

Fiero Headlight control ('84-'86 mostly)

You decide to take the Fiero and run a bunch of errands in the evening. Stop to the grocery store, gas station, pharmacy then finally the video store. At each stop you turn on and off your headlights, sure enough they work like they are supposed to, until the video store! One headlight doesn't work! First you try the switch again, and nothing happens. The only thing you see are \$\$\$ floating by as you crawl to the dealer and drop a bunch of cash for a new motor. Well maybe some of these tips will keep some money in your pocket.

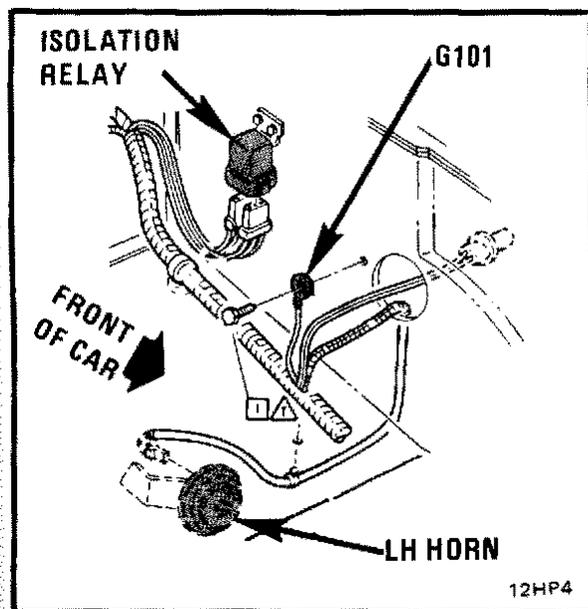
More information on headlight repairs: <http://www.angelfire.com/biz/fierosails/headlights.html>

Fiero trivia: Many people don't know that most Fieros has a front compartment light, albeit small and mostly useless. There is a little socket for little bulb in the front compartment. It is located near the vent blower motor. The bulb is the same kind that is used on the interior floor lighting (if equipped) and the side marker lights). Any autoparts store will carry these "push-in" bulbs. So you put a bulb in, then you wonder...."where is the switch?" With the front compartment open, turn on the parking lights or headlights. The front compartment bulb should turn on.

What is wrong with the headlight motor?

First check the fuse!

Are both motors not working? If this is true, locate the black Isolation Relay (shown below) on the frame of the car, NEXT TO the driver's side headlight mechanism. This isolation relay controls both motors. Most likely this is the problem after checking the fuse.



If just one motor won't go up and down, **and it is not continually running**, then make a fist and lightly pound on the top of the headlight motor knob. Sometimes this will get the motor operating again. Watch your fingers, because the knob has indentations and can grab your fingers if it suddenly turns on. (replacement motors have smooth knobs.....maybe they realized the old design was dangerous to fingers).

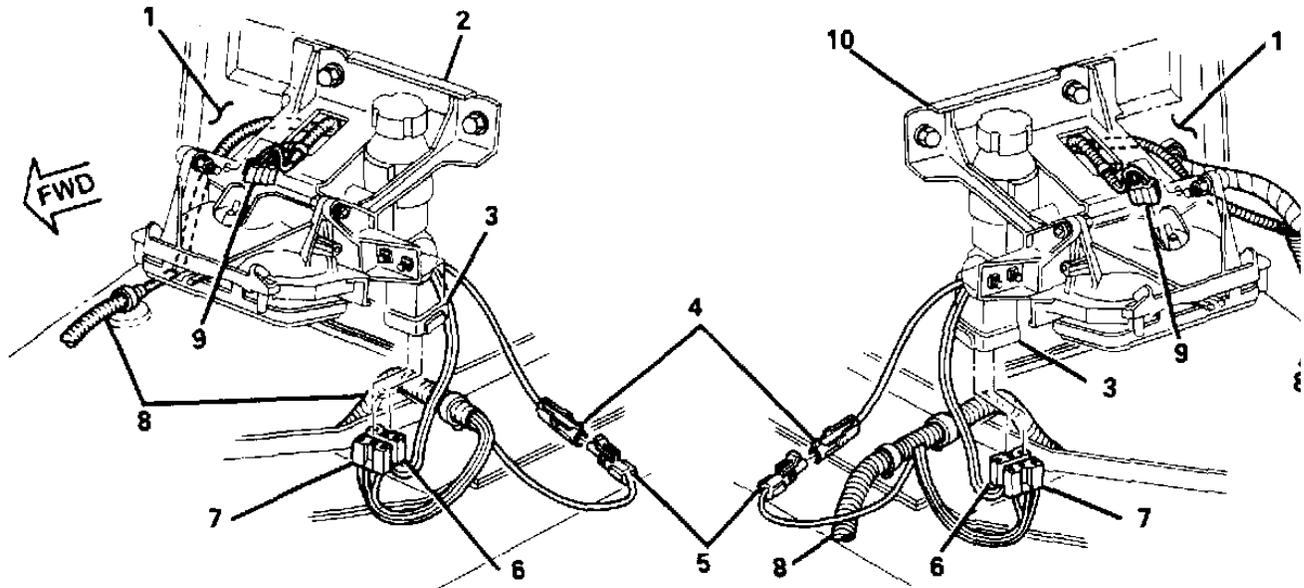
(If the motor is continually running, then you have stripped gears, and none of these ideas will help you, sorry. You will have to rebuild the motors, which is discussed below)

If tapping on the knob doesn't work. Then turn off the headlights (turn on parking lights to keep the front compartment bulb on if needed). Next to the headlight mechanism you will see blue wire with an inline connector. Take this connector and unplug it. This wire controls the operation of the motor, and when it is unhooked, the motor will not function. Now proceed to crank up the motor by hand. When you get near to the desired position (either up or down) you should start to feel resistance in the motor, and shortly

afterwards you will hear a faint "click"; at this point, stop turning the motor. Be careful when working on the motor. With the blue wire connected the motor may turn on suddenly unexpectedly. The best thing to do is unhook the blue wire before turning the headlight motor by hand. Once you have the headlight in the desired position, continue with your errands and wait for daylight to work on them.

Once back home, try reconnecting the blue wire and see if the headlight will work. Watch out for your hands and fingers! The headlight could suddenly go down with your fingers in the way! If the headlight doesn't work then disconnect the blue wire once more. Look at the headlight mechanism. You will see black relay on the inside

portion of the entire mechanism. Each headlight motor has a separate relay (Part number 3 in the picture below). On the back of the relay, below the mounting screws you will see a small metal flange, this is holding the relay from sliding up and out. So take a small screwdriver and bend the flange away from the relay. Slide the relay up, and then unhook the wires. Take the relay and swap it with the good headlight motor's relay (from the other side of the car) and reconnect the blue wire. If your headlight suddenly starts working normal, then you have a bad relay. The local dealer can get you a new one for around \$20.



1 – FRONT COMPARTMENT PANEL	4 – HEAD LAMP MOTOR TO ACTUATOR CONNECTOR	7 – HEAD LAMP RELAY CONNECTOR
2 – HEAD LAMP ASSY. – RIGHT HAND	5 – HEAD LAMP ACTUATOR CONNECTOR	8 – FORWARD LAMP CONNECTOR
3 – HEAD LAMP RELAY ASSY.	6 – HEAD LAMP MOTOR TO RELAY CONNECTOR	9 – HEAD LAMP CONNECTOR
		10 – HEAD LAMP ASSY. – LEFT HAND

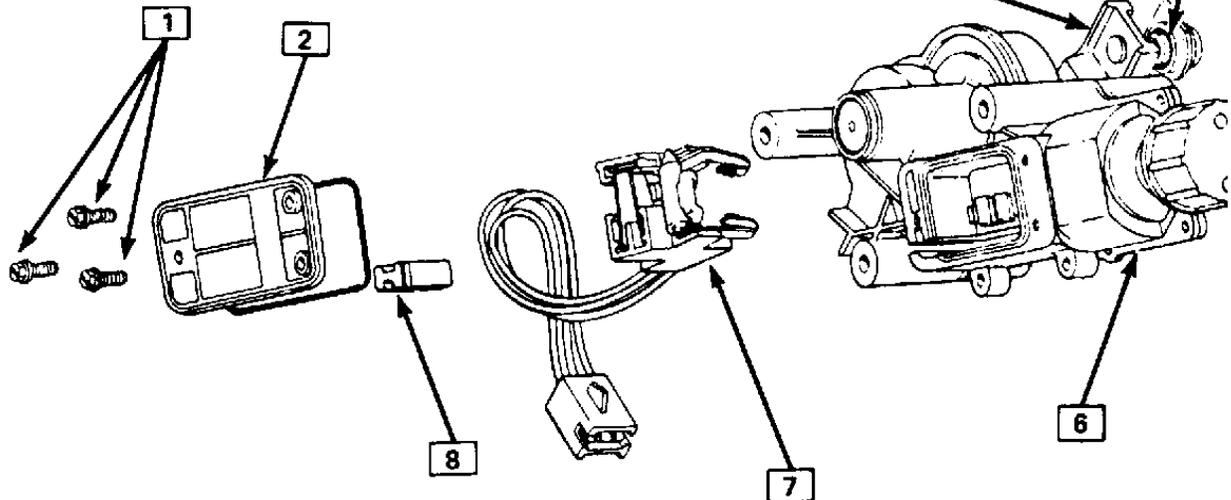
If swapping relays doesn't work. Then you have a problem inside the motor. This requires you to remove the headlight assembly, which can be done in about 10 minutes.

Unhook all the wires from the motor and headlight bulb. With the headlight in the up position (you may have to crank them up by hand, a very slow process). Reach down under the headlight and at the bottom of the assembly, you will find two 10mm nuts. Take a small ratchet with an extension and loosen these nuts. Next crank down the headlight and remove the two top 10mm nuts. Gently lift out the headlight mechanism. The bottom of the headlight mechanism has two slots for the bolts, so you don't have to remove the entire nut. This is very important when you have to install the headlight mechanism. It is much easier than trying to blindly start the bottom nuts.

With the headlight motor out remove the C-clips than hold the motor arm (Item 4 in the picture below) to the rest of the headlight mechanism. Remove the three 10mm screws from the side of the motor. These long screws hold the motor to the headlight mechanism. You may have to try a few different methods to get the motor to separate from the headlight mechanism. If you rotate the headlight motor knob, this will help align the motor arm, so it is easily remove. Just think of it as a puzzle.

Once you have the motor separated from the headlight assembly, then remove the three screws that hold the little access panel on. There should be rubber seal between the housing and the panel (Item 2). With the panel off, gently remove the rubber plug that is holding the wiring down (Item 8). With the plug out, gently lift up on the ceramic portion of the HTS switch (Item 7). It should slid out easy.

- | | |
|--|--------------------------------------|
| 1 COVER SCREWS | 5 CRANK ARM BALL |
| 2 SWITCH COVER PLATE AND "O" RING | 6 HEADLAMP ACTUATOR |
| 3 CRANK ARM | 7 SWITCH AND HARNESS ASSEMBLY |
| 4 LINK ASSEMBLY | 8 RUBBER SLOT FILLER |



With the switch out, see if the "brushes" are in good shape. I had a motor that was temperamental and when I took the switch out it was missing one of the brushes. If this happens to you, you can solder on a old (or new) brush. Check the rest of the switch for corrosion and such. These switches do go bad, so you may have a faulty switch, but visually it looks good. GM sells these (GM Part # 22038870 - about \$35).

If you find a problem with the HTS switch, then fix or replace it. Reassemble the motor and headlight assembly. With the headlight assembly in the "up" position, place it back in the car making sure the slots in the bottom line up with bolts. Then tighten everything down and reconnect the wires, leaving the blue wire for last. With your hands clear of everything, connect the blue wire. Test the headlight. It should work. If not, then your motor windings may be bad, or worse, you have a short somewhere in the wires. If you have access to an extra working motor, try and see if it works in place of the old motor. If so, then replace the motor, keeping the old one for parts (gears and HTS switch).

That was a general overview. What follows are some more in-depth articles on the Fiero Headlight motor. Even if you don't have any problems, it sure makes for some interesting reading.

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Headlight Motors - General Information

[Info - 84-86 models](#)

All 1984-1986 model Fieros use a similar headlight system to the 1982-1986 Firebirds. There are two motors, and three relays in the system. Here's how it works:

Here's more than you ever wanted to know about the headlight door circuitry for the older cars which use relays in lieu of electronic controls. Sorry about the bandwidth, but there's no easy way to say it. Hope it helps someone.

The headlight door motors reverse direction by reversing polarity. However, the automatic shut off (high torque

switch, or HTS) makes that a rather more complex task than at first it might seem.

That's because when a motor reaches its limit, one of the 'wires' is disconnected from the motor by the HTS. Reversing the polarity at this point wouldn't do anything since the circuit is broken by the HTS.

Consequently, each motor has three wires which for control. The combination of the blue wire, gray wire, and green wire provide polarity reversal to the motor (to make it able to run in both directions) and to run each motor from its resting state, after it has shut off.

There are of course two motors. They operate and are controlled identically.

Here's the matrix:

RIGHT HAND MOTOR

-----Blu---Grn--- Gry
up: -----(+)------(-)
dn: (+)---(-)

That is, in order to run the motor up, the system connects the green wire to the hot side and the gray wire to ground. In order to run the motor down, the system connects the blue wire to the hot side, and the green wire to ground.

The left hand motor operates the same, except for its blue wire is actually blue with white stripes.

There is an actuator relay for each light mounted on the body of the light housing. There is also an isolator relay, mounted on the fender wall on the driver's side. When operating properly, the two actuator relays act identically.

The actuator relays get their instructions from the isolation relay. When the motors need to run down, the isolation relay is not energized, the blue (and blue/white) wires make with the hot side through the closed contacts of the isolation relay (which is not energized), and the ground is furnished to the motor through the closed contacts of the actuator relay until the circuit is broken by the HTS. When operating properly, neither the motors nor the relays draw any current in the full down position.

When it's time to go up, the actuator relays are energized when the pink wires coming from the isolation relay are connected to the hot side through the newly closed contacts of the isolation relay, the isolation relay is energized because the yellow wire coming from the head light switch is now hot. When the actuator relays are energized, they furnish 12v from the always hot red wires, through their newly closed contacts, to the green wire. The motor is grounded through the newly closed contacts of the actuator relays. The motors will run up until the circuit is broken by the HTS. When operating properly, with the light doors in the full up position, all relays are energized and draw current, but the motors do not.

There are very counterintuitive things about this circuitry: When the motors are running UP, both the hot side and the ground are furnished by and through the actuator relay. However, when the motors are running DOWN, only the ground is furnished by the actuator relay because the blue and blue/white wires do not run to or through the actuator relay.

Similarly counterintuitive, when the motors are running down, the hot side is supplied by and through the isolation relay, but when they are running up, the hot side is supplied not by and through the isolation relay, but through the always hot fusible link.

That's how the headlamp door relays and motors work. The relays are not cheap: \$17 ea for the actuator relays and \$25 for the isolation relay. Proper trouble shooting can save a buck or two.

It is fairly easy to swap the actuator relays from side to side. If the symptoms change with them, than its probably the relays. Although the actuator relays look similar to the isolation relay, they are very different, they cannot be

swapped. Please note that the system is very interdependent, and it's easy to see why Pontiac changed to electronic (as opposed to electro-mechanical) controls.

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Info - 87-88 models

The 1987-1988 Fieros use a new headlight system, which is also used in 1987 and later Firebirds. This system has two motors and an electronic module which controls their operation. Here's how it works:

There are only two wires connected on each motor. Green(/black) and grey(black), and they connect to the output (4-pin connector) on the headlight control module. The other connector (5-pin) on the module is the inputs. The two red wires are the continuous power from the battery through two fusible links, as in the 84-86 system. The white and yellow wires from the headlight switch are also the same, as is the ground.

Everything on this system is done inside that little electronic control module. When the headlight switch is on, it tries to run the headlight motors in the up direction. When it is off, it tries to run them in the down position. Rather than having separate wires for each (and ground), as the previous system did, this one reverses the flow of current across the wires to turn the motor in the opposite direction. Also, rather than having an internal limit switch inside the motor, the control module actually senses the current being used by the headlights. When there is a sudden rise in current draw, as happens when the motors can no longer turn, the module shuts off the power to the motors.

Internally, the main difference between the new motors and the old ones (other than the fact that the current sensing mechanism is now located in the control module rather than the motor), is that the new ones are designed so that rather than stripping out the gears that drive the motor, they have a bushing which will break. They are bolted together, rather than riveted like the older ones, so that this bushing can be easily replaced.

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(Space Coast Fieros - Florida)

Headlight Diagnostics

[Note: this is obviously intended for 84-86 models, but some of it applies to all years.]
(From five page article in January 1990 Super Automotive Service)

- Both doors wont close:
- Blown Taillight fuse (20 amp) •Bad isolation relay •Bad connection or ground

- One door wont close:
- Bad actuator relay
- Bad isolation relay
- Bad connection or ground Faulty actuator motor limit switch
- Bad actuator motor

- Both doors wont open:
- Blown main fuse link to headlight switch
- Bad isolation relay
- Bad connection or ground

- One door wont open:
- Bad actuator relay
- Blown actuator relay fusible link
- Bad connection or ground Faulty actuator motor limit switch
- Bad actuator motor

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Testing - '84-'86 models

If the headlight motor (actuator) KEEPS RUNNING, it's the actuator - or more precisely, a worn out gear on the clutch mechanism at the bottom of the actuator. New actuators cost \$160/each (list). The right one (on an 84) is GM Part # 22039673 and the left one is GM Part # 22039672. You might be able to find a used one at a junk yard for \$50-\$75. But I would spend the money and get a new one. This way you won't have to worry about it for quite a while. If you are mechanically inclined you should be able to change one in 30 minutes with just a couple of sockets (13mm for headlight assembly nuts and a 10 mm for the long actuator to headlight assembly bolts). Just remember to disconnect power first and crank the actuator up and down by hand. Remove the entire assembly (4 nuts), then remove the actuator (3 LONG screws and one nut on the lever arm). Installation is just the reverse.

If the motor NEVER comes on, I'd say it could be either a bad relay or the motor brush/switch assembly is dirty or shot (this can be replaced separately. It's GM Part # 22038870 - list is about \$30). If the motor doesn't come on (won't go up/down) I'd try this:

1. turn the lights on to try to bring the headlight up. 2. With the light switch still in the on position, open the hood and bring the defective headlight up by hand by turning the knob on top of the actuator. Don't force it. It should turn pretty easily. The action of turning the shaft might be enough to get it started. 3. If 1 & 2 fail, try swapping the right and left headlight relays. BE CAREFULL! There are three relays used for headlight operation. There is an isolation relay mounted on the left cowl, and two headlight relays. The right headlight relay is mounted just to the left (inboard) of the right headlight assembly (between the headlight and the coolant overflow bottle). The left headlight relay is mounted just to the right (inboard) of the left headlight assembly. DON'T swap a headlight relay with the isolation relay (which is mounted to the left (outside) of the left headlight assembly. If you swap headlight relays and the problem switches sides, it's the relay.

If this doesn't fix your problem you either have a bad wire (really unlikely looking at the schematics), bad actuator motor (burned out contacts or winding), or bad isolation relay.

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Repair/Replacement

On the 84-86's, the gear becomes stripped, but Alan Moody in Florida who makes replacement gears out of brass which he sells for \$50 each. (Phone number: 407-275-5040).

On the 87-88 system, there is a bushing that wears out. You can get a rebuild kit with the bushing from Ecklers Corvette (mail order place out of Titusville, FL. Phone number: 1-800-327-4868) for about \$5. The part number is E-29304. The Corvette headlight motors use a similar size bushing, but you may have to sand it to fit. Rodney Dickman sells the exact replacement repair kit for 1987-1988 Fieros - \$4.00 plus \$1.00 shipping, (414) 762-9244. Check out <http://www.execpc.com/~rodney1/>

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(Space Coast Fieros - Florida)

The 88 headlight motors had what I call shear pins in them. Tear the motor apart and you'll see what appears to be either a crumbled mess of plastic or in some cases a gob of goop. That's what happens over the years to those pins. I just picked up enough to fix two headlights in Daytona a couple of weeks ago at the show for \$4.00. The bag includes 6 white plastic dowels about 1/2" long x 7/16 diameter. (Approx. dimensions.) Someone may know the number for the guy that sells them. I can't find his card. But in short, your problem may be this simple fix. \$4.00 is cheap. (

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Swapping Motors

A knowledgeable proprietor of a Firebird performance scrap yard clued me in that mid-80's (82-86) Firebird

headlight motors are interchangeable with early Fiero headlight motors (84-86) with one note:

the right and left motors are switched ie. the driver's side motor on a Firebird matches the passenger side motor on a Fiero. I cannibalized the Firebird motors for their gears and they work perfectly. If you do likewise, replace both gears -- not just the broken gear -- as there are differences in gear pattern. The Firebird motors appear to be entirely interchangeable with the Fiero motors, but they need to be internally inspected and re-greased to ensure they aren't subject to the same grease coagulation / broken gear problem as the Fiero motors you're replacing.

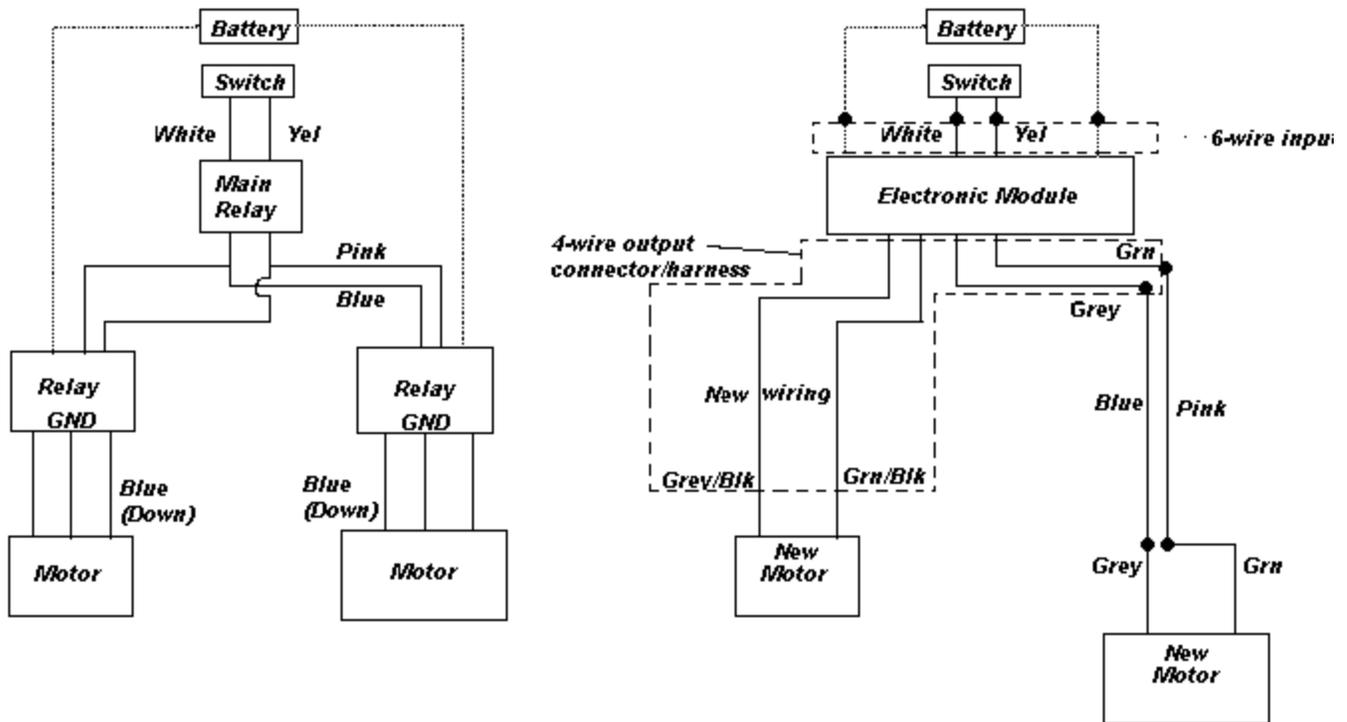
As there are so many more Firebirds out there, parts may be more available and less expensive than Fieros.

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 (c/o Nick Varetakis)

If you find an 87 or 88 Fiero in a junkyard, you can (relatively) easily convert your headlights over to the new system. This requires changing the entire front wiring harness. Remove it where it connects to the bulkhead near the power brake booster, and disconnect the wires from the windshield washer pump. Move to the front (headlight area), and you will have to remove a lot of wire holders, and electrical connectors on all of the lights and the coolant fan motor. Remove the headlight motors, and the control module, which is located on the outside of the frame, just below the driver's side front marker light (in front of the wheel well). You will also need the coolant fan relay (in front of the driver's side headlight), because it has a different connector from the one used on older Fieros. Now take all of that, and put it in your car. Instant (well, almost) 87-88 style headlights.

On the other hand, if you're handy with a soldering iron, you could just take the motors and control module, and wire it up to your existing system. If you do this, you could use the motors and control module from an 87 or later Firebird instead (may be easier to find).

I did this on my car, and here is the schematic for the headlight wiring which is now on my car. The original wiring is on the left, and the new wiring is on the right. The "dots" are the points at which I soldered the wires together.



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How to save wear and tear on the headlight motors

So now your headlights are working properly again, whew! How can you help preserve their life.

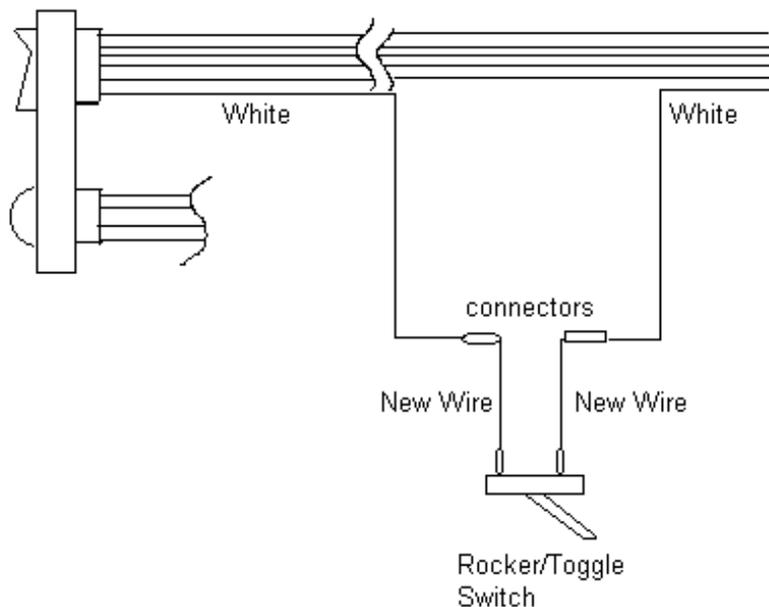
The easiest thing to do is put an in-line switch to control the headlight motors. The second life saving procedure is to regrease the headlight gears. Since the switch is easy, I will explain it first. Run down to your favorite electronics supply store (ie. Radio Shack , Autoparts store) and purchase a "on/off" rocker switch, your choice of design, and some 18 gauge wire (I believe that is close to the size. You may want to double check the size with what GM uses for the headlight switch). Get about 3 feet of wire....heck, get a roll of it! Remove the headlight switch/dimmer control panel from the dash (4 torx screws). Now remove the trim plate that is located under the steering column (4 hex head screws). Gently remove this trim. Take the headlight switch and unplug the harness from it. On that harness you will see a white wire. Cut the wire and attach some quick connectors, one male, the other female (that way if you remove the switch, you can just hook the wires back together). Now take your switch and find a nice place where you would like it and then cut two pieces of wire to the appropriate length.

Put the corresponding connectors on each end of the two pieces of wire. Now plug the white wire into your new wire, then plug this wire into the switch. Run your other new wire from the switch to the other half of the white wire. You now have an inline switch. Now test out your switch. Turn your headlights on. They should go up. Now turn them off. If they stay up your switch is in the "open position". Make a mental note of this. Now flip the switch and the headlights will go down - your switch is now in the "closed position". (if your headlights don't stay up , then try it again with your switch flipped).

With your switch in the "closed position" your headlights will operate like normal. However, if you put your switch in the "open position" then when you turn on your headlights they will open, but when you turn them off, they will stay up. To lower them, simply flip your switch to the "closed position". Simple eh?

To finish up the installation, unplug the connectors from the toggle switch. Run the wires down inside the opening where the headlight/dimmer panel was. You will see a small hole back there and with the bottom trim panel off you can reach the wires. Now run the wires to the location you desire and install the switch. Replace the trim panel below the steering wheel, this will cover the wires. Use electrical tape and wrap up the connectors. Replace the headlight/dimmer switch panel and you are all done. Now when you stop for gas, you don't have to put your headlight motors down, just flip your new switch to the "open position" and turn off the headlights like normal. You can leave them this way all winter if you so desire. It doesn't matter to the headlight motor which position it is in.

Headlamp/dimmer panel



Here is what Ron Dittmer (dittmer@pcs.mot.com) had to say about the switch

"I got a small black rocker switch which measured just over 1/2" square, and mounted it just to the left of the instrumentation dimmer switch, on that front plate. Try finding a flush mounted switch small enough and black in color, in a rocker style, rather than the typical lever style. Radio Shack does not offer the style that I used which looks factory original. DigiKey at 1-800-344-4539 has one for \$7.32, part number CKN2002-ND, from C&K Components Inc. part no. U11J51ZQE22."

Regreasing the gears

Dick Wiberg has talked about this subject before, but I thought I would cover it again. On the '84 - '86 motors the main cause of problems is stripped gears. The grease GM used tends to harden over time and does more damage than good. To fix this you have to open the headlight motor case. You will need a drill and drill bits, some silicone glue, sheet metal screws, large screwdriver and your favorite grease. White grease is easy to get and inexpensive. I have used wheel bearing grease and it worked fine. Once you have the headlight motor off the assembly. Try and remove the arm that is attached to the motor, you may or may not be able to loosen the nut, you will have a better chance at holding the gears once you open the case. Drill out the rivets and pry open the case with a screwdriver or something similar. Work your way around because the case is glued shut. Once you have the case open, you will see the gears. If they are stripped you will have to replace them (GM does not sell replacement gears, but old Firebird and Fiero motors are a good source for parts). If the arm is still attached to the shaft of the motor, get a pair of vise-grips and clamp on the flat metal flange (above the green "bumper" material of the gear) of the largest gear. Now you should be able to loosen the nut and wiggle off the arm. Be careful not to ruin the gears or the smooth shaft of the gears; only clamp on to the flat metal flange. The gears should come out with the wiggling. There is an o-ring on the outside of the case, below the arm that you just removed. Don't lose that, it keeps moisture out. Otherwise you are free to remove the gears and clean and regrease them. Watch out for the actual motor windings. Take a good look at them before working on the motor, in case you move the motor. You can't hurt the motor, but it needs to be put back into place correctly for it to work. Finish repacking the gears and apply a SMALL bead of silicone glue the groove of the case and put the case back together, making sure all the rubber seal, under the knob, is aligned. Use your sheet metal screws to re-secure the case. And assemble it back into the car. You may have to rotate the knob on top of the motor to get everything back together. When re-connecting the wires, keep your fingers clear because the motor may be half way in a cycle when you connect the blue wire. If it would be helpful, maybe we can have a tech session on this sometime. I would be happy to show everyone what I found, or if Dick Wiberg is willing he could show people at one of the monthly meetings.
