Classic car windshield wiper vacuum motor replacement

by **grandpajoe** on February 13, 2010

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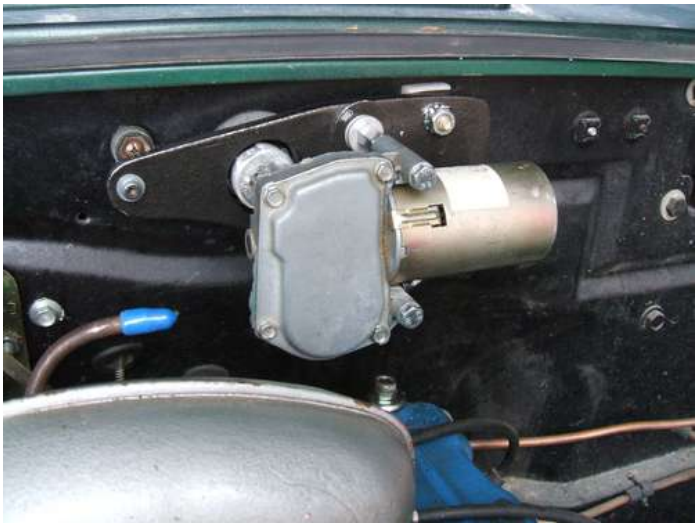
My wife and I are the proud parents of 6 wonderful children who are now married and raising families of their own. I am a recent cancer survivor(leukemia). I enjoy sharing ideas that bless peoples lives.

Intro: Classic car windshield wiper vacuum motor replacement

Up until the 1960s, most automobile windshield wipers were powered by vacuum motors. I have a 51 Willys pickup with a vac motor. The last time I registered the truck, the only way I could get the wipers to pass the inspection was to mist the windshield with a water spray bottle before turning them on. It is time to reregister the truck and the wiper motor has failed.

This Instructable describes the process I used to convert the wipers from the original vacuum motor to a 12 volt motor. If you choose to make this conversion, I suggest you read through all of the steps before starting. These instructions are a little disjointed.



Step 1: Know what you need to replace

This is my vacuum motor. There are several sizes of these motors. To make the replacement, you will need to duplicate the motor drive hub and mounting holes pattern of your own motor.

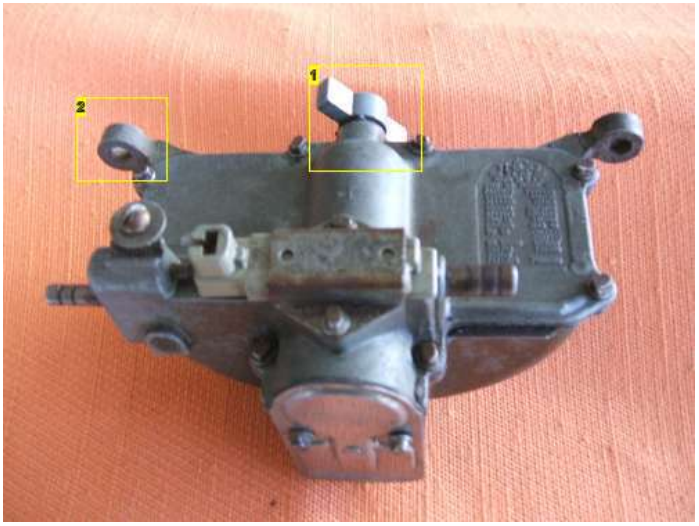
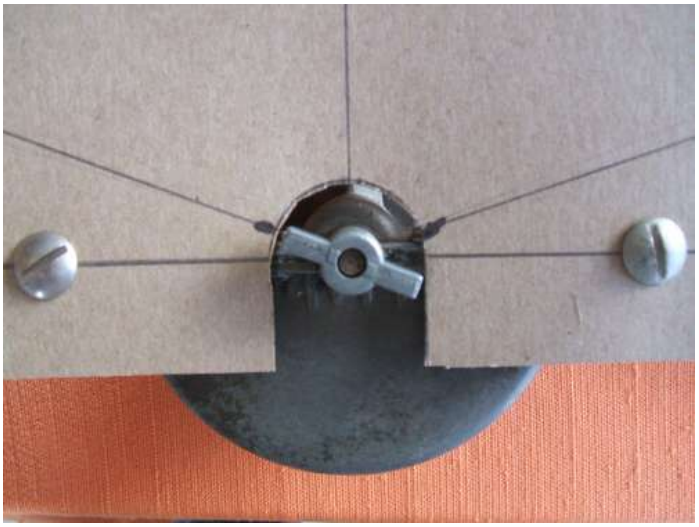


Image Notes
1. Vac motor drive hub/wings
2. Mounting ears located on each side of vac motor.

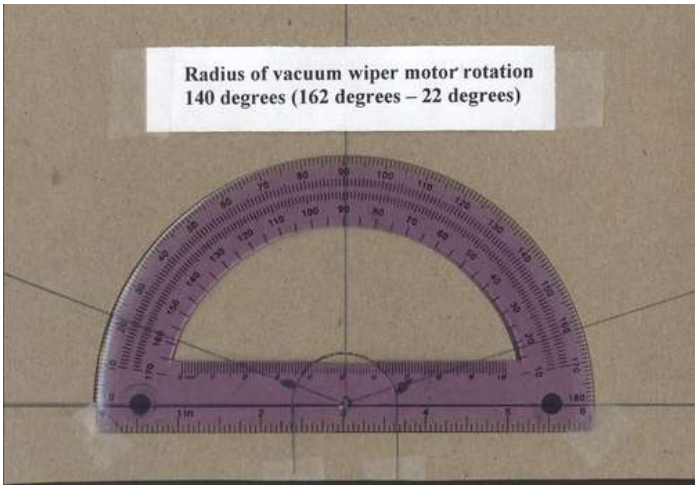
Step 2: Determine the motor drive radius 1st step

To determine the radius of the motor drive, I made a cardboard template, attached it to the drive side of the motor, and marked the outer arc swing limits of the upper hub wing. The initial photo showed only the index markings, but is was a poor photo. I made this photo after I had taken the template off, penciled in the radius line extensions, and remounted the template to the motor.



Step 3: Deterimining the radius 2nd step

Using a protractor, the radius of the vac motor drive arc is shown to be about 140 degrees.



Step 4: Select a replacement motor

Most older vehicles are 6 volt. If you decide to go to an electric motor, 12 volts will work best. We are in the process of converting my original 4 cylinder F-head engine from carbureted to fuel injected, so I have already upgraded from 6 volt to 12 volt.

Initially, I wanted to use a front windshield wiper motor in order to have the variable speeds. The problem is that most of these systems use a motor that drives in a full circle, with linkage to provide the oscillating motion to the two wiper arm pivot points. I designed a modification for one of these systems to have a shortened single pivot point, but did not like how big and cumbersome it looked.

The vac motor wipers have a single output pivot shaft and a cable system under the dash to transfer the power to the two wiper mount pivot shafts. Rear windshield wiper motors are the logical replacements for the vac motors because they have only one output shaft and do not turn in a full circle, but oscillate back and forth in a fixed arc..

From information gained in the two previous steps, I knew that I needed a motor with an output swing arc of as close to, but not more than 140 degrees. I experimented with three rear wiper motors, two from the local "Pick and Pull" and one given to me by my son Joe. I checked the swing arc on these motors in the same way as with the vac motor. I used the same type of template, taping an "L" shaped wire to the output shaft to determine the arc limits.

Of the motors I tried, the best match was from a 90 Jeep Cherokee (not a Grand). It had an arc swing of about 135 degrees. I knew it would not give the complete full swing of the wipers, but it would also not force the wiper cable system outside of its design limits. The best thing was that it did not cost me anything because it came from a Jeep my son had parted out.

Unfortunately, I had already modified the motor shaft and mounted a hub before I took this photo. As shown here, the motor is attached to a stamped sheet metal mount, with a black plastic motor controller attached. You can see what the shaft end looked like originally by checking on Google for "rear wiper motor" and then searching for this model.

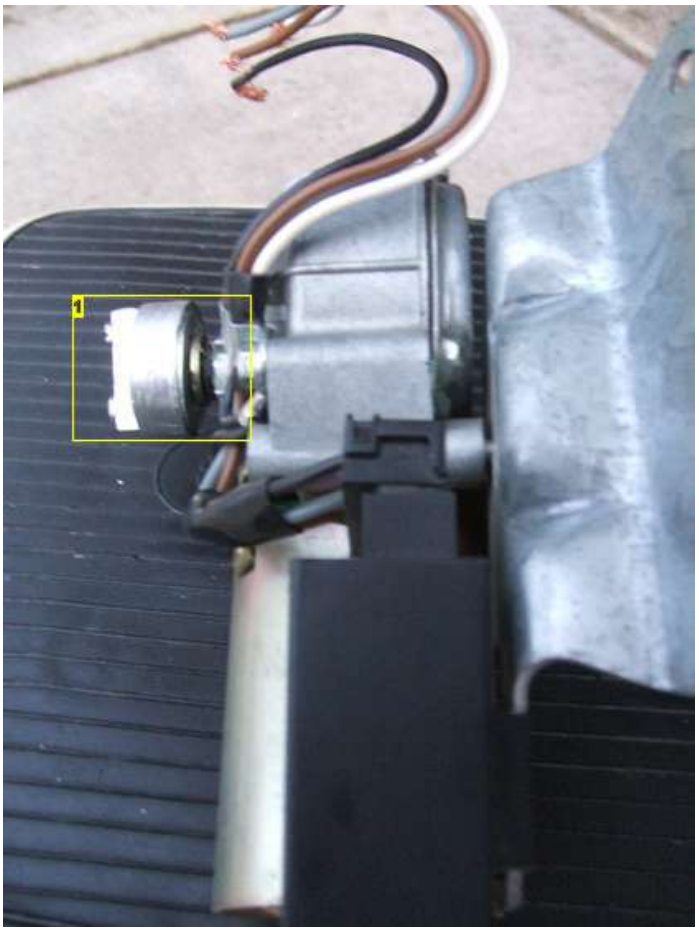


Image Notes
1. Shaft end has been cut off and both the shaft and housing have been shortened.

Step 5: Determine the motor wiring

On this design there are 4 wires coming from the assembly: white, black, brown, and gray. Connecting the white and gray wires to a positive 12 volt line, at the same time the black line is grounded, powers the motor to run continuously. If the gray wire is disconnected and the brown and white wires are connected to the positive line, while the black line is grounded, the motor runs only long enough to return the wiper to the resting position and then stops automatically.

In my first attempt to rewire the harness, I used a switch with two "on" positions. I attached the white wire and a fused positive line to the center switch tab, then attached the gray wire to the tab on one side of the switch and the brown line to the other side. Switching to the gray line turns on the motor. Switching from the gray line to the brown line returns the motor drive to the resting position and turns off the motor. I was disappointed when I realized that the resting position for this motor places the wipers in the upper rather than in the lower position.

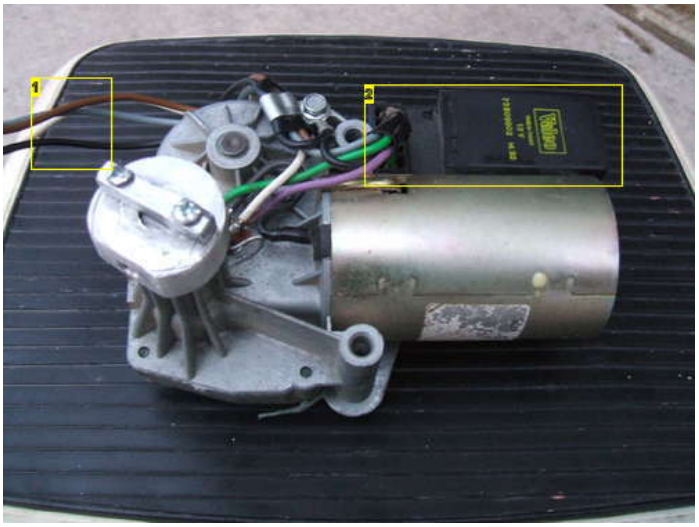


Image Notes
1. Wires from assembly to wiper switch
2. Motor controller connected to mounting plate

Step 6: Modify the motor drive shaft

To verily that this motor would work as a replacement, I needed to put a drive hub onto it and try it out. My first step was to cut off the wiper arm mount from the shaft end. This let me see that the shaft is 4 mm in diameter. Next, I shortened the housing to expose more of the shaft. This motor has a plastic bearing between the shaft and the housing. I removed the bearing and replaced it into the housing after making the cuts. As I experimented, I cut both the shaft and housing twice each before determining the lengths. This photo shows the final shaft/housing/bearing configuation. This worked well for me, using a 1/2" thick hub and washer between the bearing and the hub. Before reinstalling the bearing, I packed the shaft housing with grease. Also shown is a flat that has been filed on the end of the shaft for the hub set screw. Do not file this flat until the placement of the hub is determined in step 16.

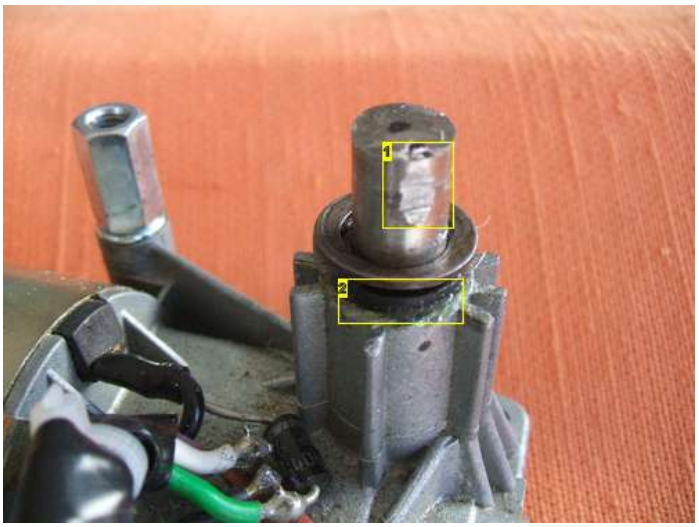


Image Notes
1. Flat for hub set screw
2. Plastic bushing

Step 7: Make a drive hub

I wanted to match the output drive configuration of the vac motor as closely as possible. The dimensions of the drive wings are 1 1/8" total length, 3/16" thick and 5/16: high. This in not too pretty, but it is functional. I cut the hub out of a scrap piece of 1/2" aluminum using a hole saw. The saw teeth kept filling up with metal and had to be cleaned out every few revolutions. A belt sander was used to take off the rough edges. The bore is 4mm. I used aluminum cut from an old fuel pump body to make the hub wing. With a lathe and mill, this would be a much nicer looking part.

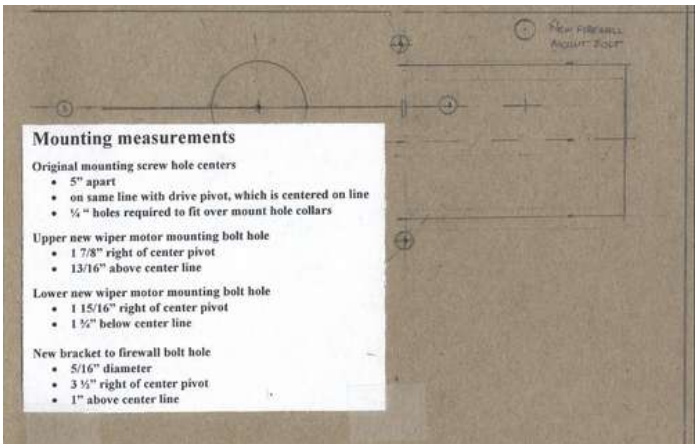
Step 8: Install the hub and test the motor

This photo is somewhat after the fact, but before making mounting modifications or even final shaft length determination, I tested the motor. To do this, I mounted the hub and held the motor in place to see that it had adequate power to operate the wipers. This takes two people, one to hold the motor in place and the other to connect and disconnect the power. I was very impressed with the amount of torque produced by the motor. To make this test I set the set screw, but did not file the flat on the shaft. The hub position is determined in step 10.

Step 9: Determine the configuation of the adapter plate

Again, I used cardboard to make a template. The adapter needs to match the new motor configuration with that of the vac motor mount to place the drive to place the drive hub the correct position.. One of the nice things about using cardboard is that you can placed the template over the adapter plate material and mark the center points with a sharp point, such as an ice pick.

To test the adapter layout, I first made an adapter out of plywood as shown the next step.



Step 10: Verify adapter fit and drill a firewall mount bolt hole

I made the "breadboard" model of the adapter plate out of 3/8" plywood. Before mounting the wiper motor onto it, I added a spacer board to position it level with the existing mount. Next, I determined where I wanted to add a firewall support bolt and drilled the hole into the adapter and attached spacer first, then screwed it onto the existing moount.

The photo show the process of using the predrilled hole in the adapter as a guide to drill the firewall mount bolt hole. Note that the position of the receiving drive hub wing has been marked on the inside of the adapter center hole. This is used for setting the position of the drive hub on the shaft in step 16. At this hub position, the wiper blades are in the resting position.

I attached the motor to this wooden adapter for a trial run of the prototype before making the final adapter.

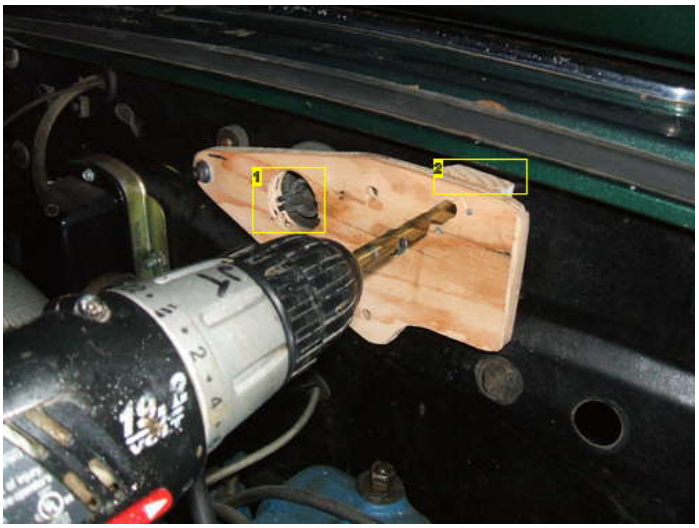


Image Notes
1. Marked position of receiving drive hub wing.
2. Spacer on wood prototype

Step 11: Add firewall mount bolt and spacer

The original mount is rubber mounted. The new spacer, with rubber pad, matches its thickness.

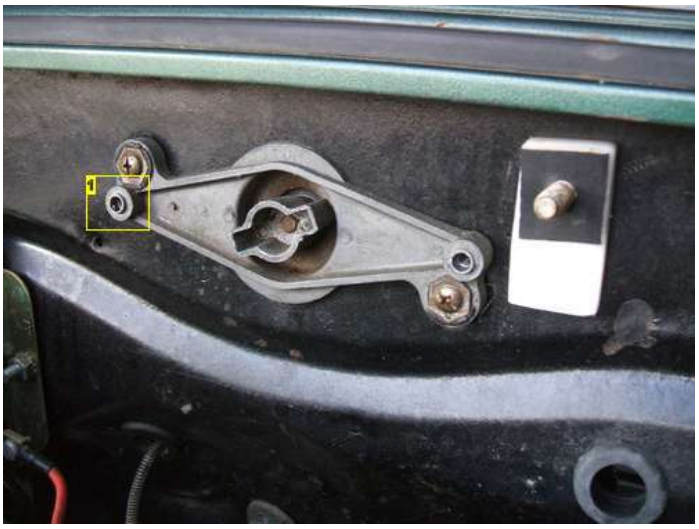


Image Notes
1. Original mount screw holes The 1/4" holes in the adapter fit over the sightly raised collars, flush with the shoulders.

Step 12: Made adapter plate

Steel or aluminum plate would probably be the best material for the adapter plate. I chose to use 3/8" nylon because I already had some and it is easy to cut. The two motor bolt holes and the two original mount holes are 1/4". The firewall mounting bolt hole is 5/16". After taking this photo, I sanded, primed, and painted it to match the firewall color.

Step 13: Separate the controller from the original mount

I wanted to move the controller to inside the cab, under the dash, rather then leave it on the firewall next to the motor. To accomplish this, unplug the wire connector and cut the connector from the stamped plate mount. I drilled a hole in the remaining smaller plate to use for mounting it on the inside of the firewall.

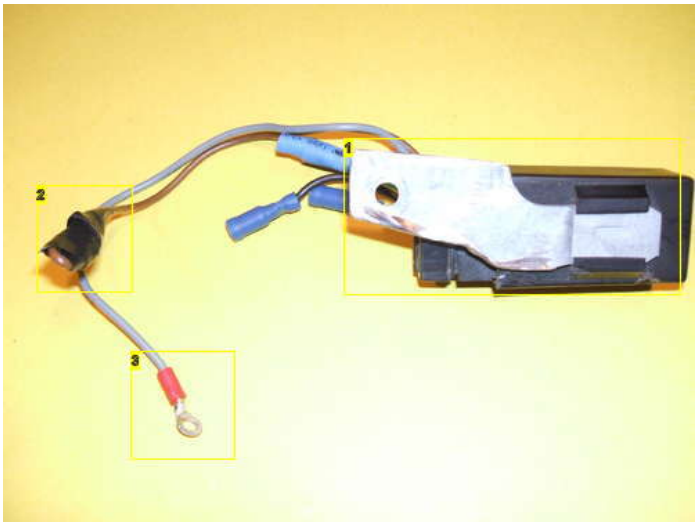


Image Notes

1. Portion of sheet metal mounting bracket cut to use to secure contoller to inside of firewall
2. Brown wire end taped off
3. Gray wire to switch...this line was too short and had to be extended.

Step 14: Make a new wire harness

There are three wires connecting the motor to the controller: green, lavender, and black. Clip these wires in the center to leave enough length on each end to attach connectors. Additionally, the white wire from the motor needs to be extended to the dash switch. I chose to wrap and secure these wires using the original harness to motor clamp. Not clearly shown is that the black ground line, in addition to being extended, it is grounded to the motor under the harness clamp. Where possible, solder the connectors to the wires rather than just crimping them. I used push-in connectors for the lines going to the controller and a loop end for the white line going to the switch.

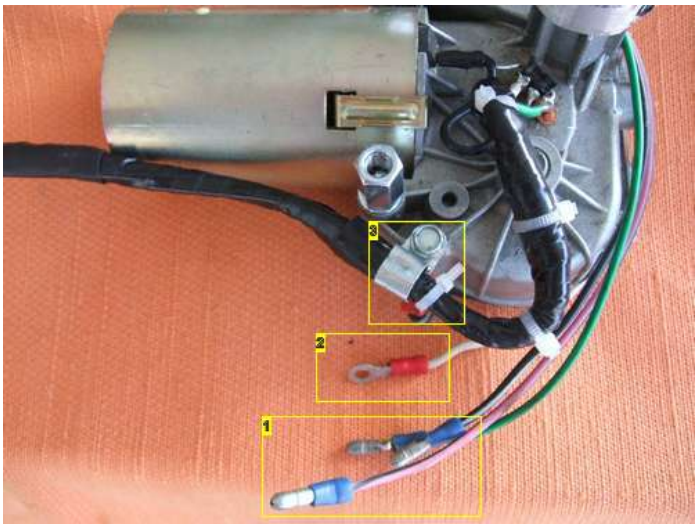


Image Notes
1. Male push-in connectors to motor controller
2. Loop end connector to switch
3. Harness mounting clamp with ground line loop connection secured below clamp

Step 15: Rewire the contoller

I extended the gray wire to the switch. It is not shown clearly, but the brown wire end is taped off due to the limitation noted in step 5. The black wire has an additional extension to ground the system to the body on a firewall screw.

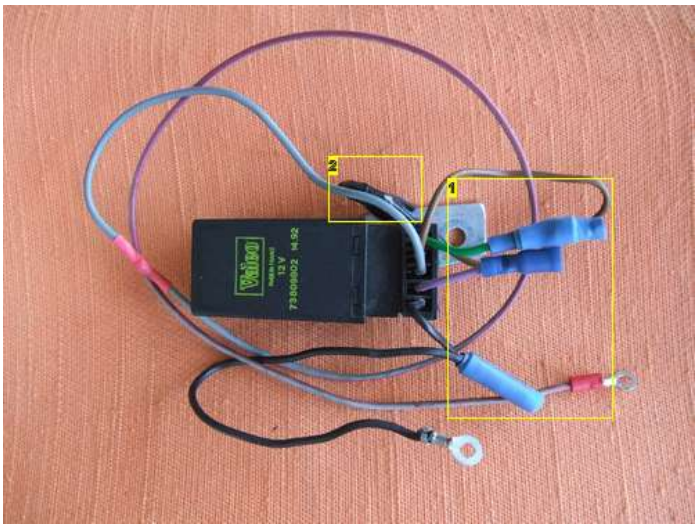


Image Notes
1. Green, lavender, and black wires have female end push-in connectors.
2. Brown wire end is taped off

Step 16: Secure hub on shaft and attach motor to mounting plate

Install the hub to the shaft prior to attaching the adapter to the motor. Based on the hub position identified in step 10, file a flat onto the shaft as shown in step 6. Install the hub to the shaft as shown in step 8 and tighten the set screw.

The shaft/hub length determines the position of the adapter plate. I spaced the adapter so that the total thickness of the spacers and adapter was 1 1/2" out from the motor mount holes. This was accomplished with extension nuts and washers.

The two motor mount holes are threaded from the back side only. I tapped these threads through to the front side. This may not have been necessary, but I did not want the security of the mounting to be dependent on the aluminum threads only. With this design, the connections are made within the steel extension nuts.

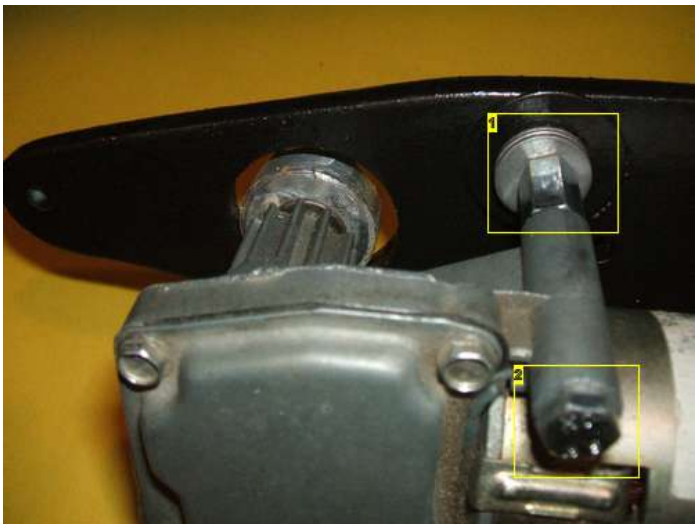


Image Notes
1. Extension nut and washers to space adapter from the motor
2. This is an all-thread bolt extending through the housing to the middle of the extension nut

Step 17: Test the completed wiring prior to installation

The motor controller wires are connected to the matching harness wires. The white and gray lines are connected to one side of the switch. By connecting a fused positive power line to the other side of the switch and connecting a ground to the black wire, it is possible to test the system by turning the switch on and off.

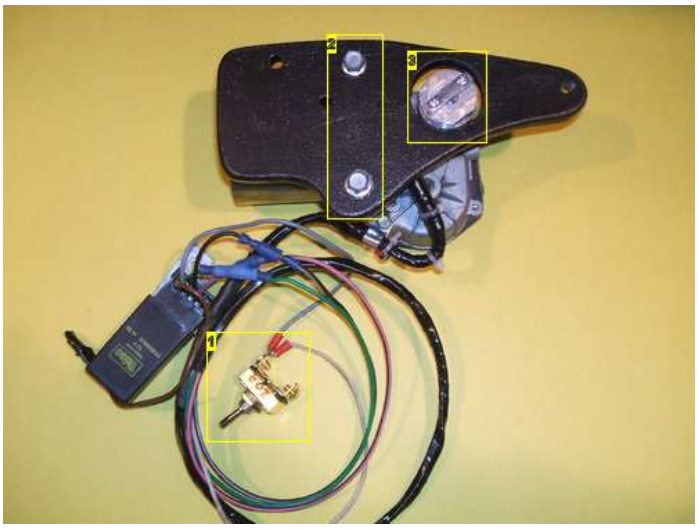


Image Notes
1. 20 amp on/off switch On installation, a fused positive power wire will be connected to the right side of the switch.
2. Mounting bolts securing adapter to motor
3. Flat surface of hub is flush with the surface of the adapter

Step 18: Install the wiper motor

This process has several steps.

1. Index the receiving wiper drive hub into the same position as the motor drive hub.

2. Mount the motor into position with the drive hub inserted and the firewall bolt in place.

3. Secure the motor adapter to the original mount using screws with the same threads as the original screws. The screw that is located on the right is behind the motor and will need to be a hex head screw due to the tight quarters. Do not over tighten these screws. Once they are secure, tighten on the nut to the firewall bolt.

4. Use a grommeted hole in the fire wall to pass the wire harness through to under the dash.

5. Connect the motor controller lines and attach the controller to the inside of the firewall. Ground the black line to the body.

6, Connect the white wire and gray wire to one side of the on/off switch.

7. Run an ignition switch controlled, fused line to the other side of the on/off switch.

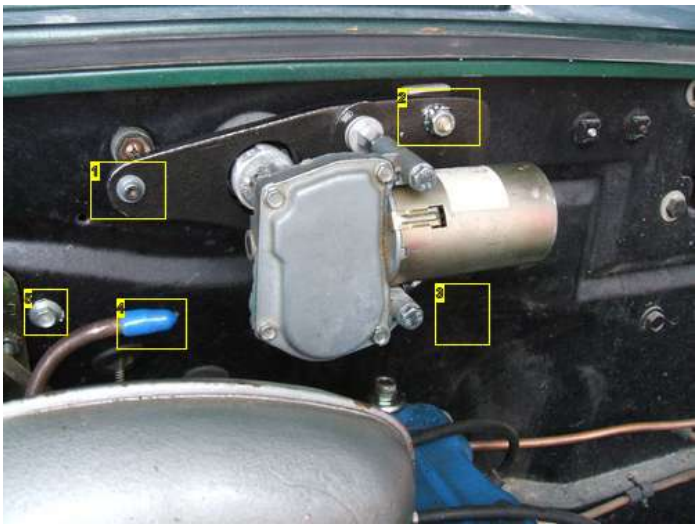


Image Notes
1. One of two screws into original mount. The second screw location is behind the motor. Use washers on these screws and do not strip out the aluminum threads.
2. 5/16" new firewall mounting bolt
3. Not clearly shown is harness wires through grommet
4. Old vacuum line...will not be needing this now...
5. New bolt through firewall to secure motor controller on inside

Step 19: Connect and install the switch

Verify that the switch will fit in the location selected and not short on adjacent metal. I taped the bottom of the switch to protect the wire from accidental shorts. I liked this location. Find what works best for you.

Image Notes
1. On/off switch mounted in same hole as original wiper contol knob
2. Odometer reading since our rebuild

Step 20: Final testing and notes

I was hoping it would snow to show the wiper pattern. In the absence of snow I smeared the windshield with whipping cream. It is a little messy, but it shows that the new motor works well.

After operating the wipers and seeing how easy it is to stop them in the right position, I am not disappointed in not having the automatic "return to resting position".

If you want to use a wiper motor that will have the correct resting position, look for one that pivots in the center, has a swing arc of 140 degrees or slightly less and its normal resting position is on the driver's side of the rear window rather than on the passenger side.

Most importantly, share your comments, so we can all learn.