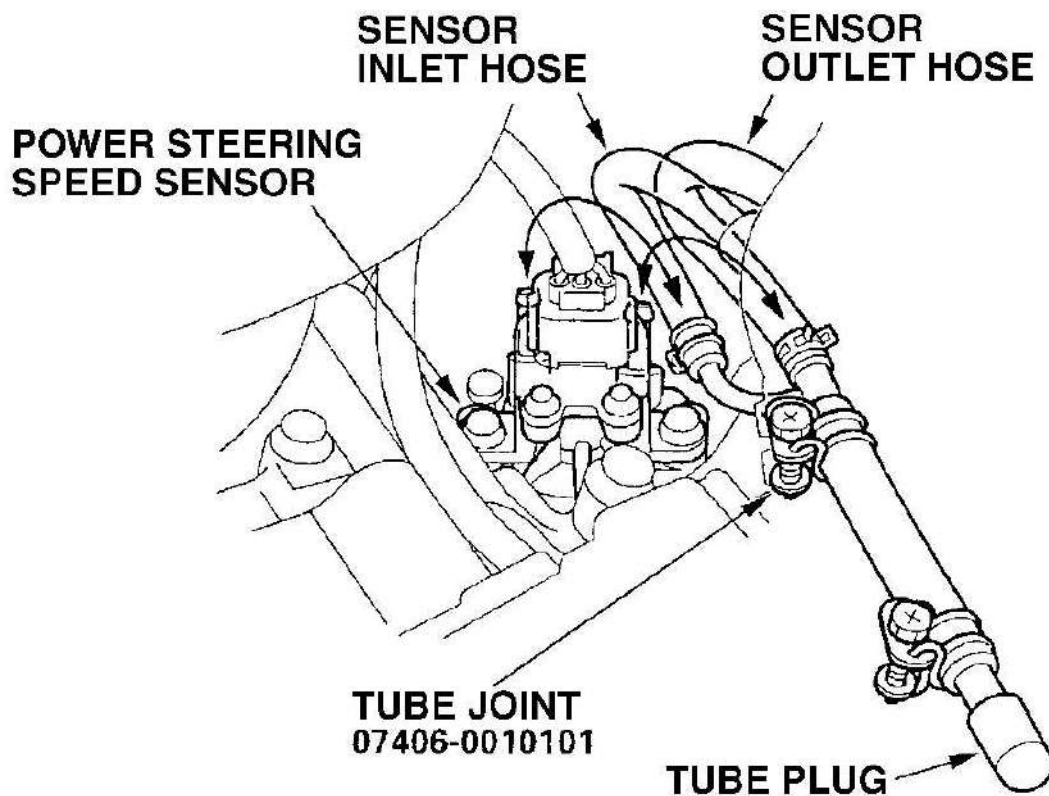


Fig. 4: Viewing Speed Sensor Inlet/Outlet Hoses (Typical)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Power Assist Check At Road Speed (3.2TL)

1. Check the power steering fluid level and pump belt tension. See **BELT TENSION** under ADJUSTMENTS and INSPECTIONS. See **FLUID REPLACEMENT** under LUBRICATION.
2. Start the engine, let it idle and turn steering wheel from lock-to-unlock several times to warm up fluid. Stop the engine, to stimulate speeds above 62 mph (100 km/h), disconnect the sensor inlet hose and sensor outlet hose from the power steering speed sensor, and connect them to the bypass tube joint (the vehicle speed pulse connector is only on vehicles equipped with the navigation system). See **Fig. 5**.
3. Attach a commercially available spring scale to the steering wheel. With the engine idling and the vehicle on a clean, dry floor, pull the scale and read it as soon as the tires begin to turn. If the scale reads more than the standard, the valve body unit is okay. The problem is in the power steering speed sensor, replace it and road test. See **POWER STEERING SPEED SENSOR**.
4. If the scale reads the standard or less, the problem is in the pump. Check the pump pressure with T/N 07406-0010001 or with T/N 07406-001000A. See **PUMP PRESSURE TEST WITH T/N 07406-0010001** or **PUMP PRESSURE TEST WITH T/N 07406-001000A** under DIAGNOSIS & TESTING.



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Fig. 5: Viewing Speed Sensor Inlet/Outlet Hoses (3.2TL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

RACK GUIDE

1. Set the wheels in the straight ahead position. Loosen the rack guide screw lock nut with a 40 mm, Lock nut Wrench (07916-SA50001), then remove the rack guide screw. Remove the old sealant from the rack guide screw and apply new sealant all around threads. Loosely install the rack guide screw on the power rack and pinion.
2. Tighten the rack guide screw to 18 Ft. Lbs. (25 N.m), then loosen it. Retighten the rack guide screw to 35" (3.9 N.m) then back it off to the specified angle. See **Fig. 6** .

Specified Return Angle

20°

3. Tighten the lock nut while holding rack guide screw. Check for unusual steering effort through the complete turning travel. Check the steering wheel play and the power assist.

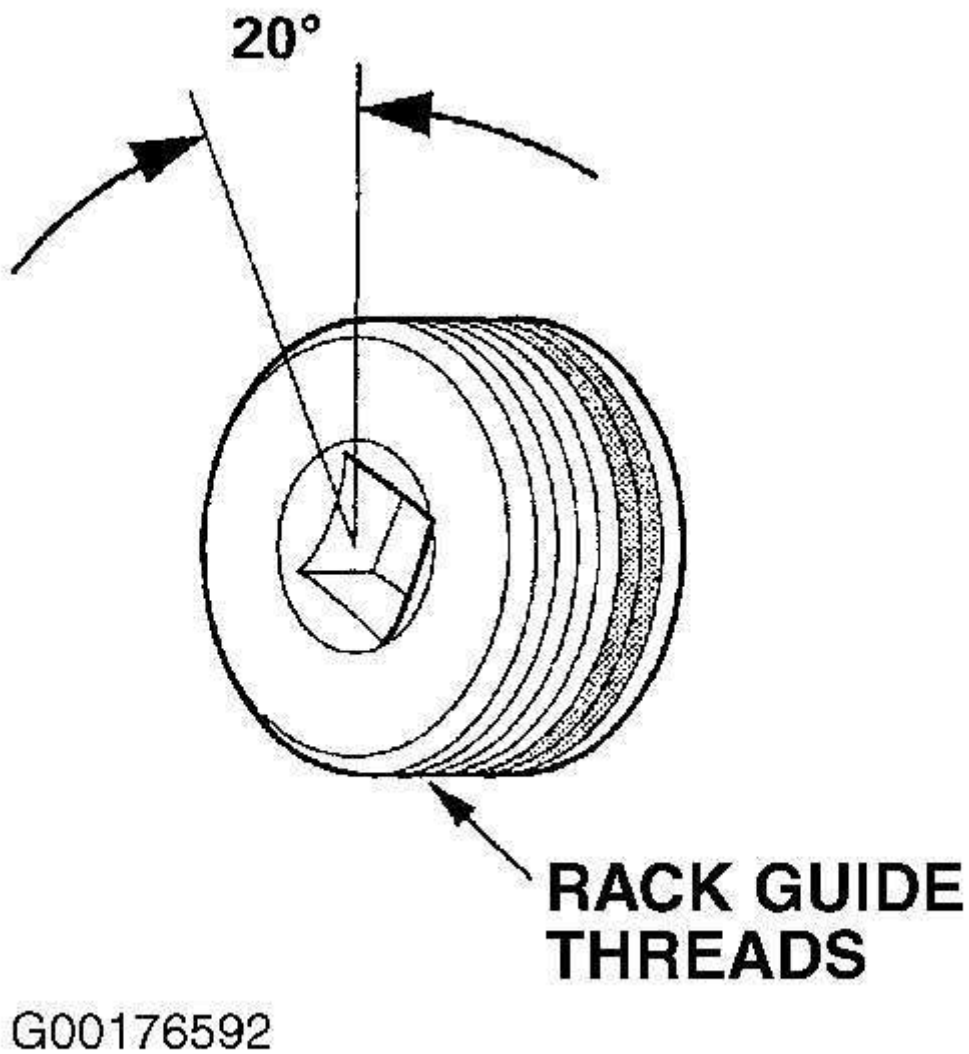


Fig. 6: Inspecting Rack Guide Screw (Typical)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

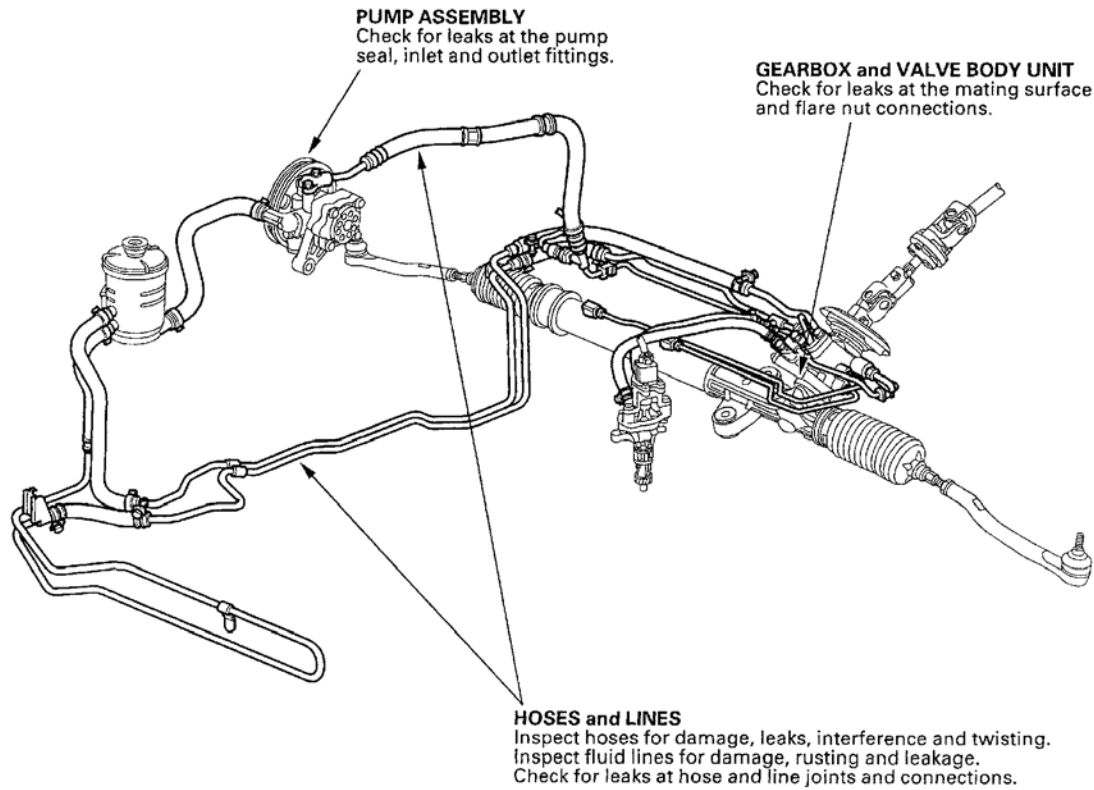
DIAGNOSIS & TESTING

FLUID LEAKAGE

See **Fig. 7** , **Fig. 8** or **Fig. 9** .

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Fig. 7: Exploded View Of Power Steering Hoses & Lines (3.2TL Except Type-S)
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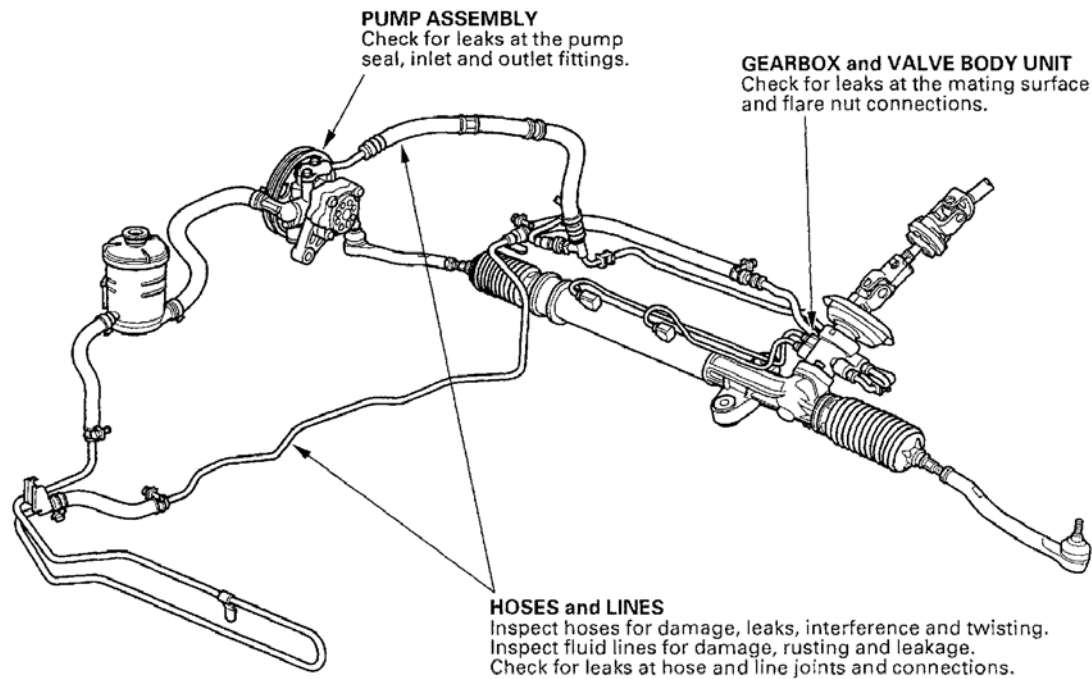


Fig. 8: Exploded View Of Power Steering Hoses & Lines (3.2TL Type-S Models & 3.2CL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

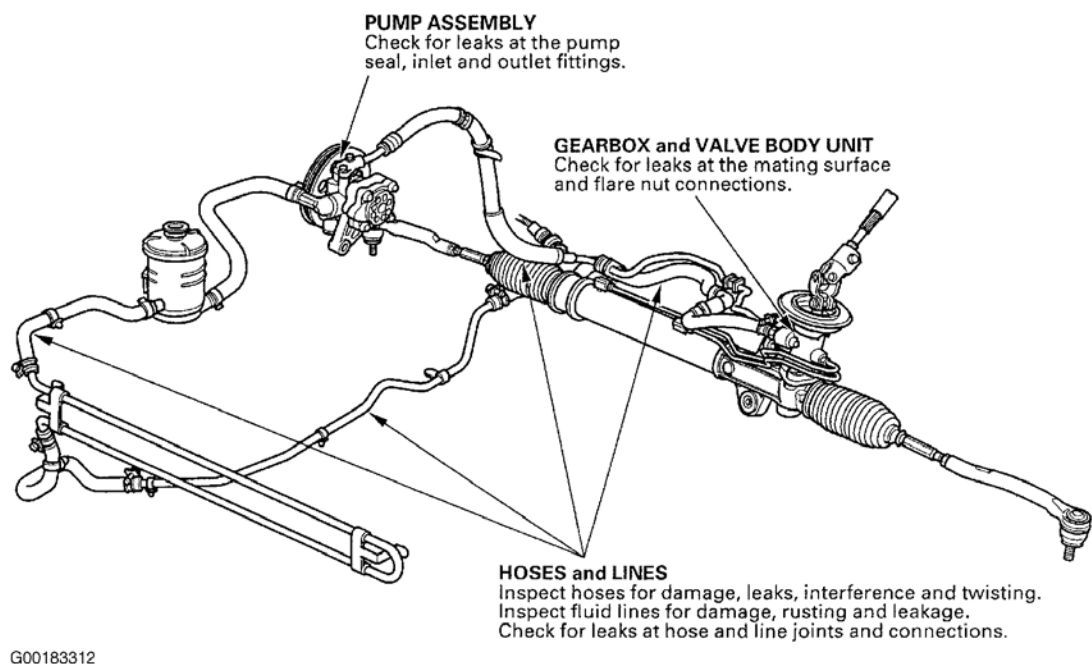


Fig. 9: Exploded View Of Power Steering Hoses & Lines (MDX)

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POWER STEERING

See **Fig. 10** , **Fig. 11** and **Fig. 12** for diagnosis, trouble shooting tables.

Symptom	Procedure(s)	Also check for:
Hissing	1. Check the fluid level. If low, fill the reservoir to the proper level and check for leaks. 2. Check the reservoir for leaks. 3. Check for crushed inlet hose or loose hose clamp allowing air into the suction side of the system. 4. Check the power steering pump shaft oil seal for leaks.	
Pump noise	1. Compare the pump noise at normal operating temperature to another alike vehicle, (pump noise up to 2-3 minutes after starting the engine in cold weather is normal). 2. Remove and inspect the pump for wear and damage.	
Squeaking	Check the power steering belt tension and adjust as necessary.	
Fluid leaks from the steering gearbox	1. Fluid leaks from the top of the valve body unit: Replace the valve body unit. 2. Fluid leaks from the left tie-rod boot: Replace the valve oil seal on the pinion shaft. Replace the cylinder end seal on the gearbox side. 3. Fluid leaks from the right tie-rod boot: Replace the cylinder end seal. 4. Fluid leaks from pinion shaft near the lower steering joint bolt: Replace the valve body unit.	
Fluid leaks from power steering speed sensor	1. Fluid leaks from the sensor outlet or the sensor inlet hose fittings on the vehicle speed sensor (VSS)/power steering speed sensor: Replace the hose clamps on the fittings and recheck. If it still leaks, replace the hoses. 2. Fluid leaks from the sensor body mating surfaces. Replace the vehicle speed sensor (VSS)/power steering speed sensor.	
Fluid leaks from lines	1. Fluid leaks from the cylinder line A or B connections (flare nuts): Tighten the connection and retest. If it still leaks, replace the fitting O-rings. 2. Fluid leaks from a damaged cylinder line A or B: Replace the cylinder line. 3. Fluid leaks from the pump outlet hose or return line fitting on the valve body unit (flair nuts): Tighten the fitting and retest. If it still leaks, replace the hose, line, or valve body unit as necessary.	
Fluid leaks from pump	1. Fluid leaks from the front oil seal: Replace the front oil seal. 2. Fluid leaks from the power steering pump housing: Replace the leaking O-rings or seals, and if necessary replace the power steering pump.	
Fluid leaks from reservoir	1. Fluid leaks from around the reservoir cap: Fluid level is too high: drain the reservoir to the proper level. 2. Fluid leaks from reservoir: Check the reservoir for cracks and replace as necessary. Aerated fluid: check for an air leak on the inlet side of pump.	
Fluid leaks from pump outlet hose (high-pressure)	1. Check the fitting for loose bolts. If the bolts are tight, replace the fitting O-ring. 2. Fluid leaks at the swagged joint: Replace the outlet hose	
Fluid leaks from pump inlet hose (low-pressure)	Check the hose for damage, deterioration, or improper assembly. Replace or repair as necessary.	

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Fig. 10: Symptom Troubleshooting Table

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Find the symptom in the chart below, and do the related procedures in the order listed until you find the cause.

Symptom	Procedure(s)	Also check for:
Hard steering	Troubleshoot the system.	- Modified suspension - Tire sizes, tire varieties, and air pressure
Assist (excessively light steering at high speed)	1. Check the rack guide adjustment. 2. Check the power assist at road speed.	Front wheel alignment.
Shock or vibration when the wheel is turned to full lock	1. Check the rack guide adjustment. 2. Check the power steering pump belt for slippage and adjust as necessary. 3. Replace the steering gearbox.	
Steering wheel will not return smoothly	1. Check cylinder lines A and B for deformation. 2. Check wheel alignment. 3. Replace the steering gearbox. 4. Check the rack guide adjustment.	
Uneven or rough steering	1. Check the rack guide adjustment. 2. Check the power steering pump belt adjustment. 3. Check for low or erratic engine idle speed. 4. Check for air in the power steering system due to low fluid level. 5. Check for low fluid level in the power steering reservoir due to possible leaks in system. 6. Replace the steering gearbox.	
Steering wheel kicks back during wide turns	1. Check power steering pump belt adjustment. 2. Check the system fluid pressures with T/N 07406-0010001 or with T/N 07406-001000A.	
Humming	1. Check when the noise occurs. • If the noise is heard 2—3 minutes after starting the engine in cold weather, this is normal. • If the noise is heard when the wheel is turned with the vehicle stopped, this is normal due to the fluid pulsation. 2. Check for the high-pressure hose touching the subframe or body. 3. Check for automatic transmission converter noise. Remove the power steering belt, and recheck.	Pump pressure
Rattle or chattering (Rack rattle)	1. Check for loose steering components (tie-rod and ball joints). Tighten or replace as necessary. 2. Check the steering column shaft for wobbling. If the steering column wobbles, replace the steering column assembly. 3. Check the rack guide adjustment. 4. Check the power steering pump pulley. • If the pulley is loose, tighten it. • If the pump shaft is loose, replace the pump.	

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Fig. 11: Symptom Troubleshooting Table
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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1. Check the power assist with vehicle parked.

Is the power assist more than 25N (2.5 kgf, 5.5 lbf)?

YES—Go to step 2.

NO—Power assist is OK. ■

2. Measure the power assist with the sensor inlet fitting and hose plugged.

Is the power assist more than 25 N (2.5 kgf, 5.5 lbf)?

YES—Go to step 3.

NO—Go to step 8.

3. Measure steady-state fluid pressure from the pump at idle with T/N 07406-0010001 or with T/N 07406-001000A.

Is the pressure 1,500 kPa (15 kgf/cm², 213 psi) or less?

YES—Go to step 4.

NO—Go to step 9.

4. Measure the pump relief pressure at idle with T/N 07406-0010001 or with T/N 07406-001000A.

Is the pressure 7,600-8,300 kPa (78-85 kgf/cm², 1,110-1,210 psi) or less?

YES—Go to step 5.

NO—Go to step 10.

5. With a spring scale, measure the power assist in both directions, to the left and to the right.

Are the 2 measurements within 5.0 N (0.51 kgf, 1.12 lbf) of each other?

YES—Go to step 6.

NO—Go to step 11.

6. Measure the fluid pressure with both pressure gauge valves open (if so equipped), while turning the steering wheel fully to the left and fully to the right.

Is the pressure 7,600-8,300 kPa (78-85 kgf/cm², 1,110-1,210 psi) or less?

YES—Go to step 7.

NO—Faulty gearbox. ■

7. Adjust the rack guide, and retest.

Is the steering OK?

YES—Repair is completed. ■

NO—Faulty gearbox. ■

8. Check for fluid leaks at the hoses, lines, joints and connections.

Are the hoses, lines, joints and connections OK?

YES—Faulty power steering speed sensor or valve body unit. ■

NO—Repair or replace the lines or hoses. ■

9. Check the supply and return lines between the pump and the gearbox for clogging and deformation.

Are the lines clogged or deformed?

YES—Repair or replace the lines. ■

NO—Faulty valve body unit. ■

10. Check the flow control valve for smooth movement and leaks.

Is the flow control valve OK?

YES—Faulty pump assembly. ■

NO—Faulty flow control valve. ■

11. Check the cylinder lines A and B for deformation.

Are the A or B lines deformed?

YES—Replace the lines. ■

NO—Go to step 12.

12. Check for a bent rack shaft or misadjusted rack guide (too tight).

Is the rack shaft bent or the rack guide adjusted too tight?

YES—Replace the rack shaft or readjust the rack guide. ■

NO—Faulty valve body unit. ■

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Fig. 12: Symptom Troubleshooting Table
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PUMP PRESSURE TEST WITH T/N 07406-0010001

Check the fluid pressure as follows to determine whether the trouble is in the pump or power rack and pinion.

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1. Check the power steering fluid level and pump belt tension. See **BELT TENSION** under ADJUSTMENTS. See **FLUID REPLACEMENT** under LUBRICATION.
2. Disconnect the pump outlet hose from the pump outlet with care so as not to spill the power steering fluid on the frame and other parts. Install the P/S Joint Adapter (07VAK-P8A011A) on the pump outlet with the P/S Joint Outlet Plate (07VAK-8A012B). See **Fig. 13** .
3. Connect the P/S Joint Adapter hose (07RAK-S040121) to the P/S pressure gauge (07406-0010001), then connect the pump outlet hose to the P/S joint adapter hose. Install the P/S pressure gauge to the P/S joint adapter pump.
4. Fully open the shut-off valve. Fully open the pressure control valve. Start the engine and let it idle. Turn the steering wheel from the lock-to-lock several times to warm the fluid to operating temperature. Measure the steady-state fluid pressure while the engine is idling. If the pump is in good condition, the gauge should read less than 213 psi (1500 kPa). If it reads high, check for:
 - Clogged or deformed feed or return line between the pump and power rack and pinion.
 - Clogged valve body unit.
5. Close the pressure control valve, then close the shut-off valve gradually until the pressure gauge needle is stable. Read pressure.

NOTE: **Do not keep the pressure control valve closed more than 5 seconds or the pump could be damaged by over-heating.**

6. Immediately open the pressure control valve fully. If the pump is in good condition, the gauge should read at least 1110-1210 psi (7600-8300 kPa). A low reading means pump output is too low for full assist. Repair or replace the pump.

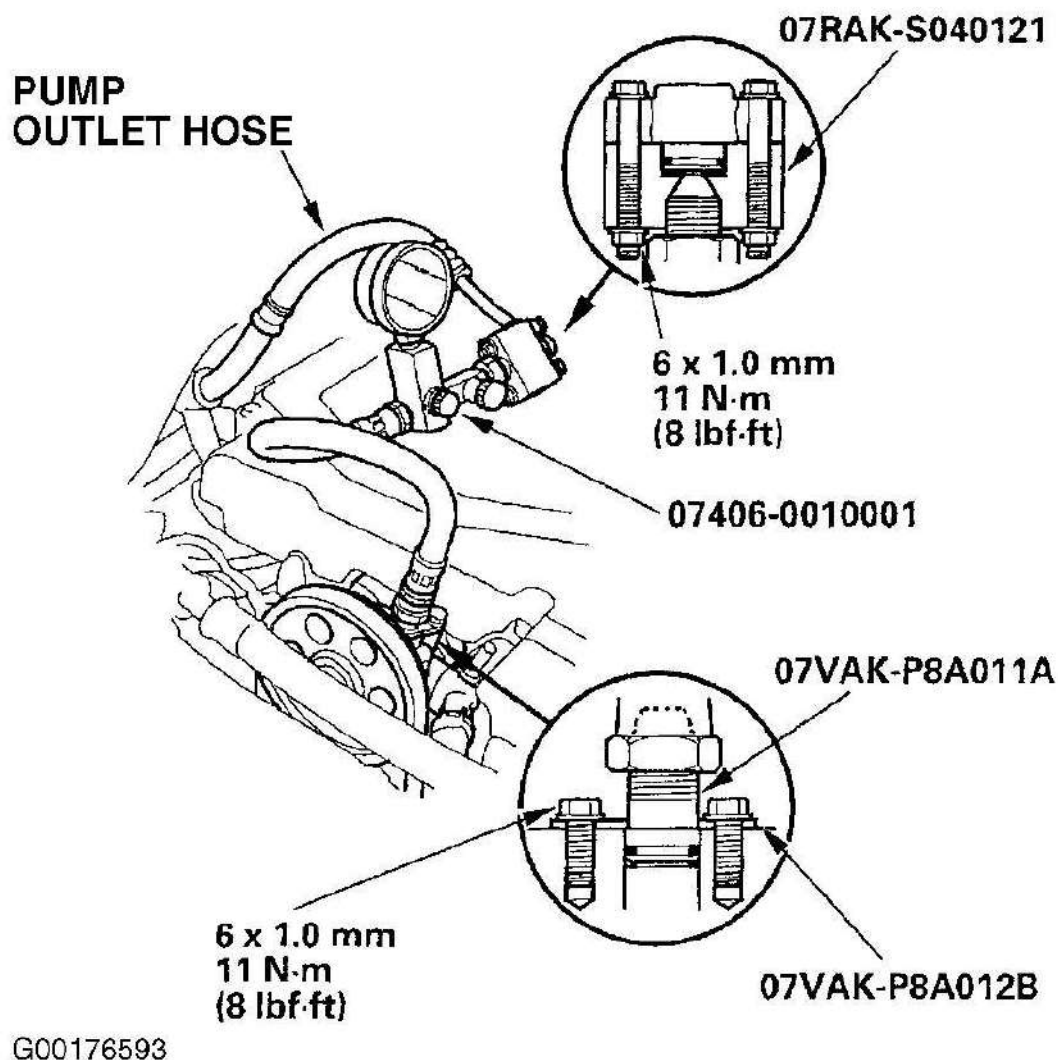


Fig. 13: Testing Pump Pressure With T/N 07406-0010001 (Typical)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PUMP PRESSURE TEST WITH T/N 07406-001000A

Check the fluid pressure as follows to determine whether the trouble is in the pump or power rack and pinion.

1. Check the power steering fluid level and pump belt tension. See **BELT TENSION** and **FLUID REPLACEMENT** under ADJUSTMENTS and LUBRICATION.
2. Disconnect the pump outlet hose from the pump outlet with care so as not to spill the power steering fluid on the frame and other parts. Install the P/S Joint Adapter (pump 07VAK-P8A011A) on the pump outlet with the P/S Joint Outlet Plate (pump 07VAK-8A012B). See **Fig. 14**.

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3. Connect the P/S Joint Adapter (hose 07RAK-S040121) to the P/S pressure gauge (07406-001000A), then connect the pump outlet hose to the P/S joint adapter hose. Install the P/S pressure gauge to the P/S joint adapter pump.
4. Fully open the pressure control valve. Start the engine and let it idle. Turn the steering wheel from the lock-to-lock several times to warm the fluid to operating temperature. Measure the steady-state fluid pressure while the engine is idling. If the pump is in good condition, the gauge should read less than 213 psi (1500 kPa). If it reads high, check for:
 - Clogged or deformed feed or return line between the pump and power rack and pinion.
 - Clogged valve body unit.
5. Close the pressure control valve gradually and read pressure.

NOTE: **Do not keep the pressure control valve closed more than 5 seconds or the pump could be damaged by over-heating.**

6. Immediately open the pressure control valve fully. If the pump is in good condition, the gauge should read at least 1110-1210 psi (7600-8300 kPa). A low reading means pump output is too low for full assist. Repair or replace the pump.

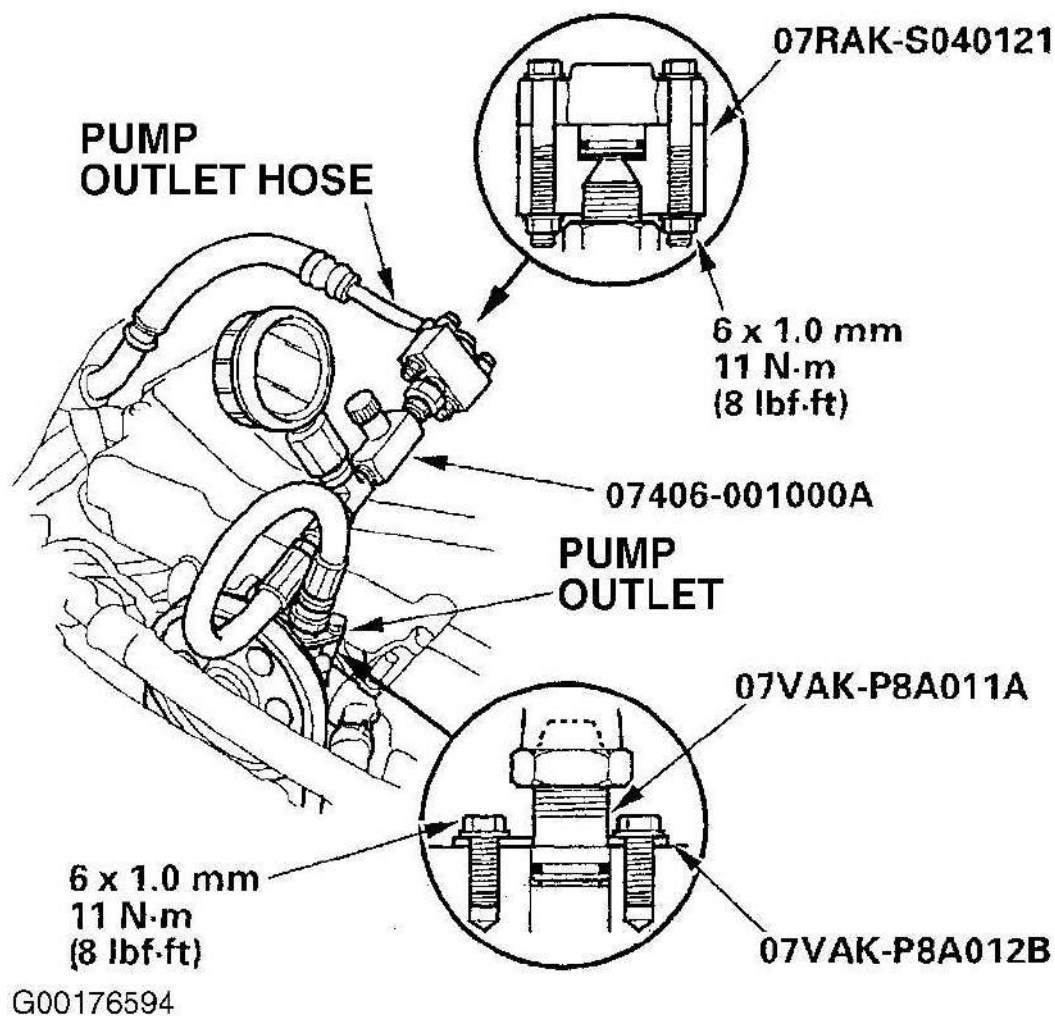


Fig. 14: Measuring Pump Pressure With T/N 07406-001000 (Typical)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

REMOVAL & INSTALLATION

HOSES, LINES & PRESSURE SWITCH

Removal & Installation

See **Fig. 15** , **Fig. 16** or **Fig. 17** exploded view and note these items during Installation:

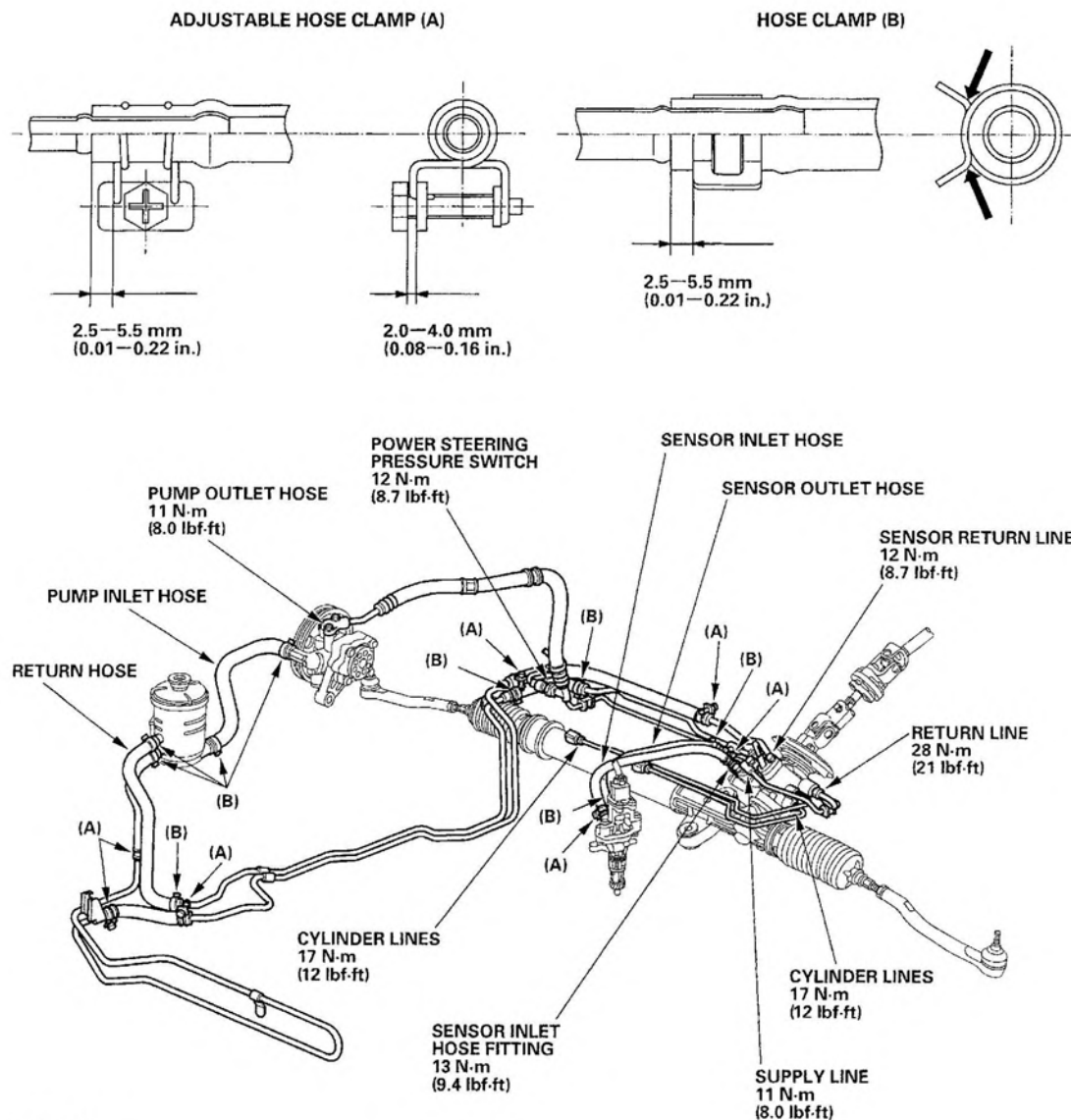
- Connect each hose to the corresponding line securely until it contacts the stop on the line. Install the clamp or the adjustable clamp at the specified distance from the hose end. See **Fig. 15** , **Fig. 16** or **Fig.**

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- Check all clamps for deterioration or deformation; replace the clamps with new ones as necessary.
- Add the recommended power steering fluid to the specified level on the reservoir and check for leaks.



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Fig. 15: Identifying Hoses, Lines & Pressure Switch (3.2TL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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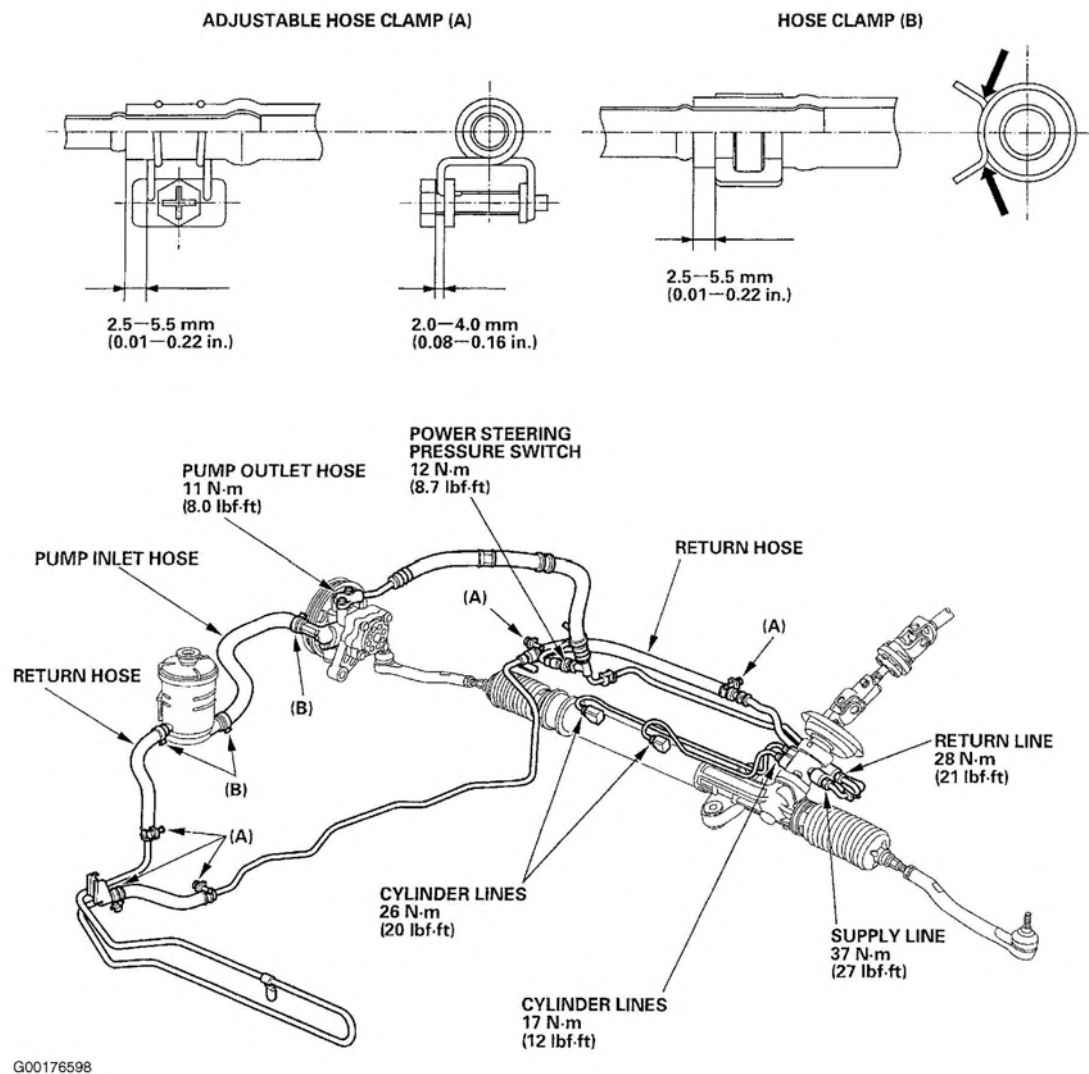
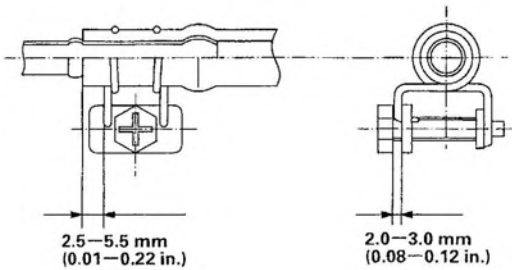


Fig. 16: Identifying Hoses, Lines & Pressure Switch (3.2TL Type-S Model & 3.2CL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

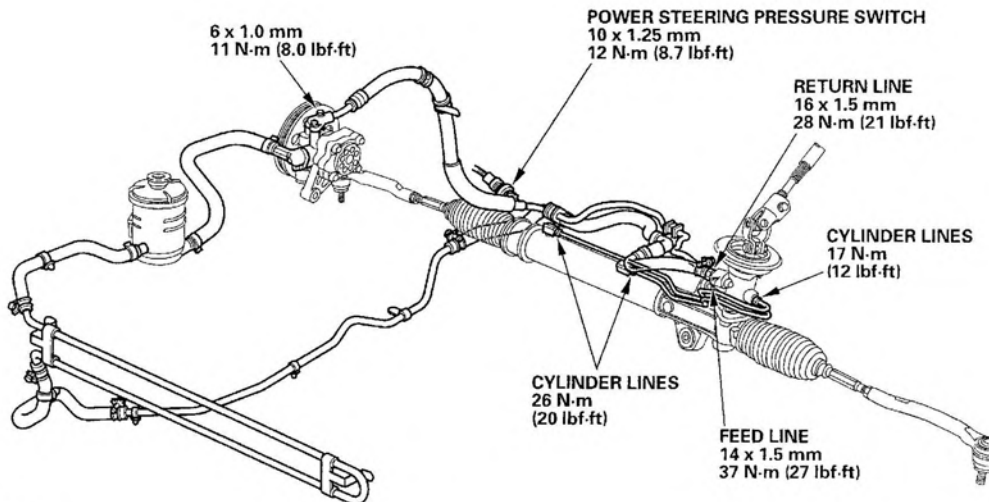
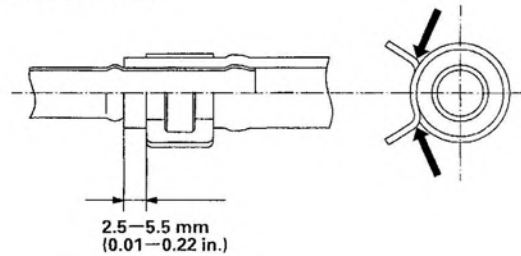
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ADJUSTABLE HOSE CLAMP (A)



HOSE CLAMP (B)



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Fig. 17: Identifying Steering Hoses & Lines (MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

POWER RACK & PINION

Removal (Except MDX)

NOTE: See Fig. 18 for inspection of steering linkage.

NOTE: Before disassembling the steering wheel see, ACURA - AIR BAG RESTRAINT SYSTEMS article.

1. Using solvent and a brush, wash any oil and dirt off of the valve body unit, its lines, and the end of the power rack and pinion. Blow dry with compressed air. Be sure to remove the steering wheel before disconnecting the steering joint. See STEERING COLUMNS -- MDX, RSX, 3.2RL, 3.2TL & 3.5RL article. Drain the power steering fluid. See FLUID REPLACEMENT under LUBRICATION. Raise vehicle and remove front wheels. Remove driver's side airbag assembly, steering wheel, and steering joint cover. See STEERING COLUMNS -- MDX, RSX, 3.2RL, 3.2TL & 3.5RL article.

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2. Remove the steering joint bolts, disconnect the steering joint by moving the steering joint toward the column. Remove the cotter pin from the 10 mm nut, and loosen the nut. Separate the tie-rod ball joint and knuckle using a 28 mm, Ball Joint Remover (07MAC-SL00200). Grasp the tie-rod and pull rack all the way to the right, then remove the right and left tie-rod ends, and lock nuts.
3. Remove the exhaust pipe and mounting bracket. On 3.2CL and 3.2TL Type-S, loosen the 14 mm flare nut, and disconnect the pump outlet hose. Loosen the 17 mm flare nut, and remove the return line. On 3.2TL, disconnect the supply line, the return line, the sensor inlet hose, and the sensor return line from the valve body unit. Remove the sensor inlet hose fitting.
4. On all models, after disconnecting the hoses and lines, plug or seal them with a piece of tape or equivalent to prevent foreign materials from entering.

NOTE: Do not loosen the cylinder line between the valve body unit and cylinder.

5. Remove the stiffener plates, then remove the right mounting brackets and the cushion. Pull the power rack and pinion down until the pinion shaft clears the bulkhead, and remove the pinion shaft grommet from the top of the valve body unit.

NOTE: Apply vinyl tape to the pinion shaft splines and the line fitting surfaces on the valve body unit to protect them during removal.

6. Move the power rack and pinion to the passenger's side until the driver's side rack end rests on the end of the rear beam. To get the driver's side rack end around the rear beam, push up and back on the passenger's side rack end, then pull down on the driver's side of the power rack and pinion.

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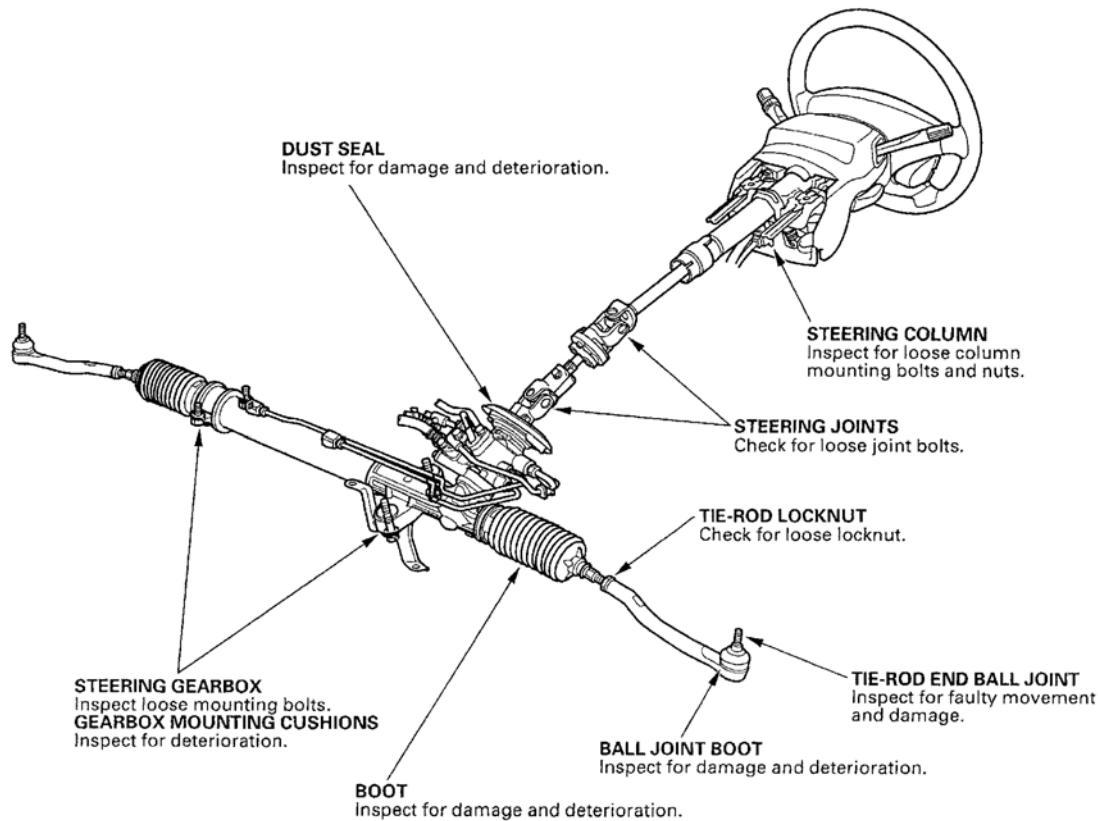


Fig. 18: Identifying Steering Linkage & Power Rack & Pinion (3.2TL & 3.2CL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation (Except MDX)

1. Before installing the power rack and pinion, slide the rack all the way to the right.

NOTE: Apply vinyl tape to the pinion shaft splines and the line fitting surfaces on the valve body unit to protect them from the rear beam during installation.

2. Pass the passenger's side of the power rack and pinion above and through the passenger's side of the rear beam. Be careful not to bend or damage the power steering lines and cylinder lines when installing the power rack and pinion. Raise the driver's side of the power rack and pinion above and through the driver's side of the rear beam. Then insert the pinion shaft up through the bulkhead.
3. Remove the vinyl tape from the pinion shaft and the valve body unit. Install the pinion shaft grommet. Align the slot in the pinion shaft grommet with the lug portion on the valve housing. See **Fig. 19** . Install the mounting cushion on the power rack and pinion. Install the mounting brackets over the mounting cushion, then install the 2 power rack and pinion mounting bolts. Position the split portion of the mounting cushion. See **Fig. 20** .
4. Install the stiffener plates with the 2 power rack and pinion mounting bolts and 6 stiffener plate attaching

bolts. Install the bolts loosely first, then tighten securely to specifications. See **TORQUE SPECIFICATIONS** . Center the steering within its stroke.

5. Install the steering joint, and reconnect the steering shaft and pinion shaft. Make sure the steering joint is connected as follows:
 - Insert the upper end of the steering joint onto the steering shaft. Line up the bolt hole with the flat portion on the shaft. Slip the lower end of the steering joint onto the pinion shaft. Line up the bolt hole with the groove around the shaft, and loosely install the lower joint bolt. Be sure that the lower joint bolt is securely in the groove in the pinion shaft. See **Fig. 21** .
 - Pull in the steering joint to make sure that the steering joint is fully seated. Then install the upper joint bolt and tighten it.
6. Center the cable reel by first rotating it clockwise until it stops. Then rotate it counterclockwise (approx. 2 1/2 turns) until the arrow mark on the label points straight up. Reinstall the steering wheel. Install the steering joint cover with the clamps and clips. For Premium 3.2TL Models install the sensor inlet hose fitting. Connect the supply line, the return line, the sensor inlet hose, and the sensor return line to the valve body unit. For Type-S 3.2TL Models and 3.2CL Models, connect the return line and feed line to the valve body unit. After connecting the fluid lines, make sure that there is no interference between the lines and other parts.
7. On all models, thread the right and left tie-rod ends and lock nut onto the rack an equal number of turns. Wipe off any grease contamination from the ball joint tapered section and threads then reconnect tie-rod ends to the steering knuckles. Install the 10 mm nut and tighten it to specifications. See **TORQUE SPECIFICATIONS** . Install new cotter pin and bend it over bolt/nut.
8. Connect the A/T shift cable to the transmission. Install the exhaust pipe and mounting bracket. Install the front wheels. Fill the system with power steering fluid, and bleed air from the system. See **FLUID REPLACEMENT** under LUBRICATION.
9. After installation, start engine, allow to idle, and turn the steering wheel from lock-to-lock several times to warm up the fluid. Check the power rack and pinion for leaks. See **FLUID LEAKAGE** under DIAGNOSIS & TESTING. Adjust the front toe. Check steering wheel spoke angle. Adjust by turning the right and left tie-rods equally, if necessary.

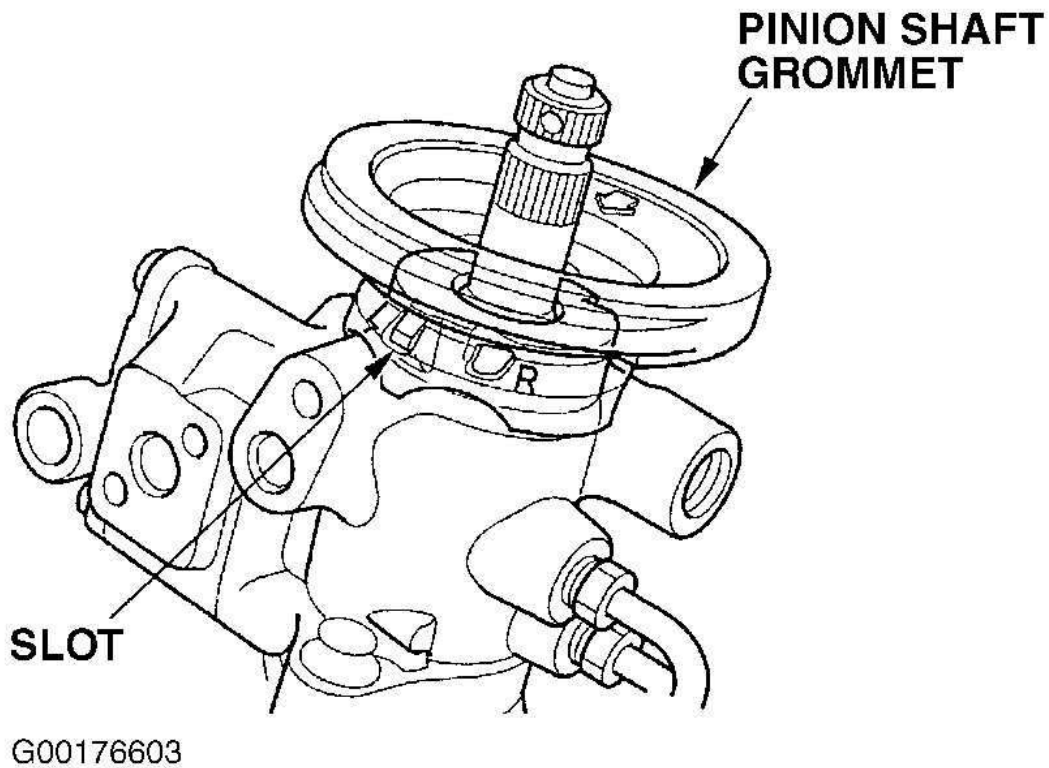
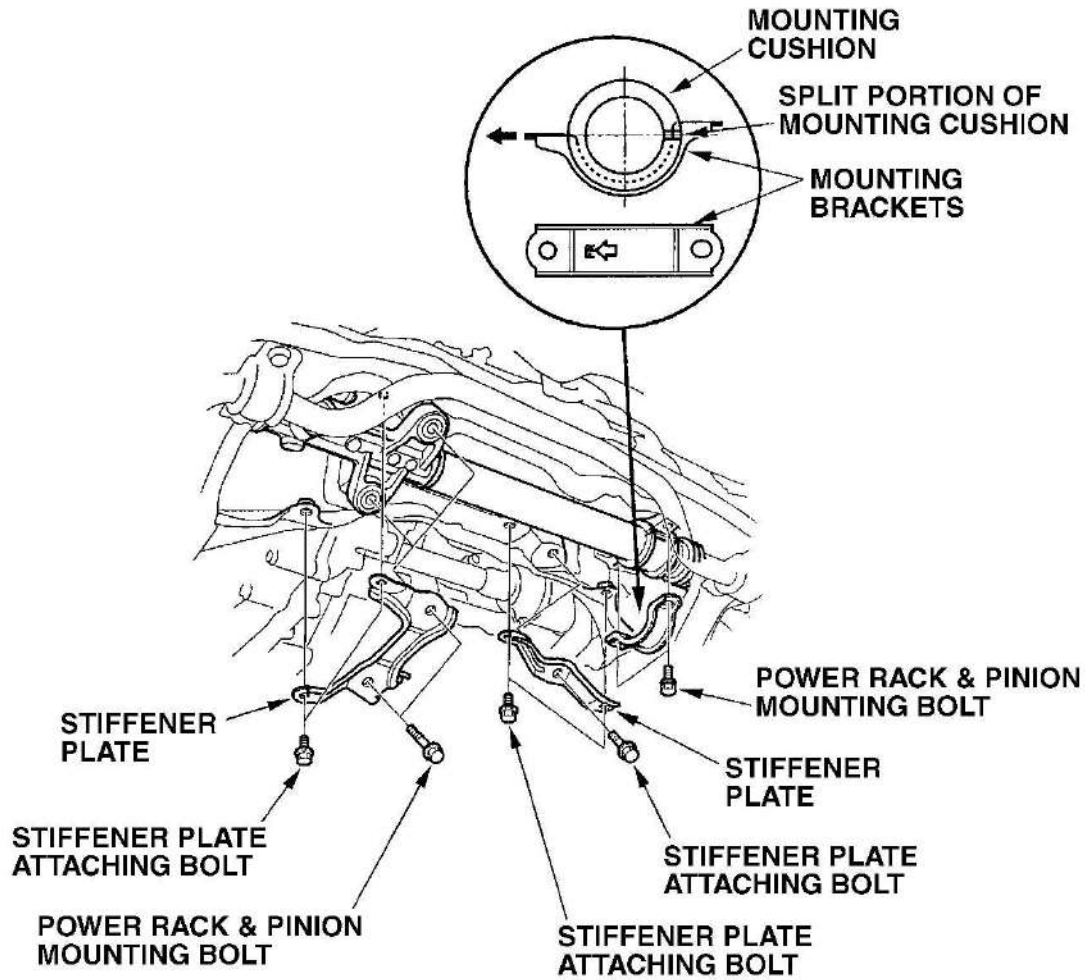


Fig. 19: Aligning Pinion Shaft Grommet (Typical, All Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

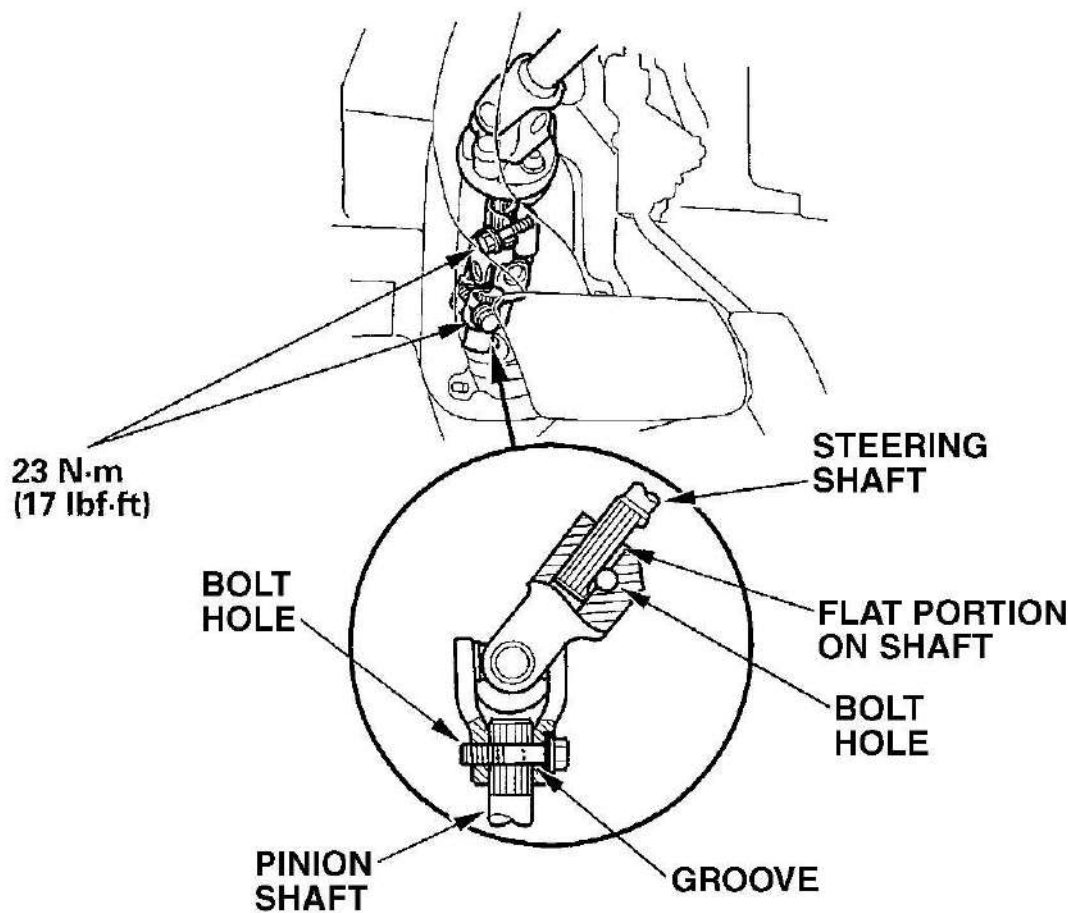
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Fig. 20: Installing Mounting Brackets & Cushions (Typical, All Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 21: Installing Steering Column (Typical, All Models)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

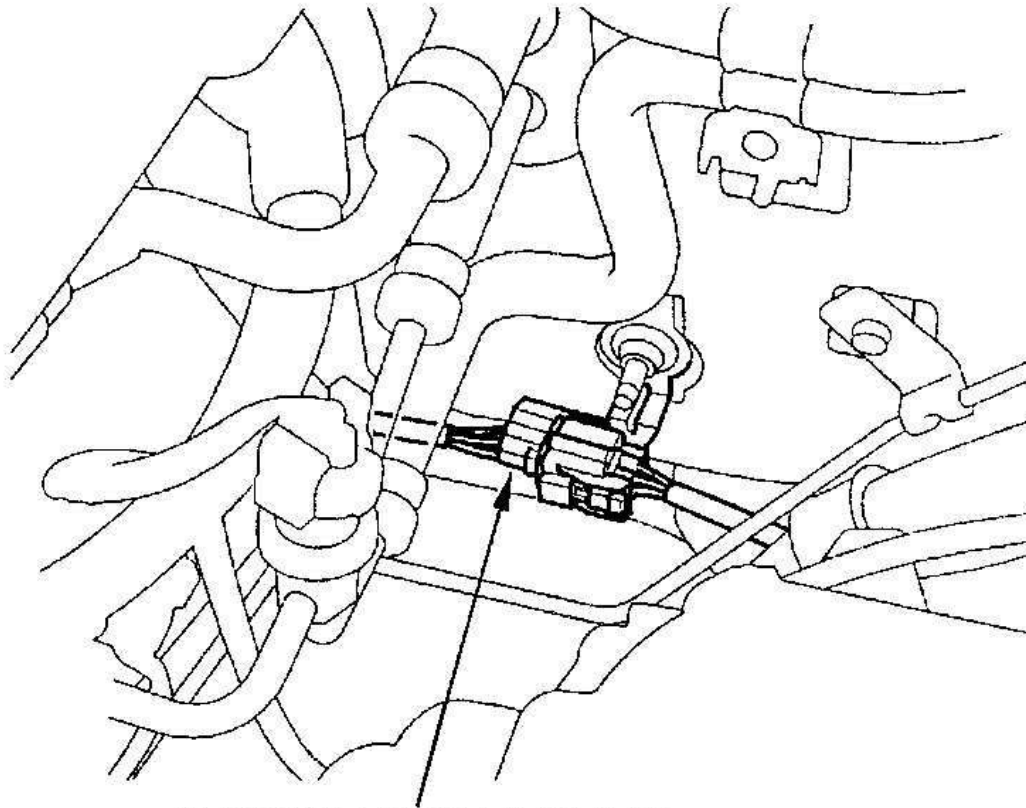
Removal (MDX)

1. Using solvent and a brush, wash any oil and dirt off of the valve body unit, its lines, and the end of the power rack and pinion. Blow dry with compressed air. Be sure to remove the steering wheel before disconnecting the steering joint. See **STEERING COLUMNS -- MDX, RSX, 3.2RL, 3.2TL & 3.5RL** article. Lower the front subframe from the body and remove/install the power rack and pinion through the gap produced by lowering the front subframe. Drain the power steering fluid. See **FLUID REPLACEMENT** under LUBRICATION.
2. Remove driver's side airbag assembly, steering wheel, and steering joint cover. See **STEERING COLUMNS -- MDX, RSX, 3.2RL, 3.2TL & 3.5RL** . Remove the steering joint bolts, disconnect the steering joint by moving the steering joint toward the column. Disconnect the pump outlet hose from the power steering pump, and remove the feed hose clamp. Remove the 10 mm flange bolts on the engine side mount bracket. Raise vehicle and remove front wheels. Remove the cotter pin from the 12 mm nut and loosen the nut.

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3. Separate the tie-rod ball joint and knuckle using a 28 mm Ball Joint Remover (07MAC-SL00200). Remove the subframe stiffener plate. Disconnect the secondary heated oxygen sensor (secondary HO2S) connector from the engine compartment. See **Fig. 22** . Remove the three self-locking nuts and disconnect the three way catalytic converter (TWC) and mufflers. See **Fig. 23** . Remove the 10 mm flange bolts of the exhaust rubber mount.
4. Disconnect the power steering pressure (PSP) switch connector. Remove the propeller shaft protector. Remove the splash shield. Place a jack under the front tube of the front subframe, and support it by raising the jack. Place a transmission jack under the center of the transfer case. Loosen the 14 mm flange bolts on the front subframe so they are about 1 3/16" (30 mm) from the mounting surface. Do not loosen the 14 mm flange bolts more than necessary.
5. Remove the four 12 mm flange bolts from the front stiffener plates. Support the transfer case securely by raising the transmission jack, then remove the two 12 mm flange bolts. Remove the two 14 mm special bolts and rear stiffener plates from the front subframe. Lower the transmission jack slowly until the front subframe has dropped about 1 15/16" (50 mm). Remove the P/S line mounting brackets from the front subframe and gearbox mounting bracket.
6. Loosen the 14 mm flare nut, and disconnect the feed line. Loosen the adjustable hose clamp and disconnect the return hose. Remove the 10 mm flange bolts from the right side of the gearbox, then remove the mounting bracket and cushion. Remove the two 10 mm flange bolts from the left side of the gearbox. Lower the transmission jack slowly until the front subframe has dropped 3 15/16" (100 mm) total. See **Fig. 24** .
7. Remove the gearbox stiffener bracket from the left side of the front subframe. Slide the power rack and pinion between the body and front subframe toward the left, and remove the power rack and pinion.



**SECONDARY HEATED
OXYGEN SENSOR**

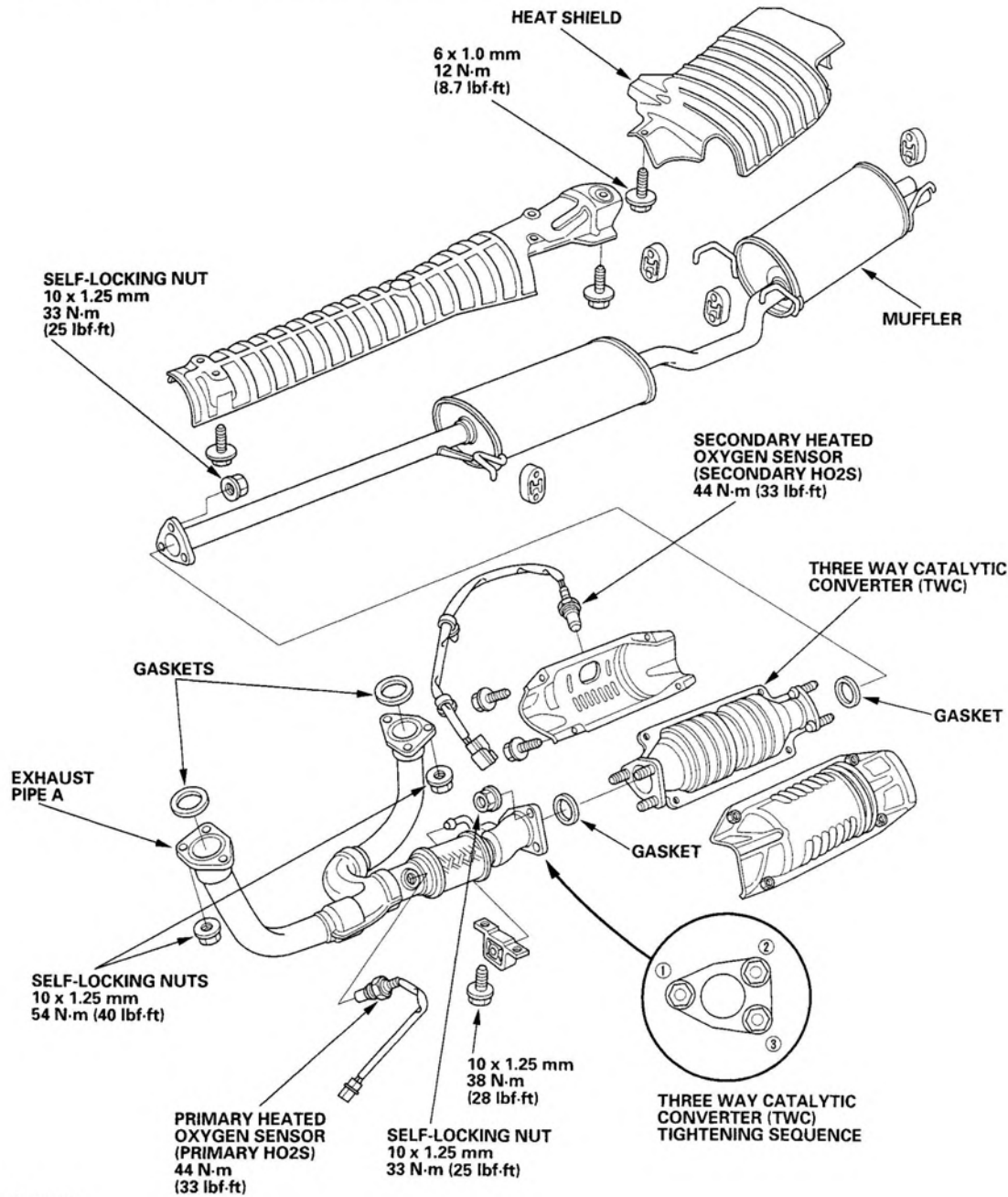
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Fig. 22: Locating Secondary Heated Oxygen Sensor Connector (MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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NOTE: Use new gaskets and self-locking nuts when reassembling.



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Fig. 23: Exploded View Of Exhaust Pipe & Muffler (MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

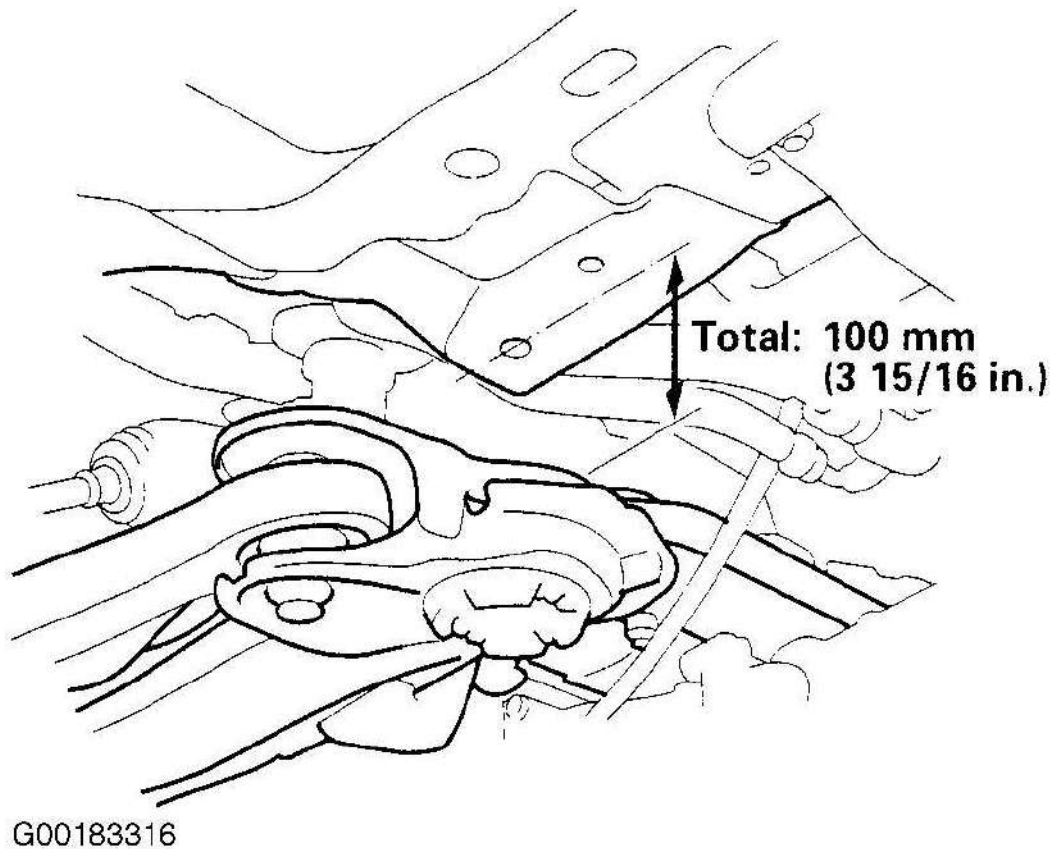


Fig. 24: Inspecting Height Of Transmission Jack
Courtesy of AMERICAN HONDA MOTOR CO., INC.

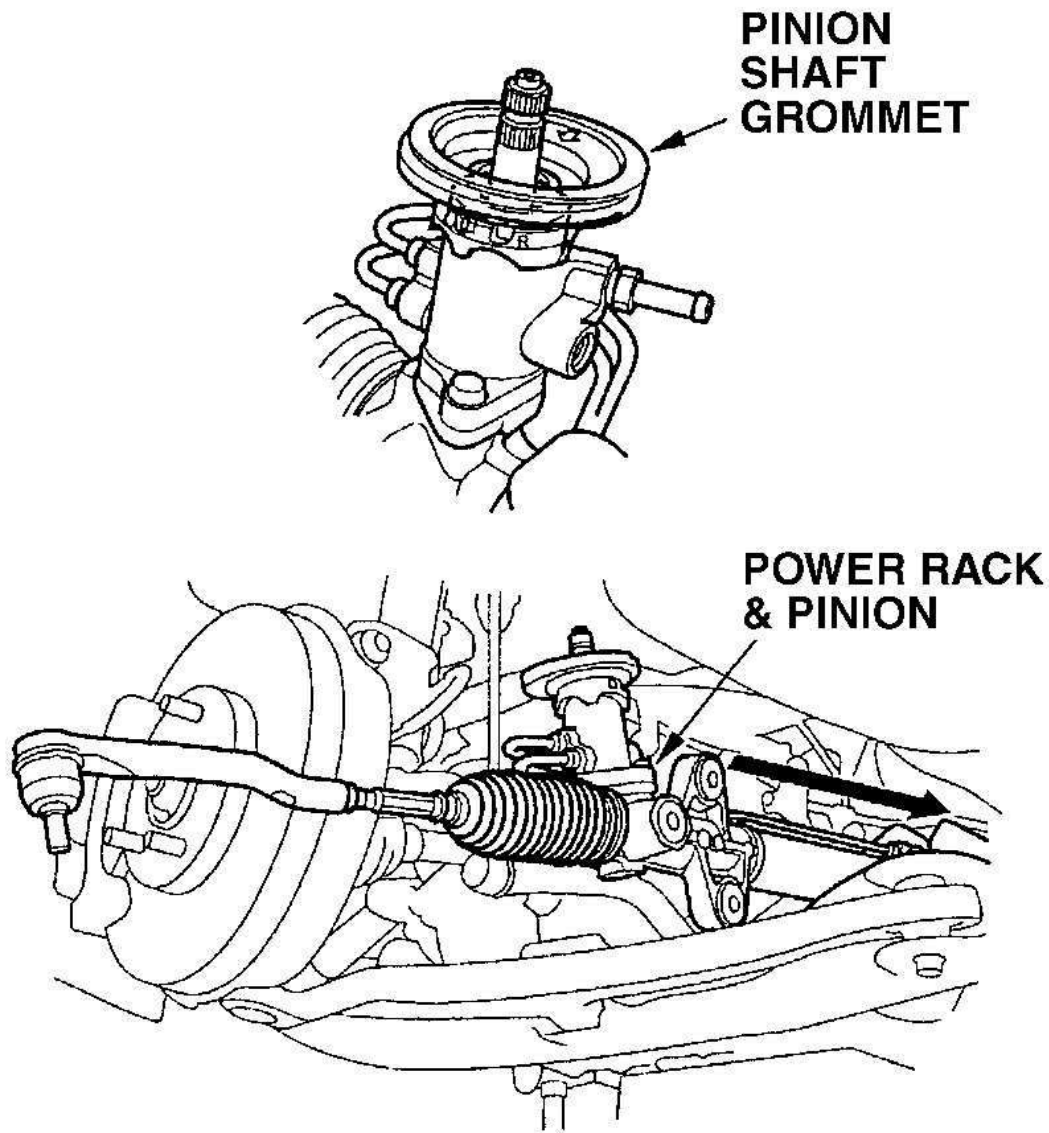
Installation (MDX)

1. Install the pinion shaft grommet on the valve housing. Slide the power rack and pinion between the front subframe and body from the driver's side. Place the gearbox in the position on the front subframe. See **Fig. 25** . Install the stiffener bracket on the front subframe, and tighten the bolt and nut to the specified torque. See **TORQUE SPECIFICATIONS** .
2. Loosely install the two 10 mm flange bolts on the left side of the gearbox. Install the mounting cushion on the right side of the gearbox. Install the mounting bracket over the mounting cushion, then install the two 10 mm flange bolts. Tighten the four 10 mm flange bolts for the gearbox to the specified torque. See **TORQUE SPECIFICATIONS** .
3. Connect the return hose securely, and tighten the adjustable hose clamp. See **Fig. 17** . Connect the feed line, and tighten the 14 mm flare nut to the specified torque. See **TORQUE SPECIFICATIONS** . Install the P/S line mounting brackets on the front subframe and gearbox mounting bracket.
4. Carefully raise the front subframe with the transmission jack (transfer case supporting jack). Install the rear stiffener plates. Tighten the 12 mm flange bolts and 14 mm special bolts to specified torque. See

TORQUE SPECIFICATIONS . See **Fig. 26** . Install the front stiffener plates with 12 mm flange bolts and 14 mm special bolts, and tighten to specified torque. See **Fig. 27** .

5. Lower the front subframe supporting jack and the transmission jack. Install the splash shield and propeller shaft protector. Connect the power steering pressure (PSP) switch connector. Connect the three way catalytic converter (TWC) and mufflers. Install the NEW 10 mm self-locking nuts and tighten them to specified torque. See **TORQUE SPECIFICATIONS** .
6. Install the exhaust rubber mount on the frame. Connect the secondary heated oxygen sensor connector, and install the wire harness on the clamp and clip. Make sure the wire harness is routed and fastened properly. Install the subframe stiffener plate. Install the 10 mm flange bolts on the engine side mounting bracket. Connect the pump outlet hose from the power steering pump, and install the feed hose clamp.
7. Wipe off any grease from the ball joint tapered section and threads. Reconnect the tie-rod ends to the steering knuckles. Install the 12 mm nut and tighten it. Install the new cotter pin and bend around bolt/nut. Center the steering wheel within its stroke, then install the steering joint, and reconnect the steering shaft and pinion shaft. Center the cable reel first by rotating it clockwise until it stops. Then rotate it counterclockwise (about two and a half turns) until the arrow mark on the label points straight up.
8. Install the steering joint cover with the clamps and clips. Install front wheels, connect the battery cable, and fill system with power steering fluid. Bleed air from the system. Start engine and allow to idle, and turn the steering wheel from lock-to-lock several times to warm up fluid. Check power rack and pinion for leaks.

NOTE: **For Tie-Rod Ball Joint Removal & Installation, see FRONT -- MDX in SUSPENSION article.**



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Fig. 25: Positioning Power Rack & Pinion (MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

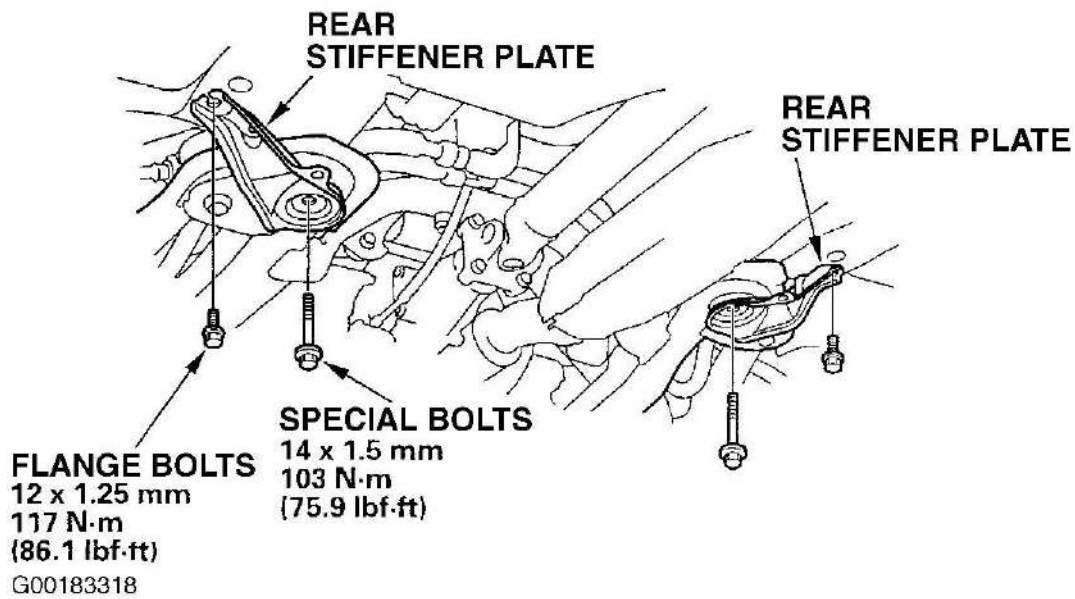
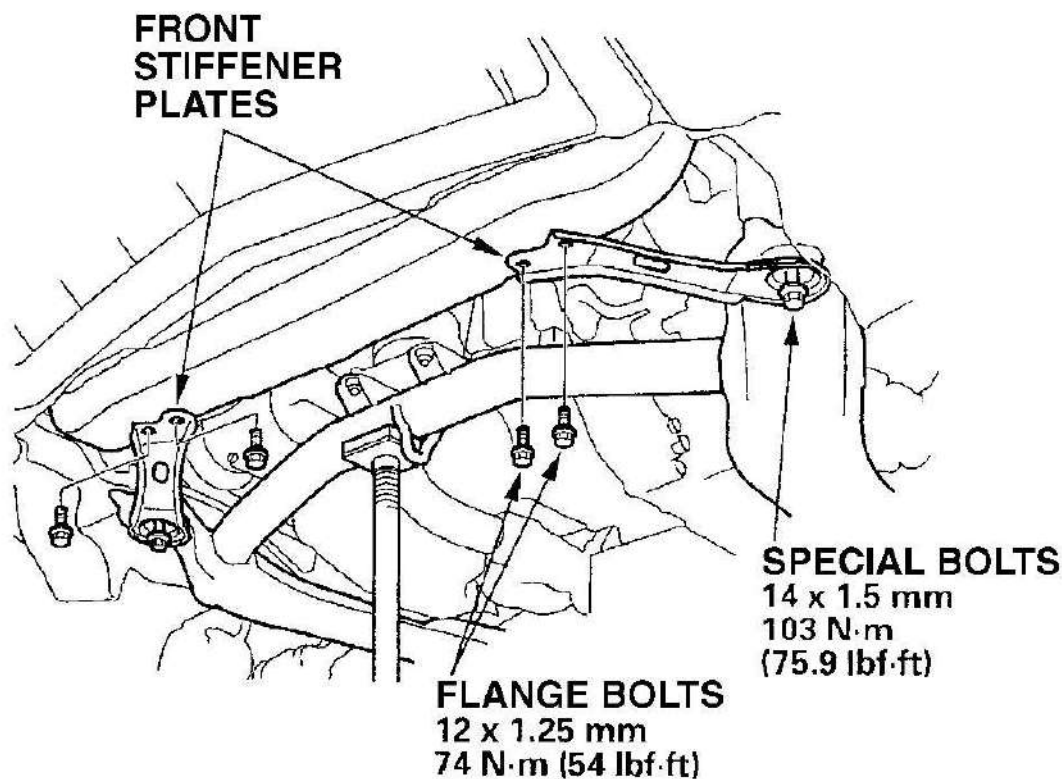


Fig. 26: Installing Rear Stiffener Plate Bolts (MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.



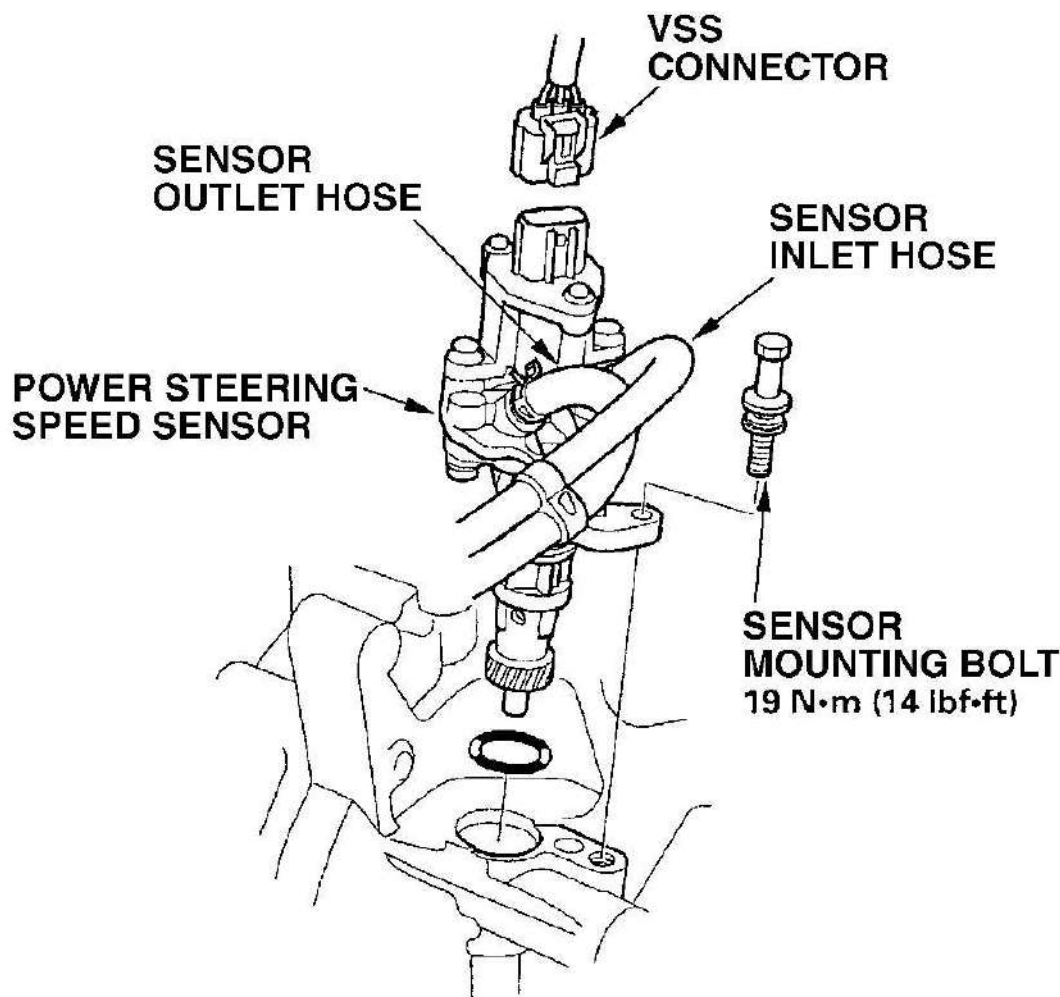
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Fig. 27: Installing Front Stiffener Plate Bolts (MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

POWER STEERING SPEED SENSOR (3.2TL)

Removal & Installation

1. On vehicles with the navigation system, disconnect the VSS connector from the power steering speed sensor. Remove the sensor mounting bolt, and remove the power steering speed sensor. Disconnect the sensor inlet hose and sensor outlet hose, and plug the hose ends. See **Fig. 28**.
2. Install the power steering speed sensor in the reverse order of removal. Fill the reservoir to the upper level line. See **FLUID REPLACEMENT** under LUBRICATION. Start the engine and run it at first idle, then turn the steering wheel lock-to-lock several times to bleed air from the system.



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Fig. 28: Removing Power Steering Speed Sensor (3.2TL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PUMP

Removal & Installation

1. Place a suitable container under the vehicle. Drain the power steering fluid from the reservoir.
2. Cover the crankshaft pulley with several shop towels to protect it from spilled per steering fluid. Disconnect the pump inlet hose and pump outlet hose from the pump, and plug them. Take care not to spill the fluid on the body or parts. Wipe off any spilled fluid at once.

CAUTION: Do not turn the steering wheel with pump removed.

3. Remove the belt by loosening the pump adjusting nut, then remove pump mounting bolts, nut and pump. Do not turn the steering wheel with pump removed.
4. Connect the pump outlet hose and inlet hose to the pump. Tighten the pump fittings securely. Loosely install the pump in the pump bracket with the mounting bolts and nut. Install pump belt on pulley. Note these items during installation:
 - Make sure that the power steering belt is properly positioned on the pulleys. Do not get the power steering fluid or grease on the belt or pulley faces. Clean off and fluid or grease before installing.
5. Adjust the pump belt. See **BELT TENSION** under ADJUSTMENTS. Fill the reservoir to the upper level line. See **FLUID REPLACEMENT** under LUBRICATION.

OVERHAUL

POWER RACK & PINION (3.2TL)

Disassembly

NOTE: See **Fig. 29** for exploded view of Power Rack & Pinion overhaul.

1. Remove the power rack and pinion. Remove the boot bands and tie-rod clips. Pull the boots away from the ends of the power rack and pinion. Unbend the lock washer. Hold the flat surface sections of the right side steering rack with a wrench, and unscrew both rack ends with a wrench. Be careful not to damage the rack surface with the wrench. Remove the lock washer and stop washer.
2. Loosen the lock nut, then remove the rack guide screw. Remove the spring and rack guide from the power rack and pinion. Remove the cylinder lines from the power rack and pinion. Drain the fluid from the cylinder fittings by slowly moving the steering rack back and forth. Remove the 2 flange bolts, then remove the valve body unit from the power rack and pinion.

CAUTION: DO NOT allow metal shavings to enter the cylinder housing.

3. Drill a 0.12" (3 mm) diameter hole approximately 0.10-0.12" (2.5-3.0 mm) in depth in the stacked point on the cylinder. DO NOT allow metal shavings to enter the cylinder housing. After removing the cylinder head end, remove any burrs at the stacked point.
4. Attach the yoke of a universal puller to the power rack and pinion mounts with bolts. Clamp the yoke in a vise with soft jaws, then loosen and remove the cylinder end. But do not clamp cylinder housing or power rack and pinion housing a vise. Install the bearing separator on the power rack and pinion housing. Place an appropriate size deep socket wrench on the steering rack.
5. Set the power rack and pinion in a press so the left side points upward, then press the cylinder end seal and steering rack out of the power rack and pinion. Hold the steering rack to keep it from falling when pressed clear. Be careful not to damage the inner surface of the cylinder housing with the tool Remove the cylinder end seal from the steering rack.
6. Insert a 24" x 3/8" long drive extension and a Cylinder End Seal Remover Attachment (07NAD-

SR3020A) into the cylinder from the left side. Make sure that the special tool is securely positioned on the backup ring edges. Be careful not to damage the inner surface of the cylinder with the cylinder end seal remover attachment.

7. Set the power rack and pinion in a press, then press the cylinder end seal and backup ring from the power rack and pinion. Keep the tool straight to avoid damaging the cylinder wall. Check the tool angle, and correct it if necessary, when removing the cylinder end seal. Use a press to remove the cylinder end seal. DO NOT try to remove the seal by striking the tool. It will break the backup ring, and the cylinder end seal will remain in the power rack and pinion.
8. Carefully pry the piston seal ring and O-ring off the rack piston. Be careful not to damage the inside of the seal ring groove and piston edges when removing the seal ring. Before removing the valve housing, apply vinyl tape to the splines on the pinion shaft.
9. Separate the valve housing from the pinion shaft/valve using a press. With your finger, check the inner wall of the valve housing where the seal ring slides. If there is a step in the wall, the housing is worn. Replace it.

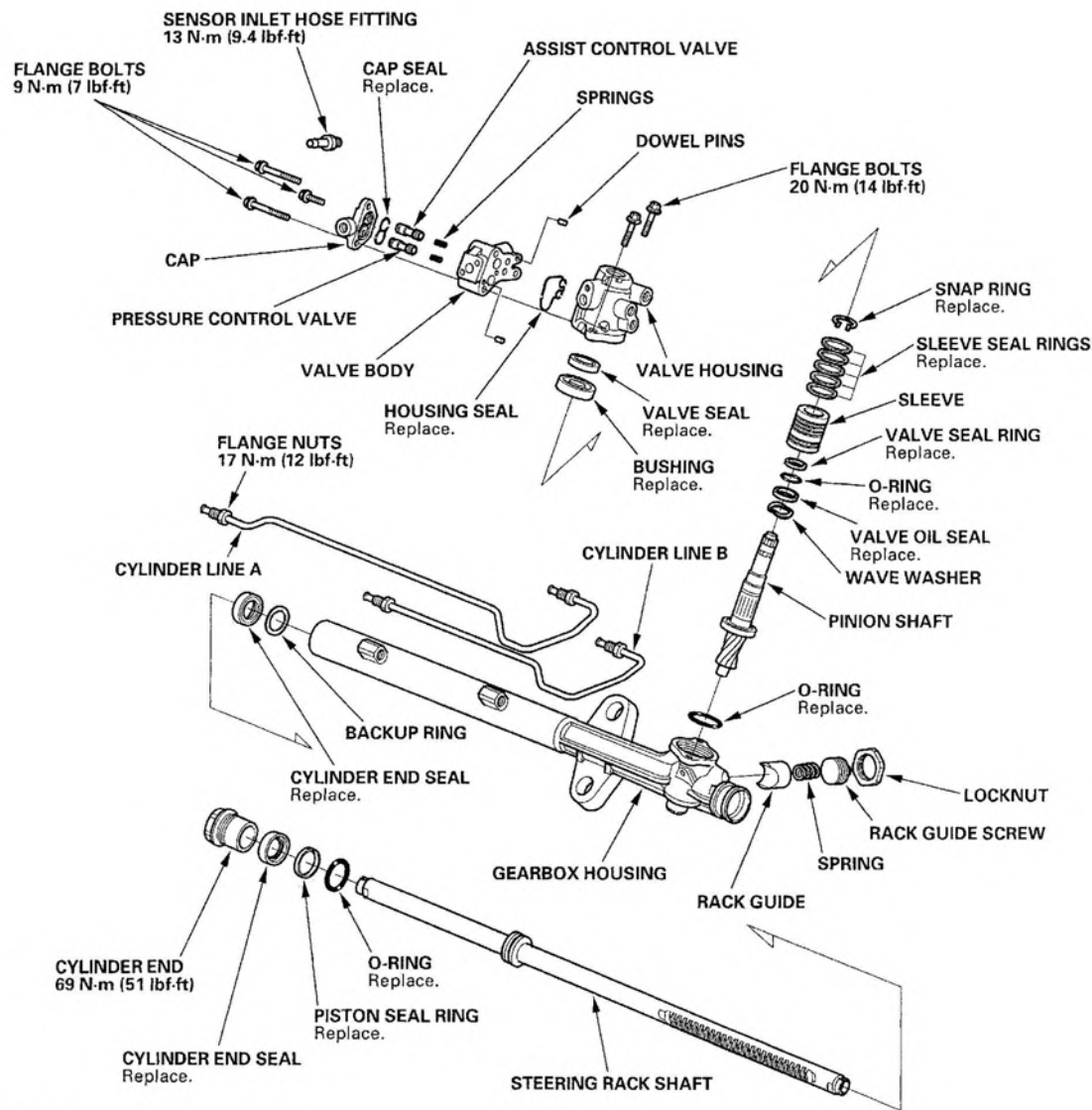
NOTE: There may be sliding marks from the seal ring on the wall of the valve housing. Replace the valve housing only if the wall is STEPPED.

NOTE: The pinion shaft and sleeve are a precision matched set. If either the pinion shaft or sleeve must be replaced, replace both parts as a set.

10. Check for wear, burrs and other damage to the edges of the grooves in the sleeve. Remove the snap ring and sleeve from the pinion shaft. Using a cutter or an equivalent tool, cut and remove the 5 seal rings from the sleeve. Be careful not to damage the edges of the sleeve grooves and outer surface when removing the seal rings. Cut the valve seal ring and O-ring at the groove in the pinion shaft. See **Fig. 38** . Remove the valve seal ring and O-ring. Be careful not to damage the edges of the pinion shaft groove and outer surface when removing the valve seal ring and O-ring.
11. Remove the valve oil seal and wave washer from the pinion shaft. Inspect the ball bearing by rotating the outer race slowly. If there is any excessive play, replace the pinion shaft and sleeve as an assembly. The pinion shaft and sleeve are a precise fit; do not intermix old and new pinion shafts and sleeves. Press the valve oil seal and bushing out of the valve housing using a hydraulic press and a Pilot Collar (07GAF-PH70100).
12. Remove the cap and cap seal from the valve body. Remove the pressure control valve, assist control valve and springs. Check the assist control valve and pressure control valve. If the valves are damaged, replace the valve body as a assembly. Inspect its surface for scoring and scratches. Slip it back into the valve body unit, and make sure it slides smoothly without drag or side play.
13. Separate the valve body and valve housing. Remove the valve housing seal dowel pins. Clean the disassembled parts with solvent, and dry them with compressed air. Do not dip rubber parts in solvent.

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2002 STEERING Power Rack & Pinion - MDX & 3.2CL



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Fig. 29: Exploded View Of Power Rack & Pinion Overhaul (Premium 3.2TL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Reassembly

1. Apply vinyl tape to the stepped portion of the pinion shaft, and coat the surface of the vinyl tape with the power steering fluid. Install the wave washer. Coat the inside surface of the new valve oil seal with power steering fluid, and install the seal with its grooved side facing opposite the bearing, then slide it over the pinion shaft, being careful not to damage its sealing lip. Remove the vinyl tape.
2. Apply vinyl tape to the splines and stepped portion of the shaft, and coat the surface of the vinyl tape with the power steering fluid. Fit new O-ring in the groove of pinion shaft. Then slide the new valve seal ring over the shaft and in the groove on the pinion shaft. Remove the tape, and apply power steering fluid to the surface of the valve seal ring.

3. Apply power steering fluid to the inside of a Valve Seal Ring Sizing Tool (07NAG-SR3090A). Set the larger diameter end of the valve seal ring sizing tool over the valve seal ring, and move the valve seal ring sizing tool up and down several times to make the valve seal ring fit in the pinion shaft groove. Remove the valve seal ring sizing tool, turn it over, slide the smaller diameter end over the valve seal ring. Move it up and down several times to make the valve seal ring fit snugly in the pinion shaft groove.
4. Apply power steering fluid to the surface of the pinion shaft. Slide the sleeve onto the pinion shaft by aligning the locating pin on the inside of the sleeve with the cutout in the shaft. Then install the new snap ring securely in the pinion shaft groove. Be careful not to damage the valve seal ring when inserting the sleeve. Install the snap ring with its radiused side toward the sleeve.
5. Apply power steering fluid to the surface of the Sleeve Seal Ring Guide (07SAG-SW50100). Slip 5 new seal rings over the sleeve seal ring guide from the smaller diameter end, and expand them. Do not over expand the seal ring. Install the resin seal rings with care so as not to damage them. After installation, be sure to contract the seal rings using the Sleeve Seal Ring Sizing Tool (07GAG-SD4020A). There are 2 types of sleeve seal rings: black and brown. Do not mix the different types of rings as they are not compatible.
6. Align the special tool with each groove in the sleeve, and slide a sleeve seal ring into each groove. After installation, compress the seal rings with your fingers temporarily. Apply power steering fluid to the seal rings on the sleeve, and to the entire inside surface of the sleeve seal ring sizing tool, then slowly insert the sleeve into the special tool. Move the sleeve seal ring sizing tool back and forth several times to make the seal rings snugly fit in the sleeve. Be sure that the seal rings are not twisted.
7. Coat the housing seal with power steering fluid, and install it in the groove of the valve housing. Install the 2 dowel pins and valve body on the valve housing. Install the valve springs. Coat the pressure control valve and assist control valve with power steering fluid, and install them into the valve body. See **Fig. 30**. Coat the cap seal with power steering fluid and install it in the groove of the cap. Install the cap on the valve body.
8. Apply power steering fluid to the seal ring lip of the new valve oil seal, then install the seal in the valve housing using a hydraulic press, a Driver (07749-0010000) and a 32 x 35 mm Attachment (07746-0010100). Install the seal with its grooved side facing the tool. See **Fig. 31**.
9. Press the bushing into the valve housing with a hydraulic press and the 32 x 35 mm Attachment. Apply vinyl tape to the pinion shaft, then coat the vinyl tape with power steering fluid. Insert the pinion shaft into the valve housing. See **Fig. 34**. Be careful not to damage the valve seal rings. Remove the vinyl tape from the pinion shaft, then remove any residue from the adhesive.
10. Press the pinion shaft/sleeve into the valve housing with a hydraulic press. Check that the pinion shaft/sleeve turns smoothly by hand after installing it.
11. Coat the Piston Seal Ring Guide Tool (07XAG-SK020A) with steering fluid, then slide it onto the rack, big end first. Position the new O-ring and new piston seal ring on the piston seal ring guide tool, then slide them down toward the big end of the tool. Do not over expand the resin seal rings. Install the resin seal rings with care so as not to damage them. After installation, be sure to contract the seal ring using the piston seal ring guide tool. Replace piston's O-ring and seal ring as a set.
12. Pull the O-ring off into the piston groove, then pull the piston seal ring off into the piston groove on top of the O-ring. Coat the piston seal ring and the inside of the Piston Seal Ring Sizing Tool (07XAG-SK010A) with power steering fluid, then carefully slide the tool onto the rack and over the piston seal ring. Move the special tool back and forth several times to make the piston seal ring fit snugly in the piston.
13. Wrap vinyl tape around the rack teeth and rack end edges, then coat the surface of the tape with power

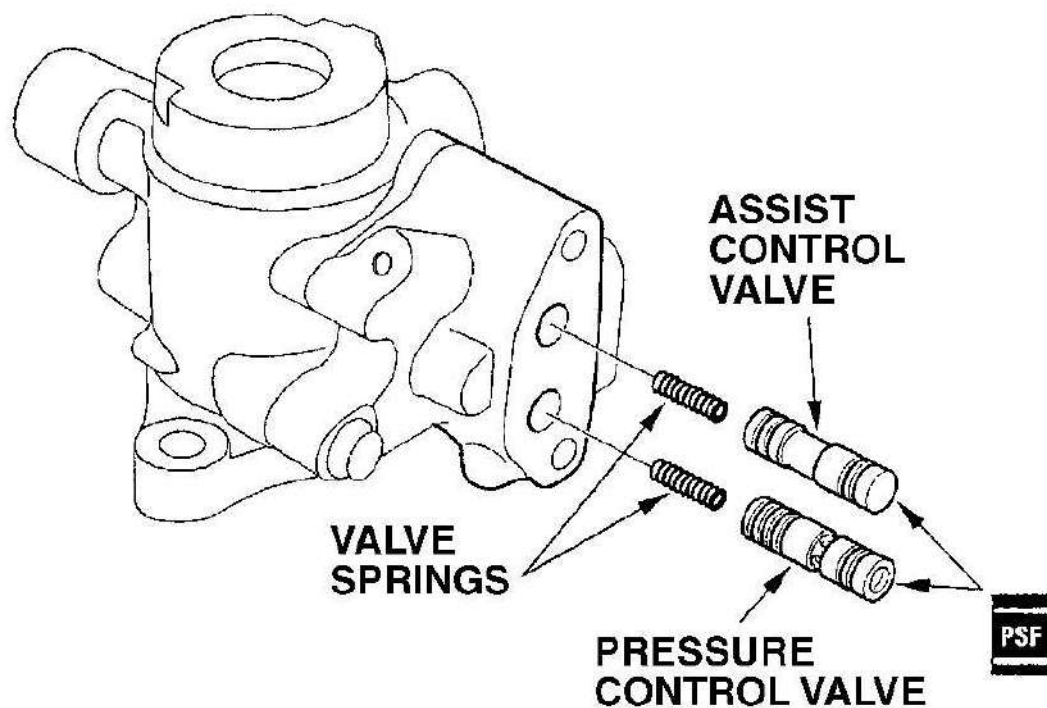
steering fluid. Make sure that the vinyl tape is wrapped carefully so there is no stepped portion. Coat the inside surface of the new cylinder end seal with power steering fluid, then install it onto the steering rack with its grooved side toward the piston. When installing the cylinder end seal, be careful not damage the lip of the seal with the edges or teeth of the steering rack. Remove the vinyl tape from the steering rack, then remove any adhesive residue.

14. Install the new backup ring on the steering rack, then place the cylinder end seal against the piston. Grease the steering rack teeth, then insert the steering rack into the power rack and pinion housing. Be careful not to damage the inner surface of the cylinder wall with the rack edges. Insert an appropriate size deep socket wrench onto the steering rack. Install the cylinder end seal into the bottom of the cylinder by pressing on the tool with a press. Do not push on the tool with excessive force as it may damage the cylinder end seal.
15. Remove the deep socket wrench, and center the steering rack. Wrap vinyl tape around the rack end edges, and coat the surface of the tape with the power steering fluid. Make sure that the vinyl tape is wrapped carefully so there is no stepped portion. Coat the inside surface of the new cylinder end seal with power steering fluid, then install the seal onto the steering rack with its grooved side toward the piston. Push in the cylinder end seal with your finger. Be careful not to damage the face of the seal with the threads and burrs at the staked position of the cylinder housing.

CAUTION: Do not clamp the cylinder housing or power rack and pinion housing in the vise.

16. Remove the vinyl tape from the steering rack, then remove any adhesive residue. Attach the yoke of a universal puller to the power rack and pinion mounts with bolts, then clamp the yoke in a vise with soft jaws. Do not clamp the cylinder housing or power rack and pinion housing in the vise. Coat the inside surface of the cylinder end with power steering fluid, then install the cylinder end by screwing it into the cylinder. See **Fig. 35** . Remove the yoke from the power rack and pinion, then, after tightening the cylinder end, stake the point of the cylinder shown (opposite from where the stake was removed during disassembly).
17. Coat the new O-ring with grease, and carefully fit it on the valve housing. Apply grease to the needle bearing in the power rack and pinion housing, then install the valve body unit by engaging the gears. Note the valve body unit installation position (direction of the line connections). See **Fig. 32** . Tighten the flange bolts to the specified Torque. See **TORQUE SPECIFICATIONS** .
18. Install the cylinder lines. See **Fig. 33** . Thoroughly clean the joints of the cylinder lines. The joints must be free of foreign material. Install the cylinder lines by tightening the flare nuts by hand first, then tighten the flare nuts to the specified torque. See **TORQUE SPECIFICATIONS** .
19. Grease the sliding surface of the rack guide, and install it onto the power rack and pinion housing. Apply sealant to the all around threads on the rack guide screw, then install the spring, rack guide screw and lock nut. See **Fig. 36** . Adjust the rack guide screw. See **RACK GUIDE** under ADJUSTMENTS & INSPECTION. After adjusting, check that the rack moves smoothly by sliding it right and left.
20. Install the stop washer, and the lock washer on the rack. Align the lock washer tabs with the slots in the rack. Install the rack end while holding with lock washer in place. Repeat this step for the other side of the rack. Hold the flat surface sections of the right side steering rack with a wrench, and tighten the both rack ends. See **Fig. 44** . Be careful not to damage the rack surface with the wrench. Bend the lock washer back against the flat spots on the rack end joint housing.
21. Apply multipurpose grease to the circumference of the rack end joint housing. Apply a light coat of

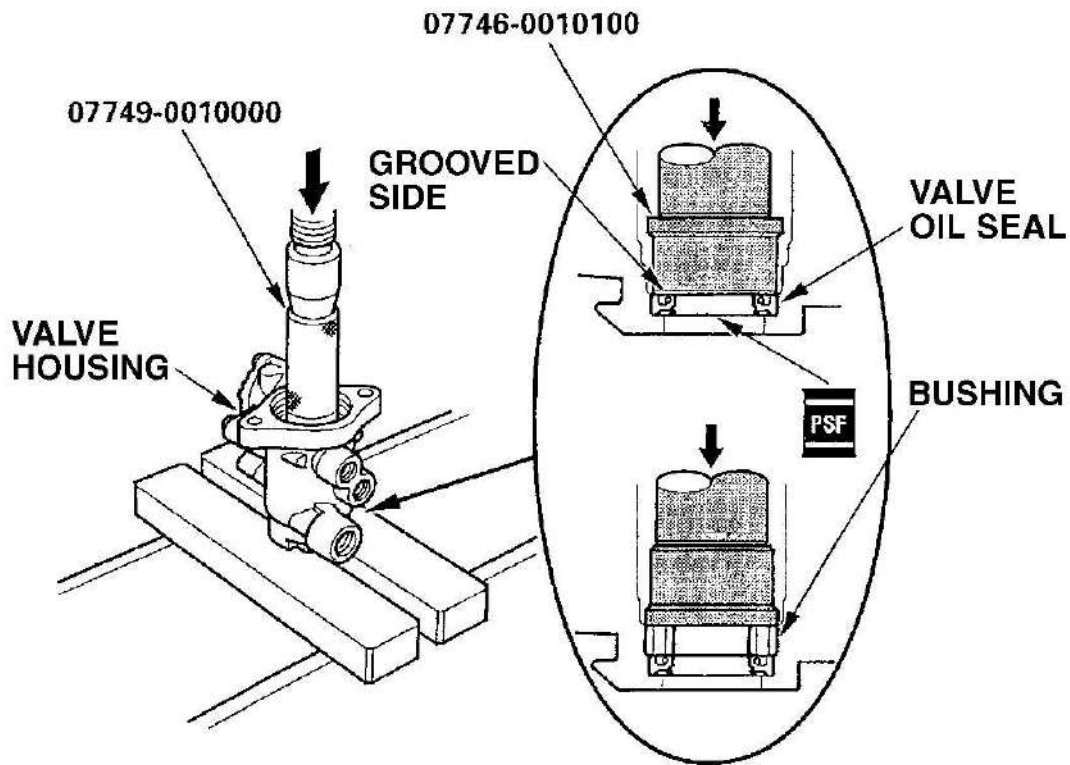
silicone grease to the boot grooves on the rack end. Center the steering rack within its stroke. Install the boots on the rack ends with the tie-rod clips. After installing the boots, wipe the grease off the threaded section of the rack end. Install the new boot bands by aligning the tabs with holes of the band. Close the ear portion of the band with commercially available pincers Oetiker 1098 or equivalent. Slide the rack right and left to be certain that the boots are not deformed or twisted.



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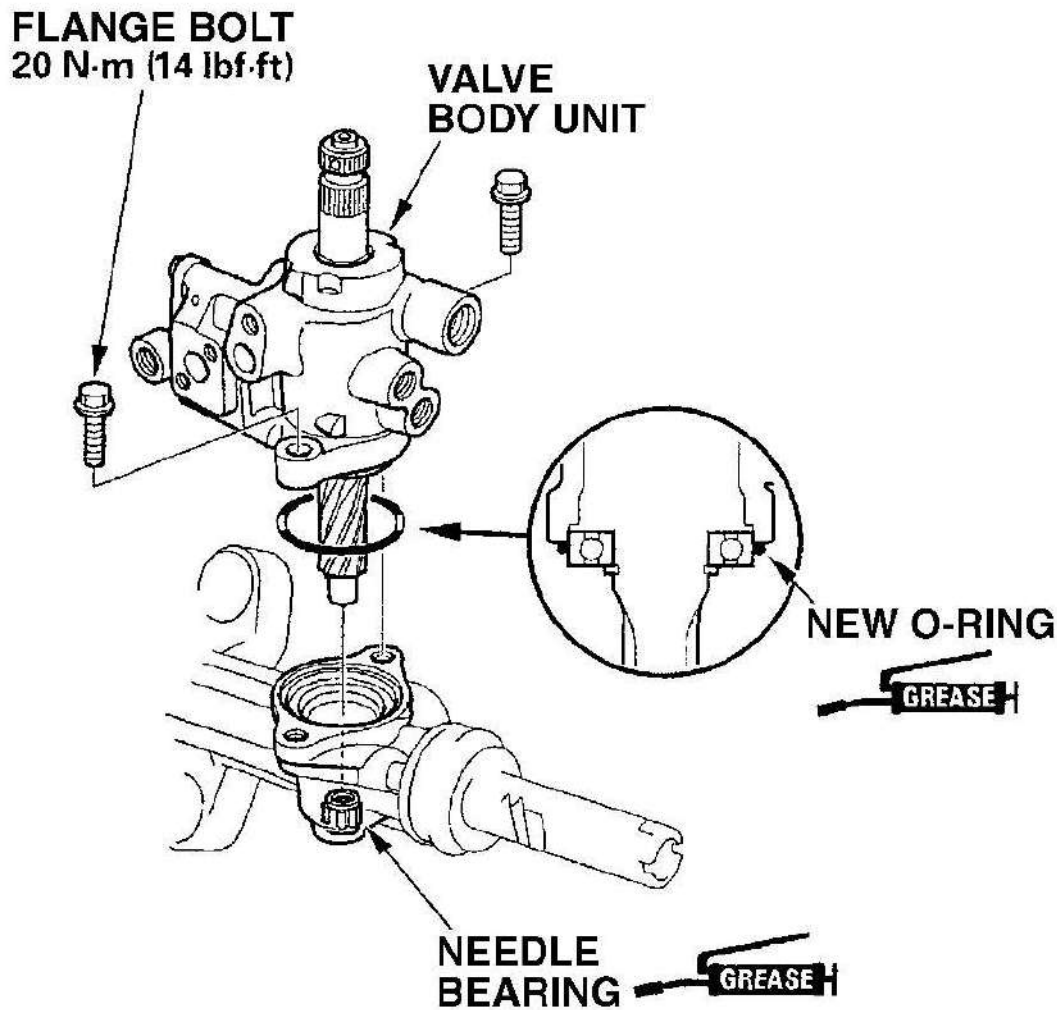
Fig. 30: Inspecting Valve Springs

Courtesy of AMERICAN HONDA MOTOR CO., INC.



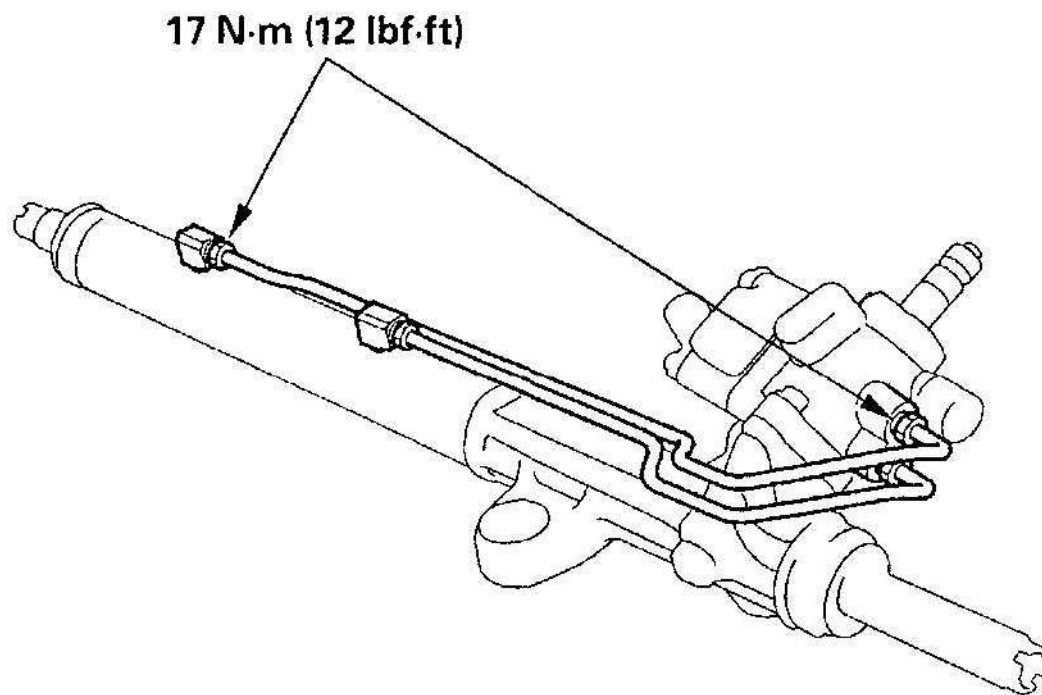
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Fig. 31: Installing Seal Into Valve Housing
 Courtesy of AMERICAN HONDA MOTOR CO., INC.



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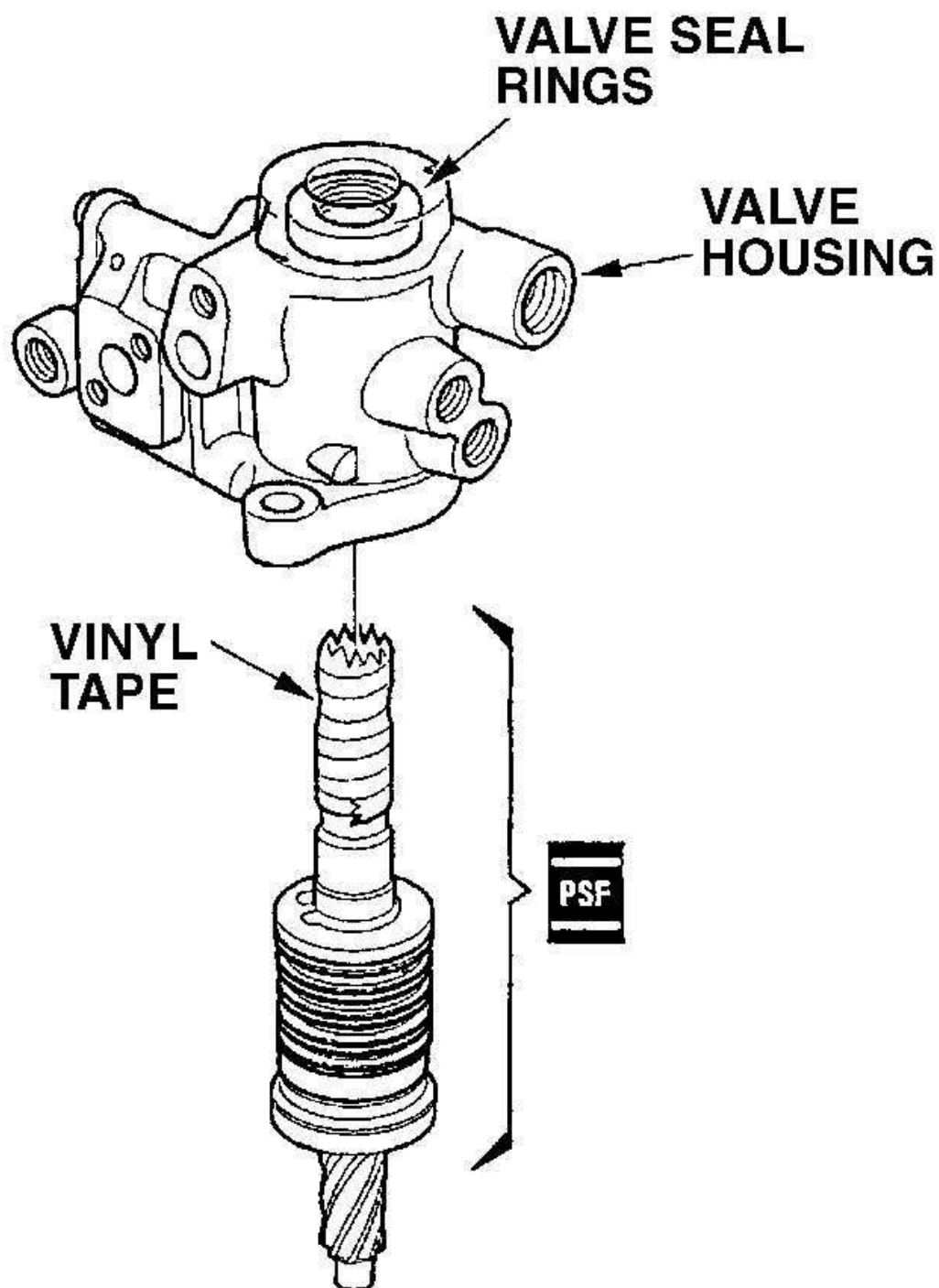
Fig. 32: Installing Valve Body Unit
Courtesy of AMERICAN HONDA MOTOR CO., INC.



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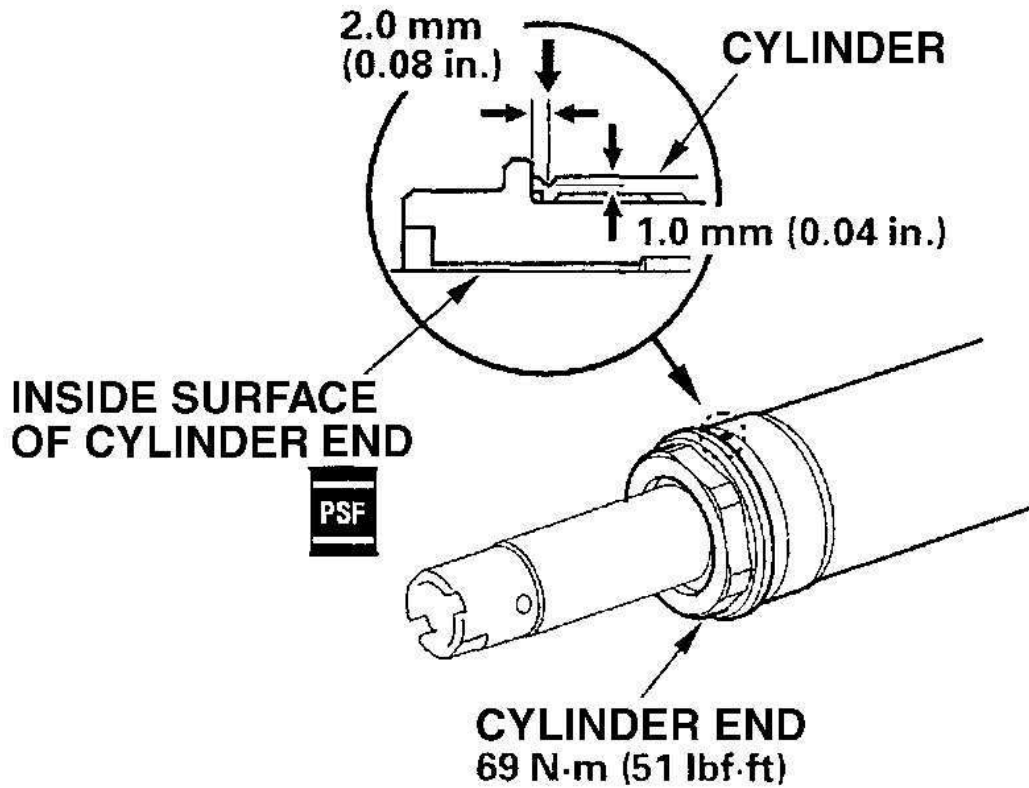
Fig. 33: Installing Cylinder Lines

Courtesy of AMERICAN HONDA MOTOR CO., INC.



G00176617

Fig. 34: Inserting Pinion Shaft Into Valve Housing (Premium 3.2TL)
Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 35: Installing Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

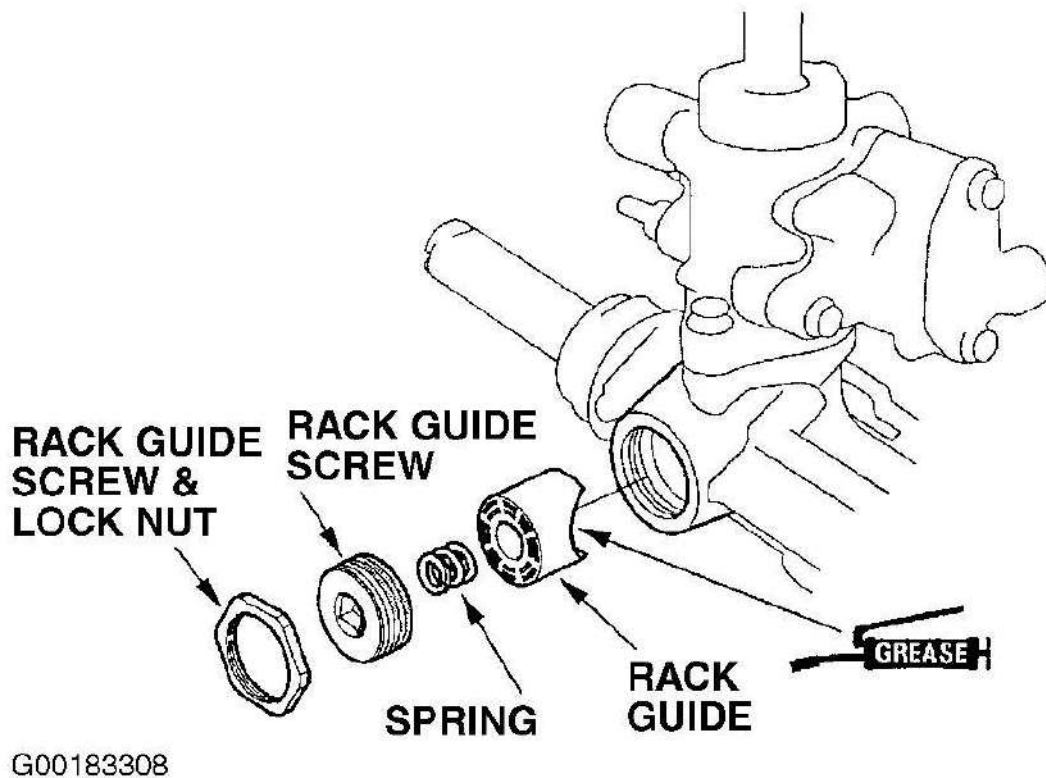


Fig. 36: Installing Rack Guide Screw, Spring & Lock Nut
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

POWER RACK & PINION (3.2TL TYPE-S, 3.2CL & MDX)

Disassembly

NOTE: See [Fig. 37](#) for Exploded View of Power Rack & Pinion overhaul.

1. Remove the power rack and pinion. Remove the boot bands and tie-rod clips. Pull the boots away from the ends of the power rack and pinion. Unbend the lock washer. Hold the flat surface sections of the right side steering rack with a wrench, and unscrew both rack ends with a wrench. Be careful not to damage the rack surface with the wrench. Remove the lock washer and stop washer.
2. Loosen the lock nut, then remove the rack guide screw. Remove the spring and rack guide from the power rack and pinion. Remove the cylinder lines from the power rack and pinion. Drain the fluid from the cylinder fittings by slowly moving the steering rack back and forth. Remove the 2 flange bolts, then remove the valve body unit from the power rack and pinion. Drill a 0.12" (3 mm) diameter hole approximately 0.10-0.12" (2.5-3.0 mm) in depth in the stacked point on the cylinder. DO NOT allow metal shavings to enter the cylinder housing. After removing the cylinder head end, remove any burrs at the stacked point.

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3. Attach the yoke of a universal puller to the power rack and pinion mounts with bolts. Clamp the yoke in a vise with soft jaws, then loosen and remove the cylinder end. But do not clamp cylinder housing or power rack and pinion housing a vise. Install a bearing separator on the power rack and pinion housing. Place an appropriate size deep socket wrench on the steering rack.
4. Set the power rack and pinion in a press so the gearbox housing points upward, then press the cylinder end seal and steering rack out of the power rack and pinion. Hold the steering rack to keep it from falling when pressed clear. Be careful not to damage the inner surface of the cylinder housing with the tool. Remove the cylinder end seal from the steering rack.
5. For MDX - Carefully pry the piston seal ring and O-ring off the rack piston. Be careful not to damage the inside of the seal ring groove and piston edges when removing the seal ring. Install a washer (O.D. 27.5 mm, HES P/N 94103-10400) so it will fit through the rack guide hole of the cylinder end seal. Make sure that the washer is securely positioned on the cylinder end seal edges. See **Fig. 39**.
 - Install the socket wrench with a 27.5 mm O.D. onto the 24" long 3/8" drive extension and carefully place it on the washer. Set the steering power rack and pinion in a press so the power rack and pinion housing points upward, then push out the cylinder end seal 0.20-0.24" (5-6 mm) by pressing the drive extension end.
 - Remove the steering power rack and pinion from the press, and remove the washer from the gearbox inside. Turn the special tool so it will fit through the rack guide hole of the power rack and pinion, then position a Cylinder End Seal Remover Attachment (07TAF-SZ50100) on the cylinder end seal. Make sure that the cylinder end seal remover attachment is securely positioned on the seal edges.
 - Insert a 24" long 3/8" drive extension, on the cylinder end seal remover attachment. Place the power rack and pinion on a press then remove the cylinder end seal from the gearbox by pressing on the drive extension.
6. For Type-S Models & 3.2CL - Insert a 24" x 3/8" long drive extension and a cylinder end seal remover attachment into the cylinder from the left side. Make sure that the special tool is securely positioned on the backup ring edges. Be careful not to damage the inner surface of the cylinder with the cylinder end seal remover attachment. Set the power rack and pinion in a press, then press the cylinder end seal and backup ring from the power rack and pinion. Carefully pry the piston seal ring and O-ring off the rack piston. Be careful not to damage the inside of the seal ring groove and piston edges when removing the seal ring.

NOTE: Keep the tool straight to avoid damaging the cylinder wall. Check the tool angle, and correct it if necessary, when removing the cylinder end seal. Use a press to remove the cylinder end seal. DO NOT try to remove the seal by striking the tool. It will break the backup ring, and the cylinder end seal will remain in the power rack and pinion. (For All Models)

7. For All Models - Before removing the valve housing, apply vinyl tape to the splines on the pinion shaft. Separate the valve housing from the pinion shaft/valve using a press. With your finger, check the inner wall of the valve housing where the seal ring slides. If there is a step in the wall, the housing is worn. Replace it.

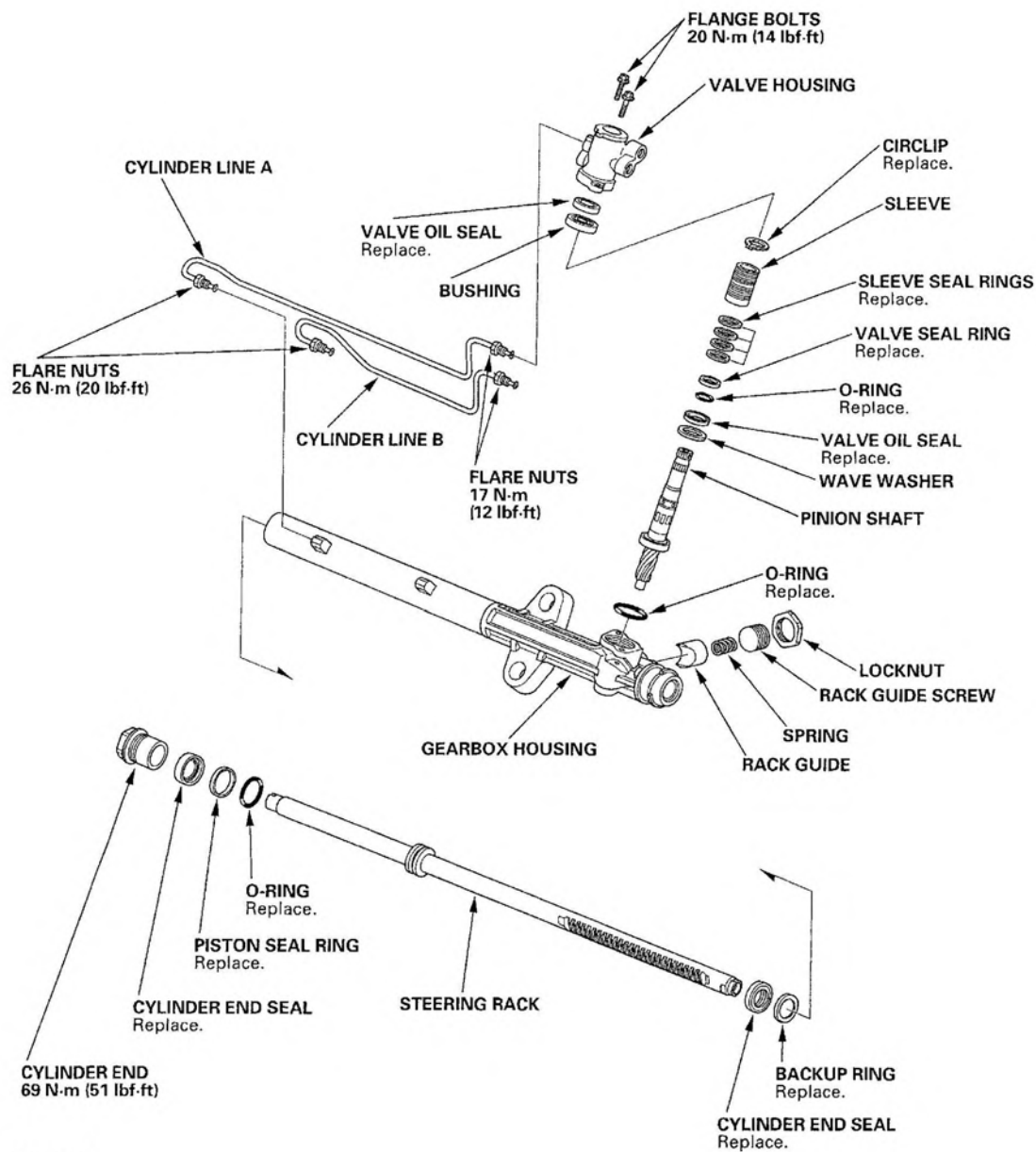
NOTE: There may be sliding marks from the seal ring on the wall of the valve housing. Replace the valve housing only if the wall is STEPPED.

NOTE: **The pinion shaft and sleeve are a precision matched set. If either the pinion shaft or sleeve must be replaced, replace both parts as a set.**

8. Check for wear, burrs and other damage to the edges of the grooves in the sleeve. Remove the snap ring and sleeve from the pinion shaft. Using a cutter or an equivalent tool, cut and remove the 5 seal rings from the sleeve. Be careful not to damage the edges of the sleeve grooves and outer surface when removing the seal rings. Cut the valve seal ring and O-ring at the groove in the pinion shaft. See **Fig. 38** . Remove the valve seal ring and O-ring. Be careful not to damage the edges of the pinion shaft groove and outer surface when removing the valve seal ring and O-ring.
9. Remove the valve oil seal and wave washer from the pinion shaft. Inspect the ball bearing by rotating the outer race slowly. If there is any excessive play, replace the pinion shaft and sleeve as an assembly. The pinion shaft and sleeve are a precise fit; do not intermix old and new pinion shafts and sleeves. Press the valve oil seal and bushing out of the valve housing using a hydraulic press and a Pilot Collar (07GAF-PH70100).
10. Clean the disassembled parts with solvent, and dry them with compressed air. Do not dip rubber parts in solvent.

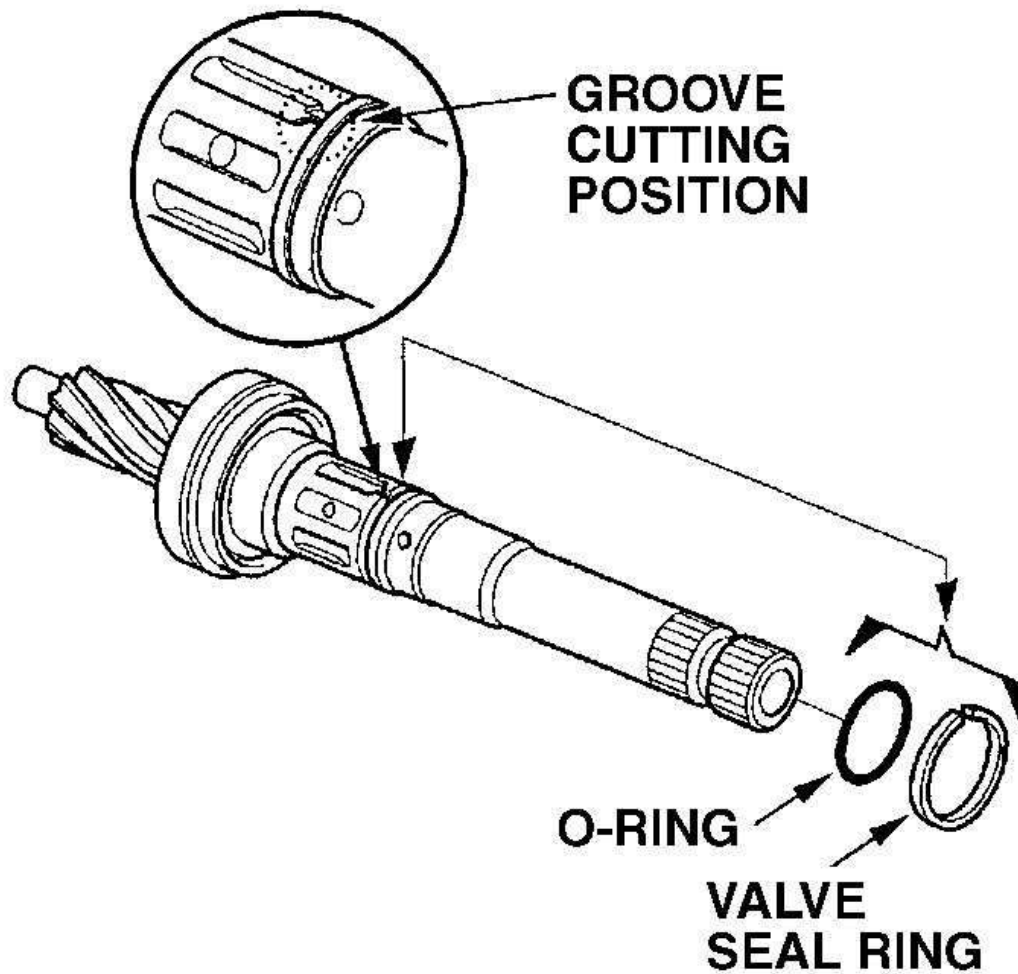
2002 Acura MDX

2002 STEERING Power Rack & Pinion - MDX & 3.2CL



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Fig. 37: Exploded View Of Power Rack & Pinion (Type-S & 3.2CL Models & MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 38: Cutting Valve Seal Rings (Typical, All Models))
Courtesy of AMERICAN HONDA MOTOR CO., INC.

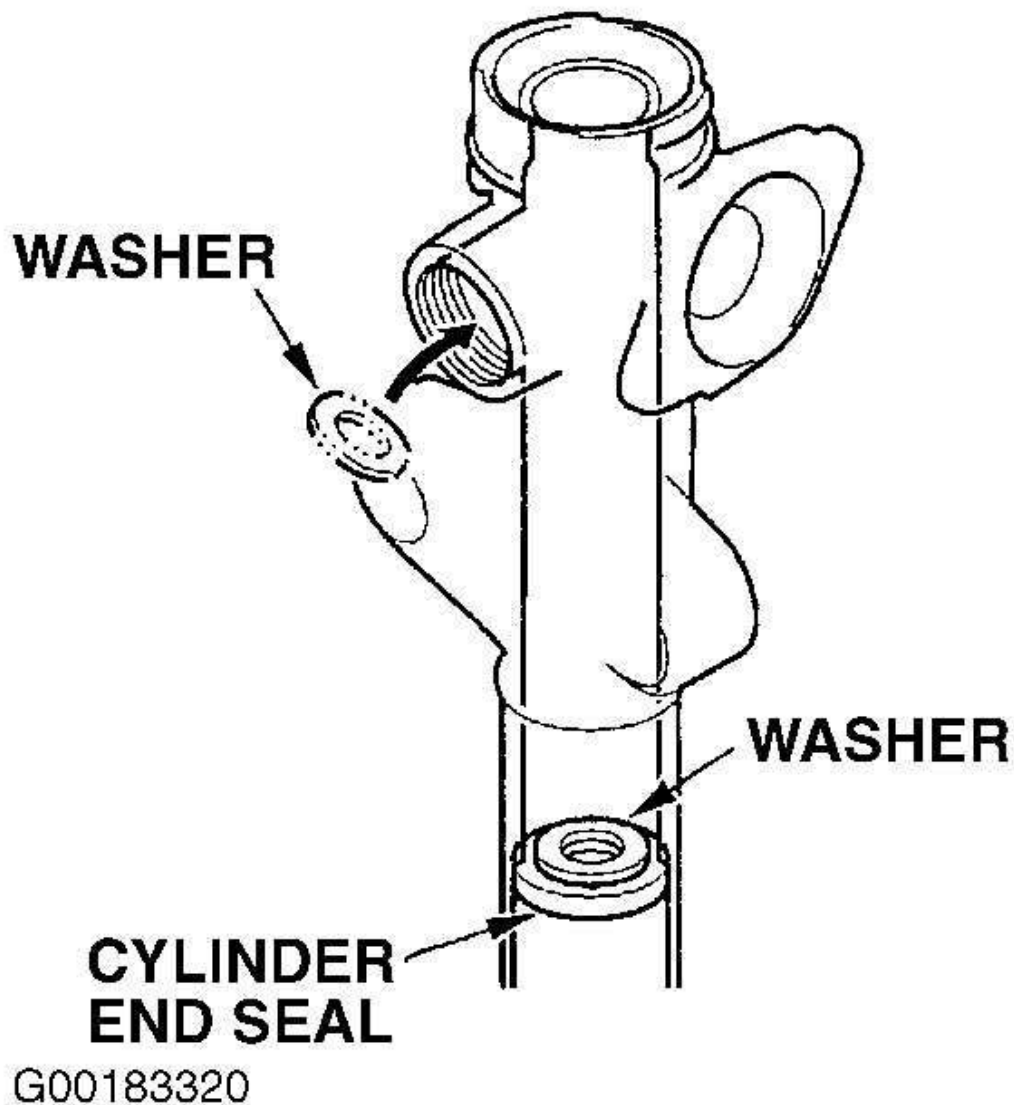


Fig. 39: Installing Washer To Rack Guide (MDX)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Reassembly (All Models)

1. Apply vinyl tape to the steeped portion of the pinion shaft, and coat the surface of the vinyl tape with power steering fluid. Install the wave washer. Coat the inside surface of the new valve oil seal with power steering fluid, and install the seal with its grooved side facing opposite the bearing, then slide it over the pinion shaft, being careful not to damage its sealing lip.

2. Apply the tape to the splines and stepped portion of the shaft, and coat the surface of the vinyl tape with the power steering fluid. Fit the new O-ring in the groove of the pinion shaft. Then slide the new valve seal ring over the shaft and in the groove on the pinion shaft. Remove the tape, and apply power steering fluid to the surface of the valve seal ring.
3. Apply power steering fluid to the inside of the Piston Seal Ring Sizing Tool (07NAG-SR3090A). Set the larger diameter end of the piston seal ring sizing tool over the valve seal ring, and move the special tool up and down several times to make the valve seal ring fit in the pinion shaft groove. Remove the ring sizing tool, turn it over, slide the smaller diameter end over the valve seal ring. Move it up and down several times to make the valve seal ring fit snugly in the pinion shaft groove.
4. Apply power steering fluid to the surface if a Ball Joint Boot Clip Guide (07974-SA50800). Slip 2 new seal rings over the all joint boot clip guide from the smaller diameter end, and expand them. Install only 2 rings at a time from each end of the pinion shaft sleeve. Do not over expand the seal ring. Install the resin seal rings with care so as not to damage them. After installation, be sure to contract the seal rings using the piston seal ring sizing tool. There are two types of sleeve seal rings: black and brown. Do not mix the different types of rings as they are not compatible.
5. Align the special tool with each groove in the sleeve, and slide a sleeve seal ring into each groove. After installation, compress the seal rings with your fingers temporarily. Apply power steering fluid to the seal rings on the sleeve, and to the entire inside surface of a Sleeve Seal Ring Sizing Tool (07974-SA50200 or 07974-SA5020A), then slowly insert the sleeve into the sleeve seal ring sizing tool.
6. Move the sleeve back and forth several times to make the seal rings snugly fit in the sleeve. Be sure that the seal rings are not twisted. Apply power steering fluid to the surface of the pinion shaft. Slide the sleeve onto the pinion shaft by aligning the locating pin on the inside of the sleeve with the cushion on the shaft. Then install the new circlip securely in the pinion shaft groove. Be careful not to damage the valve seal ring when inserting the sleeve. Install the circlip with its radiused side facing in.
7. Apply power steering fluid to the seal ring lip of the new valve oil seal, then install the seal in the valve housing using a hydraulic press, a Driver (07749-0010000) and a 32 x 35 mm Attachment (07746-0010100). Install the seal with its grooved side facing the tool. Press the bushing into the valve housing with a hydraulic press and driver.
8. Apply vinyl tape to the pinion shaft, then coat the vinyl tape with power steering fluid. Insert the pinion shaft into the valve housing. Be careful not to damage the valve seal rings. See **Fig. 41** . Remove the vinyl tape from the pinion shaft, then remove any residue from the tape adhesive. Press the pinion shaft/sleeve into the valve housing with a hydraulic press. Check that the pinion shaft/sleeve turns smoothly by hand after installing it.
9. Coat the special tool with power steering fluid, then slide it onto the rack, big end first. Position the new O-ring and new piston seal ring on an Piston Seal Ring Guide (07HAG-SF1020A or 07HAG-SF0101A), then slide them down toward the big end of the tool. Do not over expand the resin seal rings. Install the resin seal rings with care so as not to damage them. After installation, be sure to contract the seal ring using the sleeve seal ring sizing tool. Replace piston's O-ring and seal ring as a set.
10. Pull the O-ring off into the piston groove, then pull the piston seal ring off into the piston groove on top of the O-ring. Coat the piston seal ring and the inside of the piston seal ring guide with power steering fluid, then carefully slide the tool onto the rack and over the piston seal ring. Move the piston seal ring guide back and forth several times to make the piston seal ring fit snugly in the piston.
11. Wrap vinyl tape around the rack teeth and rack end edges, then coat the surface of the tape with power steering fluid. Make sure that the vinyl tape is wrapped carefully so there is no stepped portion. Coat the inside surface of the new cylinder end seal with power steering fluid, then install it onto the steering rack

with its grooved side toward the piston. When installing the cylinder end seal, be careful not damage the lip of the seal with the edges or teeth of the steering rack.

12. Remove the vinyl tape from the steering rack, then remove any adhesive residue. Install the new backup ring on the steering rack, then place the cylinder end seal against the piston. Grease the steering rack teeth, then insert the steering rack into the gear box housing. Be careful not to damage to inner surface of the cylinder wall with the rack edges. Insert an appropriate size deep socket wrench onto the steering rack.

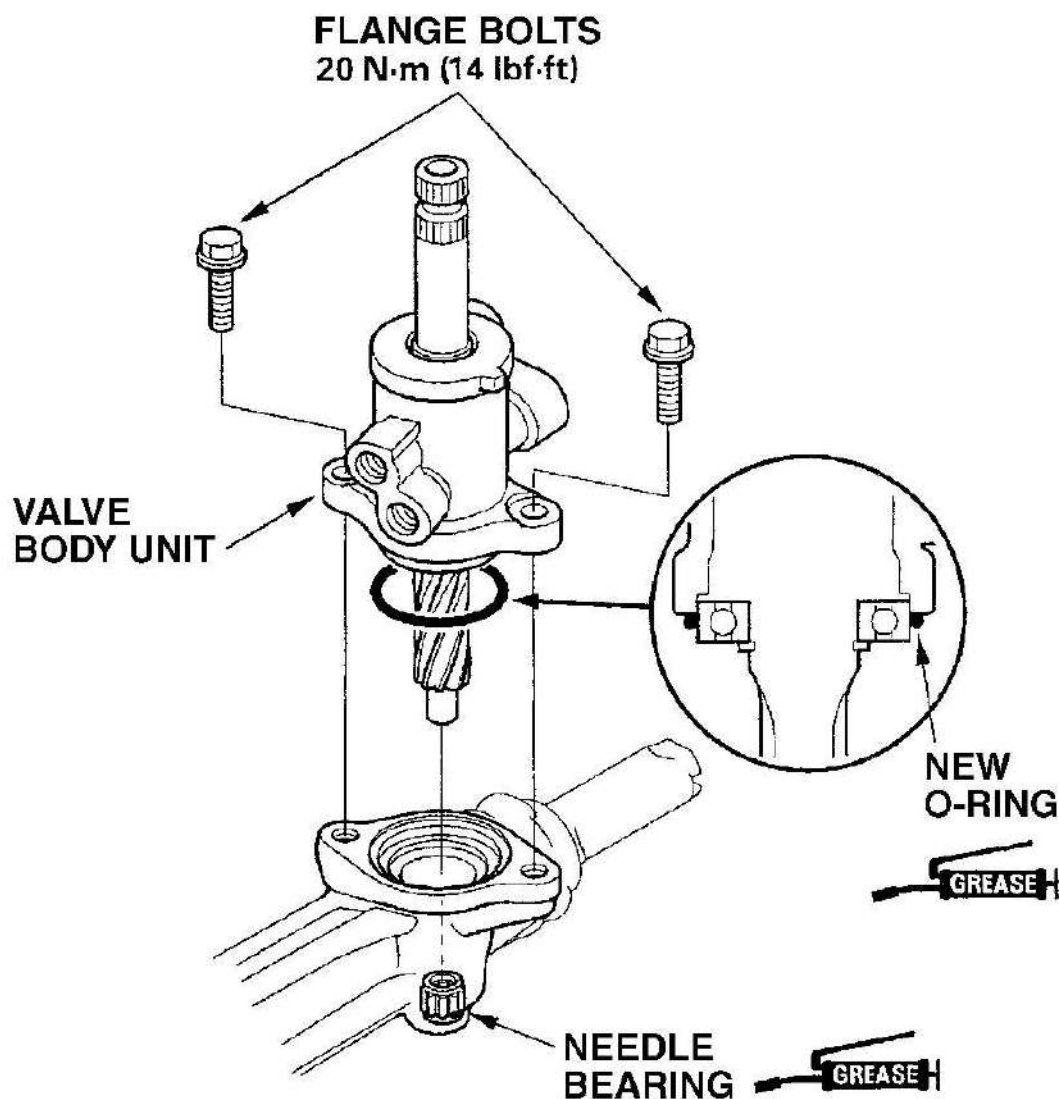
CAUTION: Do not push on the tool with excessive force as it may damage the cylinder end seal.

13. Install the cylinder end seal into the bottom of the cylinder by pressing on the tool with a press. Do not push on the tool with excessive force as it may damage the cylinder end seal. Remove the tool and center the steering rack. Wrap vinyl tape around the rack end edges, and coat the surface of the tape with the power steering fluid. Make sure that the vinyl tape is wrapped carefully so there is no stepped portion. Coat the inside surface of the new cylinder end seal with power steering fluid, then install the seal onto the steering rack with its grooved side toward the piston

CAUTION: Do not clamp the cylinder housing or power rack and pinion housing in the vise.

14. Push the cylinder end seal with your finger. Be careful not to damage the face of the seal with the threads and burrs at the stacked piston of the cylinder housing. Remove the vinyl tape from the steering rack, then remove any adhesive residue. Attach the yoke of a universal puller to the power rack and pinion mounts with bolts, then clamp the yoke on a vise with soft jaws. Do not clamp the cylinder housing or power rack and pinion housing in the vise.
15. Coat the inside surface of the cylinder end with power steering fluid, then install the cylinder end by screwing it into the cylinder. Remove the yoke from the power rack and pinion, then, after tightening the cylinder end, stake the point of the cylinder shown (opposite from where the stake was removed during disassembly). See **Fig. 42** . Coat the new O-ring with grease, and carefully fit it on the valve housing.
16. Apply grease to the needle bearing in the power rack and pinion housing, then install the valve body unit by engaging the gears. Note the valve body unit installation position (direction of the line connections). Tighten the flange bolts to the specified torque. See **TORQUE SPECIFICATIONS** . See **Fig. 40** .
17. Install the cylinder lines. Thoroughly clean the joints of the cylinder lines. The joints must be free of foreign material. Install the cylinder lines by tightening the flare nuts by hand first, then tighten the flare nuts to the specified torque. See **TORQUE SPECIFICATIONS** .
18. Grease the sliding surface of the rack guide, and install it onto the power rack and pinion housing. Remove the old sealant from the rack guide screw, then apply sealant all around the threads. Install the spring, rack guide screw and lock nut. See **Fig. 43** . Adjust the rack guide screw. See **RACK GUIDE** under ADJUSTMENTS. After adjusting, check that the rack moves smoothly by sliding it right and left.
19. Install the stop washer, and screw each rack end into the rack while holding the lock washer so its tabs are in the slots in the end of the rack. Hold the flat surface sections of the right side steering rack with a wrench, and tighten the both rack ends. Be careful not to damage the rack surface with the wrench. Bend the lock washer back against the flat spots on the rack end joint housing. See **Fig. 44** .

20. Apply multipurpose grease to the circumference of the rack end joint housing. Apply a light coat of silicone grease to the boot grooves on the rack end. Center the steering rack within its stroke. Install the boots on the rack ends with the tie-rod clips. After installing the boots, wipe the grease off the threaded section of the rack end. Install the new boot bands by aligning the tabs with holes of the band. Close the ear portion of the band with commercially available pincers Oetiker 1098 or equivalent. Slide the rack right and left to be certain that the boots are not deformed or twisted.



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Fig. 40: View Of Valve Housing

Courtesy of AMERICAN HONDA MOTOR CO., INC.

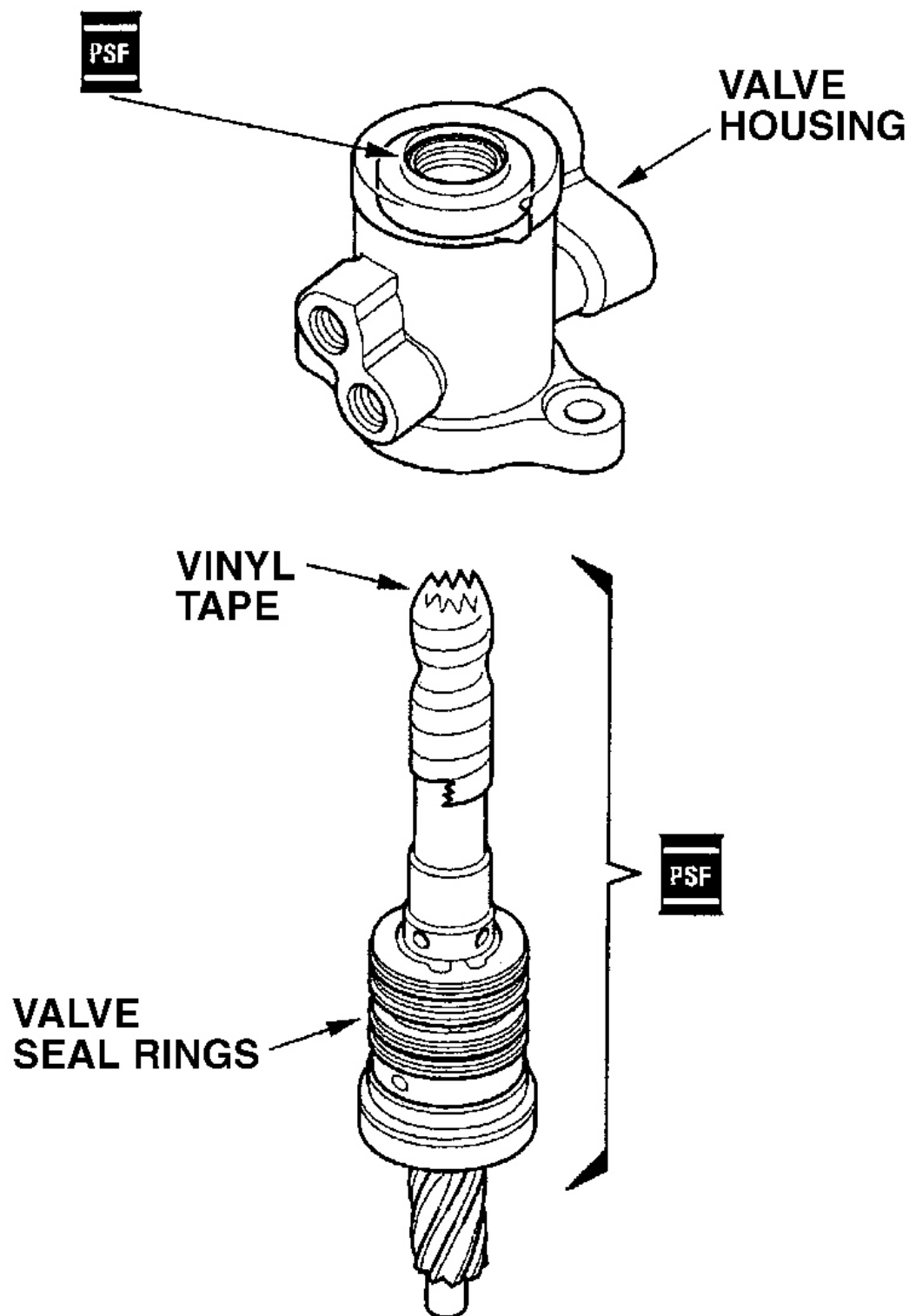
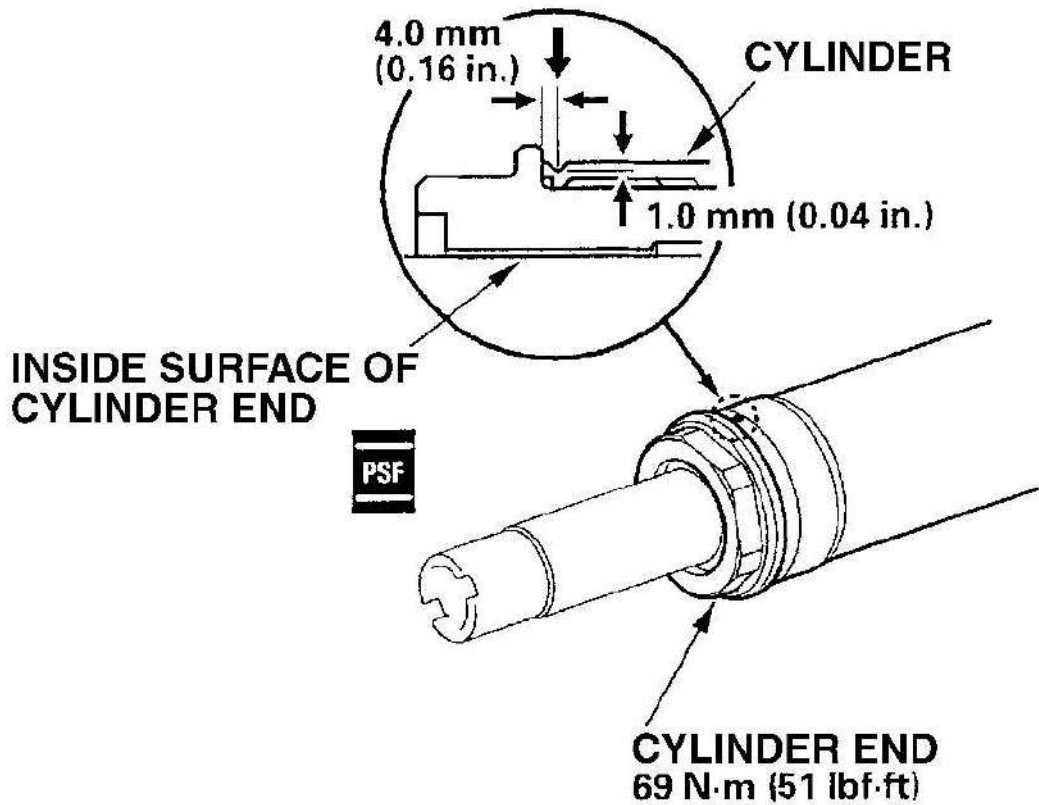


Fig. 41: Inserting Pinion Shaft Into Valve Housing

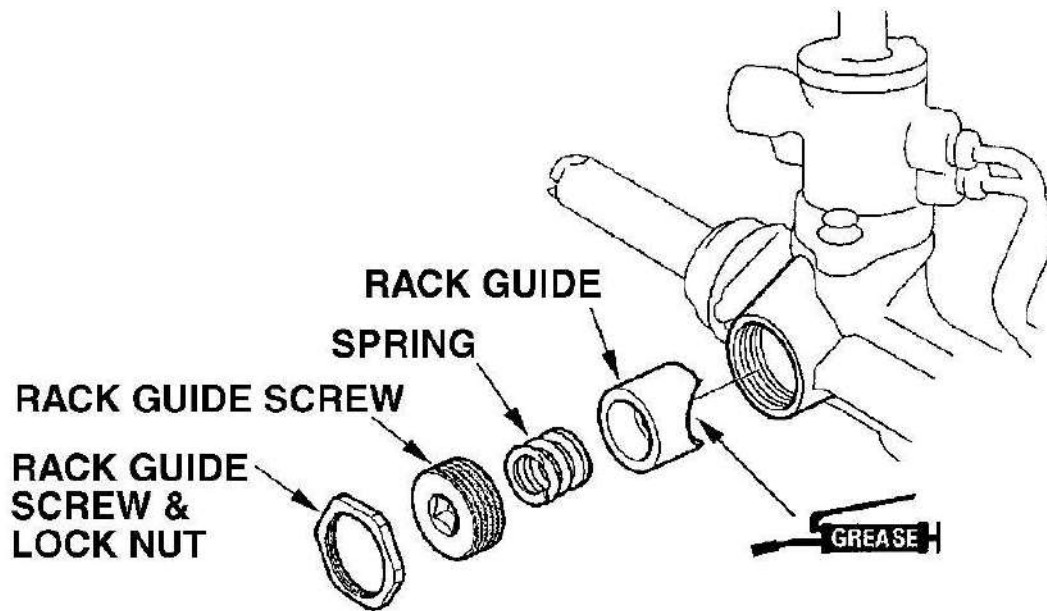
Courtesy of AMERICAN HONDA MOTOR CO., INC.



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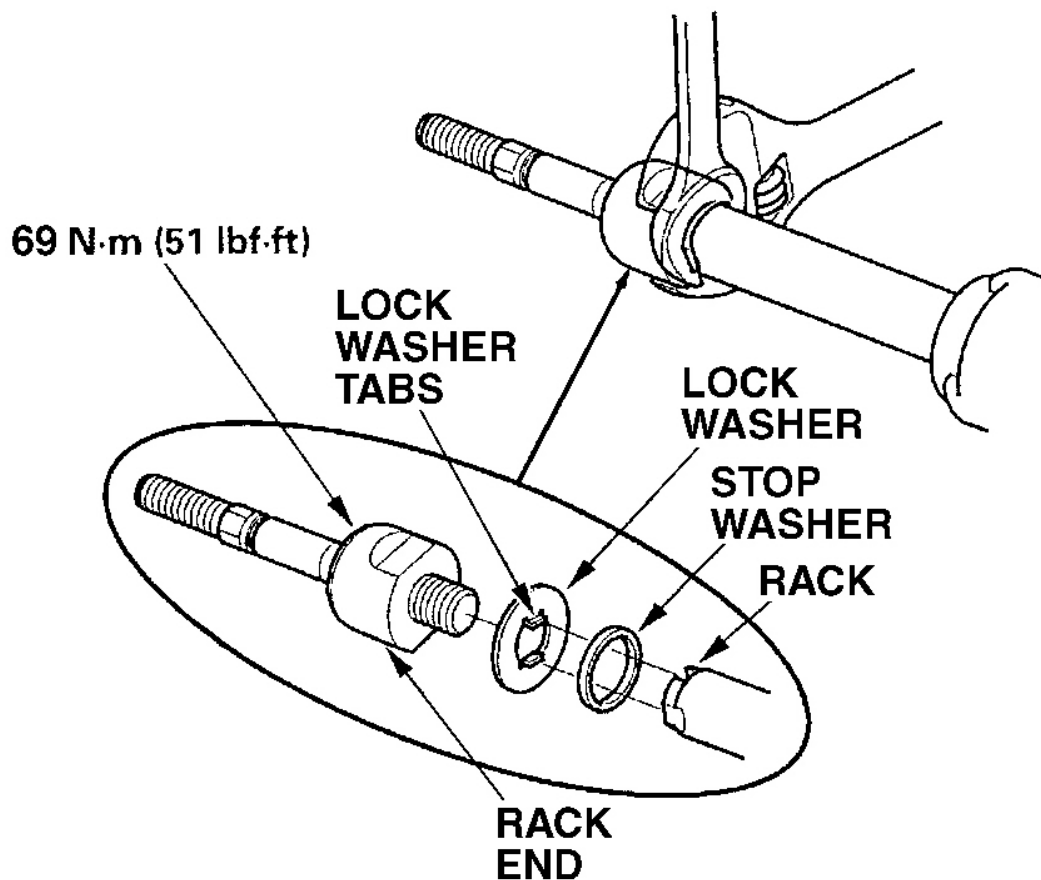
Fig. 42: Inspecting Cylinder

Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 43: Installing Spring, Rack Guide Screw & Lock Nut
Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 44: Installing Rack Ends & Lock Washer
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

PUMP

Disassembly

See **Fig. 45** exploded view.

1. Remove the power steering pump. Drain the fluid from the pump. Hold the steering pump in a vise with soft jaws, hold the pulley with the Universal Holder (07725-0030000), and remove the pulley nut and pulley. Be careful not to damage the pump housing with the jaws of the vise.
2. Loosen the flow control valve cap with a hex wrench, and remove it and the O-ring, flow control valve and spring. Remove the pump cover and pump cover seal. Remove the outer side plate, pump cam ring, pump rotor, pump valves, side plate and O-rings.
3. Remove the snap ring, then remove the pump drive shaft by tapping the shaft end with the plastic

hammer. Remove the pump seal spacer and pump seal.

4. Inspection

- Check the flow control valve for wear, burns and other damage to the edges of the groove in the valve. Inspect the bore of the flow control valve on the pump housing for scratches and wear.
 - Slip the flow control valve back in the pump housing, and check that it moves on and out smoothly. If okay, go to next step; if not, replace the pump as an assembly. The flow control valve is not available separately.
5. Attach a hose to the end of the flow control valve. Then submerge the flow control valve in a container of power steering fluid or solvent, and blow in the hose. If air bubbles leak through the valve at less than 98 kPa (14.2 psi), replace the pump as an assembly. The flow control valve is not available separately. If the flow control valve tests okay, set it aside for reassembly later.
 6. Inspect the ball bearing by rotating the outer race slowly. If you feel any play (axial or radial) or roughness remove the faulty ball bearing, and install a new one. Inspect each part with an asterisk show in the Exploded View; if any of them are worn or damaged, replace the pump as an assembly. See **Fig. 45** .

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Diagram illustrating the components of a pump assembly, showing the exploded view of the main assembly and the drive shaft/pulley assembly.

Main Assembly Components:

- 4.5 mm ROLL PIN
- FLANGE BOLTS 20 N·m (14 lbf·ft)
- *PUMP COVER
- 5 mm ROLL PIN
- PUMP COVER SEAL Replace.
- *OUTER SIDE PLATE
- *PUMP CAM RING
- *SIDE PLATE
- 15.2 x 2.4 mm O-RING Replace.
- *PUMP VANES (10 plates)
- *PUMP ROTOR
- 51 x 2.4 mm O-RING Replace.
- 13 x 1.9 mm O-RING Replace.
- INLET JOINT
- FLANGE BOLTS 11 N·m (8 lbf·ft)
- *FLOW CONTROL VALVE
- *SPRING
- 15.2 x 2.4 mm O-RING Replace.
- *FLOW CONTROL VALVE CAP 49 N·m (36 lbf·ft)

Drive Shaft/Pulley Assembly Components:

- PUMP SEAL SPACER
- PUMP SEAL Replace.
- *PUMP HOUSING
- PULLEY
- PUMP DRIVE SHAFT
- BALL BEARING
- 40 mm SNAP RING
- PULLEY NUT 64 N·m (47 lbf·ft)

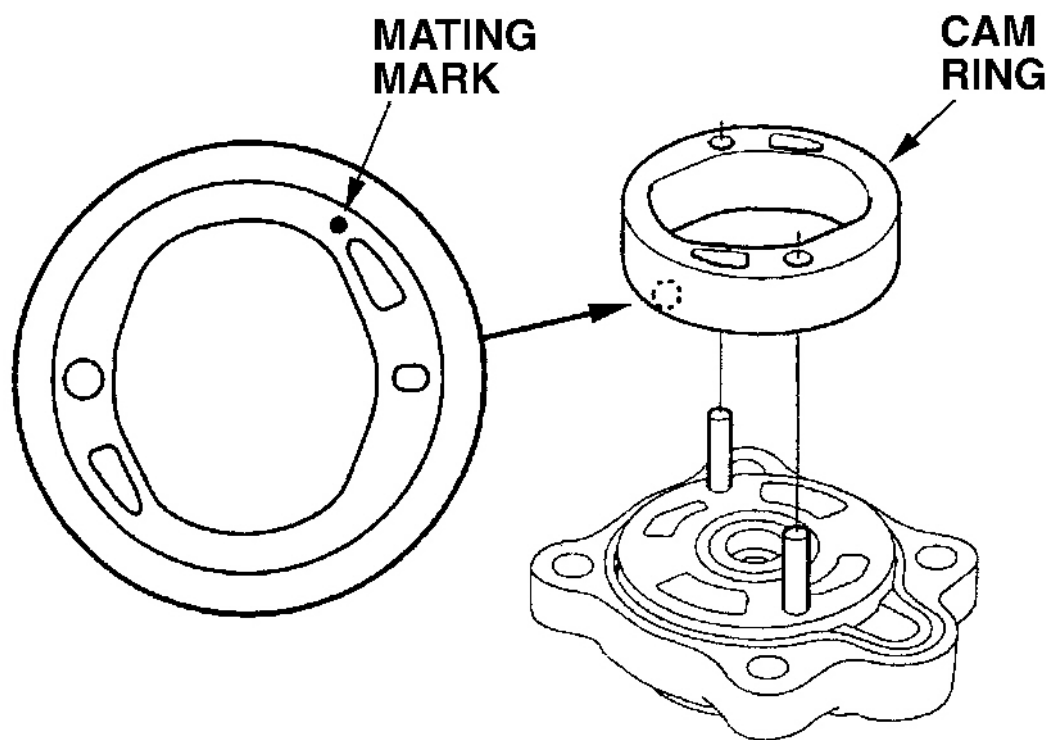
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Reassembly

- cardiagn.com

side plate on the cam ring by aligning the roll pins set holes in the side plate with the roll pins. Coat the new O-ring with power steering fluid, and position it in the bottom of the pump housing. Install the pump cover assembly in the pump housing.

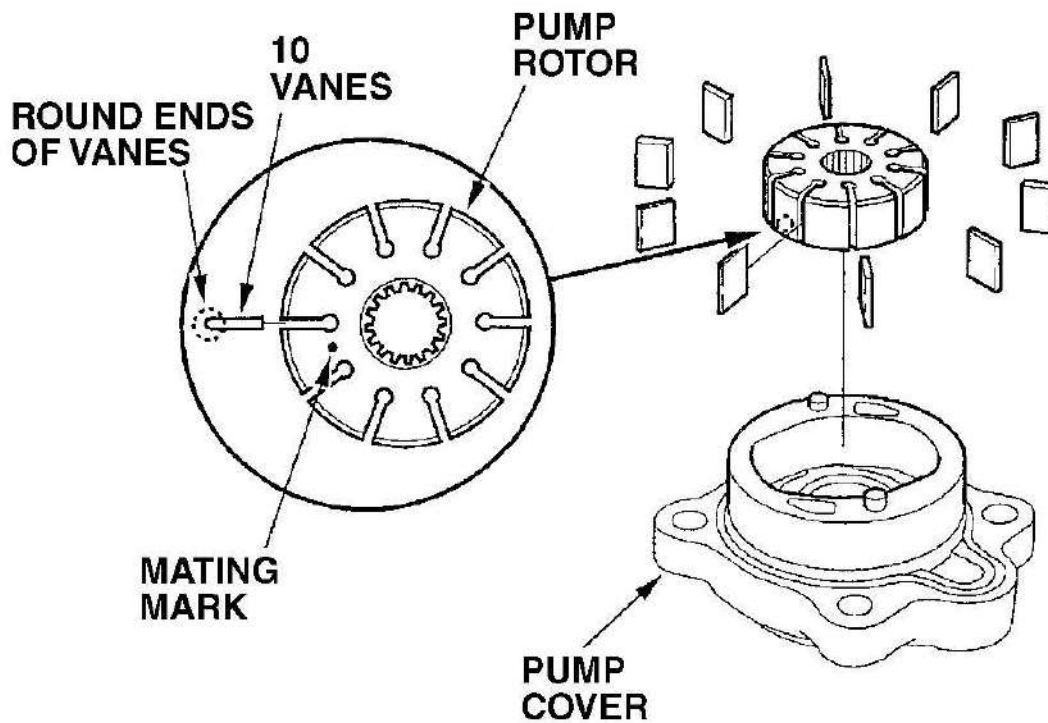
5. Coat the flow control valve with power steering fluid, then install it and the spring in the pump housing. Coat the new O-ring with power steering fluid, and install it on the flow control valve cap, then install the cap on the pump housing, and tighten it to specifications. See **TORQUE SPECIFICATIONS**.
6. Coat the new O-ring with power steering fluid, and install it on the inlet joint. Install the inlet joint on the pump housing, and tighten the flange bolt to specifications. See **TORQUE SPECIFICATIONS**. Install the pulley, then loosely install the pulley nut. Hold the steering pump in a vise with a soft jaws. Be careful not to damage the pump housing with the jaws of the vise.
7. Hold the pulley with a universal holder, and tighten the pulley nut. Check that the pump turns smoothly by turning the pulley by hand.



G00176600

Fig. 46: Installing Pump Cam Ring

Courtesy of AMERICAN HONDA MOTOR CO., INC.



G00176601

Fig. 47: Setting Vanes In Rotor

Courtesy of AMERICAN HONDA MOTOR CO., INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Speed Sensor Mounting Bolt	14 (19)
Hoses & Lines	
Type-S Model	
Return Line	21 (28)
Supply Line	27 (37)
Cylinder Lines-To-Supply Lines	12 (17)
Cylinder Lines	20 (26)
Premium Models	
Return Line	21 (28)
Cylinder Lines	12 (17)
Power Rack & Pinion	
Type-S Models	

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Flange Bolts-To-Valve Housing	14 (20)
Cylinder Flare Nuts-To-Valve Housing	12 (17)
Cylinder Line Flare Nuts-To-Gearbox Housing	20 (26)
Cylinder End Cap	51 (69)
Cushion-To-Power Rack & Pinion Mounting Bolts	28 (38)
Stiffener Plate Attaching Bolts	28 (38)
Stiffener Plates-To-Power Rack & Pinion	32 (43)
Steering Joint Mounting Bolt	16 (22)
10 mm Nut-To-Steering Knuckle	32 (43)
Premium Models	
Cylinder Line Flange Nuts	12 (17)
Flange Bolts-To-Valve Housing	14 (20)
Cylinder End Cap	51 (69)
Rack End-To-Lock Washer	58 (78)
Power Rack & Pinion Mounting Bolts & Stiffener Plate Attaching Bolts	28 (38)
Stiffener Plate Mounting Bolts	32 (43)
Steering Joint Bolt	17 (23)
Return Line Bolt	21 (28)
10 mm Nut-To-Steering Knuckle	32 (43)
Pump	
Pump Mounting Bolts & Nuts	17 (24)
Flange Bolts-To-Pump Cover	14 (20)
Pulley Nut	47 (64)
Flow Control Valve Cap ⁽¹⁾	36 (49)
Cam Ring Plate Attaching Bolts	14 (20)
INCH Lbs. (N.m)	
Pump Pressure Tests	
07RAK-S040121 Pressure Gauge Mounting Bolt	97 (11)
07VAK-P8A012B Pressure Gauge Mounting Bolt	97 (11)
Pump	
Pump Outlet Hose Mounting Bolts	97 (11)
Flange Bolt-To-Inlet Joint	97 (11)
Power Rack & Pinion (Premium Models)	
Flange Bolts-To-Valve Body	80 (9)
Sensor Inlet Hose Fitting	115 (13)
Sensor Return Line	106 (12)
Power Steering Pressure Switch	106 (12)
Pump Outlet Hose Bolt	97 (11)
Supply Line Hose	97 (11)

(1) Replace the pump as an assembly if the parts indicated are worn or damaged.

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TORQUE SPECIFICATIONS (MDX)

Application	Ft. Lbs. (N.m)
Hoses & Lines	
Return Line	21 (28)
Supply Line	27 (37)
Cylinder Lines-To-Supply Lines	12 (17)
Cylinder Lines Connecting Screws	20 (26)
Power Rack & Pinion	
Flange Bolts-To-Valve Housing	14 (20)
Cylinder Flare Nuts-To-Valve Housing	12 (17)
Cylinder Line Flare Nuts-To-Valve Housing	20 (26)
Cylinder End Cap	65 (88)
Steering Joint Mounting Bolt	16 (22)
Rack Guide Screw Lock Nut	18 (25)
10 mm Flange Bolt-To-Left Side Of Power Rack & Pinion	43 (58)
10 mm Flange Bolt-To-Right Side Of Power Rack & Pinion	29 (39)
Stiffener Plates	
Stiffener Bracket Bolt & Nut	43 (59)
Right Side, Stiffener Flange Bolts	86 (117)
12 mm	
14 mm	76 (103)
Left Side, Stiffener Flange Bolts	54 (74)
12 mm	
14 mm	76 (103)
Exhaust System	
Propeller Shaft Protector Bolts	16 (22)
Three way Catalytic Converter, 10 mm Self-Locking Nuts	25 (33)
Exhaust Rubber Mounting Bolt	28 (38)
Subframe Stiffener Plate	40 (54)
10 mm Flange Bolts-To-Engine Side Mounting Bracket	33 (44)
Exhaust Pipe Self-Locking Nuts	40 (54)
Primary/Secondary Heated Oxygen Sensor Bolts	33 (44)
10 mm Nut-To-Steering Knuckle	40 (54)
Pump	
Pump Mounting Bolts & Nuts	17 (24)
Flange Bolts-To-Pump Cover	14 (20)
Pulley Nut	47 (64)
Flow Control Valve Cap ⁽¹⁾	36 (49)
Cam Ring plate Attaching Bolts	14 (20)
INCH Lbs. (N.m)	
Power Rack & Pinion Bracket Mounting Bolts	89 (10)

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2002 STEERING Power Rack & Pinion - MDX & 3.2CL

Pump Outlet Hose Mounting Bolts	97 (11)
Flange Bolt-To-Inlet Joint	97 (11)
Power Steering Pressure Switch	106 (12)
Pump Outlet Hose Bolt	97 (11)
Heat Shield, 12 mm Self-Locking Nut	106 (12)
(1) Replace the pump as an assembly if the parts indicated are worn or damaged.	