

Installation Instructions for #209280 Deluxe Headlight Repair Kit

**This kit repairs the headlight motor assemblies on the following vehicles:
1988-91 Buick Reatta, 1988-96 Chevrolet Corvette, 1987-92 Pontiac Firebird, 1988-02 1987-88
Pontiac Fiero, Lotus Elan and Esprit**

Kit Contents:

Consists of six Delrin bushings, two 8-32 Zinc plated hex washer-head screws, two 8-32 zinc plated nuts, two Side Cover Gaskets, one Motor Housing Gasket and a packet of synthetic grease.

This kit contains enough parts to repair two headlight assemblies..

Function:

The headlight motor assembly described in these instructions was a vast improvement over the previous two-gear unit GM used. This unit has a large nylon gear that is driven by the worm gear on the motor shaft. This Nylon gear contains 3 solid gel inserts that transfer the load from the gear to a 3-lobe cast hub that is part of the actuator shaft. **See figure 1.** These inserts harden and crumble with age. When they have broken down to roughly a spoonful of crumbs the gear will no longer turn the hub to raise and lower the headlight assembly. Instead hub will just free-wheel on the gear.



Figure 1

Note: For 1988-96 Chevrolet Corvette begin with the supplemental instructions on page 3:

Tools needed:

1/4" wrench or socket, 10mm socket (3/8" drive), 3/8 drive universal and 13mm wrench, T15 Torx, small standard screwdriver or putty knife, two small paper clips and permanent marker.

Remove the headlight motor unit from the vehicle (1987-92 Firebird & 87-88 Fiero)

Manually raise headlight by lifting on it while turning motor knob counter-clockwise.

1. Unplug headlight motor wiring at connector. Remove four Torx screws from the black plastic bezel around the headlight assembly, (two on each side). Carefully remove bezel. **(No bezel on Fiero).**
2. Mark the location of the headlight assembly to the body with a permanent marker. This will help with aligning the unit after the repairs.
3. Remove two 10 mm bolts from the top of the headlight assembly, which holds it to the body. Underneath the assembly and back against the body are two more 10 mm bolts, have good lighting and look closely, you'll see them. Remove these also.
4. At this point the entire headlight assembly will lift out. Lay it over on its side on some towels to protect your paint. On the inside of the assembly you will see a 10 mm nut that holds the lever to the actuating shaft from the gear. Remove it and the headlight/motor unit will come free of the assembly. **(For the Fiero it is easier to remove the c-clip at this point, the 10 mm nut can be removed once the unit is removed from the headlight assembly).**
5. You will then see the three 10 mm bolts that hold the headlight motor unit to the headlight assembly. Remove these three bolts.
6. Take the headlight motor unit to a workbench, you're ready to do the repair.

Repairing the Headlight motor unit:

7. Lay a shop towel or clean cardboard on the workbench. This will help you keep track of the parts as you disassemble them.
8. Spray penetrating oil on the three cover mounting screws and two motor mounting screws. Allow time for the lubricant to penetrate into the threads. It is also helpful to give each screw head a few taps with a punch and hammer to break any corrosion free. It is common for the motor mounting screws to break on removal. If this happens, grind any old screw flush and center punch the location. Then drill through with a drill bit.

LH & RH units described:

From this point it is necessary to describe the differences between the LH & RH units. There are differences in how they need to be disassembled and re-assembled. LH units have the actuator shaft coming through the side cover plate. RH units have no hole in the side cover plate.

REFER TO THE CORRESPONDING INSTRUCTIONS THAT FOLLOW FOR PROPER GEAR/SHAFT REMOVAL AND REPAIR.

LH Motor Repair:

- Using a 1/4" wrench or socket, remove the three cover mount screws and the round cover plate.
- This will expose the large nylon gear as shown in figure 2.
- Using a 1/4" wrench or socket, remove the two screws holding the motor to the unit. Pry lightly to free the motor from the gasket. Gently pull the motor from the unit as shown in figure 3. **Caution:** The brushes are spring-loaded and will fall out of their tracks. **Be careful not to lose the springs.** If you do misplace a spring you can fabricate one in a pinch by cutting the spring from a ballpoint pen. Also, there is a small ball bearing on the very end of the motor shaft. Set this aside so you don't lose it.

- You can clean up the segmented copper portion of the motor shaft (called the commutator) by holding a scotch-brite pad against the commutator while turning the knob on the end of the shaft. Spray it with electrical contact cleaner and blow dry with compressed air.



Figure 2



Figure 3



Figure 4

- Pull the nylon gear and shaft out of the unit and set aside. Notice how many shim washers were used on the shaft and their sequence.
- Continue at step 9.**

RH Motor Repair:

- Using a 1/4" wrench or socket, remove the three cover mount screws and the round cover plate.
- Pull the nylon gear and shaft out of the unit and set aside. Notice how many shim washers were used on the shaft and their sequence.
- Continue at step 9.**

Preparing for Assembly:

- Clean any chunks of old gel and debris from the body of the unit. You can spray it with WD40, wipe with a clean rag or blow dry with compressed air. Generously grease the housing with the synthetic grease.
- Remove the nylon gear from the shaft/hub. You will find more chunks of gel and debris to clean out. After it has been cleaned. Install the 3 Delrin bushings from the kit onto the shaft/hub and reinstall the gear. It should fit together snugly.
- Generously lubricate the cavity and outside teeth of the large nylon gear. **For RH units, continue assembling with steps 12 & 13. LH units skip to "Additional assembly steps for LH units only" section.**
- Install the nylon gear/hub assembly into the headlight unit with the same shims on the shaft as before.
- Install a new side cover gasket if necessary and the side cover. Secure with three 1/4" screws. Be careful not to over-tighten the screws. **Continue to sequence 14 on the next page.**

Additional assembly steps for LH units only:

- Generously lubricate the worm gear of the motor shaft with synthetic grease as shown in figure 4. Put a dab of grease on the end of the shaft and put the small ball bearing back onto the end of the shaft.
- Install the nylon gear/hub assembly into the headlight unit as shown in figure 3. Be sure to use the same shim washers as before.
- You'll need to retract the brushes and springs while installing the motor. There are two methods to accomplish this. I find the paperclip method to be easier, but it does put a little stress on the stranded copper wire attached to the brush.

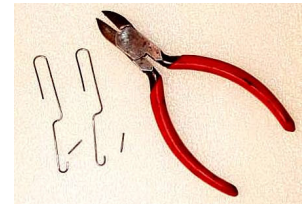


Figure 5

Method One (aka the paperclip trick):

- Unbend two small paper clips and clip the small end to form a hook as shown in figure 5. These will be used as tools to help hold the brushes into their tracks as you install the motor shaft into the unit.
- Push the springs and brushes back into their tracks. Note the orientation of the brush. The half moon shape must match up with the shaft of the motor. Hold the brushes flush into their tracks and grab onto the copper strand wire attached to it using the small hook of the paper clip. Pull the paper clip to hold the brushes in place against their springs.
- Carefully slide the motor back into the housing. When it is within 1/8" of seating with the unit **stop**. At this point the brushes should be over the commutator (the copper colored part on the motor shown in figure 4).
- CAUTION:** If the motor shaft doesn't slide in easily, then a brush has hung up. **DO NOT FORCE IT**, you will break a brush if you do. Instead, remove the motor and start over. The brushes must be held up in place against their springs for the motor to slide into the unit.
- Un-hook the paper clips from the brush wire and rotate the paper clip to remove them. Continue sliding the motor into the housing.

Method Two (aka the string method):

- Remove the two 1/4 hex-head screws attaching the brush assembly to the motor body.
- Remove the brush assembly from the motor.
- Tie a piece of string tightly around the plastic brush assembly where the brushes are located. Slip the string aside and push the springs and brushes back into their tracks. Note the orientation of the brushes. The half moon shape must match up with the shaft of the motor. Hold the brushes flush into their tracks. Slide the string over the brush so it holds it retracted against the spring as shown in figure 6. Add a second long loop of string over the retracted brush. This extra loop of string is the one that will be holding the brushes during final assembly once you've cut and removed the first loop of string.

- Install the brush assembly into the motor housing making sure the ends of the long loops of string are pulled free of the housing. Install a new motor gasket making sure that the rectangular tab is located over the wiring as shown in figure 7.



Figure 6



Figure 7

- Hold the long ends of each string tightly against the body of the housing to keep pressure on the brushes. Carefully cut the original small loops of string holding the brushes retracted against the springs. You must continue to keep pressure on the strings that you're holding against the housing or the brush will move and you'll have to start over tying a new small loop of string.
 - Carefully slide the motor back into the housing. When it is within 1/8" of seating with the unit **stop**. At this point the brushes should be over the commutator. Release the strings and carefully slip them from the motor housing.
 - **CAUTION:** If the motor shaft doesn't slide in easily, then a brush has hung up. **DO NOT FORCE IT**, you will break a brush if you do. Instead, remove the motor and start over. The brushes must be held up in place against their springs for the motor to slide into the unit.
 - Install a new side-cover gasket if necessary and the round cover. Secure with three 1/4" screws. Be careful not to over-tighten the screws.
14. Corvette only, continue with "Reinstalling the headlight motor assembly into the headlight frame:" on the following page.
 15. Reinstall the unit into the frame. Line up the frame with the location marks on the body and secure with the four 10 mm hex washer-head screws. **Firebird only; install the bezel.**
 16. Reconnect the wiring and return the unit to the closed position by turning the motor knob clockwise.
 17. Test the headlights by turning them on at the dashboard switch.

1988-96 Chevrolet Corvette Supplemental Instructions begin here:

Tools needed:

1/4" drive 10mm & 13mm socket, 1/4" drive Torx T30 tip, nut driver with 1/4" socket, hammer, pliers, 1/8" punch, awl or sharp nail or permanent marker, Truarc snap ring pliers and two small paper clips.

Mark the position of the headlight assembly: This will ensure that the assembly is correctly aligned in the headlight opening in the hood. Open the hood. Take an awl or sharp nail and scratch along the headlight mounting brackets on the underside of the hood. An alternative is to use a permanent felt-tip marker. Get as close to the brackets as possible.

Disconnect the wiring harnesses: The headlight motor assembly and headlight bulb each have an electrical harness plug to disconnect. The motor connector is grayish in color. The headlight connector is black. While you're at it go ahead and disconnect the plug that powers the under-hood lamp so you don't wear down the battery.

Removing the headlight motor assembly: Use the 10mm socket and remove the four mounting bolts. There is a small bracket on the right side of the drivers-side light (near the motor) that should be removed with the 13mm socket. An additional 10mm bolt needs to be removed from that bracket. The headlight assembly can now be removed and placed on a towel or your work bench.

Removing the headlight actuator from the headlight frame assembly:

- Use the T30 Torx tip and remove the two long bolts that hold the motor to the frame. Spray some penetrating oil on the heads to help loosen them prior to removal.
- On the motor shaft that passes through the headlight linkage you'll see a very small retaining ring on the very end of the shaft. Remove this ring using the snap-ring pliers.
- On the motor shaft you'll also see a small roll pin that has been pressed into a collar and the shaft. Use a small 1/8" diameter punch and hammer to carefully drive this pin nearly all of the way out. Now remove the linkage from the motor shaft. Be aware that there may be some small shims present. Keep track of them so they can be reassembled in the same order. The headlight actuator motor should now be free of the headlight frame.
- Continue with step 7 on page 1 "Repairing the Headlight motor unit:"

(Corvette instructions continue here after step 14 of page 3)

Reinstalling the headlight motor assembly into the headlight frame:

- Place the headlight actuator motor into the frame with the shaft protruding into the collar and linkage.
- Insert the two long motor mounting bolts into the bracket and tighten loosely.

- Slide the collar and linkage onto the motor shaft. Align the hole in the collar with the hole in the shaft. Press the roll pin back in with the hammer and punch.
- Reinstall the small snap ring on the end of the shaft using the snap ring pliers.
- Use the T30 Torx tip and tighten the two long bolts.

Reinstall the headlight frame assembly to the hood:

- Use the marks that you previously scratched or marked onto the hood to align the headlight frame with the underside of the hood. Reinstall the small bracket using the 10mm and 13mm bolts.
- Install and tighten the remaining four 10mm bolts using their alignment marks as a guide.
- **Caution:** Before you test the headlight, make sure that the headlights are in the closed and down position. Turn them manually down by hand if necessary.

Reconnect the wiring harnesses: You can now reconnect the headlight motor and headlight bulb electrical harnesses. Reconnect the plug that powers the under-hood lamp. Before you turn on the headlights it is a good idea to recheck the headlight linkage for correct assembly. Compare one headlight to the other and assure that they are the same. Make sure all the wiring harnesses are properly oriented so they aren't pinched when the headlights actuate. Turn on the headlights.

Congratulations, job done! You've saved a lot of money compared to buying a new headlight actuator from GM and have made it stronger than it was when new.

Top-Down Solutions will not be held responsible for any damages that occur to a vehicle or person as a result of improperly following these instructions. If you are confused about the installation method have a professional install the delrin bushings for you.

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p/n 209280

Descr: Deluxe Headlight Repair Kit

Qty: 1 kit



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