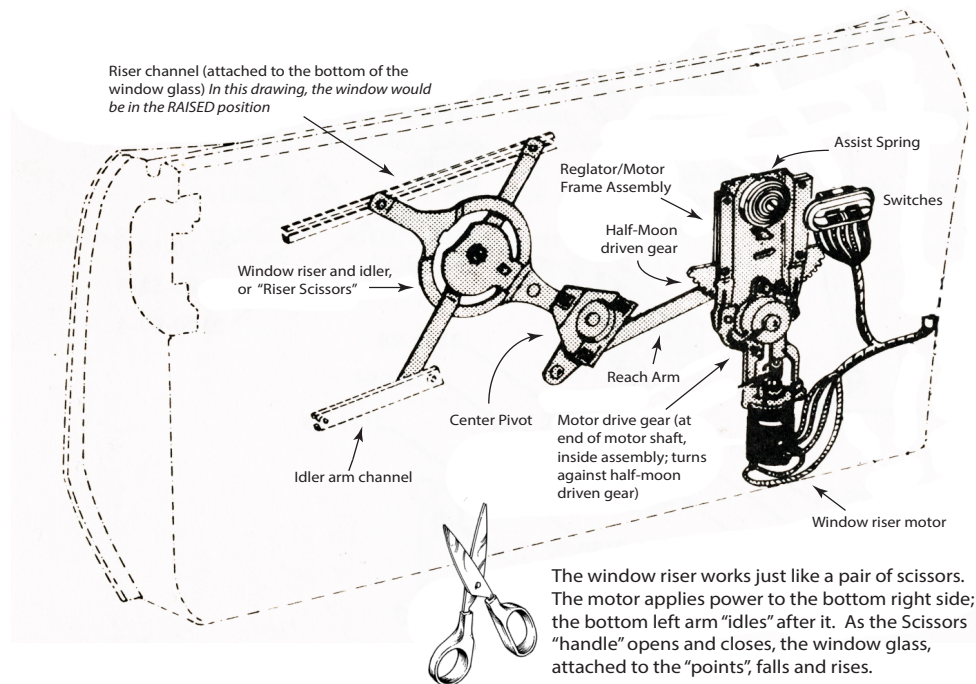


# Avanti Repair

## Avanti Power Window Repair, A to Z

How to restore speed, precision and make everything work as good as new

By: Bill Henderson, AOAI member, wfhenderson@yahoo.com



sic alignment issues. I find it amusing that the entire topic of door to window alignment is covered in one paragraph of nine steps in the shop manual. Anyone who has ever done this can attest that this challenge should have an entire chapter devoted to it, at least. Perhaps we will do an article on this in a future issue.

I would rate the difficulty of these tasks as "moderate", mostly because they involve glass, (which is clumsily heavy), electricity, compressed springs and the added difficulty of working blindly up inside the door. But unless you have the fortune to know a saintly and trusted mechanic who is glad to work on ancient cars by the hour, you will probably want to at least consider doing this work yourself.

If your Avanti has factory power windows as mine does, perhaps you also say three Hail Marys and cross your fingers for good measure when engaging the window riser switch, wondering if, this time, anything productive will happen. If they are "down", they might not go up, and if they are "up" they may not go down. Sometimes a helpful push or pull on the glass will get them started. In my case, when allowed to go all the way down my driver window disappears so far down into the recess in the door that it cannot emerge under its own power, requiring the application of tools and curses in the garage. When driving my Avanti, approaching tollbooths and seeing looming rain clouds take on new ominous meanings with windows that are balky and troublesome.

Allow me to start with a painful truth: if when closed your doors are out of alignment with the body, and the windows are out of alignment with the doors, it is a complete waste of time to try to perfectly fine-tune things with the window riser mechanisms. No amount of fiddling with motors and wires will overcome ba-

Only the manual window winding mechanism is depicted in the shop manual, and these use a different riser configuration than the electric windows. The power windows are shown in detail only in the body parts book. You should have both publications; they are available for your computer or iPad at [www.ClassicManuals.net](http://www.ClassicManuals.net). The power window circuits are not included in the factory wiring diagrams either, but they are included with this article for reference.

Before we begin, this article assumes that while parts may be worn, that your physical door is in structurally sound condition. Because the window winding mechanism can put great stress on the fiberglass construction of the door, in some cases the door's inside frame may be cracked near the center pivot point. With trim panel removed, check the structural soundness of your door by running the window fully up and down while watching for deflection of the mounting points of the scissors pivot and the motor frame. If great deflection or cracking is apparent especially when the motor is pushing against the window's fully open and closed positions, you must fix this before you can continue with the steps in this article. (See <http://www.studebaker-info.org/tech/Body/avdoor/avdoorm.jpg> for some ideas on fixing serious structural door damage.)

### Understanding how things (are supposed to) work

Let's start with a basic discussion of how the Avanti's electric windows work. Electric windows and crank-up ones work basically the same, except instead of a human arm providing the power to turn the crank and raise the window, a compact but powerful electric motor with a small gear on the end of its shaft provides the handle-shaft turning power.

Very simply, the window is raised and closed using a mechanism like a scissors. The "points" of the scissors point straight up, and as

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the “scissors” handles are opened and closed by the gear driven by the motor, the window rises and falls. The gear on the end of the motor shaft is attached to a much larger diameter gear that moves one side of the scissors bottom. The small gear on the window motor turns a larger gear (even though it is only a pie-shaped slice of one) that opens and closes the scissors. The other bottom scissors handle is simply an “idler” arm. It has a short slide that it moves on, keeping things aligned, but it really doesn’t do any work.

The electric window switch does double duty. Not only does it supply power to the motor, but it depending on which direction it is pushed actually reverses the polarity of the motor. Switching positive and negative within the motor makes it turn in the opposite direction, lowering the window instead of raising it.

There is really only one thing that affects smooth operation in a mechanical process like raising and lowering a car window, and that is RESISTANCE. One type of resistance comes from the physical weight of the item being lifted. Resistance is also increased by friction between moving parts, or can be introduced as electrical resistance. Increasing any of these three increases the amount of effort we are asking the motor to do, sometimes pushing past the point of physical possibility. Let’s look at each of these in detail.

## Resistance from Weight

Glass is heavy. Car door window glass is thick, and at its bottom is bonded to a steel frame that attaches to the mechanism that moves it up and down. We’ve all struggled with the wind-up windows on one old car or another. Usually the window will go down more easily than it will go up. Sensibly, we can understand that gravity helps the windows go down, while gravity must be overcome to make them rise.

But in a modern car with new power windows, the glass appears weightless as it goes either up or down at exactly the same speed. The hidden trick that makes this possible is a small but powerful coil spring inside the mechanism, totally hidden from view. These mechanisms work on the same principle as the window shades in your house. If you have ever dropped a window shade and the spring inside briskly unwound with a loud whir, you surely found that upon remounting the shade that it would no longer raise itself, and to fix it one had to rewind the spring inside the end by hand before it would work as it once did.

The spring that assists the movement of a 15 lb. curved pane of glass in the car door is quite a bit stouter than the one that assists the paper window shade, but the principle is the same. Not only does a properly wound spring assist the glass in rising, but also it damps it when going down, preventing it from falling too fast under its own weight. So while we cannot change the actual weight of the glass, we can affect *how heavy it seems* to the mechanism by employing a properly balanced helper spring.

## Resistance from Friction

If you have ever spilled sand inside the bottom track of a sliding glass patio door you have felt the measurable difference that the

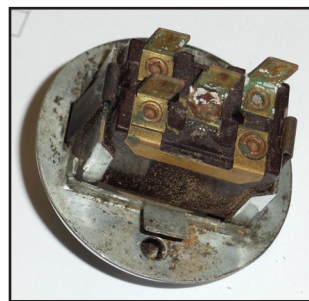
grit immediately adds to the rolling action of the door. Inside our car windows there are nearly a dozen points of contact where friction is present. While each may be a small factor, every one of them together creates a cumulative effect. We will want to minimize friction at each and every one of these points.

The Avanti’s windows are stylishly frameless on the top and rear edges. But on the other two sides there are lubricated channels that the glass rides on. The front glass channel is part of the vent window post, and it goes all the way to the top of the closed glass. You can’t see the bottom end, anchored deep inside the door. The rear glass channel is found only inside the door, and cannot be seen when the window is raised. Both of these channels are adjustable, and must be perfectly parallel to each other for the glass to raise and fall without too much added resistance. If the window is tight sliding up and down because of binding from the channels, this issue must be addressed before doing anything else.

Simply put, the less friction present in the mechanism, the less energy that will be required to move it. Applied to power windows, with less friction present, the same motor will raise the window faster than it will when more friction is introduced.

## Electrical Resistance

The 12 Volt DC electric motors in the Avanti’s design are considered by most restorers to have been marginal for their task, even when new. This means that they don’t have a lot of power to spare if something else is less than perfect. Very simply, bad motors may suffer any combination of rusty or worn out bearings, shorted or open windings, worn brushes and corroded connections.



*The terminals on the back of this riser switch feature fifty years of tarnish and corrosion. Gently take steel wool to every visible electrical connection to reduce electrical resistance.*

It can never be said often enough, but bad grounds are the causes of more electrical problems than any other on a fiberglass bodied vehicle. In steel cars, the body’s structure provides a source of grounding to every device bolted to it. Not so in a car like the Avanti. Here, every device must have both a hot (positive) wire running to it, and a ground wire attached as well. Electricity always travels in a loop: from the battery, to the device, then right out the other side of the device and back to the other battery terminal. Just like a physical chain, this linkage only as strong as its weakest link. If the power coming from the “hot” wire is good and strong, the device will not work its best unless the connecting ground wire is equally strong.

Every single electrical connection in a half-century old car should

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be considered suspect. Moist air, salt water, and constantly changing temperatures cause tarnish and rust to form on any exposed metal. As boring as it sounds, separate all connections one at a time and clean each one with fine steel wool and electrical contact cleaner (available at a store like Radio Shack). Wear gloves to protect your fingers.

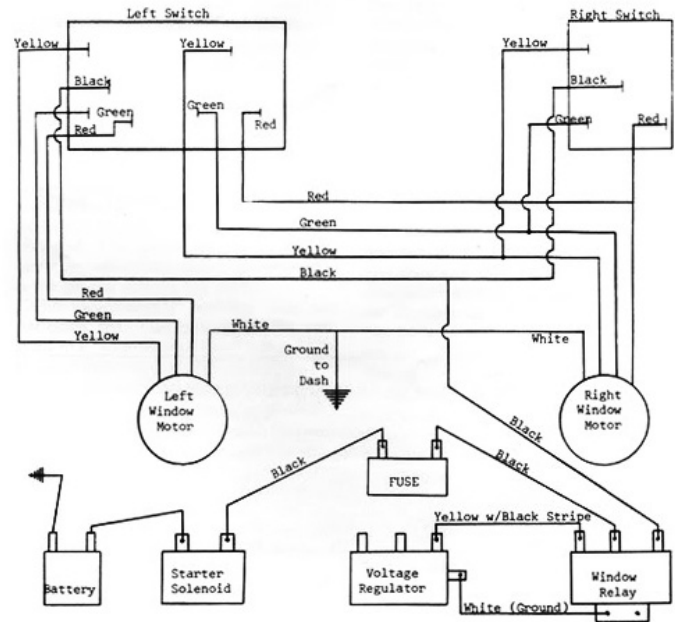
When testing high-draw devices like motors (often recognizable as devices that make the lights dim when you first engage them) it never hurts to add another ground wire between the case of the device and the car frame to ensure that the ground connection is not the source of problems. A perfectly good hot wire but a bad ground will cause voltage to drop at the device you are trying to run, and cause it to work slowly or even not at all, while heating up the wires at the point of the resistance, potentially blowing a fuse, or worse. At some point in 1963 production (after serial #5168 according to the factory parts manual), the factory modified the window motor harness to include a second ground wire, with its end bolted to the motor's frame.

## Are your motors good?

Exposed to the elements as these motors are, several problems are likely. First, look for obvious signs of corrosion or heat damage. Most common are rusted and seized motor shafts, bearing grease that has petrified into a solid block of gunk, and shorted or burned motor windings from getting too hot in operation due to all of the other problems we have discussed so far. When disconnected from the window riser frame, the motor shaft should spin freely. If it does not, you can attempt to free it with penetrating lubricant and emery cloth to smooth the shaft if it is rusted. But chances are, if the motor has seized, it may also be burned inside as it worked itself to death trying to overcome resistance. If it smells burned, it is probably bad. You have a choice of trying to have it rebuilt, or find an exact replacement. Original motors have four wires coming out of their cases, and carry the 1960 Ford/Lincoln part number COLF-14553-A, or Bosch M 05810. Research suggests that Ford station wagon tailgate window motor COLF-14553-B will work as well. Doubtless, a more modern, but non-exact replacement window motor can be adapted if you have the ingenuity, but we will leave that up to you.

With the motor on the test bench, you can power it with your battery charger by attaching the black (negative) cable to the motor's black wire<sup>1</sup>, and by leaving the red lead disconnected and connecting BOTH the green and yellow motor wires to the charger's red (positive) lead. Connecting BOTH the green and red motor wires to the charger's hot lead, while leaving the yellow lead disconnected will reverse polarity and make the motor spin in the other direction. If it does not spin quickly and silently, assume it is bad and replace. If you want to check the motor for an internal winding short, first disconnect the motor from the charger, then set your multimeter to Ohms on the highest scale and attach one

probe to the motor's grounded case and the other probe successively to the red, green, and yellow wires. On each one, the tester should indicate a very high value of resistance; barely moving off the highest point on the scale. If it shows little or no resistance, you have a short. Next, measure the resistance between the colored leads of the motor and its ground lead, one at a time. If any shows very high resistance, you probably have a burned winding<sup>2</sup>. While there are more sophisticated tests that can be done to check the health of a motor, these are beyond the scope of this article and are best done by a motor repair shop.



*The Avanti's power window circuit diagrams are not included in the shop manual. This one is borrowed from Rob Johnstone's web site. Before beginning any electrical disassembly, disconnect the negative battery cable for safety.*

Moving ahead, as we start taking things apart we will address potential problems of as we come to them. Usually we find that problems with devices like our windows are the result of accumulated issues, and that each issue plays a part in the eventual failure of the whole mechanism.

## Common Sense Troubleshooting

Before taking up a single wrench or removing a single screw, it is sensible to define first exactly what is wrong. In my case, sometimes the windows would simply not work at all; they appeared to be completely dead. Moving the switches produced neither window movement nor dimming of the courtesy lights, which might have indicated they were trying to move but were stuck. When they were alive, my passenger side window went down too quickly (3 seconds), and went up very slowly (15 seconds or more). My driver window went down OK, except when it was all the way down it went so deep inside the door that it fell below the wipe strips and couldn't generate the energy to rise above them without assistance. Even when in motion, it too raised very slowly usually stopping before it was fully closed, then unexplainably would

<sup>1</sup> Original Ford window motors have a black wire pigtail for the ground connection, because Ford uses black as its universal ground wire color. Conversely, Studebaker uses black to mean hot/positive, and uses white as its universal ground wire color. Therefore, in a breach of electrical harmony, the white wire from the Avanti harness connects to the black wire on the Ford motor. Beware of mixing things up.

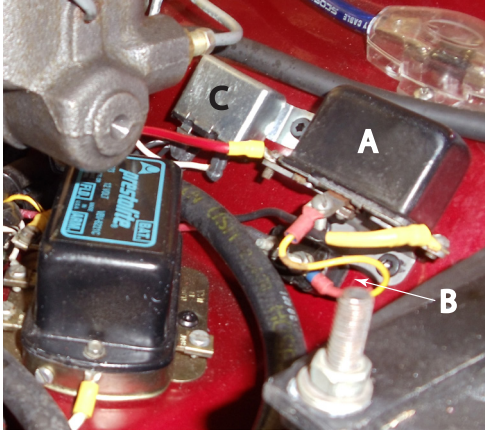
<sup>2</sup> <http://www.wikihow.com/Check-an-Electric-Motor>



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go neither up nor down for a few minutes when it would then come back to life. I decided to first to troubleshoot why the entire window system went dead at times.

The wiring diagram for the Avanti window circuit is shown on the prior page. Briefly, the hot wire is attached under the hood to the starter solenoid's "key hot" side<sup>3</sup>.



*Electrics on the car's inner left fender. Black box "A" with three visible terminals is the power window relay. Small black rectangle "B" below is the window circuit breaker. Silver relay at left "C" is for horns.*

Reading the diagram, it shows a circuit breaker attached between the window's hot lead and the battery. This is sensible, as the circuit breaker will trip and then reset after a time if a motor jams or there is another major electrical fault or short circuit in the window wiring. Next is a small relay, whose job it is to further insulate the window system from overload. In this case, the single relay controls both windows and their travel in both directions<sup>4</sup>.

The diagram shows that as soon as power is applied to the circuit, the single relay closes and power is delivered first through the relay and then to window wiring harness. With the key "on", all three of the exposed terminals of the relay should show 12V. But when I checked with my multimeter, I found that the third terminal on the relay—the one that supplies power to the harness when the key is on—was not showing voltage. Therefore, no power was getting to the windows. Checking the "always hot with ignition on" black wire on the backs of the window switches confirmed that there

<sup>3</sup> Depending on when it was manufactured, your Avanti may have its window power connected in a different place. When connected as shown in this wiring diagram drawn for the early cars, the windows are powered only when the key is in the "on" position, and not the keyed "accessory" position. Studebaker changed this at some point during production because they found customers were burning their ignition points when they would stitch the ignition to the "on" position to raise the windows, and then accidentally leave the switch there. Later production relocated the power source to a spot where the windows could be activated with the key in either the "ACC" or "ON" positions.

<sup>4</sup> Most modern cars no longer use this setup of a single key-on relay for power windows. The disadvantage of the Avanti's method in using a single relay is that heavy gauge wiring and heavy-duty switches must be used throughout to control the windows' operation. Modern cars use two small relays per window, one each to control the motors moving the window either up or down. Relays complete and break the high draw circuit inside of their sealed bodies, allowing much lighter gauge wires to run to the switches and much smaller switches to be used. There are therefore fewer thick, bulky wires are needed to carry heavy current in the harness.

was no current present at the doors.

Remembering that all electrical devices need to be grounded to work, I first checked to see if the relay was grounded and found that the white wire that went to its base was indeed slightly loose. Cleaning the connection and tightening this bolt solved the problem immediately. Now, when the key was turned the relay clicked "closed" immediately, full power was being delivered to my windows regularly and I had solved my first problem.

The problems with the driver's door were greater of the two, which is not surprising since it is used every time the car is driven. The passenger door on the other hand is used far less often and had fewer issues. I decided to start with the passenger door.

## Step One: My Passenger door

Removing the door panel is the first step. Because I must assume you have a shop manual, I will skip detailed instructions on disassembly. You will need a simple special tool (available at any AutoZone in the "Help" section) to pop out the hairpin clip that will allow the inner door handle come off. The tool fits blindly between the round aluminum trim ring and the vinyl door panel, and for the uninitiated, getting this little clip to let go can feel like an impossible task. Work it and eventually you will push it out.

The bare door has a single 6" x 12" rectangular access hole near the center of the door at the bottom. Compared to other cars I have worked on, it is a generous workspace. The first thing I did was to run the window up and down a couple of times to see what I might notice. My observation was that because the window went down so quickly, it was likely that the tracks were in alignment and not part of the problem. Tracks that cause binding usually are balky in both directions. From this observation I decided first to look at the condition of the assist spring in the riser mechanism.

## Removal of the riser mechanism from the door

The factory service manual describes the process. Wear gloves to protect your fingers from sharp edges. Very briefly, you will remove the lower glass stop, remove the arms from the rollers in the window channels, raise the disconnected window to the top of its travel by hand and jam it in place with a screwdriver pushed through the upper window stop hole, so that the detached glass



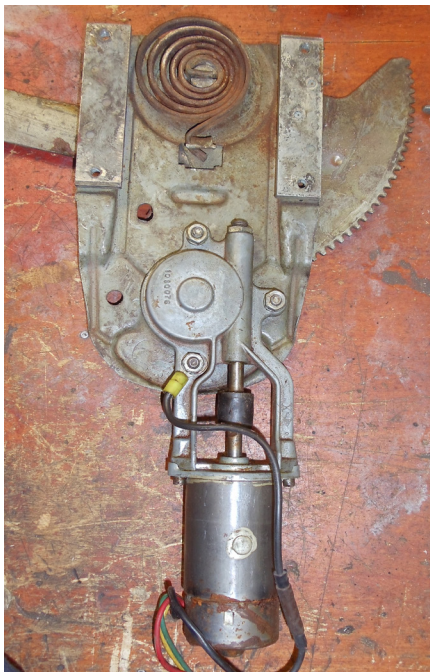
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will not fall and hurt you. Unbolt the motor frame and the center pivot of the regulator from the door. Your motor probably has four quick disconnect electrical leads that allow a pigtail of wires to remain with the motor. You do not need to detach the terminals from the riser switch to remove the motor from the door. The complete motor, the motor frame and riser mechanism can be removed through the access hole. Laid on the workbench I observed the dried, caked on grease and dirt throughout, probably acting very much like that sand poured into the patio door slider I mentioned before.

*A digital camera is arguably the most timesaving tool invented for the auto mechanic in the past 50 years. Take photos of everything at each stage of disassembly to help you remember how it all goes back together.*

## Removal of the motor from the riser mechanism

Before the window motor can be removed from the mechanism, it is very wise to momentarily attach 12v to the wiring and raise scissors so that the riser is in the fully open position. Why? Because when we removed the window glass from the scissors riser, the mechanism had been wound “fully down”. And when it is fully



*The riser mechanism “as removed” from the passenger door. The position of the half-moon gear shows that the window would be all the way up in this position. All tension is off this spring; it can be removed without effort. That is not right; as even when fully down, the window spring should retain some of its tension. Rusty spring was sandblasted and greased before proceeding, to help it move more easily as it coils.*

down, the assist spring is wound its tightest. Unbolting the motor from the riser assembly with the spring twisted closed may cause it to come apart with some sudden force, which could hurt you and break something besides. (If your motor is inoperable, you may want to clamp the spring in its current position with a c-clamp or a large vice grips while you remove the motor. At any rate keep fingers clear of the large half-moon gear and the reach arm when unbolting the motor as they may move suddenly.)

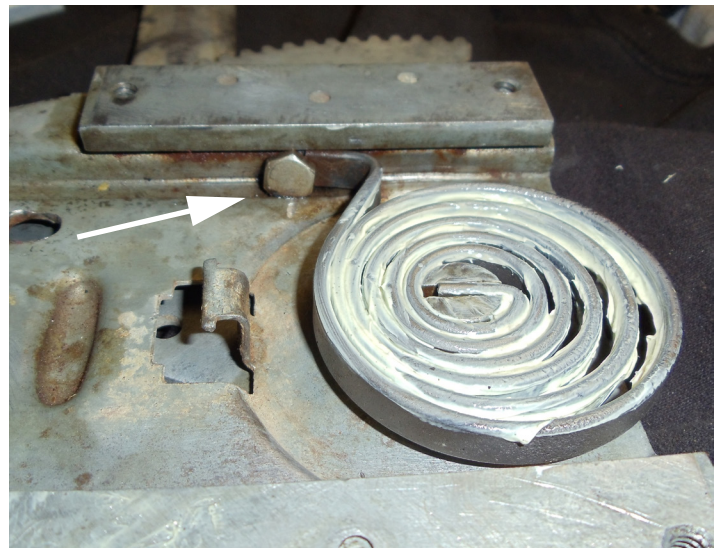
Be very careful when powering the motor in either direction with the assembly on the test bench. It is very easy to allow the large

gear to turn until it comes right out of its driven gear. It only takes three seconds or so to go from fully open to fully closed. Running the motor longer will cause the mechanism to go right past the end of its travel, causing the gears to spring apart. While it can be reset, keep your wits about you and avoid this happening if possible.

The way the window mechanism works is that it reverses the polarity of the motor to make it turn one way or the other. Use a 12V battery charger (set to its low, or 2 watt output if there is a choice) to power the motor. With the battery charger at first unplugged from the wall outlet, clamp the black battery charger cable to a bolt on the motor's case or the motor's black wire. When the yellow and green wires are connected to the battery charger's red clamp and the charger is plugged in for the briefest moment, the motor will turn; the “window” would rise and the spring will loosen. Conversely, if the red and green wires are connected to the battery charger's red clamp, the motor will turn in the opposite direction; the window would lower, and the spring winds tighter.

After thoroughly cleaning all of the points where metal touches metal (I soaked the whole assembly, minus the motor of course, in the de greasing tank) I sandblasted the rusty spring (though using emery cloth would work well too, only take longer.) I re-greased the spring and all points of metal to metal contact with white grease. A little is all that is needed, smeared on the specific points of contact. Do not use wheel bearing grease or any other heavy grease. It is not meant for this type of duty, and will gum the works up.

Trick: How to wind your current spring tighter



In the case of my passenger side window, I decided that if the spring could be wound a little tighter, it might solve both the issues of the window falling too fast and rising too slowly. Yes, these springs lose their tension over the years. Notable was the fact that when the mechanism was at “fully raised” position. The spring had almost no tension on it and could be removed easily without tools. This is not right; the spring should retain some tension, even when the window is all the way up.



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If you watch the coiled spring carefully while the motor runs through its full up/down-travel, you will notice that it turns and compresses only about half a turn. The only way to adjust the spring is to install it pre loaded, so that when the window is fully open, the spring is still trying to push it up more.

Logically, if one could simply remove the spring from its mounting slot, and rotate it clockwise by 180 degrees, then reattach it while keeping the end mounting tab in its hole, one will have accomplished this feat. The problem with this is that it is nearly impossible to turn this spring even a fraction of an inch by hand, let alone another half turn!

So, here is the trick: Because a half turn was too much for this particular spring, I made a new mounting point for the spring's base by welding a sturdy bolt into a hole I drilled in the window winder frame. Spring in place and motor still removed of course, clamp the riser frame securely in the table vice between two pieces of wood (to avoid bending or otherwise marring it), push on the reach-arm, and very carefully but very firmly rotate the gear to line up the two alignment holes (one is in the frame, the other is in the half-moon gear). You will be pushing against the increasing spring pressure. Make sure you are wearing gloves, the mechanism is not greasy to ensure a good grip and get someone to help you if you are at all unsure of your steadiness. Then, have a helper quickly insert a long Phillips screwdriver blade through the two alignment holes provided for just this purpose, jamming the mechanism in place. Screwdriver still locked in place, remove the assembly from the table vice, and carefully reinstall the motor to the frame using two of the bolts with lock washers. Note that the third (center) bolt is not accessible with the half-moon gear in this position.

Once the motor is tightened to the frame with the two bolts, you can remove the screwdriver from the alignment holes, as the motor gear will hold the spring tension. Now, with great care, briefly apply power to the motor leads again, bumping the gear to near the end of its travel, and exposing the third and final bolt hole. Install the third bolt and nut with lock washer.

*Tip: while you have the mechanism out of the car, clean the inside of the door with a good de greaser and install Dynamat (or equivalent) to the inside of the door panel. You will never have such good access to this spot again! Your doors will feel more solid when closed and road noise will be reduced as a result.*

Now, before putting things back together, I decided to address a couple of other problems best tackled now that can only be done when the window is apart.

## Replacing the outer window rub strip

This is the rubber strip that is attached to the outside edge of the door's window opening that is supposed to press against the outside of the glass and keep water out of the door. Not surprisingly mine was brittle and torn, and not the least bit flexible. New rubber is available from our vendors, but the stainless steel channel surround must be reused. To get the old one off, the window glass is best removed from the door. This process is explained in the shop manual, but you have already done most of the work. For the glass to come up and out, you will need to loosen the five bolts that hold the vent window frame in place, then with a helper tipping the frame away, carefully raise the glass to the top of the opening by hand, and tip it gently past the upper window stop to allow it to come free.



*Outer rub strip is captive in a stainless channel that must be reused, and is connected to the door with four spring clips and a single screw. Replace it now while the window is apart.*

*Tip: cover the painted surface of the door top with masking tape and heavy paper to avoid marring the finish on accident as you remove the window glass.*

With the glass out of the way, use a sharp knife to cut away the very rear edge of the old rubber, exposing the screw beneath it. Remove the screw using the access hole thoughtfully provided by South Bend. Being careful of the paint, insert a non-marring prying tool between the painted door and the stainless trim and pop the four spring clips out of their holes on the door. The strip is pinched at its far front end in between the painted door and the vent window; shift the vent window forward again to allow the strip to be pulled free.

With the stainless strip removed and on the workbench, score the old rubber down the center with a sharp knife, split it and carefully pull it out and discard. Steel wool the inside of the stainless strip, spray a small amount of WD40 or other lubricant into the channels, and slide the new rubber strip in place, leaving the screw hole

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at the far back temporarily exposed. Snap the strip back into place, reinstall the screw, and slide the rubber strip back into its final position, covering the screw. You may need to trim the strip at either end to allow it to lay flat against the window glass.

## Restoring the window “up” stop



Top stop, sandblasted and fitted with new rubber from a heater hose

Nothing more than a small L-bracket bolted to the door frame, the easily ignored (and possibly missing on your car) top-stop keeps the glass from going up too far. When properly installed, the top arm of the window scissors bottoms against this adjustable stop. Close inspection showed that while it was originally covered with a thin cushion of rubber, the years of use had caused the rubber to peel away, leaving metal on metal contact at the top of the window travel.

Removing the small stop, I used a tiny length of heater hose slipped over the end to replace the original rubber cushioning, and secured it in place with a dab of windshield sealer adhesive. When reinstalled and adjusted, the window nestles softly against the stop rather than hitting it with the former “clunk”. Little touches like this are what make an old car feel new again. If your top stop is missing altogether, Jon Myer has a supply of them for sale.

## Replacing the front glass run

This concerns the edge of the glass that sides up and down inside the vent window post. If, when the window is halfway down, you are able to rattle the glass back and forth in this channel, you will want to renew the glass run. If the glass does not rattle around, leave it alone. On my car, the driver door required attention but the passenger door did not.

The entire vent window assembly must be unbolted from the door and pulled up and out of the door for this step. I have found that the best replacement for the original fabric insert is the “soft” half of a roll of Velcro. You can buy Velcro by the roll at the fabric store. After removing the old material and cleaning the inside of the channel, unroll the soft Velcro, and cut it into three long strips. Using 3M spray super trim adhesive, I glued the three strips, one at a time to the three contact faces of the inside of the channel. Do not try to take a single piece and stuff it in there covering all three surfaces; you will probably end up with a window that fits too tightly and will bind.

## Reinstalling the Window Glass

Before reinstalling the glass, I cleaned all the old grease and rust



*Before and after, cleaned and painted*



from the frame, and repainted the bottom of the frame with Rustoleum. I used white lithium grease on the rollers and freshly cleaned rear glass track. Preferably with a helper, pull the loosened vent window assembly forward (tip it towards the front of the car) for clearance and reinsert the pane into both the front and rear channels at the same time.

Ensure that the window is properly seated in its channels, and test it by moving it fully up and down manually. If it is all right, wedge it at the top of its travel again with the screwdriver through the top-stop hole, and reinstall the window motor and scissors assembly through the access hole, bolting it in place. Reattaching the motor and switches, use the electricians to lower the scissors to its “full down” position, lower the window glass carefully by hand to the bottom, then reattach the scissors ends into the three rollers. (Hint: if you leave the rollers in place in their tracks with the small hairpin clips pre-installed, the posts will snap securely into place when you seat them.)

The rebuilt and re-tensioned window now lowers in 4 seconds and rises in 6 seconds; very acceptable indeed.

## The Driver Door Is Next

Owing to the fact that it is used much more than the passenger door, the driver door had far more severe symptoms. The door’s center near the armrest, while not cracked, bowed noticeably in or out when the motor was engaged, especially at the top and bottom of window travel. Beginning disassembly, I found that all of this had clearly been apart before. When the scissors arms were disconnected from the window, the glass was still hard to wrestle up and down. It rattled in its front channel. I found the door was missing its lower stop completely, explaining why the window



# Avanti Repair

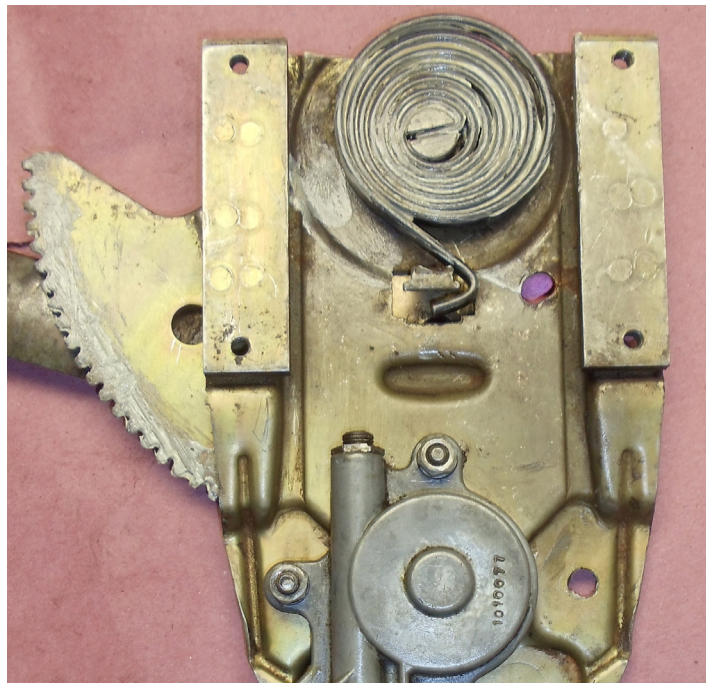
would drop so far into the door that it could not rise again under its own power, and while I fiddled with the riser switch to try to get it to rise, the entire system suddenly went dead. Checking the under hood circuit breaker, I found that it had tripped off, explaining my periodic loss of all window power from time to time. At least the circuit breaker acting as a safety valve had probably prevented frying the motor, though I noted the motor case was still almost too hot to touch.

Removing the assembly from the door I found more artifacts of damage. First, the reach arm attaching the window scissors to the crescent gear was bowed and bent. The assist spring was completely missing, and the entire mechanism was gunked up with heavy grease instead of the proper light white grease. The motor appeared to be a replacement OEM Ford-logoed part. The slider insert in the front channel was shot, and just as with the passenger door, the upper stop had lost its rubber cushioning and the window squeegee weather strip needed replacement.

Like an archaeologist surveying ancient evidence at a dig, I concluded that a prior owner had diagnosed the problem simply as a burned out motor, had clumsily disassembled the door, and without correcting the basic problems that likely had CAUSED the motor to burn out (poor channel alignment, worn assist spring, bent reach arm, lack of proper lubrication) he simply replaced the motor, slapped some grease on things and put it all back together, leaving out some key parts like the assist spring and bottom stop in the process. He had taken his problem and unwittingly had made it even worse.

## The Bent Reach Arm

This is a common problem in many vintage cars with power windows. The reach arm acts like a lever between the half-moon gear and the movable window. It is nothing more than a stamped piece of mild steel with an embossed ridge on it to give it some strength. As the window got stickier over the years, the lever arm began to distort and bow slightly every time it engaged trying to move the balky window glass. Finally, it started to bend. Each first impulse of power applied to the motor would then always cause the arm to bend and bow OUT before it awkwardly began to move UP, bowing the inner face of the door out at the same time it strained to move the misaligned glass. The weak or missing assist spring was



*The driver's side window regulator, cleaned and greased with a replacement spring correctly installed. Notice this spring is flipped over and wound in the opposite direction to the one on the passenger door. This particular spring was lighter in gauge, and allowed itself to be preloaded a full half-turn even with the window fully raised. The small hole at 4 o'clock below the spring is the alignment hole, used to temporarily lock the spring-loaded half-moon gear in place while the motor is installed.*

not helping lift the glass, and the misaligned trolleys and gunky dried grease didn't help either. My guess is that due to this, the original window motor finally burned out and was replaced by the new one, which was on its way to suffering the same fate unless things were properly fixed.

The first step was to straighten and reinforce the original reach arm. I had done this before on my 1957 Thunderbird (which as a side note surely has the most Mickey Mouse window mechanisms ever installed on a car), so I knew what to do. I used my MIG welder to bond an additional thickness of strap steel solidly to the face of the newly straightened arm, more than doubling its strength, as the factory should probably have done in the first place. If you do not have a welder, find someone who does. Once bent, these are weakened, and simply straightening them is not enough, as they will bend again much more easily the second time. Ask your professional mechanic, or look in the yellow pages under "blacksmiths" if you live anywhere near farm country, and you will find someone who can weld!

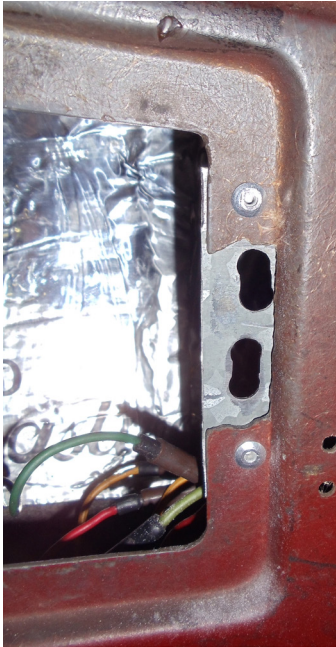
## More Surgery

Just like the other door, when the window mechanism was fully raised, this uncompressed spring showed no tension. New exact replacement springs are not available, but a used rear quarter window spring from a GT Hawk in the 1962-1964 vintage is a suitable replacement. (These windows are typically barely used, and left raised most of the time, so their used springs are generally good-





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*The bottom stop on the driver side was missing because at some point it had been totally ripped out of the frame, breaking fibreglass as it departed. Period service bulletins indicate that this was not uncommon and a second lower stop was added on the other side when these repairs were made by the dealerships. I made my repair plate from a piece of scrap steel from a deceased wheelbarrow, and riveted it securely in place. New stop (not shown) was purchased from Myer's Studebaker.*

as-new.) I found a used window spring, though I noticed it was a slightly lighter gauge than the passenger window. It is quite possibly from a manual crank window. I was able to pre-load and wind this lighter spring a half clockwise turn mounting it. Therefore I did not have to weld a new spring mount like I did for the passenger door. A word of advice: just double-check yourself that you put the spring in, so that when the window is lowered, the spring coils tighter. The driver door and the passenger door have the spring flipped over in relationship to each other, and it is easy to get it wrong. In your own head, figure out the physics of the movement before putting it all back together.

Pre loading the springs is the hardest part of the job, as it is slightly nerve wracking. In browsing the web, I found articles and tips written by others that suggest that these springs can be pre wound somehow with pliers, and then clamped in place with vice grips for installation. My method as I have described is much safer, as it starts with the spring already "in position" and uses the leverage of the reach arm and the strength of your arm to preload the spring. Visualize the entire process before beginning, and you must have a table vice to clamp the riser frame securely in place. You will be pushing quite hard against it as you rotate the half-moon gear to tighten the spring, so you can slip the screwdriver through the locking holes the very moment they are aligned with each other. If you try this without a vice, your friends may begin calling you "lefty" in reference to your missing fingers.

## Alignment of the window tracks inside the door

Unless someone has taken your door window channels out at some point, the window tracks "as installed" at the factory *should* never need adjustment. But if something has worked itself loose, or the door has been apart for any reason, and the window tracks removed, you will need to follow the shop manual alignment procedure in strict order. Said in another way, if you skip a step you might as well not bother. Each step in alignment is dependent on

the prior one having been done correctly.

It does not take much misalignment to make a big difference in the effort needed to raise or lower the glass. The glass is supposed to fit tightly in its channels to keep it from rattling around. But if it is too tight it may be impossible for the window motor to overcome the resistance. If it is too loose, the window will rattle. If misaligned when it is raised, it will allow air to whistle into the car as you drive. It is common for owners to blame their weather stripping for air and water leaks when it the doors and windows are actually misaligned instead. The common test for perfect alignment involves slipping a dollar bill between each point of window to weatherstrip contact, closing the window or door, then pulling the bill out. You should feel some resistance, but not too much or too little. It turned out that my driver door was adjusted so that the window leaned permanently so far in at the top that the door had to be slammed closed to make the door latch engage. Because of the excessive angle, the top of the window glass was pressed so firmly against the weatherstrip that the window would not easily slide against it. This condition could surely have caused all of the problems with bent metal, burned motor and tripping circuit breaker that my poor Avanti had experienced!

## Driver Door Reassembly and Conclusions

With the glass properly adjusted and the motor and repaired riser reinstalled, I was amazed to watch this window work perfectly on the first attempt, going full-up and full-down in less than four seconds each way.

This is not an easy job to tackle. I'd call it a "seven" on a scale of 1-10. But if you are ambitious and careful, not in a great hurry, and have someone to help you with the tricky parts that require three hands to do, it is not impossible and can give you quite a bit of satisfaction. I recall attempting to do this job on my first car (one with manual roll-up windows) back when I was 18 and very inexperienced. I nicked up my paint and did a pretty sloppy job back then because I didn't do things in order and didn't properly diagnose the problems before I started tearing things apart: probably just like the former owner of my car had done here. I also had a penchant for having parts left over at the end, and usually figured they were not needed. You can take my word that there is NOTHING installed in the mechanicals of your car that is not needed for some reason. With manufacturers' constant focus on cost cutting and simplification, if it was not needed, I promise the factory would have left it off before it ever got to you! My window's missing assist spring and bottom stop were probably thrown away by a novice mechanic who didn't know their purpose, the same fellow probably who covered every inch of the mechanism in heavy wheel bearing grease like he was icing a cake. Now, rebuilt, aligned and properly maintained my windows should no longer cause me to worry when approaching tollbooths. They move reliably up and down, smoothly and quickly.

*- The author thanks both Brad Bez and Jon Myer for their help in researching this article.*