

## Electrical: Wipers

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#### **Wipers:**

##### **Wiper Arms**

**Loose Wiper Blade Falls Off.** [Don Foster] If you lose a wiper blade, IMMEDIATELY lift the arm so it simply waves in the air. Get it off the glass to prevent gouging.

**How to Remove.** [Tip from Sheldon Fast] There is a plastic black cover over the end of the shaft. Take this off and you will see a nut on the end of the shaft. Remove the nut and pull the wiper up off the splined shaft. Same for front and rear

wiper arms. [Editor] This black plastic shaft cover can easily break, so when removing it spray with WD-40 to loosen things and gently work it off. It is held on by two notched tangs at the square end.

**How to Tighten.** [Tip from Don Foster] If your wiper arm is loose, remove it (the nut is under the cap), clean off the metal chips from both the arm and the splined shaft, reinstall, and add Loctite Blue to the joint and stud. Then sock down the nut tight. Volvo recommends new nuts, but Loctite allows you to reuse the old ones.

**How To Reposition Arm on Windshield.** [Editor] If your wiper parks in the wrong spot, remove the shaft nut and arm. Clean off the shaft with a wire brush to expose the tines. Place the wiper in the correct park position, press down real hard on the arm over the shaft and remount it on the shaft. Fasten the nut with Loctite and torque it down firmly but not overmuch.

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**Replacing Wiper Control Stalk.** See the section in [Electrical-Instruments](#) for more information.

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**Wiper Switch Repair.** [John Davies] These switches are prone to a common electrical fault: the wipers do not return to parked position when the switch is moved to the off position. Wash/wipe may also be affected.

To rectify, [remove](#) the stalk from the from car, drill out the two rivets at the rear and remove, and slide the two parts of the assembly apart, taking care to keep the arm within the larger of the two parts of the casing. There are two sliding contacts built into the arm, with a spring between each. There is a further spring between the arm and a locating block which has a small roller on the end which gives the switch its location. Take care not to lose the roller! Clean the contacts.

Having carefully dismantled the switch, examine the flat copper tracks on the smaller part of the casing and you will probably see a place where the sliding contact has caused a depression on two adjoining strips. Flux this well, fill each depression with solder, and then scrape off surplus solder until dead flat. Solder quickly - for a few seconds only - as you want the copper to disperse the bulk of the heat before the plastic melts.

There are a further two sprung contacts on a bar on this smaller part of the casing - clean the contacts with some fine emery paper or at a pinch wet and dry sandpaper.

Apply a very thin film of vaseline or silicone dielectric paste to the contact areas and then reassemble, replacing the rivets with suitable long screws. This should keep the unit operating for a few thousand more miles yet. Time taken about 1 hour.

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**Wiper Motor Problems.** [Symptom:] Whenever I use either my intermittent or low they work for maybe five minutes and start to slow down until they stop. The weird thing is that my high wiper setting seems to work fine. [Fix:] I had a problem like that and found that the motor brushes were marginal. I guess the low

speed stress them more and tend to over heat and bind in the holder... at higher speeds the momentum is a help and also lower current flow and less heat generated... in a nutshell replacing the brushes cured my problem..

[Related Comment:] Not sure about the 740, but the 240 equiv. failure mode is usually due to the permanent magnets inside the motor shell separating from the case due to rust infiltration on the glue. They shift and drag on the rotor, as well as mis-align the field. Can be repaired quite easily, if that's what it is. You can replace the brushes same time, if needed, and if you can find some, but I found my 1984 original brushes were fine. (Stretch the springs a bit if the brushes have shortened). I found my high speed was slower than normal, and low was very slow. And then it stopped.

[Another Comment:] Assuming 740 is not too different than the 240, fix involves pulling the motor out, (you have to disconnect the linkage clip under the dash), and open the shell. Careful to not drop the magnets, they are ceramic. They have a tendency to follow anything ferrous, I smashed one once when it followed a screwdriver I had picked up and it accelerated right off the bench. Clean up the rust, and epoxy the magnet(s) back in. Note position and orientation when you remove the magnet. Buff up the brush contact segments on the armature if necessary, lube bearing and reassemble. Brushes are a bit tricky to compress while inserting the armature, a loop of thread and masking tape works great.

[Another Comment:] Also: first you may want to check the ground connection; my 745 had a bad ground to the wiper motor, which consisted of a jumper across the rubber-mount at the driver's side. I wired in a new ground and voila [Chris Mullet] Bad steering column grounding has been known to cause rear wiper problems, sometimes even causing the wiper to move when you honk the horn due to electrical feedback.

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## Wipers Are Slowing Down.

[Inquiry:] I noticed my wipers to be sweeping slower than usual lately, and a whirring sound to be coming from the wiper motor. There was even an instant that the wipers would not sweep, before it suddenly came to life and began to sweep slowly. Fuse was OK. Windshield was very wet with rain. Wiper rubber strips are 3 months old. Is my wiper motor about to die? Or should I squirt some WD-40 somewhere to loosen up the motor?

[Response: Richard Klasic] It's hard to describe but the wipers are mounted on the shaft going through a bushing. After years of usage. this bushing becomes dry and corroded making the wipers move more slowly until they freeze completely. You need to take out the shafts and polish them gently with sandpaper and then lube the shaft with a grease that doesn't go away with water. You can always unhook the motor from the ball joint to the wipers and see if it runs fine. I bet it does. This was the case on my wipers on the old 760 I had. It really squeaked when running. And after 15 minutes hammering at the tap with a plastic hammer and lot of WD-40 it finally came loose. After my operation WOW the wipers were dead silent and swept like lightning over the windshield.

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is adhered, you will have to separate it and the cowl from the glass before removing the cowl.

Gently move the cowl panel (the the painted chassis part where the air inlet is located) back and lift it up, pulling the rear up toward the windshield. It has two hooks at the rear corners and clips under the windshield so you have to wiggle it some: lift the ends where the 2 endbolts were to clear the rubber stop. Once clear, pull towards the front. The molding comes off with the cowl (but under the molding area are windshield clips that remain.) It can be helpful to do this with the hood in two positions. To get the tab over the firewall, close the hood just a bit so that you can lift the cowl enough for the tab to clear. Then reopen the hood so as to allow the cowl to be drawn forward. Lifting the hood to full open (by adjusting the stops on the hinges) makes the final removal easier.

6. Under this cowl panel, the wiper assembly is found. It can removed by unhooking the electrical socket and unscrew maybe 2 screws. See the [section in Heating](#) for more information on the air intake screen replacement and the water shield. Now is a perfect time to clean the side drains of leaves and dirt and inspect the water shield over the air intake.

*Misaligned Cowl?* The center of my cowl panel keeps rising up and when it does, it will bind with the hood when it opens. If I loosen the center bolt for the cowl and push it down and tighten, it's good for a while but slips back up over time. [Jay Simkin] Your cowl is slightly skewed. Once you re-seat it, all should be well. On each sid at the rear, the cowl has a "tab" with a slot. Each slot is supposed to be seated on a pin that projects from the fender panel. If the cowl is properly seated, the gaps - between the cowl's edges and each fender - should be uniform. Also, the gap between the cowl's front edge - and the hood's trailing edge (that closest to the windshield) should also be uniform. [John Sargent] The cowl piece has a plastic part in the center which catches on the body and holds the center of the cowl down. If the cowl piece has been off and re-installed incorrectly it will ride up in the center. You may have to take the three cowl retaining bolts off, move the cowl forward and then push it back while pushing down on it in the center.

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## **Wiper Transmission and Linkage Replacement.** [Neil Noonan]

To remove and replace the wiper transmission, open the hood to its fullest extent

- Mark the wiper arms with a piece of tape and label "Right" and "Left" . They are different and it will save you time trying to figure out which one is which.
- Remove the wiper arms and the big rubber escutcheons from the wiper shaft.
- [Remove the cowl](#)
- Disconnect the ground wire on the bracket that holds the wiring connector. My bracket bent a little during this part but was easily straightened out. The connector for the wiper motor can be released from its holder by sliding it one way or the other. There are two posts on the bottom that slide and lock into the holder.
- Disconnect the wiring harness for the wiper motor by squeezing the connector and rocking it apart.
- The wiper transmission is attached at 4 points. There are two bolts that are up near the windshield and two nuts that hold the lower part of the transmission. These are very easy to see.

- Once these are removed lift the transmission from the bottom (where the 2 nuts were) and lift it out, over the studs, with a slight rolling motion. It should come out rather easily.
  - Remove the nut on the wiper motor and work the transmission arm off the motor. Make a note of the way the arm is aligned on the motor; it must look the same when you're done.
  - Remove the three bolts holding the wiper motor.
  - Install the motor on the transmission.
  - Don't attach the transmission arm to the motor yet.
  - When reinstalling the transmission fit the top part in first and lower the bottom part over the studs.
  - Screw the nuts on the studs, but don't fully tighten yet. Put the 2 bolts in the top part. When I did mine, I tightened the two top bolts first and the tightened the two nuts.
  - Plug the wiring harness back together and attach the ground wire. The connector can then be slid back into the bracket.
  - Turn the wipers on and after a few seconds turn them off so the motor parks in the correct position.
  - Now you can attach the transmission arm to the motor. Remember how it was originally attached? The arm should be in a straight line to the motor or as close to a straight line as possible. The shaft has grooves on it and so does the inside of the arm. It has to fit into these grooves. Once it's on tighten the nut. You may want to use a bit of Lok-Tite here although I didn't.
  - Put the wiper arms on and test the movement of the arms, adjust if necessary.
  - Take the wiper arms off and reinstall the cowl. Make certain the edge next to the windshield fits into the groove in the windshield molding.
  - Install the rubber escutcheons.
  - Install the arms and make any final adjustments.
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## **Rear Wiper Motor.** [Various diagnostic tips on rear wiper motor failures]

### **Diagnostic Tips:**

- **Motor Won't Rotate.** I pulled the entire wiper motor out, took it apart, and (believe it or not) everything worked great after I put it back in. Problem was tarnished electrical contacts on the brushes and commutator of the electric motor. I polished them up with a piece of emory cloth, and it's working great now. [Editor's tip: prevent this by operating the motor every few weeks.] See as well the ground comments in the paragraph [above](#).
- **Shaft Seizure.** The reason for the constant failure of these motors is because the linkage going out through the rear window needs greasing every year. This takes a salt pounding all winter and seizes up, over-stressing the motor and burning it out. Remove the nut holding the rear wiper arm, then the arm, remove the rubber protective cap, remove the black plastic collar surrounding spindle, remove the tiny C-clip, then a washer and a tiny black O ring, and you will find the assembly slides in and out a small distance for lubrication. Everything can be accomplished from the outside. Clean the hole, sand the shaft, grease with a synthetic grease (still viscous in the cold weather) and reassemble. Don't push the shaft all the way in since the shaft and arm may fall inside the hatch.

- **Linkage Bearings.** My rear wiper motor (1985 740 wagon) kept going slower and slower and I ignored it (bad move). It was the pivot bearing (white metal?) that had just corroded to the point where it was freezing up and eventually burned out the motor. Strangely enough, my independent dealer cleaned up the bearing and reinstalled it (and a rebuilt motor, too). My first instinct would've been to replace the bearing with as new one but, so far, so good. So, if you're fiddling in those parts, check it out.

**Rear Wiper Motor Park Position Reset.** There is only one way to get the arm to rest in the correct position. First, note which side the wiper arm is supposed to park. Remove the wiper arm from the shaft, this is the last part to go back on. Now turn the key to the on position and start and stop the motor so you are certain it is in its rest position. Remove the inner panel. On the motor is a 10mm nut holding the short linkage piece of the wiper arm. Remove it and pop off this short piece. Turn the short piece until it is parallel to the long linkage arm to which it is attached: not outward but inward, so the total length of the linkage is not longer than the long piece. They're now overlapped. Now pop the short linkage onto the motor and replace the nut. This requires deft hands as the nut is exactly between the two pieces of linkage, but don't worry, there's room. Before you tighten the nut, ensure the two linkage pieces (the short and long) remain perfectly parallel. Tighten. Reinstall the wiper arm, making sure you place it on the correct parking side. Mine is a 745, so the arm rests to the driver's side.

**Motor Removal.** [AI] To remove the rear wiper motor, first remove the [tailgate panel](#). The shaft is attached to a nut, the linkage and crank arm from the inside of the car. Pop the cap on the wiper arm and remove the small nut releasing the wiper arm. Sometimes you need to rock the arm to get it off the spindle. There is a large silver flat nut beneath. Unscrew that and the assembly is freed from the glass section. Don't forget to loosen and remove the nut on the motor to release the arm assembly from the motor first. That just makes it easier to drop the assembly out when you remove the nut.

**Motor Gear Repair.** [Tom Kaylor] My rear wiper motor stripped the driven (big) gear. I removed it from the vehicle and noticed there are no screws holding the case cover on; while they look like rivets they are actually protrusions of the die cast housing and will break off flush. I reinstalled the cover and drilled and tapped the housing for 8-32 screws. Be sure to use the cover for a template so everything lines up. The shaft has serrations that deform the plastic gear ID to hold it in place. When it fails it enlarges the bore of the gear. This was my first experience using JB Weld so I had my doubts. Anyway I used a small 3 corner file to create several keyways or notches in the plastic gear to give the JB Weld something to flow into. Be sure to prep the shaft and gear with a non-petroleum based solvent, something that won't attack the plastic; brake cleaner worked for me. Clean the housing, check and clean the electrical contacts. The old grease was dried out so I used Lubriplate 105 white grease but not to excess. Reinstalled and ran the motor until it reached park, then re-attached all the linkage. You could or maybe should give it about 24 hrs to set up since the JB cures slowly before reattaching the linkage. At this point it has performed flawlessly for 2 weeks and saved me about \$140.

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## 960 Headlamp Wipers.

**960/90 Headlamp and Wiper Assembly Removal.** [Tip from Warren Bain] After removing the bolts holding the capsule in place as above, you can then remove the lamp and wiper assembly. The headlight wiper and washer motor shaft goes through the plastic bumper cover. To save time, I cut the top piece above the shaft. No one can see the cut. The old one comes out with some twisting and turning. The wiper motor is attached to the bottom of the headlight housing. I swapped the metal clips and the wiper motor from the old headlamp assembly to the replacement unit. Make sure the electrical pins on the new headlight are the same as the old ones. If not, swap the harness inside the housing. Use slip joint pliers to free the headlight electrical connector on the back of the housing. It takes some work to get the old connector out but it can be done. On mine, the new pins were shoved back inside the connector and the lights would not work. I had to swap the internal harness. Replace the housing and the electrical connectors including the wiper motor, and put the turn signal back in.

**960 Euro Spec Wiper Removal.** [Adam Stevens] After finding that my headlamp wiper parks in the middle, I decided to replace the wiper motor assembly. It is in fact a very easy job! Braydon Motors sent me a second-hand unit for £26 (new about £95!). Disconnect the fog lamps, take off the grille, remove the headlamp wipers and undo 6x16mm nuts holding the bumper, air-dam, fog lamps etc to the chassis and slide the whole assembly forward as one unit - simple! Take out headlamp, swap motors, reverse process for re-assembly. [Cautionary Tip from Ryan] I learn't the hard way never to tuck the blades under the 2 plastic arms before going into an automatic carwash. With the best will in the world its all too easy to forget them and a couple of miles down the road use the wash/wipe. Mostly the relays will prevent damage to the locked arms but not always, as I know to my cost!

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## Washers:

### Windshield Washer Jets and Check Valve.

**Aiming the Nozzles.** [Tip from Peter Rhyins] The nozzles are all adjustable. You need a pretty stiff piece of wire or a stout needle that fits into the jet to get them to move. I used a strand from a stainless steel wire brush I have. A very tiny needle will work but these are brittle and can break off too. You can drip a small amount of 3-in-1 oil onto the base to get the round mount to rotate.

**Removing and Replacing the Nozzles.** [Tip from Nathan] You need to partially remove the sound insulation on the inside of the hood. Then you'll be able to see a couple tabs on each jet. You'll need 1 or two small flat head screw drivers to pry in the tabs.

### Nozzle Repair.

[Response 1: Dennis Hamblet] The best tool for cleaning washer nozzles can be bought at a welding supply house and is called a tip cleaner. It consists of a graduated series of very small round files that can be fitted into the jet and remove the deposit which is generally mineral deposits. Jets may be adjusted by inserting a pin (or a tip cleaner) into the jet and rotating it into proper position.

[Response 2: Michael Brown] Do you have access to compressed air? I took off the hose at the plastic connector under the hood and put a compressed air nozzle in the end of the hose. It blew out the blockage and all is well. [Response: Stephen Ringlee] Use a sliver of thin steel wire to clean out tip deposits and buy an in-line filter from IPD or Volvo to keep debris from clogging the lines. A needle can be used to adjust the aim.

[Response: Jack Reed] Clean them with the finest wire that will fit in the hole without binding. Prevent the problem in the future by buying a lawn mower sized gas filter. Fits perfectly into the main feed line from the pump before the T. Just cut the line in the best spot for the filter and remove a filter sized section. Change it every few years and you should be fine. Considerably cheaper (~\$1.50) by the way, than the \$5 IPD wants for the same thing.

[Response: GN] I took out the nozzles and put it in an ultrasonic-cleaner with the regular vinegar ( it has only 5 % ) and some drops dishwasher liquid. Approximately 10 minutes each side then rinse it and spray with teflon oil and put it back in the hood.

### **Windshield Washer Check Valve:**

**Valve Function.** [From GN] The T-valve with red cap under the middle of the windscreen is a backflow-suppression valve. It will keep some water in the lines to be ready. Otherwise it will take 1-2 seconds to deliver water to the nozzles.



### **Check Valve R&R.**

[Tip from John Kupiec ] These valves commonly leak from the small hole in the red cap, a sure sign the internal diaphragm has failed. To test the check valve: Disconnect the tube that feeds from the washer to the check valve. Try the washers. If you get a stream of washer fluid, you know the pump is okay. Next, reconnect the feeder tube to the check valve, and disconnect one or both of the tubes leading to the jets. Try the washer. If you fail to get a good stream of fluid from either of the two tubes leading to the jets, the check valve is bad. Replacement check valve run less than \$10.

[Steven Sherman] You can rebuild them for pennies and actually make them better: take a nitrile surgical or mechanics glove (or plain old latex, which will wear faster) cut out a square inch, and then pry open the valve carefully using a knife blade. Don't lose the spring that will pop out. Take out the busted membrane. Take a needle and clean the narrow groove between the black diaphragm and the red cap to remove accumulated crud. Then lay in the piece of polymer that you made. Snap the top back on, and you are in business. If you are a neat-freak, trim the excess material.

**Washer Filter.** [Tip: Stefan Schader] I found that the windshield washer fluid bottles contain sometimes small plastic shavings which clog up those nozzles and the fluid tank filter does not stop them. To prevent this, I put a small in-line fuel line filter in the washer fluid line a few years ago. Voila! no more problems since then. (Editor's note: this style of filter is also sold by Volvo, IPD and NAPA. [From GN:] NAPA 3011 BP - \$ 2.70 has the right connector size to fit in the hoses.

**Check Valve Upgrade.** [John Davies] Over the years I have had several cars need a new 't' piece in the screenwash hose, which on most Volvos is combined with a one way valve. This sits about 4" away from the nozzles under the bonnet, sometimes hidden behind sound deadening. It is an untypically poor design by Volvo standards. The normal problem is a rubber diaphragm in the one way valve which rots, meaning that water can leak out of the small hole drilled in the 't' piece to allow air in and soak the distributor cap every time the screen washers are used. I had one car stop on the road in bad weather due to this fault which could have been dangerous. A further problem is that any rubbish, including rubber from a failing pump, can block the nozzles; also, the 't' piece can fail on one side only, leading to the incorrect conclusion that the nozzles are blocked.

The answer is to replace the combination 't' piece with a standard one from an accessory shop, and then put in a one way valve from the same source just forward of the bonnet hinge. I go one better than this by putting a small torpedo type fuel filter just by the hinge so any rubber which does come off the one way valve or the pump doesn't find its way to the nozzles but is filtered out with any other debris. If the one way valve fails there is no real problem - the fluid will simply start to take longer to get to the nozzles. On estates I put a further fuel filter in the supply to the rear screen washer, again under the bonnet. Once the nozzles are cleared out this mod takes about five minutes to do and saves a great deal of future fiddling for an outlay of only a couple of pounds. Well worth it!

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## Tailgate Washer

**Check Valve Failure.** [Inquiry] My rear washer does not work; the nozzle is fine. What is the problem? [Response: Dave Stevens] When mine quit, I figured maybe the hose was pinched shut somewhere. Starting ripping off trim panels along the passenger side. Eventually I found the hose going over the wheel well and followed it back to discover (surprise) the small right-angled check valve (Volvo p/n 9178897) in the hose in the hole near the tail light assembly. I knew the problem right off as I've often encountered check valves with disintegrated diaphragms. I decided to try a [DIY fix](#) of the check valve. I pried it open with a knife edge and carefully picked out all the white gum. I then cut a new diaphragm and it now works again without leaking and without any chance of back siphoning.

**Nozzle Replacement.** [Inquiry:] I bought a new tailgate washer nozzle for my 745 and now realize that I have no idea how to get the old one off or the new one on. I tried pulling out the old one but either you have to pull really hard or I am about to break something and really screw things up.

[Response: Nathaniel] This is a delicate operation but very simple. The nozzle that is in your tailgate is held in place by expandable clips that squeeze in when you push the nozzle into the tailgate and expand once firmly seated. If you take a look at your new nozzle you'll see what I mean. In fact, study this nozzle and you'll begin to get an idea of what you have to do in order to get the old one out. Seems simple but these things are real buggers to get out without scratching your car. What I do is simple grab the old nozzle with a pipe wrench (provides good leverage and grabbing strength) and wiggle it back and forth to weaken its seat in the tailgate. Sounds crude but, at this point, if you try to slide a screwdriver between the nozzle and your tailgate you are certain to scratch the paint. Once you have

the nozzle loosened up and you've got a gap between the tailgate and the nozzle, carefully take a screwdriver and push against one of the detents on the side of the spigot that connects to the washer hose. You may have to really work at this so be patient. While you are pushing against the detent continue to pull out on the nozzle. With any luck, and a little practice, the nozzle will eventually come out of there. If you've done it right, your old nozzle should be all beat to hell from all the pulling and prying.

NOTE!!! Be careful not to let the hose fall back into the hole after you disconnect the nozzle. Pull the hose out as far as you can before disconnecting and clamp it down so it won't fall back in while you've got your back turned. When your ready, simply push the male end of the nozzle into the female end of the hose until fully attached and do a quick check to see if the connection is working properly (good time to go get your dirtiest kid). Do this check BEFORE putting the nozzle back in or you'll be buying a new one to replace the old new one because you failed to make sure the connection was secure. Ask me how I know.

### **Aiming:**

[Tip: Steve] Use a pin in the nozzle outlet to re-aim the nozzle down so the fluid stream hits the window glass. The nozzle moves easily with little pressure.

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**Adding a Low-Fluid Warning Sensor to Your Washer Tank.** [John Martin] This was the easiest upgrade to my 940 yet. Can be done easily to all 1993-1995 940's, and probably to late 740's also. The wiring is all in place in the vehicle, all you need is a new cluster warning light bulb and the washer fluid level sensor out of a 960. 760's also have washer level sensors, but they have a different connector and you'd have to do some wiring modifications to make it work in a 940.

First, confirm your car has the wiring already in place. All 940's I've seen in the junkyards already had it there waiting, ziptied together with the washer pump connector(s). Look at the existing unused connector so you can be sure you get the right version of the sensor. Then go to the junkyard and get:

- spare cluster warning light bulb. (Get several, you should always have spares of these around)
- washer fluid level sensor assembly from a 960 washer tank. Get the sensor with wiring connector attached, the plastic cap, and the rubber washer under the cap.

The 960 style is plug-and-play. Be GENTLE unscrewing the sensor from the top of the tank, the plastic cap can be brittle and split at the top edge. The screw cap for the sensor is actually the same cap as on non-sensor cars just with the center knock-out punched through.

Get the airbox out of the way on your 940. (Now's a great time to change your air filter, BTW). If you have a Regina car, be VERY CAREFUL not to tug and abuse the wiring to the air temp sensor when you unclip the connector from the sensor body. With the sensor connector off, everything should lift up and out of the way. Gently unscrew the plain black cap in the middle of your washer tank, drop the new sensor down into the hole so it seats firmly, make sure the rubber washer sits on top of it, and screw the cap down. Not too tightly or it will break. The contacts in your

unused connector are probably pretty dirty and corroded--clean them up with a small wire brush, then plug it into the sensor connector.

Remove the instrument cluster, remove red/orange "dummy" socket from the fourth socket on the right (looking at the rear of the cluster). The washer fluid icon is already there which you can confirm with a flashlight. Seat the replacement bulb in that space. Reinstall cluster. Make sure everything is reconnected and reseated under the hood. Start the car. The light should illuminate on startup just like all the other functioning warning lights.

Installing it took me about 20 minutes, start to finish. If you've never removed the instrument cluster before, be aware that removing the [black metal trim bezel](#) from the cluster is the most challenging part of this job.

### **Washer Pump Repair.**

**Motor Commutator Repair.** [Tip] On both my 93' 940T and 89' 740T cars the windshield washer motor had locked up, probably from infrequent use. I jumped power directly from the battery and could feel the motor want to turn over but wouldn't, even tried tapping the motor with a hammer - still nothing. Then I tried reversing the polarity to run the motor backwards and it spun immediately. Then I changed the polarity back to the right direction and the motors work perfectly now.

**Removing Deposits.** [Inquiry:] I have an 87 745 and its rear washer pump is dead. I never added anything but standard washer fluid. Is this pump a known failure item in high mileage bricks of this vintage? It worked fine until I added the orange colored fluid booster additive sold by IPD and other sources curious about replacement cost and difficulty... [Response: Robert Haire] Before trashing them, take the pump out and unscrew the tiny screws in the bottom. You will often find the crude from old washer fluid has precipitated and clogged the gears. If you clean them out, they might start running fine again. I have salvaged several of mine this way and have never had to buy one.

**Removing Deposits from Pumps With Glued Casings.** [Matt Webb] Some Bosch motors have a cap (to which the connector is mounted) glued to the body of the motor. To access the pump innards, bend or break the plastic tab of the casing that interlocks with the cap. Lightly grip the connector with channel locks or pliers and twist to break the glue joint. If stubborn, a little cement solvent or some heat should help. Carefully remove the cap from the body; there's a washer that goes between the armature and the cap's bushing... don't lose it. Now you should be able to twist the armature by hand to break up the crud that's clogging the pump... remove armature from pump body, set it back in place in the lid-- the brushes can easily be spread apart by hand w/out any drama. Carefully re-insert the armature/brush assembly into the body of the pump... do not let the magnet in the body pull the armature away from the brushes. Once down, a little twisting of the lid will rotate the armature shaft into position and it will easily push down in... line the lid back up with tab and dab a little epoxy between the lid and the body; ziptie or rubberband it together to clamp it. A little bench testing before glueing it back together doesn't hurt; I like to flush the pumps with a bath of rubbing alcohol while I'm at it -- this helps prevent loosened grit from entering your cars lines and clogging the jets.

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