

Shark Bit



NOV 29 2000 Version

Models 1980-1993

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ABS

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1 Legal and Safety Notice

The procedures described in this document are for information use by professional, trained automotive technicians ONLY. Use this document at your own risk.

Use extreme care and caution when working on vehicles. Risk of crushing death (vehicles falling from jacks), dismemberment (rotating equipment/heavy objects), explosion, fire, electrical and chemical burns, respiratory, eye and hearing damage are all real hazards.

Wear proper protective equipment and study safety before proceeding with any operation. Consult local work safe authorities for information on safety equipment, work practices and requirements. Do not proceed with work unless you have had training, and have checked with another person to be 100% sure the job environment and proposed procedures are safe.

This document has not been approved, checked or certified in anyway by Porsche, or any other governing body. The Author disclaims liability for all damages and or injuries resulting from the contents or use of the contents.

2 Introduction

2.1 Model Information and History

2.2 Service Tools and Products

(Not completed)

Besides the basic compliment of sockets, pliers and wrenches, the following is a minimum listing of products & tools:

Hearing, eye, hand and respiratory protection.

Floor Jack with 4 adjustable jack stands of same type

Mechanical – Special tools

Flywheel lock tool – required for cam drive belt/water pump

9201 Belt tension tool – rental is available

VWxxx Tie Rod separator

***2.3 Specifications and
Recommended Lubricants***

3 Maintenance

In most situations vehicle maintenance is ultimately the responsibility of the owner. A good number of inspections and tasks can be accomplished at home, provided you have a garage, etc. Despite the promise, most shops don't have the time to spend with a car to determine all of the details around problems that come up. When even the most minor problems start to add up, the ownership experience becomes tainted.

Cars don't have a personality, aren't good or bad. I don't believe in the term "lemon". Each and every car can be made to operate as designed and be reliable – it just takes expertise, and the right remedial action.

Every fault or problem has a reason. A failure or fault on a vehicle is either a flaw inserted at the manufacturing stage (premature failure), the result of improper or neglected maintenance, improper service or a "normal" failure due to age or use.

The remedial action for a failure requires troubleshooting process to determine the problem, then corrective action. All too often the troubleshooting process is shortened and the corrective action is successive parts replacement. Not only does the cost of the service drive up, there is often incorrect installation in replacement of perfectly good components.

I believe maintenance should follow a balanced approach. For example there is no reason to be obsessive about oil changes while driving 50,000 miles on ripped CV joint boots. You are better off following the factory interval for oil changes and paying attention to some of the less obvious items, like brake fluid and the cooling system. A properly maintained car not only lasts longer and it's simply more enjoyable to drive.

3.1 Schedule of Maintenance Tasks

See	Interval in Miles	15,000	30,000	60,000	Every	Every	100,000
Section	Description of Task	24,000	48,000	96,000	2 Years	4 Years	10 years
	Km's						
	Change engine oil and filter – Consider every 7.5-10K miles	X					
	Fluids Service	X					
	Inspection Service	X					
	Lubrication Service	X					
	Exterior & Interior Finish	X					
	Automatic transmission - Change ATF and filter		X				
	Replace air filter		X				
	Replace air pump filter		X				
	Check camshaft drive (timing) belt		X				
	Check & top up oil in drive (timing) belt tensioner		X				
	Replace Spark Plugs		X		X		
	Exterior Polish		X				
	Replace oxygen sensor			X			
	Replace fuel filter			X			
	Replace camshaft (timing) drive belt			X		X	
	Manual Transmission - Change Lubricant			X			
	Differential – Change Lubricant			X			
	Brake and PSD (PSD for 1990&up) Fluid Change				X		
	Cooling System – Renew coolant (opt. Flush)				X		
	Renew crankcase breathing (PCV) hoses, injector rail service, idle stabilizer						X
	Replace cooling system hoses						X
	Replace V and poly-rib belts						X
	Inspect/Replace ATF, Power steering hoses,						X
	Inspect/Replace motor mounts						X
	Inspect/Replace oil filler neck, crankcase breather hose and oil pan gaskets						X

3.2 Oil & Filter

1. Optionally flush engine per product instructions. Change oil when the engine is warm. Wear eye and hand protection and suitable work wear.
2. Loosen oil filler cap. With car raised, undo oil drain plug and drain oil into catch pan.
3. Remove oil filter.
4. Smear some oil on the new filter's gasket before turning hand tight on engine. This is about $\frac{3}{4}$ of a turn after the gasket contacts the engine block.
5. Install drain plug with new gasket. Tighten to specified torque only. DO NOT overtighten.
6. Add new oil, run engine. Check for leaks. Recheck level once again.

3.3 Fluids, Inspection and Lubrication Service

The following fluids are to be checked per the maintenance schedule:

- Engine Oil
- Coolant level.
- Power steering level
- Brake Fluid
- Clutch Fluid
- Automatic Transmission
- Washer fluid.
- Windshield intensive cleaning reservoir

Inspect the following items on suggested maintenance intervals:

3.4 Automatic Transmission (AT)

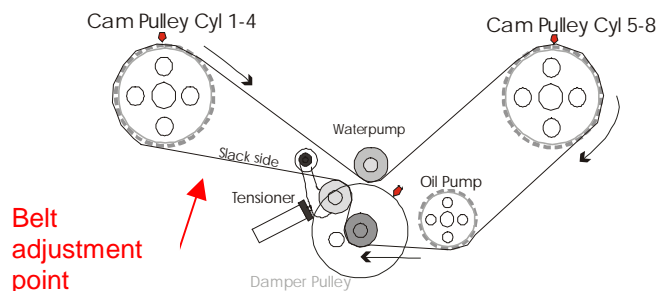
Inspect the AT fluid (ATF) level by raising the car so it's level. Use extra caution. Start the car and cycle through R and 2 3 D back to P. With the engine running check fluid level. Note temperature as the fluid volume expands when heated. There are two levels on the sight window, one for when the fluid is at operating temp and the other for room temperature.

3.4.1 Replacement of Filter and Fluid

3.5 Air & Air Pump Filter

3.6 Fuel Filter

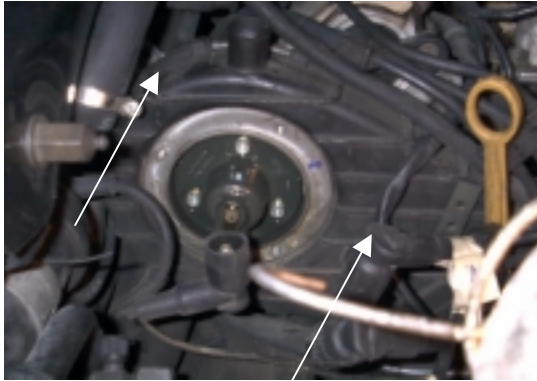
3.7 Camshaft Drive (Timing) Belt Inspection and Adjustment



There is a tremendous amount of hype generated about the 928's camshaft drive or timing belt, when compared to other cars with a similar setup. Justifiably so, when neglected, improperly maintained, or mechanical/bearing failure results, the camshafts can cease to be rotated by the belt. This causes some of the valves to remain fully open, while the engine may still be turning, and the tops of the pistons hit the valves, bending the stems.

The 928 is not much different than any other car when it comes to this belt, other than the length of the belt. The belts are constructed to be very tough and reliable when properly installed and adjusted. Short life or belt failure is usually not the result of the belt itself, but for other reasons:

- Water pump bearing failure
- Tensioner pulley bearing failure
- Belt tension too tight, or ineffective tensioner, resulting in wear on the cam sprockets and excess loads on the water pump/tensioner pulley bearings.



For 85 and later cars, a belt tension light is incorporated into the tensioner. If encountering a "Belt Tens" warning light, always verify the wiring to the CWS and the switch contact is in fact an open circuit (not grounded) before proceeding with belt adjustment. The switch will go open circuit at belt tension gauge reading of about 4.0.

Porsche tool 9201 belt tension gauge is required to ensure the belt is adjusted to the specified tension.

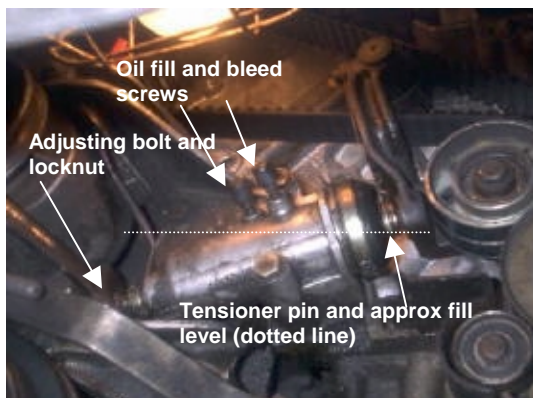
1. Remove left cam cover.
2. Turn engine clockwise to TDC, when the cam marks are aligned. Install the gauge on the belt and take a reading.

Correct value is:

5.0 +/- 0.3 for 8x and up models

4.0 +/- 0.3 for 8x models

Adjust belt by using tensioner adjustment bolt (loosen lock nut)



3. Turn engine clockwise for two revolutions of the crank to TDC, cam marks aligned. Take another reading to verify. Turn the engine around again to TDC and re-verify readings.

There are a few other methods that can be used if the gauge is unavailable. First some background. The belt draws the cam pulleys clockwise, against forces of friction, inertia and the valve springs, under engine acceleration. Under engine deceleration, the cams might actually drive the belt somewhat, as the crank slows. Also, at certain points the valve springs push the cams ahead.

The oil and water pumps load the belt. Therefore as the engine rotates, the belt is in tension from the 1-4 cam pulley, with the highest belt tension at the point into the crank pulley, much like a string with 4 weights hanging from it.

The slack side of the belt is where the tension pulley is located. The idler pulleys are located at strategic locations and come into play when the engine rapidly accelerates, then decelerates, which cause belt deflections. As the belt deforms, it contacts the idler pulleys, and suffers little wear. Note the idler pulleys are lightweight, as they have to be accelerated from a rest position when the belt contacts the surface.

The tension that is applied to the belt by the tensioner roughly equalizes the tension of both sides of the belt at TDC, cam marks aligned.

Several owners have obtained correct belt tension (verified later by using the gauge) using the following methods:

One turn of the adjustment bolt after the tensioner switch makes contact.

Using maximum twisting force possible with one hand, the ability to twist the belt to 90 degrees the adjustment point.

Keep in mind the only definitive way to set belt tension is with the gauge.

Porsche recommends the belt tension be re-checked 1500-2000 miles after a new installation, to ensure proper tension.

3.8 Differential

3.9 Belts and Hoses

3.10 Wheels and Tires

3.11 Air Filter

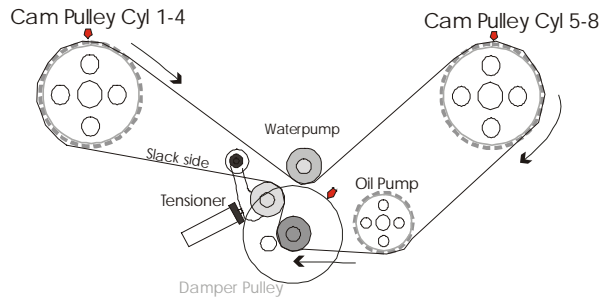
3.12 Long Term Storage

Here is our advice for winterizing or storing a 928. You are battling several things when storing a car. Moisture resulting in corrosion is the #1 enemy, manifesting itself in both external and internal damage.

1. For the most thorough preparation, start with brakes. Blow or clean all brake dust from calipers. Remove calipers and clean, spray piston seals with LPS #2 or suitable moisture inhibiting lubricant/protectant. Remove rear rotors and lube the parking brake assembly & metal surfaces using the lubricant/rust inhibitor. OPTIONALLY Apply light lubricant spray to rotors sparingly to prevent severe rust formation. Bleed brakes at this time if fluid is more than 2 years old.
2. Optionally coat the suspension joints and check the boots for any damage, cuts or tears.
3. Apply a protecting agent to door & hatch seals and rubber parts, lubricate all locks, hinges & sunroof guides. Clean the bottom door drains, remove door seal at the bottom only and apply rust inhibitor to door bottoms and drains. Re-install the seal.
4. Change the oil if it has not been done fairly recently (in the last year or so). Ensure the brake fluid, the coolant and transmission fluid have all been changed within the last 2 years. Coolant must be a 50/50 mix for proper freeze protection. Make sure windscreen washer is also freeze protected.
5. Add a fuel stabilizer to the fuel tank.
6. Run the car, idling is fine, with the A/C on until the exhaust is hot and all moisture has been expelled from the exhaust system.
7. If sitting for more than say 2-3 months, fog the engine with an Engine Storage Sealant by either a) Fogging through a suitable vacuum line with the engine in IDLE run or b) through the spark plug holes. Follow the instructions on the can, and watch the spray spout does NOT get sucked into the engine. DO NOT spray past the heated wire mass sensor and get that part coated.
8. Charge battery at 2-6 amps for 24 hours using the post in the engine compartment. After charging remove the ground strap at the back. Charge again in a few months.
9. It's best to provide for air circulation if covering the car. Use two covers if possible, with an air gap in between. Portable storage sheds are a great idea. Optionally use a safe, circuit overload and thermally, ground fault protected heater set to low in the back hatch of the car, blowing forward over the seats folded in the down position. If possible have the windows open a slight crack, and have the rear hatch popped.
10. Prop the wipers up off the glass. Jack the car up to reduce load on the tires - they will lose their shape but should return to round after heating up again. It also might be a good idea to carefully and partially support the engine up off the mounts especially for long term storage.
11. Apply a suitable leather conditioner to the interior. Buffing and waxing the exterior is a good idea too, but of least importance.

4 Engine Operations

4.1 Camshaft Drive Belt Replacement



1. Raise car to allow access underneath and from the engine bay. Drain radiator using the plastic plug under the rad as shown by the arrow. Drain the engine block at the same time, using the two drain plugs (13mm socket) at either side of the engine if the



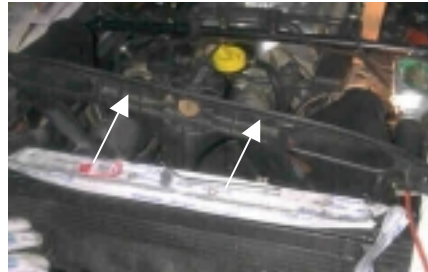
water pump is part of the job.

2. Disconnect the battery ground strap inside the rear hatch. Remove the tool kit and there is the black strap with a wing nut.
3. Remove both upper and lower rad hoses by undoing clamps at each end. Remove 1/2" hose from engine as well.
4. For PRE-MY87 you have to remove the gaggle of cables for the throttle, cruise, transmission, and move out of the way.
5. For MY87& onward you'll have to remove the transmission cooler line piping (arrow) and oil cooler piping at the top of the rad to give clearance for the fan shroud. These are undone using two large open-ended

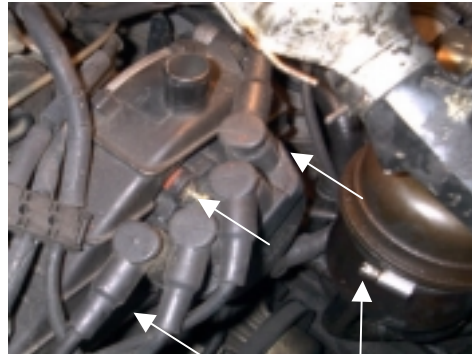


wrenches with one countering.

6. Remove fan shroud (or console) by removing the two bolts at the top (arrows) and the air pump hose. Pull upwards/out and unplug the wiring to the fans, at each fan housing.



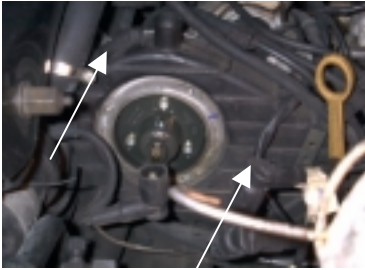
7. Unscrew the distributors on either side. There are three slotted/hex head screws that hold the distributors in place. Label or mark and disconnect the ignition wires or use some wire to hold the distributors up and out of the way. You'll want to disconnect the power steering pump reservoir-holding band as well for easier access.



8. Release tension from and remove V-belts for A/C, power pump, air pump and the flat belt for the alternator. If the belts are just being replaced anyway, cut them off to save some effort.



9. Remove the two upper cam belt covers, by removing the three bolts that secure the right cover and two on the left, shown below. (10mm socket).



10. For manual cars remove the clutch slave cylinder from the flywheel housing. Take off clamp on clutch hose holder and remove the push rod. Let cylinder hang down with line connected. (**Never operate the clutch with the cylinder disconnected**)

11. For auto cars simply remove the two bolts that hold the small rectangular cover plate on the flywheel housing.

12. Use a 27mm long socket to turn engine CLOCKWISE to 45 degrees before top dead center (BTDC) cyl. #1, as indicated on the damper pulley, and reference pointer. **Turning the engine counterclockwise may damage the tensioner.** The camshafts can be rotated in this position without impacting the valves on the pistons.

13. Insert special tool #9161 /1 with original bolts to lock the flywheel/crankshaft. Don't over-torque and strip the threads.

14. Using a bolt breaker bar, a rugged ½ or ¾" 27mm deep socket loosen the pulley bolt at the engine front. Because of corrosion, estimated torque to remove may exceed 500 ft lbs. (I had to use a 4 ft. lever). It's NOT a reverse thread.

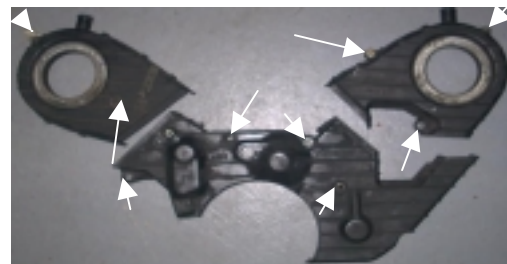
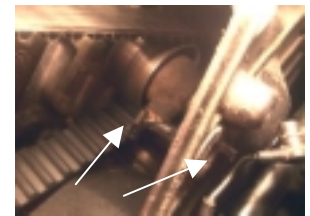
15. Remove the pulley, A/C belt pulley and damper pulley, and collar. Because of corrosion you'll likely need a good penetrant, a rubber hammer and some sort of heat source, safest being a heat gun. Spray the penetrant in front, behind and in-between the pulleys. After heating, tap the pulleys on the outer edges to work loose. This may take some time to do. Let the penetrant work for 4-8 hours if possible. Work the

pulleys free. Do not use a puller, or steel hammer. The damper is an expensive item.

16. Tap the pulleys with a rubber mallet to work them free. Again be patient if they are difficult to remove.



17. Once the pulleys are off, remove the lower belt cover to expose the timing belt, water pump and tensioner. The belt tensioner switch connection is mounted on the lower cover, and unplugs at the cover itself and the top of the tensioner arm.



18. Remove the power pump by undoing the two bolts and third adjustment bolt. Remove the alternator console (3 bolts) as well and carefully lower the alternator onto a support like a wooden or plastic box of suitable size.

19. Although not in the factory manual procedure, two wiring harnesses have to be disconnected before the belt can be removed (this is an S4). This is because the

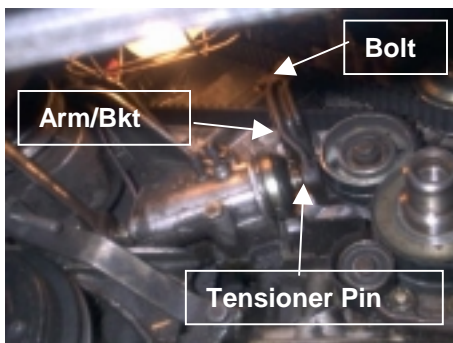


cables are routed through the opening of the belt loop of the right side when facing the

engine. One multi-pin connector is on the left side of the engine bay under the post used for jump starting, and the other on the right side of the engine bay. A cable clamp at the left side of the engine behind the left pulley has to be undone as well, and access is tight.

20. Before undoing the belt, mark the cam pulleys on the reference marks of the back plates. Since the cams are adjustable, the stock marks may not reflect the cam position. If you mark and release the belt with the engine at TDC, the 1-4 cam pulley will rotate back and the 5-8 may also when the belt is released as they are sprung by the valves. The cams "sit" at 20 Deg ADTC, so you can turn the engine to this location and mark the cams there for convenience. The pistons will contact the valves if the engine is rotated without the belt attached. **The cams maybe rotated without damaging the valves if the engine is positioned only at 45 Deg BTDC.**

21. Completely slacken the toothed belt by first loosening the locknut and turning the adjuster bolt counter clockwise.
22. Unbolt the tensioner bracket, and the copper electrical strip (may require a socket or hex key). Remove the tensioner. The drive pin from the tensioner sits fairly deep into the bracket that holds the tensioner pulley so carefully separate the two. Pull the bracket out toward the front of the car.

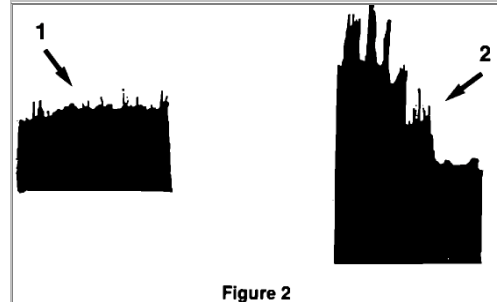


23. Remove the belt from the right had side over cam sprocket 1-4 and the water pump pulley, cam sprocket 5-8 the oil pump and finally the crankshaft.
24. Refer to the sections for water pump removal and tensioner maintenance.

4.1.1 Cam Belt Installation

Handling of the belt is a concern. Make sure the belt is not stressed or kinked when installing.

To prevent damaging toothed belts, it is very important to avoid sharp bends when packing, storing and handling toothed belts.

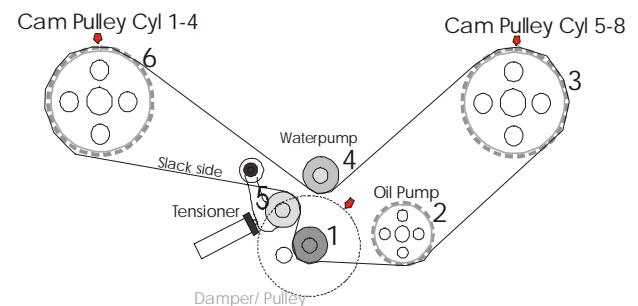


Tests reveal that sharp bends influence the stability and, therefore, shorten the lifetime of the toothed belt considerably. The break of a damaged camshaft belt (4 and 8 cylinder engines) is almost straight across (Figure 2, arrow 1) as compared to a slanted break from belt failures for other reasons (Figure 2, arrow 2).

Installation is a relatively stress free process if a sequence is followed. The key is to "preload" the belt around the 5-8cyl cam sprocket by pulling the 5-8 pulley into proper position by hand. The tension comes from the valve springs as they pull/hold back the cams (at or near TDC).

To facilitate pre-loading of the belt, position the crank between 5 and 10 Deg BTDC (if you are installing at TDC). I used the damper pulley and moved it by hand (with gloves). Also position the cam pulley about one notch before your reference the mark.

Install the belt on the crank pulley(1), the oil pump (2), cam 5-8 (3), the water pump(4) and tensioner (6). I left the belt just off pulley 1-4.



With the belt in place but just off cam pulley 1-4, slowly rotate the crank the short amount to TDC

by hand, grasping the damper to bring the marks in-line for pulley 5-8 and the damper.

At TDC the 1-4 cam sprocket needs to be held in place, while slipping the belt on and for initial tensioning. By removing the ignition rotor, a socket can be used to carefully position the cams. **DO NOT loosen the cam adjustment bolts.**



Now you are free to work on getting the belt positioned over cam sprocket 1-4. Use the socket wrench to position and hold the cam sprocket and slide the belt on the sprocket.

Turn the tensioner bolt clockwise to apply tension to the belt and prevent slipping.

Use an ohmmeter to check the belt tension switch. Turn in the tensioner bolt until the switch makes contact to ground, then turn the bolt about one more turn. Rotate the engine clockwise by hand several more times stopping at TDC to make sure the reference marks line up.

Refer to section regarding belt tension adjustment. Top up tensioner oil. Ensure belt doesn't come in contact with oil or grease. Clean and replace all removed components in reverse sequence. Torque fasteners to specified settings.

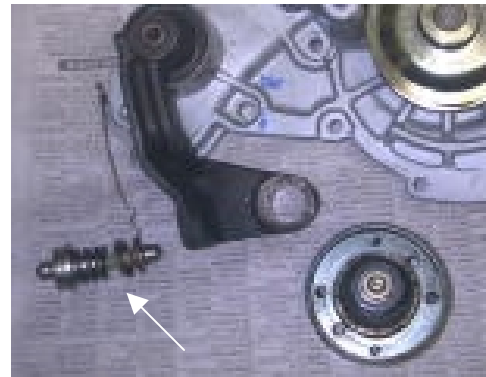
4.2 Cam Belt Tensioner Service

The cam belt tensioner consists of a body, an adjustment bolt, a bimetal disc pack surrounded by oil, a piston on and a pin (or a spring loaded pin forming an electrical switch on 85 & up cars) surrounded by a rubber boot.

Since the aluminum block and heads expand with heat, and the 928's belt covers a large area, there is a need for thermally based "detensioning".

The bi-metal washers in the tensioner act as a thermal spring, much like a thermostat. The reason for so many washers is to obtain the desired travel. The oil provides both hydraulic dampening, and lubrication.

As shown below (arrow) for 85 & later cars a spring, pin & housing, and copper contact assembly make up the tensioner switch. When the belt is tensioned, the spring compresses until you are seated on the thermal washers, and the switch makes contact as the front half of the pin connects to the rear housing.



In this position the thermal washer pack can

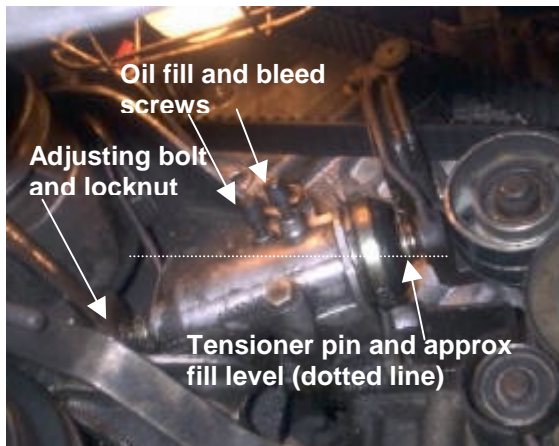


perform its designed function. If belt tension goes out of spec the switch breaks and you get the BELT TENS lamp from the CWS module.

If troubleshooting a BELT TENS lamp fault, always check the wiring to the tensioner first, as it is subject to engine vibration. The wiring plug connection for the belt tensioner circuit is mounted on the lower cover, and unplugs at the cover itself and the top of the tensioner arm. The switch maintains a connection to ground when there is adequate belt tension

The early warning system has a 5 minute delay after startup. I suspect this delay is for when the engine is very cold. But after 5 minutes of running the block heats up enough to bring everything back to specification.

The tensioner is serviced on the car by ensuring there is adequate oil in the device. The tensioner is filled approximately 50-70% full as it



sits on an angle with the oil being retained by the boot. If the boot is broken or cracked, the oil will leak out. Fill the tensioner with warmed gear oil (75W90 or equivalent) when the belt is installed & tensioned.

When the cam belt is removed the tensioner and arm can be more thoroughly examined. The tensioner arm mounting bushings must not be worn and the roller turning freely without restriction or abnormal noise. The tensioner pulley must also turn freely without restriction or abnormal noise. If in doubt either replace or have someone examine the parts who is more experienced. The boot must be supple and free of cracks.

The switch operation can be checked by assembling the spring and copper lead as shown, and compressing the spring in a vise. The copper lead is connected to the rear pin when the spring is sufficiently compressed. Installed in the tensioner, the closed switch provides a path to ground, indicating adequate belt tension.

The switch does not indicate if the belt is too tight, however.

Finally, always replace the tensioner boot and clamp when replacing the timing belt at the specified interval.

4.3 Water Pump -Checking, Removal and Installation

The water pump is a critical engine element as it is driven by the smooth or back-side of the cam belt. If there is bearing trouble the cam belt is affected.

As a rule, water pumps should be replaced along with the cam belt at the prescribed interval. If the cam belt is being replaced earlier, the water pump can be checked.

Signs of a defective water pump are leaking of any kind around the shaft seal, noisy or rumbles during rotation, and excessive play felt when grasping the pulley and applying some up/down pressure. Age is also a factor. If in doubt consider replacement.

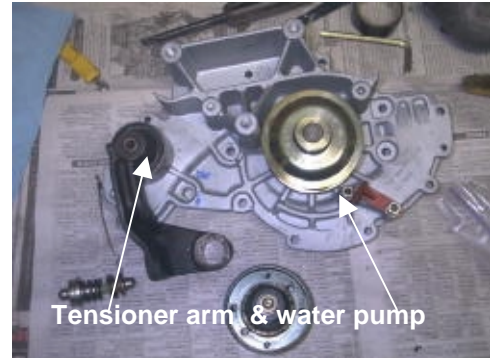
Note - A replacement pump with a plastic impellor is desirable, so that in the rare event of a bearing failure, the engine block (or pump housing) will not be damaged.

4.3.1 Removal & Installation

1. Follow the procedure for cam belt removal. Drain coolant from the block. Undo the bolts that mount the pump.
2. Carefully separate the pump from the block. Clean block, removing traces of RTV and gasket using gasket remover, #320 fine sandpaper, etc.
3. If bolts are broken they must be first ground flush or flat if not already so. The old water pump is used a drill centering tool for starting the new hole. Once the hole is established the old pump housing can be removed again and the hole drilled to a sufficient depth. Tap with a M6 x1 metric tap. It's important to get the holes on the block centered or the holes on new housing will have to be enlarged.

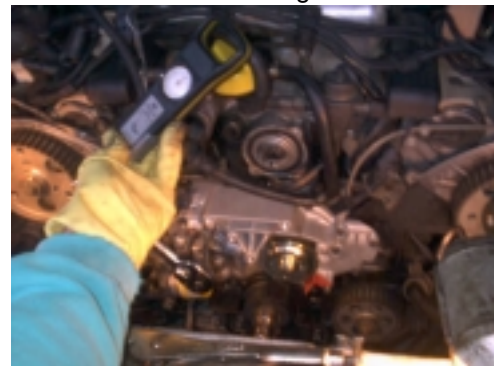


4. Remove the tensioning arm mount post and damper pulley reference mark from the old water pump housing, and re-install on the new core. Porsche recommends no



substance be applied to the pump gasket. If you want to, spread only a very thin layer of RTV blue sealant over both sides of the water pump gasket. Install the water pump on the engine

5. Install all bolts being careful to use the shorter ones for the countersunk holes. Torque each bolt snug a first working around the housing in an even manner.
6. Torque all bolts to specified torque, less 2 ft-lbs. Wait for 10-15 minutes for gasket to compress or RTV to move outward. Check torque on bolts once more.
7. If a torque wrench that reads in the lower ranges is not available, you can improvise by using a fishing gauge and a socket driver as shown here. I am using a 6" handle and



required 20lbs of pull force to achieve 10 ft-lbs torque.

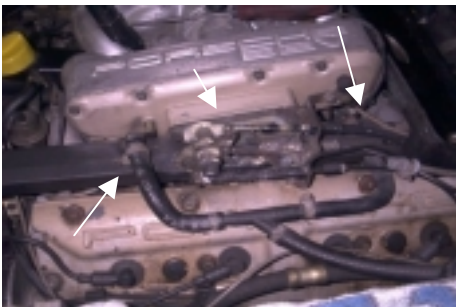
8. Follow procedure for cam belt installation

4.4 Series 4 Intake Removal

Removal of the intake facilitates several operations including service of the idle stabilizer, resonant intake flap, oil filler neck, engine crankcase breather hoses and vacuum lines. Refer to the diagrams in the section for engine vacuum, air and fuel injection before proceeding.

Parts required are intake gaskets, and dependent on the age of the existing parts, fuel injector O rings, emissions breather hose (one in particular), and the idle stabilizer unit.

1. Remove strut brace, raise car to comfortable height, install fender and front guards and remove hood for easier access. Disconnect battery ground strap.
2. Remove air intake hoses, and undo air intake cover clamps. Remove air filter. Unbolt the base of the air filter box, and remove separating from hose attached to the base on one side.
3. Unbolt the accelerator cable assembly from the side of the intake and move to the side. Undo the hoses from this side as well. Remove the plastic fuel injector rail covers.

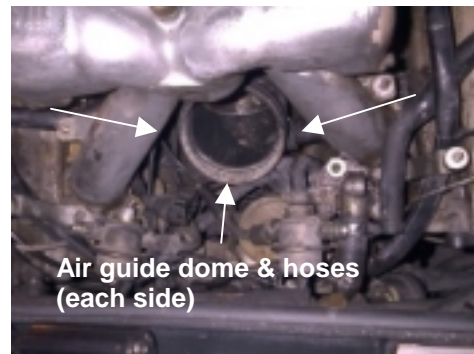


4. Remove the fuel line unions at each end of the fuel injector rails. This is a total of four unions. Counter hold with a second wrench and catch the fuel that escapes. As well, have several rags handy to wipe any spilled fuel.
5. Remove the two nuts that hold each fuel rail. Work the rails loose with spray lubricant, and carefully prying upward. If it has been



years since the rails were last removed, the O-rings may be stiff & dry making them stubborn.

6. Working from the passenger side/rear (or as required dependent on position of the clamp screws) of the intake with a long screwdriver, unscrew the clamp for the air mass flow sensor & remove. Disconnect the throttle cable and the plug for the throttle position switches from the throttle valve. Unscrew clamp, and the large rubber vacuum hoses with plastic fitting from the air-guide dome. Remove the air guide dome.

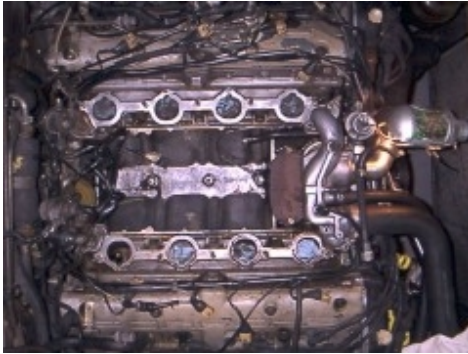


7. Tucked underneath the intake, slightly rearward is the rotary idle actuator, or stabilizer. Disconnect its electrical connection. A special tool is available to do this. A screwdriver can also be used to pry the thin wire retainer from the plug, sighting the end of a thin screwdriver through the intake's drain hole from above.
8. Unbolt the one bolt from the small cooling jacket covers that hold the air box supports and the fuel pressure dampers, so the air box supports may be lifted from the rear of the intake when the intake is removed.



9. Undo the bolts securing the intake manifold, removing the washers and inserts (if possible). Loosen the fitting for the vent line that is routed over the 5-8 cam cover so the intake can be lifted slightly. Mark and remove all remaining hoses and remove the intake from vehicle. Clean or vacuum and

cover or stuff rags in the intake openings to prevent dirt, small parts etc. from falling in.



10. While the intake is off inspect hoses & fittings. In addition to new intake gaskets, and hoses consider: replacement of fuel injector O rings, replacement of oil filler neck gasket, testing of flap actuator, lubrication of the flap shaft and butterfly, replacement of idle rotary actuator, testing knock sensors (see ignition section), refinishing of intake manifold.
11. Testing of the flap actuator is quick and simple. It requires a vacuum pump (\$50) to connect onto the flap vacuum line. The alloy flap, located at the center of the manifold as shown, opens by rotation when vacuum is applied. When the flap moves it opens a passage between both sides of the manifold tuning the intake to optimize induction and noise caused by resonance of the intake



system (that's a guess).

12. Installation is the reverse of the above. Note the tightening torque for the intake nuts is 11 ft lbs. Refer to the diagram for routing of hoses. Ensure hoses and electrical devices are properly routed and connected.

4.5 Series 4 Intake & Cam Covers Refinishing

The finish on the S4 intake cracks and peels with exposure to heat and of course age. The base aluminum oxidizes in spite of the finish.

While there are specialized coatings and extensive procedures that can be done, to be able to DIY we'll take a different approach here.

4.5.1 Preparation

The flaked paint and surface has to be prepared for the first stage of either aluminum paint or aluminum primer. Both products are available in auto supply stores, in a spray can form. The primer contains zinc chromate and is specifically designed for adhesion to bare metal and aluminum.

If the intake is flaking badly most of the original surface paint has to be removed. **Note – Personal Safety Equipment is required for this job: eye, ear and appropriate breathing respirator/lung protection.**

We removed the old finish with a brass wire brush, small and large, and a high-speed drill. Also compressed air can be used blast off flaking sections. The old surface, in visible areas, has to have the oxidation removed as well. The wire brush followed by a 180 or 240 paper is suitable for this job.

4.5.2 Finishing

This plastic grocery box makes an excellent base for working. Mask areas that are not to be painted. Apply several coats of zinc chromate or aluminum primer suitable for bare metal. Sand and finish with a primer/filler to desired smoothness. To do a decent job this will take a few hours at least, dependent on how bad the existing paint on the intake is.





Zinc chromate primer is yellow, but can be found in grey too.

Apply a quality topcoat. We used a base/clear finish that is very durable, looks outstanding and can be matched to the original colour. You might consider using a body shop to repaint. A base clear system requires: a breathing apparatus with air feed (or painting outdoors with a proper full face respirator), base colour, base reducer, clear coat, clear reducer, Isocyanate-hardener. All total it's a few hundred dollars in the smallest quantities, but the materials can be used for work on the car body too.



5 Exterior Body

5.1 Finish Restoration and Polishing

The first step to restoration is assessment.

Wet sand – Unigrit 600 to 1000 paper

Medium Cut Cleaner or Compound for use with Rotary buffer and suitable pad.

Fine Cut cleaner

Swirl Remover, Meguiars #9. Good stuff.

Hand polish or dual action polish (optional)

Surface protectant

Final Inspection

6 Central Tube

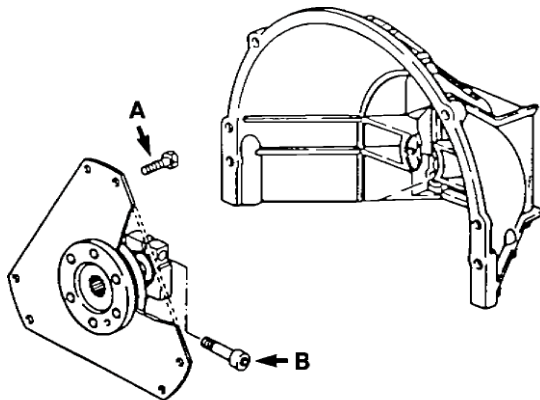


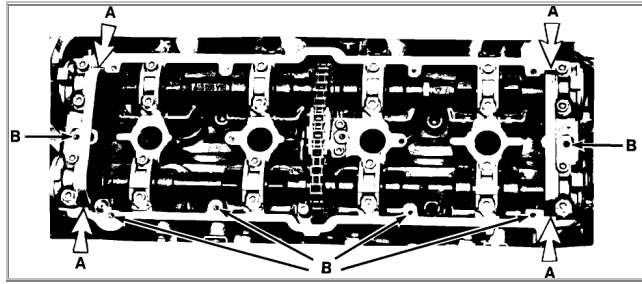
Figure 1

Repair Information:

After the central tube is bolted to the forward housing, first tighten the six (6) drive plate attaching bolts (A in Figure 1) to 32-39 N-m (23-28 ft.lbs.). Then tighten the clamping screw (B in Figure 1) to 75-85 N-m (54-62 ft.lbs.). Following this procedure will ensure necessary ninning clearance for the crankshaft thrust bearings.

Any damage to the engine which has been caused by improper central tube installation is NOT a warranty matter.

7 Head Cover Sealing 87 Models



When installing the cylinder head cover, additional sealing is required. Apply a small bead of silicon Silastic 730 RTV Sealer Part Number 000 043 019 00 in the area where the end camshaft bearing caps meet the head cover mating surface. (Arrows A)

Note: Avoid using excessive amounts of sealer.
Torque head cover bolts to 10 N-m (7 ft.lbs.).

928S4 Only:

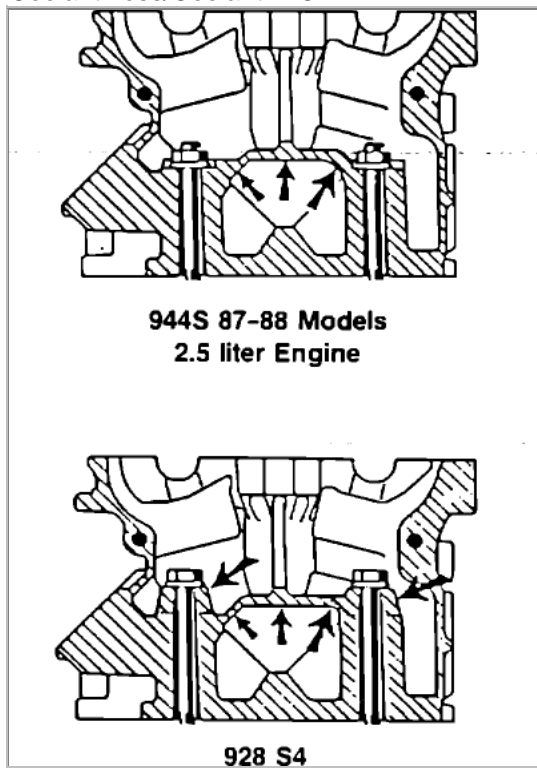
To improve sealing of the cylinder head cover, clamping pressure of the cover to the cylinder head is increased by using spacers Part Number N 013 811 2, between the guide washers and the mounting bolt heads. The spacers must only be added to the four (4) mounting bolts along the bottom (exhaust side) of the cover and the two mounting bolts, one centered at each end of the cover (Arrows B). Twelve spacers are required for repairing one engine.

Coolant Loss, Coolant In Oil

January 20, 1989

Subject:

Coolant Loss/Coolant in Oil



Loss of coolant or coolant in the engine oil may, among other reasons, be caused by cracks in the cylinder head cooling jacket. These cracks may begin in the area of the exhaust valve and extend toward the cylinder head mounting bolt holes. The figures show possible fracture locations.

If coolant loss with no visible external leaks is found, the cylinder head should be checked. To test an installed cylinder head, remove the cylinder head cover and apply 1 bar maximum (14.7 psi) pressure to the cooling system. Check for leakage of coolant in the areas of the arrows and/or pressure loss.

For 944S cars, an improved cylinder head is available. The part number is unchanged.

For 928 S4 cars, a new cylinder head PN 928 104 014 03 is installed from Engine No.:

81K00121 Manual Transmission
81K05240 Automatic Transmission

Refer to Technical Bulletin Group 1, No. 8821, for mounting bolt information.

The previous version cylinder head, PN 928 104 014 02 should not be used.

If engine oil enters the cooling system it has to be cleaned and flushed after repairing the leak. Also change the engine oil and [oil filter](#).

Work procedure:

- I. a) Drain coolant (Radiator and crankcase drain plug).
- b) Remove expansion tank and clean, using a "radiator cleaner". Reinstall tank.
- c) Fill cooling system with 2 quarts "radiator cleaner" and water.
- d) Run engine to operating temperature and bleed system.
- e) After thermostat opens set heater control lever to "warm" and run engine with increased RPM for approximately 2 minutes.
- f) Stop engine, drain system.

II. Repeat steps C through F.

III. Flush system with water only until no oil or "radiator cleaner" is noticeable in the water.

IV. Fill cooling system with water and coolant. Bleed cooling system.

Refer to Repair Manual Volume I Group 19, Replacing Coolant and Bleeding Cooling System.

8

Retrofitting of R12 air conditioning systems to R134a (formerly R12).

General Information:

As of January 1, 1995, (January 1, 1996 for USA) production of R12 containing CFC substances is no longer permitted in accordance with legislation in the European Union and several other countries and will be made illegal (with specific exceptions) worldwide in the near future. Starting with Model Year '93 (P), all air conditioning systems of new Porsche vehicles are factory charged with non-CFC refrigerant R134a. The formerly used refrigerant R12 was phased out at the same time. A new type of refrigerant oil, ND-Oil 8, must be used in conjunction with refrigerant R134a. This refrigerant oil is of a synthetic type. The formerly used refrigerant oil based on mineral oils will not mix with the ND-Oil 8 refrigerant oil required for R134a.

Due to the chemical properties of the new [refrigerant](#) R134a and of the new refrigerant oil, modifications to the materials of various components exposed to refrigerant oil have become necessary.

The maximum [refrigerant](#) and refrigerant oil capacities are changed in this retrofitting process!

Retrofitting:

In most cases, older vehicles fitted with air conditioners charged with R12 [refrigerant](#) containing CFC can be converted without any major problems.

It is the responsibility of the dealer/retrofitting agent to maintain A/C system integrity during the retrofitting process.

It is of particular importance to draw off the R12 [refrigerant](#) and refrigerant oil charge. Recycling service equipment should be used for this purpose and to separate the refrigerant oil from the refrigerant.

Retrofitting operations should only be performed by qualified personnel in Porsche workshops. After retrofitting, a sticker should be attached near the compressor and

in the Maintenance Booklet to confirm that retrofitting has been performed according to specifications. This technical information provides you with an overview of the required scope of operations and parts requirements for retrofitting air conditioners to non-CFC R134a.

Warranty Information:

A two year parts warranty without mileage limitations applies to all Genuine Porsche parts used for retrofitting.

The dealer warrants the A/C system integrity, correct installation and execution of all retrofitting operations.

Description	Qty.	Part Number	Notes
Receiver Dryer	1	944 573 943 00	May also be retrofitted to A/C systems using R 12
O-ring 7.5 X 2 mm	2	999 707 247 40	Coat with fresh ND-Oil 8 when installing
Charging Valve (see note)			Tightening Torque: 10 - 12 Nm (7.5 - 9 Ftlbs)
High Pressure Valve	1	928 573 965 03	Angle Valve 90°
Low Pressure Valve	1	928 573 965 00	Straight Adapter
ND-Oil 8 Refrigerant Oil		PNA 573 001 40cc PNA 573 002 250cc	Capacity: 130 ± 20 ml (120 ml) Value in () = Cap. for R 12
Refrigerant R 134a		-----	Capacity: 860g 1030g with rear A/C
Self-Adhesive Label	2	964 701 141 02	Attach the self-adhesive labels in the following places: - on the body work near the A/C compressor - in the Maintenance Booklet

Assembly Note:

When fitting Angle Valves (A), remove the formerly used valve inserts.

When fitting straight adapters (B), the former valve inserts remain installed.



Installed Compressor 928 126 113 00 with drain plug.

TECHNICAL BULLETIN # 268

DATE: 1995

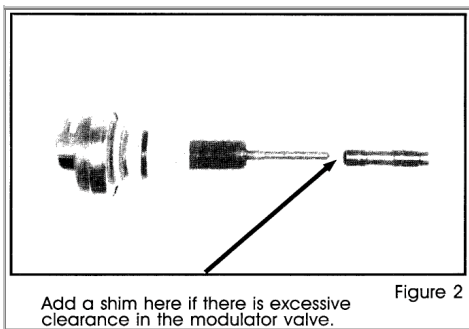
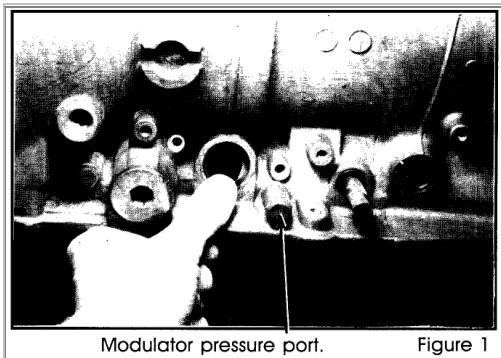
TRANSMISSION: 722.3, .4, .5

SUBJECT: Slipping or Soft Shifts

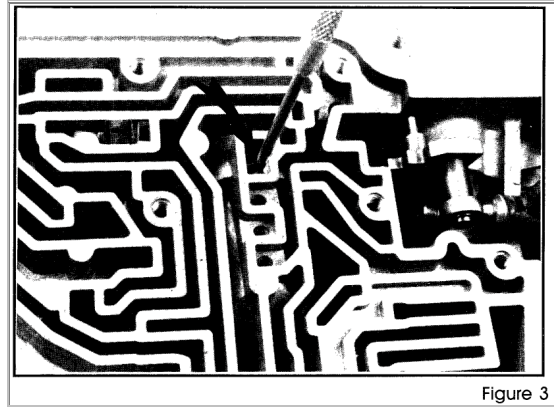
APPLICATION: Mercedes Benz, Porsche
722.3, .4, .5

Slipping or Soft Shifts

If a test of modulator pressure shows zero pressure at an idle in drive, try adjusting the modulator. If there is still no pressure, it may be due to excessive clearance between the end of the modulator and the modulator valve assembly.



To inspect for this condition, remove the modulator. Start the engine and press in on the modulator valve assembly (figure one). If there is now pressure showing on the pressure gauge, make a shim and install it into the modulator valve (figure two).



Inspect the assembly to make certain that all clearance has been removed. With the shim installed in the modulator valve, reattach the modulator to the [case](#). Remove the [valve body](#) and carefully push the modulator valve assembly against the modulator. Make certain that you use the exact location as shown in figure three. There should be no clearance and zero preload.

May 18, 1993

ATTENTION:
Service Manager/Service Technician

This bulletin supersedes Technical Bulletin Group 4, Number 9007, Book G, page 115.

Models Affected:

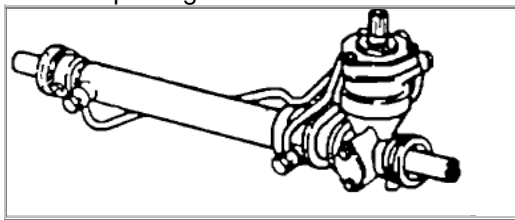
All

Concern:

Determining need to replace power assisted steering racks.

Repair Procedure:

In cases where the steering rack appears to be leaking, the following procedure must be applied before replacing the unit.



ZOOM

- a. Remove both rubber bellows from the steering rack housing and push aside.
- b. Clean the steering rack thoroughly in the area of the rack shaft and seals.
- c. At an engine speed of approximately 1000 rpm, turn the [steering](#) to the right stop and hold there under light pressure for approximately 5 seconds (the [steering wheel](#) should not be turned so hard as to activate the pressure relief valve). Repeat the procedure with the steering turned to the left stop.

Repeat 8 to 10 times to each side.

If ATF is noticeable on the rack shaft or on the housing in the area of the pinion shaft, replace the rack. If no leaks are found, the oil on the steering rack may be from another source such as the power [steering](#) reservoir, hoses, sealing washers, etc.

NOTE:

A light accumulation of oil in the rack boots over an extended period (i.e., between service intervals) should be considered normal and does not warrant replacement of the [steering gear](#). In such cases, the rack boots should be cleaned free of oil, reinstalled and the fluid level topped off. The vehicle should then be returned to the

customer for normal use. In so doing, the rate of oil accumulation in the rack boots can be more efficiently determined and a possible misdiagnosis avoided.

Repair Procedure (cont.):

Grease may be seen on the rack shaft or seals during the test. This is the lubricant used for initial assembly of the rack and must not be mistaken for an oil leak.

- d. Whenever a steering rack is replaced, the two rubber bellows must be replaced and secured on the housing.
- e. Whenever removing fittings or lines from the steering rack or pump, always replace the sealing washers.

Warranty Information (if applicable):

*Labor	48900200	Check power	25
Operation:		steering rack	TU
for leaks			

*Labor may only be claimed with steering rack replacement.

9 Camshaft Timing 87 S4

Camshaft timing checking and adjusting procedure.

- 1) Check adjustment of [drive belt](#), correct if necessary. Adjusting value: 5.0+0.3 (Refer to 928 Repair manual Volume I, Pages 15-102).
- 2) Turn crankshaft in direction of engine rotation to cylinder 1 TDC. In this position:
 - a) Both distributor rotors should point to the left (driving direction).
 - b) The markings on the camshaft sprockets and flange bearings left and right side should be aligned.
 - c) The markings (old version) or casting tabs (new version) on all camshafts should face the exhaust side of the cylinder heads.

At cyl. 1 TDC the tabs should face the exhaust side of the cylinder heads.

3) Checking Cylinder Bank 1-4 Install dial gauge holder, order number PNA 721 003 (VW387) with dial gauge and extension (tool number 9232) on the right cylinder head, cylinder 1 intake valve. The dial gauge must be perpendicular to the intake valve. Set dial gauge to 0 with 5 mm preload.

4) Turn crankshaft in engine rotation direction away from TDC cylinder 1 while observing the dial gauge. Continue turning until a valve lift of 1.6 +/- 0.1 mm for 85 and 86 model year cars or 1.8 +/- 0.1 mm for cars from model year 87 on is reached. The 20 degrees mark (after TDC cyl. 6) must now be lined up with the pointer on the [drive belt](#) cover.

5) If the 20 degrees mark does not align with the pointer, proceed as follows:

- a) Remove the [ignition rotor](#) and install and tighten three bolts 5 x 15 mm into the camshaft sprocket to prevent the camshaft and sprocket from turning while loosening the camshaft bolt.
- b) Loosen camshaft bolt, while counterholding. Make sure dial gauge still indicates desired value. If not, turn crankshaft in direction of engine rotation until the correct valve lift is reached again. Loosen the three 5 x 15 mm bolts.
- c) Turn crankshaft until 20 degrees mark lines up with the pointer.
- d) Tighten the three 5 x 15 mm bolts and then torque the camshaft bolt to 65 N-m (47 ft. lbs.) Remove the three 5 x 15 mm bolts. Recheck the camshaft timing.

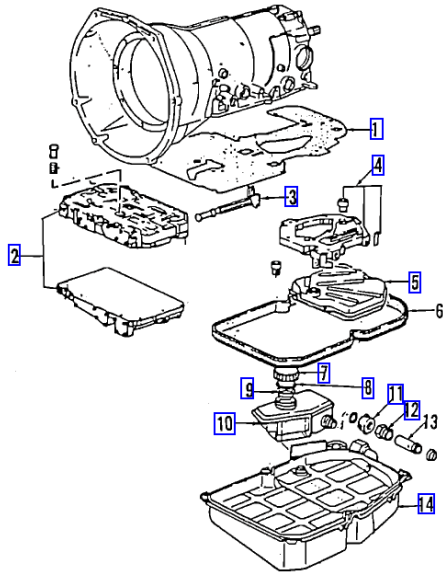
6) Checking Cylinder Bank 5-8

Turn crankshaft in engine rotation direction to TDC cylinder 6. Install dial gauge holder with dial gauge and extension, on the left cylinder head, cylinder 6 intake valve. The dial gauge must be perpendicular to the intake valve. Set dial gauge to 0 with 5 mm preload.

7) Turn crankshaft in engine rotation direction away from TDC cylinder 6 while observing the dial gauge. Continue turning until a valve lift of 2.0 +/- 0.1 mm (for all model years) is reached. The 20 degrees mark (after TDC cyl. 1) must now be lined up with the pointer on the [drive belt](#) cover.

8) If the 20 degrees mark does not line up with the pointer follow procedure outlined in step 5.

10 Automatic Transaxle



10.1 Preliminary Inspection Procedures

STALL SPEED

Do not conduct this test for longer than 5 seconds. Rear wheels must not be permitted to turn. Also, engine must be operating temperature and full power available. Turn all accessories OFF when conducting this test.

1. Connect a suitable tachometer onto engine as per manufacturer's instructions.
2. Start and operate engine at approximately 2000 RPM for 2 minutes prior to testing stall speed.
3. Apply parking brake completely and depress brake pedal.
4. Position selector lever into drive, completely depress accelerator pedal and check stall speed.
5. Stall speed obtained should be 2200-2600 RPM.
6. If stall speed drops by approximately 400-700 RPM, [torque converter](#) one-way clutch is slipping.
7. If stall speed exceeds specified limit by approximately 300 RPM, the transaxle is slipping.

8. If stall speed is correct and top speed is still not reached, one-way clutch is locking up in both directions or has seized. This will be noticed during fast highway driving by automatic transaxle fluid leaking through vent.
9. Stall speed will drop approximately 125 RPM for every 3280 ft. above sea level.
10. Excessively high ambient temperatures will affect stall speed.

MODULATING PRESSURE

The modulating pressure must be checked and, if necessary, adjusted before measuring any other pressure. Incorrect modulating pressure will adversely affect the operating pressure.

1. Disconnect vacuum line and plug opening, then accelerate vehicle on a dynamometer or road to 30 mph with selector lever in drive position and note pressure obtained.
2. Pressure readings should be 63.8 psi on A28.01 units, and 58 psi on A28.02 units. If pressure obtained is incorrect, proceed as follows:
 - a. Remove rubber cap from vacuum modulator.
 - b. Pull lock plate out slightly and turn vacuum modulator adjusting screw using the lock plate. One complete turn of adjusting screw will change modulating pressure by approximately 5.8 psi.
 - c. After adjustment lock plate must be pressed into nearest locking slot.

OPERATING PRESSURE

Operating pressure is not adjustable, modulating pressure automatically affects operating pressure. Pressure readings should be 245 psi on A28.01 units and 221 psi on A28.02 units.

[GOVERNOR](#) PRESSURE

When checking [governor](#) pressure, disconnect vacuum line. Governor pressure is part of the operating pressure and is brought to the necessary value by the centrifugal governor. Since governor pressure is derived from the operating pressure, operating pressure must be checked simultaneously. Operate vehicle on a dynamometer or the road and compare governor pressure with pressure readings listed. If no or deviating governor pressure is measured, the governor must be disassembled, cleaned and repaired.

CONTROL PRESSURE

Control pressure is part of the modulating pressure. It is regulated mechanically depending on position of the accelerator pedal. If modulating pressure is adjusted correctly, the control pressure will automatically be correct.

10.2

10.3 Troubleshooting

SLIPS IN ALL GEARS

1. Incorrect modulating pressure.
2. Faulty modulating pressure control valve.
3. Incorrect vacuum line routing or vacuum line disconnected.
4. Faulty [valve body](#).
5. Faulty primary pump.

SLIPS IN 2ND [GEAR](#) OR SHIFTS FROM 1ST TO 3RD GEAR

1. Faulty [valve body](#).
2. Damaged brake [band](#) B1 piston seal.
3. Damaged brake [band](#) B1 and/or B1 element.

SLIPS IN 1ST & 2ND [GEAR](#)

1. Faulty shift valve B2.
2. Faulty brake [band](#) B2 piston.
3. Incorrectly adjusted brake [band](#) B2.

SLIPS DURING 2ND/3RD SHIFT OR SLIPS, THEN GRABS HARD

1. Incorrect modulating pressure.
2. Temperature orifice not installed.
3. Damaged shift valve housing.
4. Damaged inner [clutch](#) K1 plates.

SLIPS DURING 3RD/4TH SHIFT

1. Incorrect modulating pressure.
2. Damaged shift valve housing.
3. Damaged inner [clutch](#) K2 plates.

AFTER INSTALLATION, TRANSAXLE HAS NO POWER

1. Incorrectly installed [torque converter](#).
2. Damaged primary pump.
3. Damaged [torque converter](#).

NO POWER FLOW IN ANY [GEAR](#) POSITION

1. [Torque converter](#) draining due to leaking and/or defective driveshaft lubricating ring.
2. Check or clean shift valve housing lubricating valve.

NO POWER FLOW IN REVERSE

1. Damaged brake [band](#) 3 lined plates and seals.
2. Damaged one-way clutch.

SHOCK WHEN ENGAGING DRIVE OR REVERSE

1. Incorrect idle speed and CO level.

2. Incorrect modulating pressure.
3. Missing shift valve housing check ball (5) spring.
4. Leaking or disconnect vacuum line.
5. Binding shift valve housing pressure acceptance piston.

SHOCK WHEN CHANGING GEARS

1. Incorrect modulating pressure.
2. Leaking or disconnected vacuum line.

SHOCK WHEN DOWNSHIFTING FROM 4TH TO 3RD

1. Damaged B2 release end seal.
2. Damaged B2 brake [band](#) piston.
3. Damaged B2 pressure element.

SHOCK WHEN SHIFTING IN PARTIAL LOAD RANGE

1. Incorrectly adjusted control pressure cable.
2. Incorrectly adjusted modulating pressure.
3. Leaking or disconnected vacuum line.

NO UPSHIFTS

1. Incorrect [governor](#) pressure.
2. Dirty centrifugal [governor](#).
3. Dirty [valve body](#) housing.

NO KICKDOWN

1. No or insufficient power supply to solenoid valve.
2. Faulty solenoid valve.
3. Incorrectly adjusted or damaged control cable.
4. Damaged [valve body](#).

NO BRAKE SHIFTS FROM 4TH TO 3RD & 3RD TO 2ND

1. Incorrectly adjusted control pressure cable.
2. Leaking or disconnected vacuum line.
3. Damaged brake shift piston.

POOR ACCELERATION

1. Incorrect stall speed.
2. [Torque converter](#) one-way clutch is slipping.

SELECTOR LEVER CANNOT BE ENGAGED IN REVERSE & PARK

1. Dirty centrifugal [governor](#).
2. Restricted lower cover piston.

ENGINE CANNOT BE STARTED IN PARK & NEUTRAL

1. Incorrectly adjusted selector lever cable and starter interlock switch.
2. Damaged starter interlock switch.

10.4 Removal

1. Disconnect battery ground cable.
2. Disconnect electrical connector located in spare wheelwell.
3. Remove upper and lower air cleaner housings.
4. Remove upper air guide section.
5. Raise and support vehicle.
6. Disconnect control cable from throttle housing.
7. Disconnect oxygen sensor electrical connector.
8. Remove engine air guide.

Shark Bit: An Illustrated Notebook for the Porsche 928 © 2000 Paul Jager, P.Eng.

9. Disconnect and remove complete exhaust assembly and shields. housing attaching bolts to 6 ft.lbs.
Torque transaxle to crossmember attaching bolts to 61 ft.lbs.
10. Remove starter attaching bolts, then suspend starter motor using a suitable piece of wire.
11. Drain fluid from transaxle.
12. Disconnect driveshafts from transaxle and suspend in a horizontal position.
13. Support transaxle using a suitable jack.
14. Remove rear axle crossmember to transaxle suspension attaching bolts.
15. Mark position of toe eccentric nut and rear axle crossmember, then remove rear axle assembly.
16. Remove clamp bolt.
17. Disconnect selector lever cable from transaxle and cable sleeve on holder and [case](#) assembly.
18. Disconnect and cap transaxle oil cooler lines.
19. Disconnect vacuum modulator pressure line.
20. Disconnect control pressure cable from transaxle and remove guide.
21. Disconnect control cable from operating rod.
22. Remove front and rear reinforcement plates.
23. Lift transaxle slightly and disconnect holding chain.
24. Lower transaxle only far enough that torque tube to transaxle attaching bolts and control cable attaching bolts can be removed.
25. Move torque tube to installed position, mount rear brace with two attaching bolts and place a suitable block of wood between torque tube and brace.
26. Pull back on transaxle and carefully lower assembly from vehicle.
27. Reverse procedure to install. Tighten torque tube attaching bolts to 87 ft.lbs.
Torque control cable to converter

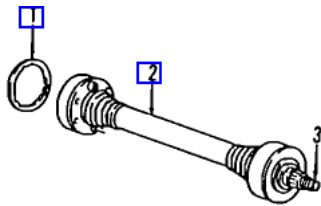
11 Chassis

11.1 Wheel Bearings

Adjustments

1. Raise and support vehicle.
 2. Remove wheels and axle hub cap.
 3. Loosen adjustment nut retaining bolt.
 4. While rotating the hub by hand, tighten the adjustment nut slightly.
 5. Loosen adjusting nut until thrust washer can just be moved using finger pressure on a screwdriver. **Do not support the screwdriver against the hub for use as a lever.**
 6. Torque the Allen head adjusting nut retainer bolt to 11 ft.lbs.
3. Remove wheel cover to gain access, then remove self locking nuts on wheel end.
 4. Remove both axle shafts toward inside, lowering rear of left side exhaust assembly as necessary.
 5. Run axle shafts into [wheel hub](#) on wheel end.
 6. Ensure axle shaft flanges are free of grease and install socket head bolts, torquing to 60 ft.lbs.
 7. Torque self locking nuts to 333 ft.lbs.

11.2 Axle Shafts



REAR AXLE - 928

Service and Repair

Axle Shaft Bolted On Both Sides

1. Raise and support vehicle, then remove left rear wheel and tire assembly.
2. Remove socket head bolts from drive flanges.
3. Remove right hand axle shaft inward.
4. Remove left hand axle shaft outward.
5. Reverse procedure to install, ensuring flange surfaces are free of grease, and torque socket head bolts to 60 ft.lbs.

Axle Shaft Welded On One Side

1. Raise and support vehicle.
2. Remove socket head bolts on transmission end.

12 Cooling System

1990-82 928, 928S4 16.0 17.0

