

The EndWrench®

A Publication for Professional Repair Technicians from Subaru N.E.W. Horizons Dealers www.endwrench.com

SUBARU 

Spring 2003 Number 22 \$6

Subaru Maintenance Service



Information Inside

**ENGINEERED TO
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RUN SMOOTHER...**



**AND YOUR
BUSINESS, TOO.**

Genuine Subaru Maintenance Parts. They not only keep your customers' cars running better, they make your work go smoother—with fast, trouble-free installation. From belts, hoses, brake pads and shoes, to ignition wires, spark plugs and everything in between, we've got the competitively priced parts you need to get your customers on the road. Find your nearest Subaru N.E.W. Horizons wholesaling dealer at www.endwrench.com.



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Good Work!**

When you install Genuine Subaru Maintenance Parts, you help keep every Subaru performing at its peak. You also help keep your customers happy with parts that are designed to match original equipment specifications so their cars respond beautifully. And, you'll keep your business thriving with the competitive prices and the wide variety of maintenance applications available through O.E.PRO.



Why would you risk all that by trying to save a few pennies on non-genuine parts that can cost car owners a lot more over time in poor performance, faster wear and possibly even damage due to poor fit or not being up to OE specifications? Off-brand parts don't meet the high standards of Genuine Subaru Maintenance Parts and they don't offer the Genuine Subaru Parts Limited Warranty.

Keep up the good work instead and use Genuine Subaru Maintenance Parts. Call your local Subaru dealer for details and pricing today.

**Genuine Subaru
Maintenance Parts**



Part Category	Description
Filters	Includes oil, air and fuel filters
Spark Plugs	Includes standard and platinum tip plugs
Brake Pads and Shoes	Includes front and rear plus repair kits
Belts	Includes timing, alternator and a/c belts

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Caution:
Vehicle servicing performed by untrained persons could result in serious injury to those persons or others.

Information contained in this publication is intended for use by trained professional auto repair technicians ONLY. This information is provided to inform these technicians of conditions which may occur in some vehicles or to provide information which could assist them in proper servicing of these vehicles.

Properly trained technicians have the equipment, tools, safety instructions, and know-how to perform repairs correctly and safely. If a condition is described, DO NOT assume that a topic covered in these pages automatically applies to your vehicle or that your vehicle has that condition.

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The End Wrench®

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A Publication for Professional Repair Technicians from Subaru N.E.W. Horizons Dealers



Original Equipment Parts/
Professional Service



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A program of periodic maintenance service offers an excellent opportunity to check the entire vehicle for possible wear or damage, and to assure trouble-free driving for your Subaru customers.

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Our commitment to help you keep your customers satisfied and coming back to you for their Subaru service and repairs has not changed. In fact, there are more parts being offered under the Subaru O.E. PRO banner than ever.

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Subaru N.E.W. Horizons Dealers have been recognized for their outstanding performance in serving the wholesale market. They provide you with a direct wholesale parts hotline and also maintain a large inventory of competitively priced Genuine Subaru Parts.

www.endwrench.com

Whether you need quick reference to an article about Subaru repair or part numbers for the cylinder heads in a 1996 Subaru Legacy, you'll find the information you need when you visit the new *End Wrench* Web site at www.endwrench.com.



Subaru Periodic Maintenance Services

The frequency of scheduled inspection and maintenance services required on Subaru vehicles is minimal when compared with vehicles of the past. While the number of items requiring regular replacement has decreased, the number of items needing periodic inspection has not. Periodic maintenance offers an excellent opportunity for engine belts, hoses and other parts to be checked for wear. Old tune-up standbys like spark plugs, fuel and air filters are still on every Subaru vehicle, and they still require periodic inspection and replacement.

The same applies to the other items on the Subaru maintenance schedule. The important thing is to carefully inspect each item. If additional corrective action is required, now is the time to find out. In this article, we'll concentrate on some of the items on the maintenance schedule that tend to be overlooked.

Drive Belts

Drive belts certainly last longer than they used to, but they don't last forever. That's why they should be inspected at the 30 month or 30,000 mile intervals

and replaced at 60 month or 60,000 mile intervals. If inspection reveals that any of the belts is cracked, frayed or worn, they should be replaced. Proper belt tension, for both new and used belts, must be observed. Refer to the service manual for vehicle-specific belt tension information. Most Subaru vehicle employ sliding-bolt adjusters, which makes drive belt adjustment simple and precise.

Camshaft Drive Belt(s)

Most late model 49-state Subaru vehicles have a 30 month, 30,000 mile camshaft belt inspection recommendation, with a 105 month/105,000 mile replacement recommendation. Different Subaru vehicles have employed different camshaft drive belt configurations; consult a vehicle service manual for belt inspection and replacement recommendations for the particular Subaru vehicle you're servicing.

Inspecting the belt(s) before the recommended replacement interval involves removing the accessory drive belts, then removing a protective cover to get a look at the belt(s). Manually crank the engine through four rotations while checking the timing belt's back

surface for cracks or damage. A loose belt, or one that is cracked or has been damaged by oil or coolant should be replaced. Measure the timing belt width, then compare this measurement to the service manual specifications. Misalignment of the idler pulley, tensioner, water pump pulley and cam sprockets may cause the edges of the timing belt to wear away. Any other visible signs of wear would make the belt a likely candidate for replacement.



Timing Belt Replacement

Engine Cooling System and Engine Coolant

Engine coolant should be replaced at 30 month or 30,000 mile intervals. Check the condition of the hoses and other cooling system components during every scheduled maintenance visit. Check for cracked or otherwise damaged cooling systems hoses, as well as any signs of coolant leakage. A cooling system pressure test will confirm the integrity of the cooling system and radiator cap. A radiator hydrometer can be used to test the antifreeze concentration of the coolant. Use of Subaru Genuine Coolant, which contains antifreeze and anti-rust agents that are specially made for Subaru engines, which feature aluminum crankcases. Some Subaru vehicles feature an air breather plug in the radiator, which can be used to remove trapped air during a coolant change.

Fuel Filter and Fuel Lines

A 30 month or 30,000 mile fuel filter replacement interval is prescribed. Remove the battery negative cable before you begin work on the fuel filter.

While you're replacing the fuel filter, don't forget to check the condition of the rest of the fuel system. If any of the rubber hoses (especially the ones that were opened up to replace the filter) look damaged or frayed, they must be replaced before they can cause any further damage. Weak fuel hose clamps should be replaced, and the new ones must be properly positioned and tightened to specification.

Drivetrain Fluids

There is no recommended replacement interval for the transmission fluid on late model Subaru vehicles. The same applies to manual transmission and front and rear differential lubricants. In all cases, the recommended procedure is a fluid inspection at 30 month or 30,000 mile intervals. If the fluid in any of these units is found to be dirty, contaminated or at the incorrect level during the inspection, fluid replacement and/or seal or gasket repair are the only options.

Differential and transmission fluid recommendations for varying climate conditions can be found in the appropriate Subaru service manual. Subaru recommends against the practice of mixing lubricants from different manufacturers. Although both may comply with the GL and API ratings, lubricants from different manufacturers are refined from different base oils and additives. Combining them may produce unpredictable results.

Rear differentials and manual transmissions feature familiar add and drain plugs, while many Subaru automatic transmissions actually have a drain plug in the transmission pan (a feature welcomed by anyone who's ever had the mis-

fortune to take an ATF bath). Another welcome feature is the fill level dipstick that can be found on manual as well as automatic Subaru transaxles.

Brake Fluid

Many late model Subaru vehicles are equipped with ABS braking systems. The added complexity of these systems provides an additional incentive for following the recommended brake fluid replacement interval of 30 months or 30,000 miles. Brake fluid accumulates water and other contaminants over time. These contaminants can attack the internal parts of the brake system, compromising its performance and possibly causing brake failure.

Note: When the brake fluid level in the reservoir tank is lower than the specified limit, the brake fluid warning light in the combination meter will come on.

Do not mix brake fluids from different manufacturers. Doing so may degrade the quality of the fluid. Only DOT 3 or 4 brake fluid should be used in any Subaru vehicle. Consult the service manual for vehicle specific brake bleeding procedures.



Brake Fluid Replacement

Brake Pads, Shoes, Rotors and Drums

The maintenance schedule calls for inspection of all brake components during 30 month or 30,000 mile major services. It's possible to



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Warm Weather Maintenance Opportunities Bloom with O.E.PRO

After a long, punishing winter and now that the weather has improved, many Subaru owners have begun eagerly taking to the open road again. To ensure that your customers experience the full enjoyment of all-wheel drive this is the perfect time to promote special deals on Subaru vehicle maintenance.



A thorough check of each car's heating and cooling system will determine if everything made it through the winter in good operating order. You can also verify that there are ample levels of refrigerant, factory fill coolant and factory fill windshield washer fluid. Be sure you have plenty of Genuine Subaru Automotive Chemicals in stock to top off all those vehicles that have less than satisfactory levels or are due for a fluid change.

To increase the amount of maintenance business that comes through your service bays, be sure you're advertising your shop and its special promotions adequately. Some independents use coupons in local mailings, others send out their own postcards or flyers to their regular customer list and others use newspapers and local cable television to boost their service business. Any or all of these can work depending on your local conditions. You will want to try to develop a broader customer base by going beyond your

customer list with alternate media.

Whatever method you choose, you'll help maintain your customers' satisfaction, keep their cars operating at peak condition, catch any potential problems before they get worse and build your bottom line all at the same time. What a great way to spread the sunshine of the season!



New Muffler, Performance and Axle Applications Join the O.E.PRO Family

Mufflers are all about noise suppression, but in this case, we feel like we want to blast the news from the rooftops. Hear ye! Hear ye! New Genuine Subaru Replacement Mufflers applications are here! And that's not all. New applications for Genuine Subaru Remanufactured Axles and Subaru Performance Parts are also here!

The fact is, spring means much more than warm weather and flowers to experienced auto technicians. It means it's time to check your customers' vehicles' undercarriages to see if their mufflers have taken a beating from salt, potholes and corrosion. While you're under the car checking the muffler, exhaust pipes and hangers for wear and tear, be sure to look over the front axles and CV joints.

Now that there are more Genuine Subaru Muffler and Axle applications available, you're in a better position than ever to offer your customers the under-vehicle maintenance and repair work they need after a rough winter. And these Genuine Subaru parts give them the original equipment quality they expect from you.

With Genuine Subaru quality mufflers, they'll be getting extra noise suppression baffling and one-piece welded construction not available on many low-grade aftermarket mufflers. You'll be able to get these mufflers installed quickly, fast and easily because they perfectly match the original factory models in their fit, their associated nuts, bolts, hangers and gaskets. And now, you can even handle muffler repairs on Legacy 2.5 liter models up to 1999.

As for the new applications of high-quality Genuine Subaru Remanufactured Axles, now you can handle more of your customer's vehicles that are experiencing steering problems, noise and vibration that can come with worn CV joints. Applications include Legacy models with automatic transmissions up to 1999, all Foresters produced through January 2000 and Impreza models up to 2001. Of course, since these parts fall under the O.E.PRO Program you can offer all this maintenance and repair work at competitive prices.

Springtime also means the off-roaders and performance fans come out of the woodwork! Subaru lets you meet this warm weather surge of corner-hugging, clutch-popping zealots with more performance parts than ever. You've got STi Performance clutch discs, covers and timing belts, high-flow air intakes for the 2000 and 2001 Impreza 2.5 RS, SPT springs from Eibach for the 2002 and 2003 WRX Sedan, a wide variety of STi performance parts covering 2000 to 2004 models and much more. It's a great time of year for you to pull in extra revenue from these performance parts sales that can be so profitable.

So let your customers know you have it all for spring: Genuine Subaru replacement mufflers, remanufactured axles and performance parts. Then watch your profits start to grow!

Your Answers Are Waiting at the End Wrench Web site!

No matter what time of day or night you may have questions about a Subaru repair job, you can always rely on the one-stop answer source for Subaru technicians: www.endwrench.com. With its well-categorized and comprehensive storehouse of technical articles, you'll be able to find practical advice on Subaru vehicles both old and new, clearly written by an expert staff of technicians who share all their insights and repair suggestions with you.

Need to find a part number? There's no place better than The End Wrench Magazine Web site for O.E.PRO

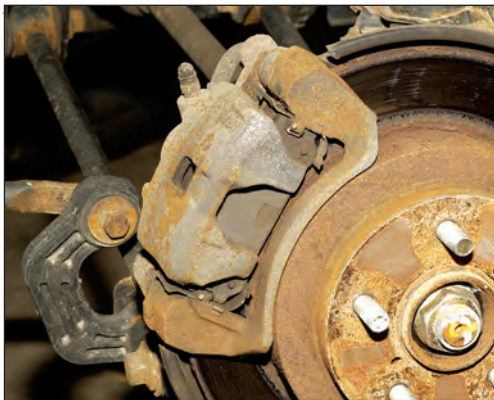
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application charts arranged by model and year so you can quickly and easily locate the part in question.

As for links to local Subaru dealers, this is the site you want to use. You'll find many offering specials on parts so it pays to return to this site frequently to see what's new and what's available. Remember, this site was built with you in mind, so you'll always find something worthwhile when you visit!



Subaru Periodic Maintenance Service



Brake Pad Measurement

determine the remaining pad thickness by sighting through the caliper inspection holes. A more precise method involves moving the caliper to get a clear shot at the pads. The Subaru service manual lists minimum pad thickness specs, as well as rotor runout limits.

Minimum brake lining thickness as well as drum dimension specifications for drum brake models can be found in the vehicle service manual. Minimum rotor and pad thickness dimensions for rear disk models can also be found in the service manual.

Models equipped with rear disk brakes feature a drum brake setup inside the rear rotor that serves as the parking brake assembly. Remove the caliper, caliper bracket and rear brake pads to reach the parking brake assembly. Adjust the parking brake (to compensate for wear by turning of the parking brake star wheel adjuster. Rear drum brakes feature automatic adjusters.

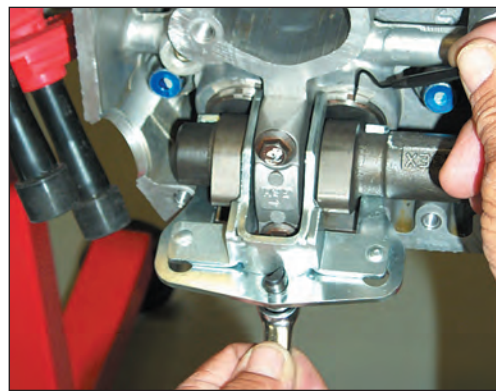
While you're working on inspecting the brakes, you're right around the cor-



CV Boot Inspection

ner from another unpredictable maintenance item. Inspect the front and rear drive axle boots for deformation, damage or failure. While these are normally very long-lived, there's no way of predicting what debris or other material might come in contact with and possibly damage the axle boots. If the boots are damaged, replace them with new ones.

Keep an eye on brake wear items during your regular maintenance inspections. If it appears unlikely that the vehicle will make it to the next inspection before the brakes are completely worn out, alert the owner. He'll then have the option to have the work done now or during a return visit.



2.5 Liter DOHC Valve Adjustment

Brake Hoses and Lines

At 15 month/15,000 mile intervals, check the following brake system items:

- Scratches, swelling, corrosion or traces of fluid leakage on brake hoses or pipe joints,
- Adjacent parts interfering with brake pipes or hoses during driving or loose connections or clamps,
- Any traces of fluid leakage, scratches or other damage on the master cylinder, wheel cylinder, pressure control valve and Hill-Holder.

Service Brake and Parking Brake

Procedures for checking brake pedal free height and specified pedal stroke can be found in the vehicle service manual. These tests must also be performed during the 15 month/15,000 mile service. A low or spongy service brake pedal is a sure indication of a brake problem. Check to see if air is in the hydraulic line by the feel of the pedal operation. The brake system must be bled to remove the air. Check for even operation



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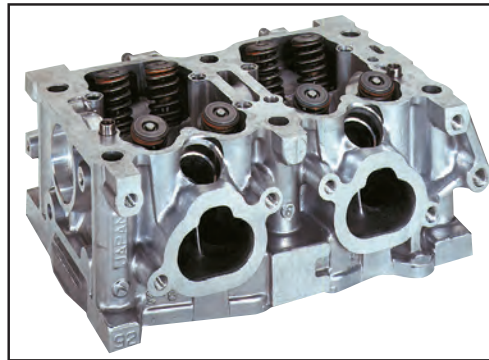
Genuine SUBARU ENGINE COMPONENTS



...offer exceptional fit, reliability and value.

Don't take chances with your reputation or your customers' satisfaction with rebuilt or inferior aftermarket parts. Genuine Subaru Engine Components are manufactured to demanding original equipment specifications, they're competitively priced and they install easily. No force-fits! More value.

Your local authorized Subaru dealer has a ready supply of a wide variety of applications so you get fast turnaround on everything you order. Of course, every part is backed by the Genuine Subaru Parts Limited Warranty so you know you can trust them to perform flawlessly. Call for details and prices or visit www.endwrench.com.



Genuine Subaru Engine Components

Head Assemblies	Fully assembled with valves, springs, seals and retainers
Valve Train	Includes cam shafts, lifters, rockers, belts and pulleys
Clutch Parts	Includes clutch kits, discs, covers and bearings
Other Components	Includes short blocks, oil and water pumps

of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road. The parking brake should be adjusted after adjusting the shoe clearance for the rear brakes. Adjust the parking brake lever by turning the adjuster (double nut) until the parking brake lever is set at the specified number of "clicks" when the specified amount of force is exerted (consult service manual). The parking brake mechanism must apply and release completely, with no brake drag after the parking brake lever is released. Rusted or binding parking brake cables may keep the parking brake from releasing normally.

Clutch Operation

Some Subaru vehicles are equipped with cable-operated clutch systems, while others feature a hydraulic arrangement.

Clutch linings, like brake linings, do wear over time. Cable-operated clutch systems will require adjustment to compensate for wear. Adjustment details, as well as information about the adjustment of the Hill-Holder system installed on some manual transmission-equipped Subaru vehicles, can be found in the appropriate vehicle service manual. To test a Subaru hydraulic clutch system pedal free play:

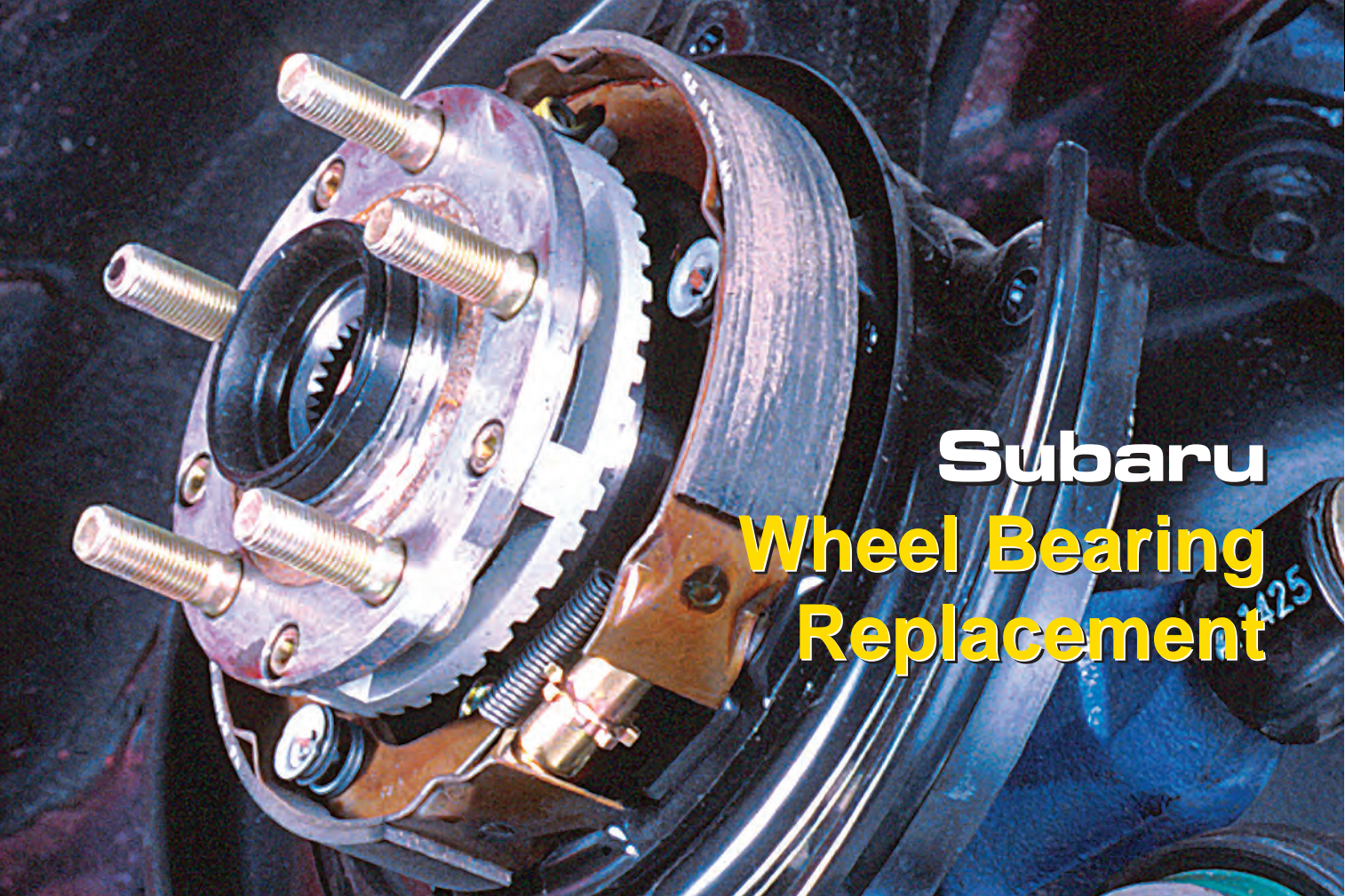
- Push the release fork to retract the slave cylinder push rod. The fluid level in the clutch master cylinder should rise.
- If the fluid level rises, the pedal free play is correct.
- If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal according to the service manual procedures.

Check the fluid level using the

scale on the outside of the clutch master cylinder reservoir. If the level is below "MIN," add DOT 3 or 4 brake fluid to bring it up to "MAX." Inspect the underside of the master cylinder, clutch damper, slave cylinder, hoses, pipes and couplings for fluid leaks. If leaks are found, correct them by retightening the fitting and/or replacing the damaged parts.

Valve Clearance

Some Subaru vehicles are equipped with hydraulic valve lash adjusters, while others feature "solid" lash adjusters. Solid adjusters require a clearance inspection at 105 months/105,000 miles. Consult the manual to determine whether the vehicle you are servicing has solid or hydraulic valve lash adjusters. Procedures for adjusting valve clearance on solid adjuster engines can also be found there.



Subaru Wheel Bearing Replacement

Ongoing studies of vehicle repairs and service procedures have led to the development of a new rear wheel bearing replacement procedure for the following vehicles:

- 1998-2003 Forester
- 1993-2003 Impreza (excluding WRX)
- 1990-1999 Legacy

Additionally, several design changes have been made to increase the durability of the original equipment caged ball bearings in all types of operating conditions. The installation of secondary dust shields to the axle (August 2000 vehicle production), and changes to the wheel bearing itself represent some of the results of this continued study. The most recent production changes were:

- Grease material changed,
- Treatment changes to the rear ball bearing and inner race,
- Initial preload applied in produc-

tion changed.

These changes took place effective August 21, 2001, starting with the following VINs:

- **Impreza Sedan:** 2*517136
- **Impreza Wagon:** 2*817579
- **Forester:** 2*735724

To reduce the possibility of repeat premature failures, Subaru has introduced a new procedure to service the rear wheel bearings of the models listed above that entails replacing the rear wheel bearing on the vehicle. This new procedure eliminates the heavy forces needed to service the rear wheel bearings that occur when using a hydraulic press. This smooth, low force installation eliminates the chances of deforming the wheel bearing housing and increases the efficiency of the repair.

A new special tool kit has been developed to perform this procedure on the vehicle (Kent Moore J45697). The



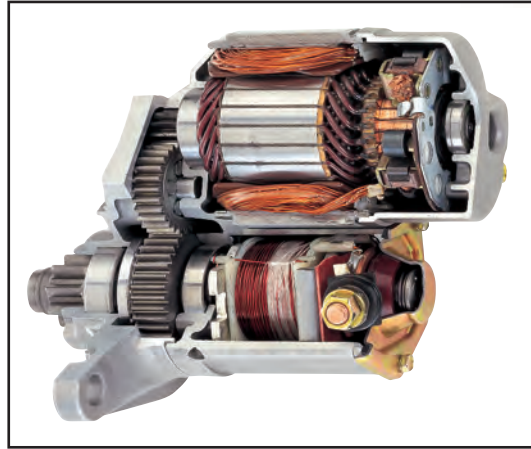
Genuine SUBARU REMANUFACTURED PARTS



...meet original equipment specifications, perform like new and save money.

Want to save money on big-ticket auto parts without risking a thing? Consider using Genuine Subaru Remanufactured Parts. All of them meet the strictest OEM specifications and fit and function like new Genuine Subaru parts.

They cost less because they cost less to build. Built using only the best cores that are disassembled, cleaned, machined and refitted to strict quality standards, each Genuine Subaru Remanufactured Part is designed to offer trouble-free driving and unsurpassed reliability. Of course, they're all backed by the Genuine Subaru Parts Limited Warranty. So call your local authorized Subaru dealer for prices and details or visit www.endwrench.com today.



Genuine Subaru Remanufactured Parts

Brake Calipers	Includes front and rear calipers
Electrical	Includes alternators, starters and digital dashes
Automatic Transmissions	Includes AWD and FWD
Drive Train	Includes rear differentials and front axles

new tools are designed to work only with tapered roller bearings. The complete repair procedure can be found in Subaru Service Publication Booklet MSA5TT0201.

Subaru has also authorized the installation of a taper roller-type bearing, part number 28016AA030, as the replacement part on the applicable Impreza and Forester models. This taper bearing is the same bearing that is applicable to 1999 model year and prior Legacy models.

If you have diagnosed a failed rear wheel bearing, repair it with the new procedure and check the condition of the remaining side. Replace only if needed.

The new genuine Subaru rear wheel bearings are not to be packed with grease of any kind. The bearing is ready to install out of the box.

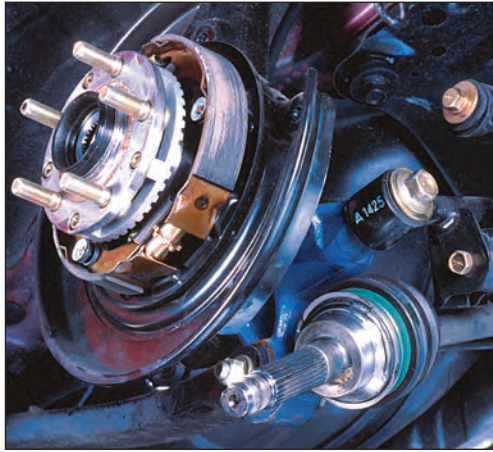
Wheel Bearing Installation Procedures

The following is a summary of the revised wheel bearing installation procedures. A PDF version of Booklet Number MSA5TT0201, containing the complete procedure, photographs and tool listings is available for download on the *End Wrench* website at www.endwrench.com. Do not attempt this procedure without the proper tools. They may be purchased from Kent-Moore by calling 800.345.2233.

- 1 Remove the wheel.
- 2 Remove the caliper mounting bolts.
- 3 Secure the caliper. Place a mark on the hub and rotor so that they can be reassembled the same way they came apart.

- 4 Remove the rotor.
 - 5 Unstake and remove the axle nut.
 - 6 Remove the lateral link bolt.
 - 7 Push the bearing housing outward and slide the axle out.
 - 8 Set the axle below the lateral link bolt and reinstall the lateral link bolt.
- Note: Inspect the axle for any deep scratches, pitting or damage dust shield. Replace if necessary.*
- 9 Connect the slide hammer to the wheel-bearing hub. Do not use the original wheel lug nuts. Note: After threading on the five lug adapter to the slide hammer, thread on the nut and tighten the adapter to the nut.

Subaru Wheel Bearing Replacement



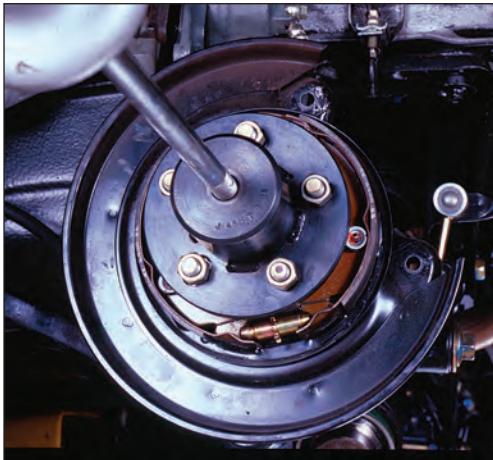
Step 8

Set the axle below the lateral link bolt and reinstall the lateral link bolt.

! Carefully thrust the slide outward until the wheel bearing hub is removed.

! Remove the snap ring.

! Remove the inner seals from the bearing housing.



Step 10

Use a slide hammer to remove the wheel bearing hub.

! Place OTC 311882 over the bearing housing. The groove must face outward.

! Rotate the OTC 311882 as it is installed and make sure it is making full contact with the backing plate.

! Place the OTC 311883 into the OTC 311882.

! Make sure the groove is outward.

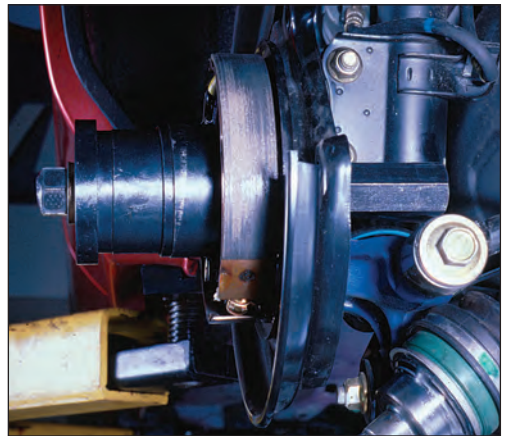
! Place the OTC 314308 with a washer onto the puller bolt. This will be placed into the bearing housing. Apply the included special grease to the puller bolt, once during disassembly and again during reassembly.



Step 16

Install the special tool.

! The OTC 311887 with washer and nut will be placed onto the opposite end of the puller bolt after it has been inserted into the bearing housing. If the wrong side of OTC 311887 is placed against the bearing the tool will become jammed into the inner race.



Step 19

Position the tools for bearing removal.

! Position the tools for bearing removal.

! Secure a wrench on the nut located on the backside of the bearing hous-



Genuine SUBARU REPLACEMENT MUFFLERS



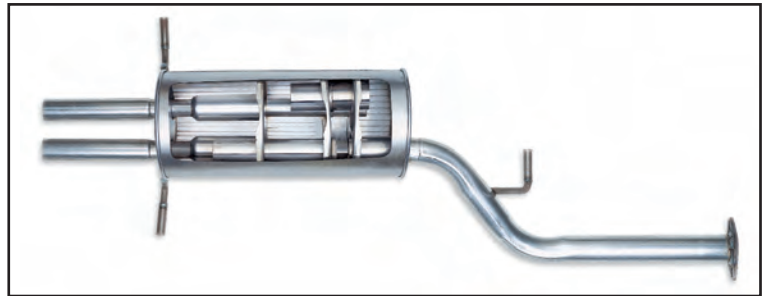
...provide perfect fit and function.

Still trying to force fit or jury-rig non-genuine mufflers to save a little money? Save time and all that hassle with competitively priced Genuine Subaru Replacement and Performance Mufflers. They're specifically designed so that mounting parts precisely match the original Subaru assembly for easy, safe, no-rattle replacement.

Each Subaru muffler is a heavy-duty integrated unit of thicker materials than typical aftermarket mufflers, plus the sound absorbing materials of Subaru Replacement Mufflers help subdue sound without hampering performance. Special corrosion-resistant aluminized steel construction helps them last longer, too.

Naturally, every Genuine Subaru Replacement Muffler is backed by a Genuine Subaru Parts Lim-

ited Warranty that covers the entire integrated unit, including welded-on pipes, clamps and hardware. Call your local Subaru dealer for details and prices and visit www.endwrench.com today.



Genuine Subaru Mufflers	
Replacement Mufflers	Includes associated hangers, gaskets, bolts, nuts, etc.
Performance Mufflers	Applications for Impreza 2.5 RS and Legacy GT models



ing. Using a breaker bar, begin tightening the puller bolt.

" Switch to the air ratchet after the initial tension of the bearing has been overcome.

" Remove the bearing and tools from the outside of the bearing housing.

" Clean and inspect the bearing housing for damage. Use the test outlined below to check for out of roundness condition. Replace bearing housing if out of round.

Note: Measure the roundness of the housing where the bearing is installed as follows.

- Measure inner diameter "X" and "Y" at both "A" and "B" positions by using cylinder bore gauge.
- If difference of the measure-

ment between "X" and "Y" is more than .020mm, replace the housing with a new one.

" Prepare the new tapered roller bearing for installation. Do not remove the bearing stay (plastic piece inside the bearing) at this time.

Note: Do not disassemble the bearing. Do not add any grease to the bearing.

" Set the bearing assembly into the bearing housing.

" Assemble the tools for wheel bearing installation. Place a washer on the bolt followed by OTC 311888 (open end facing toward the wheel bearing housing). Place another washer on the bolt followed by J45697-9. Apply the included grease to the puller bolt.

Note: All three included washers are the same thickness.

" The J45697-1 larger diameter surface will face the wheel bearing housing on the inner side after the puller bolt has been inserted into the bearing housing.

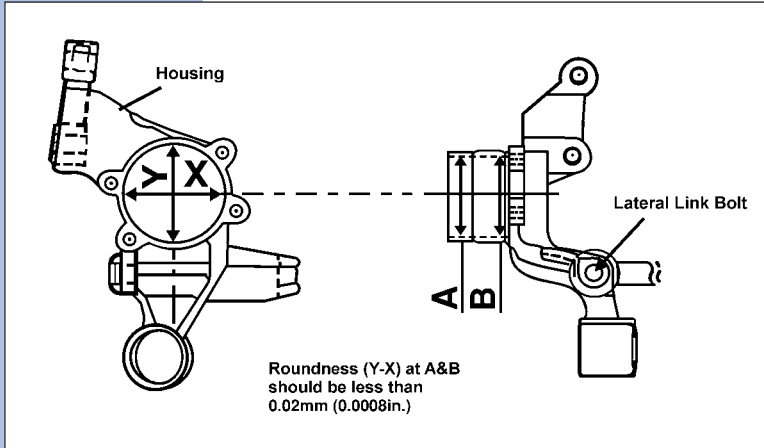
" Position the tools on the bearing housing front side for installation.

" Position the tools on the back side of the housing for installation.

" Secure the nut on the inner side with a wrench and begin tightening the bolt with an air ratchet.

" Tighten the last few turns with the breaker bar if necessary. Installation is complete when OTC 311888 makes contact with the bearing housing.

Subaru Wheel Bearing Replacement

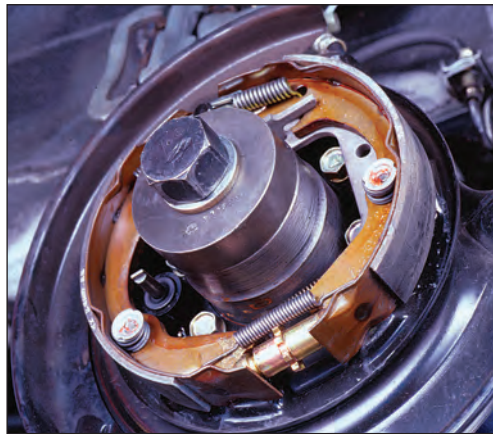


Step 23

Measure the bearing housing.

ˆ Remove the tools.

£ Insert the snap ring. If the snap ring will not seat properly the bearing is not fully installed.



Step 30

Install the new bearing.

\$ Thread seal installer J45697-11 with the smaller diameter facing outward onto driver handle J8092.

Install the outer seal.

/ Remove all tools from the puller bolt. Push out the bearing stay from the center of the installed bearing using the head of the bolt.

| Prepare the hub for installation. Remove the old outer seal from the hub.

[Remove the tone wheel if equipped.



Step 38

Remove the old inner bearing race.

] Install a set of press plates below the old inner race and remove with appropriate press and press tools.

- Reinstall the tone wheel (5.4 ft-lb) if equipped. Insert the puller bolt with washer into the hub.

' Place the J45697-1 with the *smaller* diameter surface facing inward onto the puller bolt after it has been inserted through the bearing housing.

ˆ The slot will be used to insert a depth gauge.

£ Secure a wrench on the nut and begin tightening the puller bolt with the air ratchet. Finish the installation with the breaker bar.



Step 50

Install and torque the lateral link bolt.



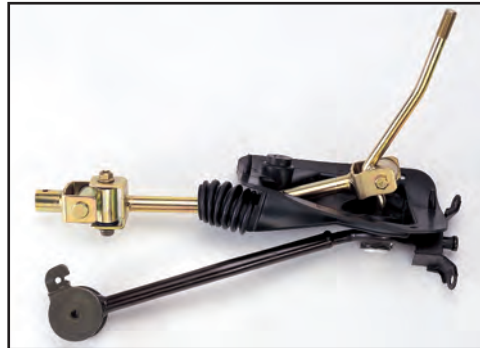
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§ Check the installed depth of the hub with the following procedure. Measure through the provided slot on J45697-1. (Remove the washer if necessary and reinstall nut) Using an appropriate depth gauge measure from the top of J-45697-1 to the top flat edge of the wheel bearing. This will represent "A." Measure again to the top flat of the hub. This will represent "B". Use the following formula: B - A = C. "C" should equal 2.0 ± 0.3 mm, the correct installed depth of the wheel bearing hub.

Thread seal installer J 45697-10 onto driver handle J 8092 with the pictured surface facing outward. Place the inner number one seal on the tool and install the seal. The tool will make contact with the bearing housing when the seal is fully installed.

/ Reverse the J 45697-10 on the driver handle J 8092. Place the inner number two seal on the tool and install the seal.

Note: The seal is fully installed when the seal is flush with the bearing housing.

| Check the rolling resistance of the hub with the supplied torque wrench. The hub should turn smoothly. (Starting force should be 7 to 17 inch-pounds.)

[Remove the lateral link bolt.

] Push the bearing housing outward and slide the axle in.

~ Install and torque the lateral link bolt. Use a new self-locking nut.

Note: Do not use impact tools.

Legacy: 87-116 ft-lb

Impreza and Forester: 101 ± 14 ft-lb

‘ Install the brake rotor. Match the marks made during disassembly. Install and torque new axle nut.

Legacy, Impreza and Forester: 137 ± 14 ft-lb

“ Stake the axle nut. Then install the brake caliper mount and torque the bolts to 38 ± 4 ft-lb.

£ Install the wheel and torque the lug nuts.

Legacy, Impreza and Forester steel wheels: 65.7 ft-lb

§ Pump the brake pedal before



A/C Service Tips

The following tech tips apply to specific symptoms or conditions on Subaru air conditioning systems. Scan these pages to see if the symptoms on your problem vehicle match the descriptions here. Follow the recommended service procedures for all air conditioning repairs.

Dash Vent Mist

If a customer complains of mist coming from the A/C vents when the air conditioning system is operating, it is more than likely a normal condition caused by a number of factors. The evaporator is probably operating close to or at the freezing point. There may even be a small amount of ice accumulation on the evaporator, but not enough to affect system operation. The outside air is probably very humid, perhaps 85-95 percent relative humidity. When this very moist air comes in contact with the cold evaporator, it causes the moisture in the air to condense into a mist. You have probably observed a similar situation when you opened the freezer on the refrigerator at home. This mist is then pushed by the fan, through the vehicle's ducts, and into the passenger compartment.

A very minor adjustment to the vehicle's air conditioning system will correct the problem. Move the temperature

lever on the control panel slightly toward the warm position. This blends a little of the warm air from the heater core with the outside air to melt the coating of ice on the evaporator. Vehicle cooling will not be noticeably affected by this small movement of the temperature lever. The customer will have to experiment to find the position that cures the condition, as it may change based on the weather conditions mentioned above.

So if you have checked out the system and can find nothing wrong, the weather conditions may be to blame. Spend a few minutes explaining this to the customer. Vehicles in areas with low humidity are unlikely to exhibit these symptoms.

Refrigerant Cross Contamination

All 1996 and later Subaru models are equipped with R-134a refrigerant air conditioning systems. Some models were equipped with this type of system as early as 1994. R-134a does not contain suspected ozone-depleting chlorofluorocarbons. The chemical compounds and molecular structures of R-12 and R-134a are completely different. However, the temperature/pressure relationships of the two are very similar. R-134a and R-12 are not compatible. Under no circumstances should

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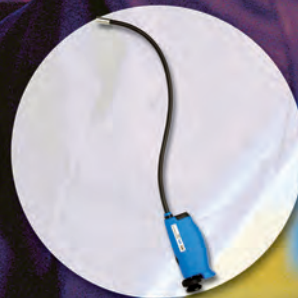
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A/C Service Tips

they be mixed.

If you suspect that a refrigerant system has been tampered with or may be contaminated, observe the following general rules.

Symptoms of a contaminated refrigerant system may be any of the following:

- High system pressure (could be extreme). The higher the mix of contamination, the higher the pressure will be.

- Poor cooling.
- Rapid cycling of the compressor.

Inspect for:

- Correct condenser fan operation,
- Debris in front of the condenser,
- Correct blower fan operation,
- Charge/caution label,
- Service ports, stripped threads (from wrong fittings),
- Cloudy, milky sight glass.

Contact the customer for:

- Repair history,
- Previous dealer or independent shop repair.

Refrigerants must be handled properly. Always wear protective gloves and goggles. For your safety and the safety of others, it is imperative that the work area be properly ventilated. If a refrigerant release occurs, wait until the mist clears before continuing. R-12 and R-134a must be handled separately. The two refrigerants cannot be mixed. The lubricating oils used in the R-12 and R-134a systems are incompatible. Service tools cannot be intermixed. If you find yourself unsure of what to do when servicing an R-134a system, don't guess. Refer to service manuals and service bulletins. As with all automotive repair work, good service depends on good diagnosis.

Compressor Failure Precautions

Always examine the oil when replacing a failed (seized or not pumping) A/C compressor. If you find metal particles, flush the entire with an approved air conditioning system flushing agent to remove the particles. Simply installing a new receiver-drier with the replacement compressor may not be enough to keep the leftover par-

ticles from clogging the expansion valve and possibly the bellows valve in the compressor.

If compressed air is used to dry the system after the flushing agent has been used, the system must be evacuated for an extended period of time to remove any residual moisture. A 30 minute evacuation period is necessary for a new system that has not been opened to the atmosphere. Air conditioning manufacturers are recommending alternative system flushing procedures to comply with the Montreal protocol.



Recovering Refrigerant and Oil

Compressor Failure

If the compressor is fixed at minimum displacement, look for a much smaller than usual difference between the low side and high side pressures. In other words, the low side may appear slightly higher than normal and the high side slightly lower, as the two system sides move towards equalization. Manifold gauge readings of 50 (low side) and 75 (high side) are representative of this condition.

Expansion Valve Failure—Excessive Restriction

Your manifold gauge readings will show the low side almost normal or slightly below normal and your high side will definitely be lower than normal. Reading of 28 (low side) and 90 (high side) are representative of this condition. In addition, if the expansion valve is clogged, stuck closed or inoperative, the expansion valve inlet area will exhibit heavy sweating or frosting. There will be a slight decrease in cool-

ing performance that will increase as the condition worsens. A low side reading of 25-35 is not necessarily abnormal. The high side reading must always be considered along with the low/high side relationship.

A/C Service Oil Adjustment

Should an A/C compressor or other component require replacement, it's important to adhere to the oil charge table listed in the service manual. Each component retains a certain amount of oil when removed. During replacement, this amount of oil must be compensated for. For example, if the condenser is replaced in a Calsonic-equipped 1991 Legacy, 2.9 fluid ounces must be added to the system to compensate for the estimated amount of oil that will be taken out of the system when the original condenser is removed. On the other hand, since

replacement compressors come with a full oil charge for the whole system, oil must actually be removed from the compressor to avoid overcharging the system with oil. Overcharging the systems with oil will result in reduced cooling effectiveness, while undercharging will result in increased system wear and possible failure. Subaru recommends the use of a refrigerant recycling machine to protect the environment.

Air Conditioning Evaporator Odor

As outdoor temperatures rise, so do the complaints of evaporator musty odor. To help control the amount of bacterial growth within the evaporator case (which causes the odor), perform the following:

- Check the evaporator drain hose for kinks or clogs which might restrict proper condensation or

water drainage. Also, make sure the firewall outlet end of the drain hose is routed away from the catalytic converter.

- Try using the 'Max A/C' or 'Recirculation' mode for initial cool-down only. Then switch to the 'Normal A/C' mode. This allows outside air to enter the evaporator. Changing the mode positions to selections other than 'Max A/C' may reduce the conditions in which the bacteria grows.

- When the vehicle is parked, the duct system will remain in the last position programmed by the Mode control. Using a selection other than 'Max A/C' can also help reduce the odor-causing environment.

- For chronic customer complaints, an evaporator cleaning agent can be used. Evaporator removal for core cleaning is not necessary. Cleaning the evaporator through the fresh air duct is just as effective.

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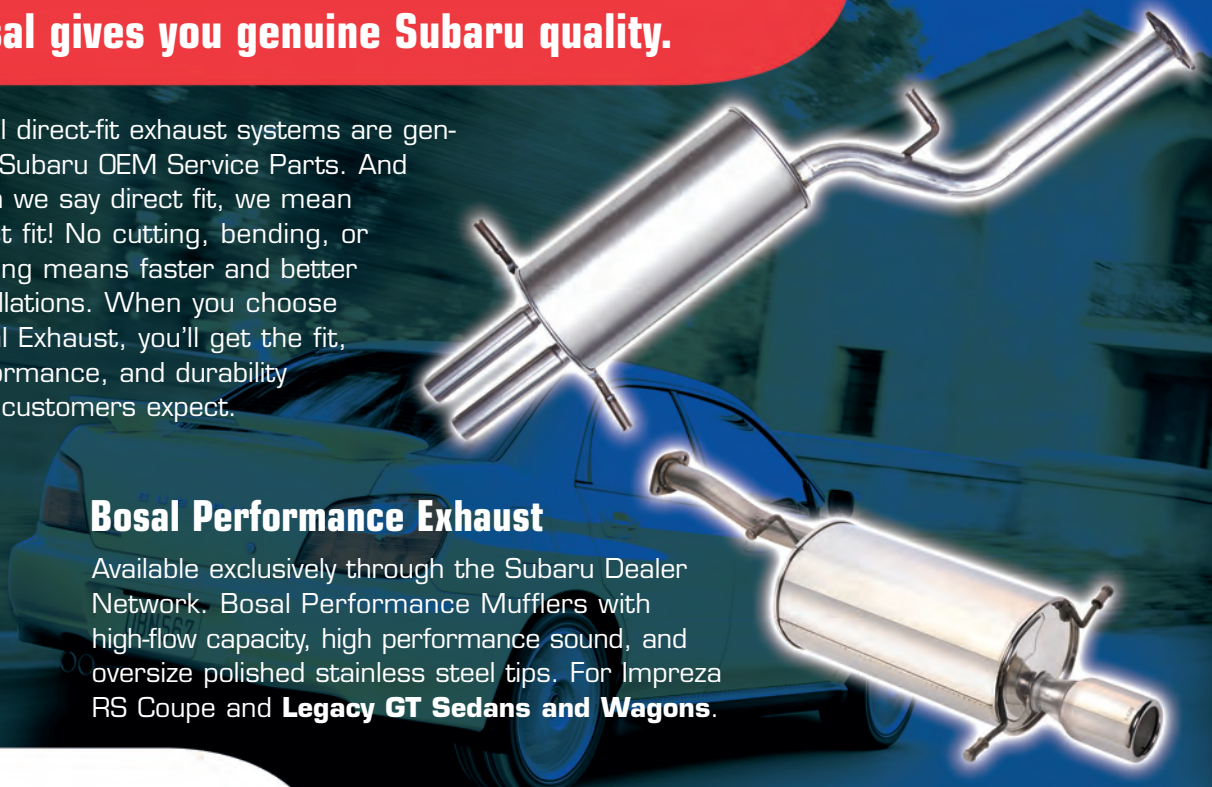
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H6 A/C Compressor Cutting Out

If you come across an H6 A/C system where the compressor is cutting out when the A/C is engaged, it might be the revolution sensor on the compressor that is causing the problem. To determine if this is the cause of the concern, refer to the diagnostic information below.

Both the Subaru Legacy L.L.Bean and VDC model Outback use the Valeo/Zexel Automatic Climate Control System. This system contains a few new circuits not found on any other Subaru A/C systems. The following is some information you may find useful.

The first new circuit is a two-wire circuit that runs from the Engine Control Module (ECM) Connector B134, pin 13, to the rear of the A/C compressor connector F82, pin 2, then from the compressor to a vehicle ground at connector B83, pin 12. This circuit was thought to be a compressor thermal limiting device but it was found to be an internal compressor speed sensor. This is a “pulse” signal that is emitted four times per compressor revolution.

Upon closer inspection of this new circuit, it was found that the black (B) wire that exits the rear of the compressor is the ground-side of the circuit, which ends at the vehicle ground connector (B83). The second wire, which is yellow (Y) in color, comes out of the compressor and then changes to white (W) at the first connector on top of the compressor. This circuit continues to the ECM as the input side of the circuit to the module. By monitoring this wire with a digital volt ohm meter (DVOM) set to the AC volt setting, you can monitor the AC voltage being sent to the ECM.

The New Select Monitor (NSM) was installed and noted the following air conditioning monitors:

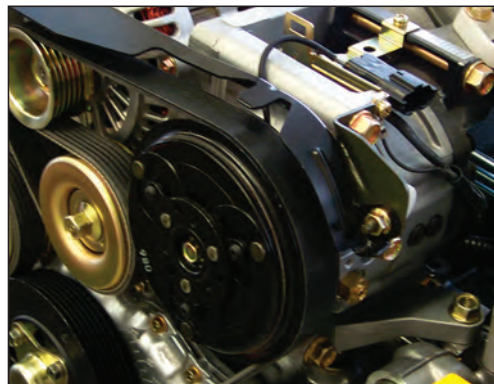
A/C Switch ON/OFF (monitors driver input from A/C switch)

A/C Lock ON/OFF (ECM lockout of compressor clutch engagement)

A/C Mid Pressure ON/OFF (input of high pressure to ECM for fan control)

A/C Comp Signal ON/OFF (command from ECM to energize A/C clutch)

Next the compressor speed signal circuit to the ECM was disabled and it was discovered that when A/C is requested through the switch by the driver, the compressor clutch engages for 5 seconds and then disengages for the remainder of the key ON cycle. It was also noted that without the compressor speed signal input, the A/C Lock Signal changed from OFF to ON, meaning the ECM had cancelled the compressor ON signal therefore disabling the compressor clutch.



H6 A/C Compressor

Next, three key ON/OFF cycles were performed, requesting A/C each time, with the speed circuit disabled, followed by an ECM self-test that revealed that no trouble codes were set due to the loss of this signal. This leads to the conclusion that failure of the internal speed sensor or an open anywhere in the circuit will render the A/C compressor inoperative. Again, by monitoring the A/C Lock Signal and the A/C Comp Signal, using the select monitor, one can see if the ECM has locked out the compressor clutch circuit causing a no engagement concern.

The second circuit investigated was from the ECM connector B135/pin23 to the Dual Pressure Switch on the receiver drier connector B10/pin4/R wire. The Dual Pressure Switch continues to control the compressor clutch for high and low system pressure cutoff in the same manner as on previous systems. The fourth wire (red in color) is new to this vehicle application. It was noted that this new circuit uses a 5V reference signal from the ECM to the pressure switch, which can be monitored using a DVOM.

Monitoring this circuit with a DVOM

and observing A/C system refrigerant pressures with service gauges revealed that the voltage changes from 5V to 0V at approximately 260 PSI high side pressure reading. In conjunction with the circuit voltage change, it was noted that the ECM increased the engine cooling fan speed to combat the higher high side pressure. It was determined that this new circuit is for mid-pressure cooling fan control by the ECM, and again, a new feature to this vehicle. This circuit can be monitored using the Select Monitor A/C Mid Pressure data reading.

Once you have determined that the revolution sensor is the problem, be advised that the sensor is now available as a separate part. It is no longer necessary to replace the entire compressor as in the past. Refer to Service Bulletin 10-

74-02 for more information.

Change To A/C Operation

A change was made to the A/C operation on 2002 Legacy and Outback vehicles, starting with 7/18/01 production date.

The "recirculation" (RECIRC) button is electronically overridden (cancelled) when the selector switch is moved to any part of the defrost mode. This change was made to help eliminate situations in which window fogging might occur when insufficient fresh air is available during defrost, where the switch was set on "recirculation."

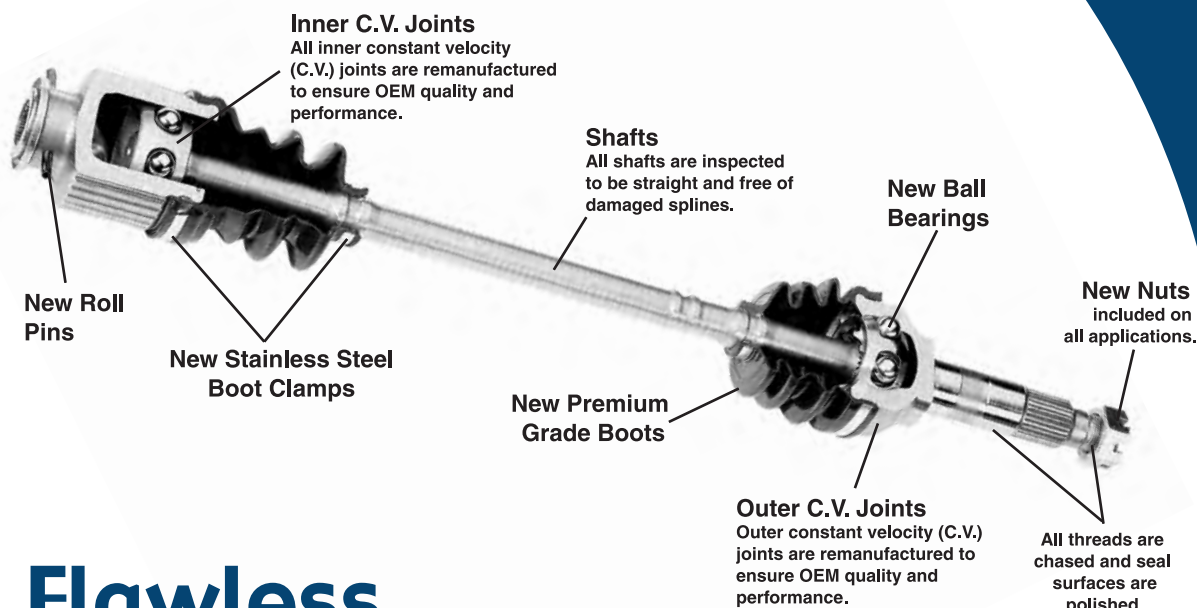
Evaporator Icing Countermeasure

There is a possibility that icing could occur in the evaporator core of A/C-equipped 2002-2003 Impreza vehicles, up to October

2002, VIN 3*511336 (sedan) and 3*801514 (wagon). During operation under warm, high humidity conditions the customer would notice a diminished output of air from the dash vents causing the cabin temperature to rise. The icing condition can be eliminated by replacing the original thermosensor with a new fin sensitive type sensor and placing it in the proper location.

The location of the original thermosensor will depend on the production date of the vehicle. In December 2001, it was moved to the right side of the evaporator. You will replace the surface mounted probe with the internal fin-mounted probe if the condition still exists on vehicles up to the production change listed here.

The part number for the new thermosensor is 72166FE010 and



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the O-rings needed are 73039FA100 and 73039FA110.

Repair Procedure

1. This procedure is different than what is shown in the service manual.

2. Start by evacuating the A/C system.
3. While the system is evacuating, start removing the (9) screws and 1 clip that hold the glove box assembly in place. Remove the connector for the glove box light. This is a different type of clip. You must lift the end of the connector to get the locking tab out. There is no depression tab to push.

4. Remove the A pillar lower kick panel.

5. Remove the daytime running lights relay and bracket as an assembly.

6. Remove the daytime running light control module and bracket.

7. Remove the heater control cable, intake side.

8. Disconnect the heater recirculation door cable.

9. Remove the two (2) nuts and one (1) bolt that hold the blower assembly in place. The upper nut is hidden behind the white wire tie clip that is mounted to the same stud. At this time, disconnect the electrical connectors from the blower unit. Be careful of the sealing packing material on the unit.

10. Remove the five (5) screws and one (1) hidden black clip that hold the white evaporator cover to the main case. a) Lift the cover guide pin off then, and remove the cover. It is easier if you set the heater control to DEF before removing the cover.

11. Check to insure the system is completely discharged.

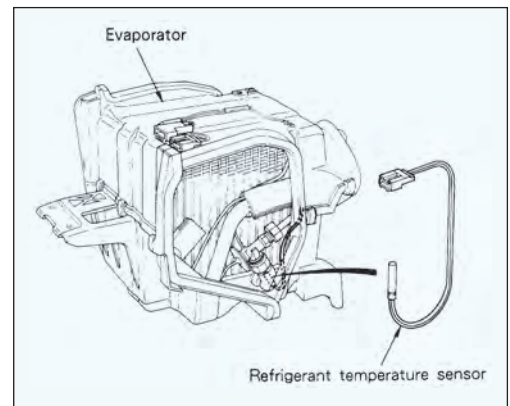
12. Remove the high and low pressure lines from the expansion valve block from under the hood on the firewall. There is one (1) 10mm bolt holding these

two lines in place. If you are working on a WRX, it may be easier to also remove some of the firewall line clips to gain more clearance. If there is not enough clearance, you may need to remove the air box or intercooler on turbo models.

13. Remove two (2) 4mm Alan screws from the same location, These are found after the lines are removed. Do not remove the aluminum block at this time. It must come out from the inside.

14. From under the dash you can now remove the expansion valve block (gold in color), followed by the aluminum block previously mentioned. Cover openings to prevent contamination and catch any oil that may leak out to prevent customer complaints.

15. You can now slide the evaporator out to the right with the thermosensor probe attached. Work it out slowly because the wiring harness attached above the evaporator on the top of the dash will be in the way.



Refrigerant Thermosensor

16. Remove the old surface mounted thermosensor and discard it. Replace it with the new style internal thermosensor P/N 72166FE010 at the new location as shown in the picture in this bulletin. The metal thermosensor goes in the eighth row from the right and 30 mm up from the bottom fin. Assemble the thermosensor and the plastic holder first, then push them both into position. The plastic tab goes to the right of the metal thermosensor in the seventh row.

17. Replace the O-rings (P/N 73039FA100 and 73039FA110) on the high and low pressure lines and expansion valve.

18. After the evaporator is reinstalled and the lines are secured, test the integrity of the seals by pulling and holding a vacuum on the system. This is done before the final assembly.

19. The white cover must be sealed from the lower corner where the thermosensor wire goes through to the top side as far as you can reach. Failure to do this will cause water to leak out on the carpets.

20. Assembly is in the reverse order of disassembly.

Evaporator Thermostat Probe Location

Evaporator freeze-up can take place if the thermostat probe tip is located incorrectly within the evaporator core on 2001 Legacy vehicles. The same situation applies for the evaporator sensor on the Auto A/C system.

The correct location for the tip to be inserted into the core is as follows:

- Position evaporator core or assembly with the air outlet side facing towards you. This positions the core to where the inlet and outlet pipes are facing away from you.

The front of the evaporator core or assembly, the side that faces the front of the vehicle, should be to your left.

- The tip of the thermostat probe should be inserted on the seventh (7th) row of fins from the left, and 100mm down from the top of the core.

Phase II 4EAT Transmission Characteristics

Phase II 4EAT transmissions have been used in Subaru vehicles since the 1999 Model Year. They can most readily be identified by the external ATF oil filter located on the driver's side of the transmission case. Be advised that H6 equipped vehicles use a remotely

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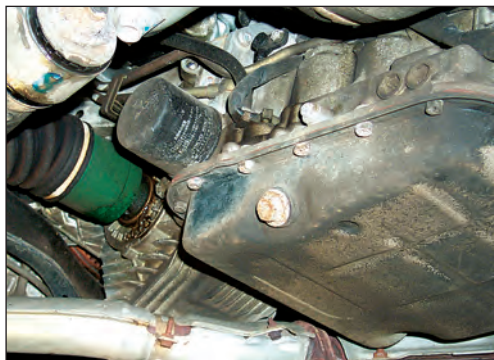
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located ATF oil filter. This filter is located in the left front fenderwell area.

Several different symptoms have been identified that would be considered normal operation for the unit. These characteristic symptoms will not be corrected by replacement of the unit or any components within the system. It is important to understand that many decisions are made in the designing of the transmission. Items like fuel economy and emissions play a big part in the design. The design of the new 4EAT considerably increases the fuel economy and reduces the overall emissions of the vehicle. To accomplish this, the design incorporates fewer parts than its predecessor. This not only reduces the total friction, but also the overall weight of the unit. Because of this, the unit functions differently than the older 4EAT.

We would like make you aware of these characteristics, so when you receive a concern from a customer, it can be identified and explained to them quickly. Repairing of a vehicle starts with detailed questioning by the service adviser as to how, when, and where the condition occurs. Duplicating the how, when, and where by the technician should enable the concern to be identified. If the concern is similar to one listed below it should be explained to the customer it is a characteristic of this model and is not an indication of reliability or future concern. No repairs should be made to the vehicle. If you are unsure, we recommend you road test a “like” vehicle. If both vehicles are similar, chances are it is a characteristic of the unit.



Phase II 4EAT Transmission

Delayed Engagement or judder felt when shifting into Reverse or Drive.

Symptom

When the driver shifts the select lever into reverse or drive and applies the accelerator too quickly delayed movement or a judder can be felt.

Mechanism

It takes approximately 1.5 seconds to engage the internal clutch(s) after the select lever gear is chosen. If engine torque is increased before the clutch is fully engaged, the clutch will slip and make the judder feeling.

Recommendation

To determine there is an internal problem with the unit, perform a “TIME LAG TEST” as outlined in the appropriate Service Manual for the vehicle. If the average is less than 1.5 seconds the unit is operating normally. If it is more than 1.5 seconds then an internal problem exists and repair/replacement should be performed.

Explain to the customer the mechanism and function of the system and that it is not a defect in the unit. Also, recommend that the customer wait a second before applying the accelerator pedal.

Shock felt during light acceleration with the Lockup clutch applied.

Symptom

When the driver tries to lightly accelerate the vehicle, when driving at a constant speed in 4th gear and the Lockup clutch is engaged, they may feel a slight shock through the body of the vehicle. Some customers may compare it to a manual transmission vehicle.

Mechanism

When the accelerator is pressed lightly (approximately 20 percent or less), the lockup clutch is not released. This causes a direct coupling between the engine and the drive train of the vehicle. The slight shock is from the small clearances in the drivetrain gears, axle splines, etc. If the lockup clutch is not applied then, the shock is absorbed by the fluid cou-

pling in the torque converter. Under certain conditions, this same shock can also be felt when activating the cruise control.

Recommendation

Explain to the customer that what they are feeling is a normal operation. Basically, the lockup clutch is kept on as much as possible to increase fuel economy of the vehicle. Increasing the engine load (driving on hills or pushing the accelerator more) will disengage the lockup clutch sooner.

Try duplicating this during your road testing so you are familiar with the sensation. To do this, drive at a constant speed around 40 mph. Confirm that the lockup clutch is applied (use Select Monitor) and accelerate using light

throttle. You will feel a slight shock throughout the body of the vehicle.

Click noise when transmission shifts from 2nd to 3rd.

Symptom

When the transmission upshifts from 2nd to 3rd gear under light acceleration, a click can be heard from under the vehicle. Most customers will only notice this noise when they have the driver's window opened and are driving close to some structure that will reflect the noise back into the vehicle.

Mechanism

The noise is created when the 2-4 brake is released during the 2nd to 3rd gear upshift. At this

time, the clutch steel plates that are located into groves on the internal wall of transmission case shift creating the metallic click noise.

2nd to 3rd shift flare after vehicle is parked.

Symptom

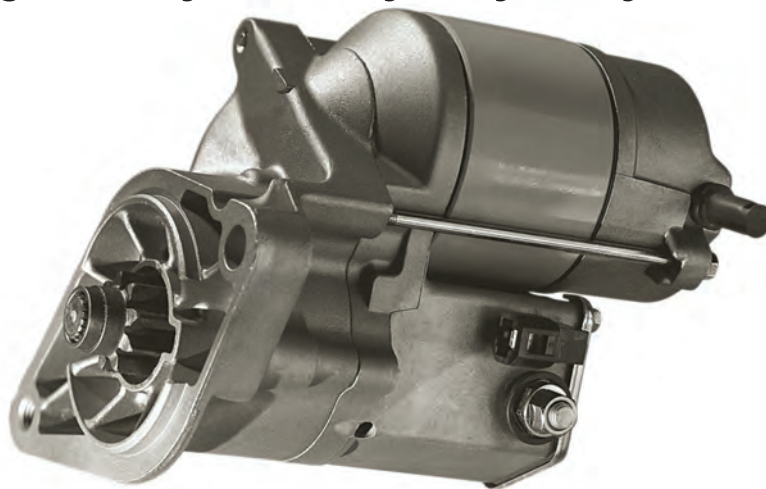
After a vehicle is parked and it sits typically overnight, when it is started and the transmission upshifts into 3rd gear for the first time, the RPMs may flare slightly. This can be an intermittent condition depending on how the vehicle is positioned when parked, temperature of the transmission when parked, and ambient temperature.

Mechanism

The shift flare occurs because the

Continued on page 30.

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hydraulic circuit for high clutch in the transmission occasionally drains. When the transmission upshifts for the first time into 3rd gear, the hydraulic circuit must fill before it will apply the high clutch. The time needed to fill the circuit slightly delays the applying of the clutch causing the RPMs to rise slightly. The transmission will function normally for the rest of the driving cycle.

Recommendation

Explain to the customer how and why they are experiencing this symptom. Also, make sure they understand it is not causing any damage or excessive wear to their transmission or vehicle.

Transmission delays downshifting during low to middle speed acceleration.

Symptom

The driver wants to accelerate quickly and starts applying the throttle, but the transmission will not downshift to a lower gear ratio until almost full throttle.

Mechanism

Basically, the logic (normal shift map) that controls gear selection is trying to keep the transmission in the highest gear possible for fuel economy.

Subaru vehicles utilize a microcomputer (TCM) for accurate control of the gearshift timing, engine braking, lock-up clutch operation and other functions. It directly corresponds to throttle opening, vehicle speed, engine speed, and gear selector position. Various sensors and switches located on the vehicle feed information to the TCM. The TCM will make calculations based on all these inputs. The throttle position sensor provides electrical signals corresponding to the accelerator pedal position. The TCM not only can calculate how far the accelerator pedal has been depressed, but how fast it was depressed. In other words, the system detects and based on the driver's direct input from the accelerator pedal will shift the transmission.

Depending on the vehicle speed, if the accelerator pedal is slowly pushed down even to the floor, the TCM may not downshift the transmission. If, however,

you quickly depress the accelerator pedal to the floor, it certainly will downshift into whatever the TCM determines to give the driver the best gear range for power and acceleration. This is a direct driver input and depending how far and fast the accelerator pedal is depressed will determine the vehicle power and acceleration. This gives the driver some ability to operate their vehicle based on power or economy.

Another item to consider is the internal operation of the transmission. In most cases, the TCM must turn off one clutch and apply another to change gears. If a clutch is turned on or off too soon it would cause a harsh shift. It also could cause premature wearing of the clutches. The logic was chosen to provide a balance of shift feel and wear characteristics. Fluid temperature is also a consideration. Cooler thicker fluid takes longer to move through a given passage than warmer thinner fluid.

Recommendation

Explain system operation to the customer.

High Frequency noise at 65-70mph.

Symptom

The driver hears a high frequency noise (whine) between 65-70mph during a steady throttle or coasting. Noise can only be heard driving on a smooth flat road with the windows up and radio off.

Mechanism

The noise is being generated by the reduction gear teeth in the rear of the transmission. The noise will only be heard on slight acceleration or coasting not both. Noise is not an indication of an internal problem and will not create any.

Legacy/Outback A/C Operation

A change was made to the A/C operation on 2002 Legacy and Outback vehicles, starting with 7/18/01 production date.

The "recirculation" (RECIRC) button is electronically overridden (cancelled) when the selector switch is moved to any part of the defrost mode.

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