

Corvair Headlights – Past to Present

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The Corvair's original sealed beam tungsten filament headlights are considered by many to be "too dim" for night driving. This article will look at "brighter" alternatives. There many headlight options that raise questions about what works and what is legal. You do not want to blind oncoming drivers with your headlights.

Regulations call the front headlights "main lighting". Running, fog, and driving lights are "auxiliary lighting" and often referred to as "Off Road Lighting" that are regulated differently. This article will use headlight to mean either "headlight" and "headlamp".

This article will describe:

- The Corvair original quad sealed beam headlights and specifications.
- Power consumption, wire gauge, and illumination.
- Tools to remove headlights.
- Regulations – DOT, NHTSA, State, County, City
- Upgrades via sealed beam Halogen, bulb in housing, LED bulb in housing, LED.

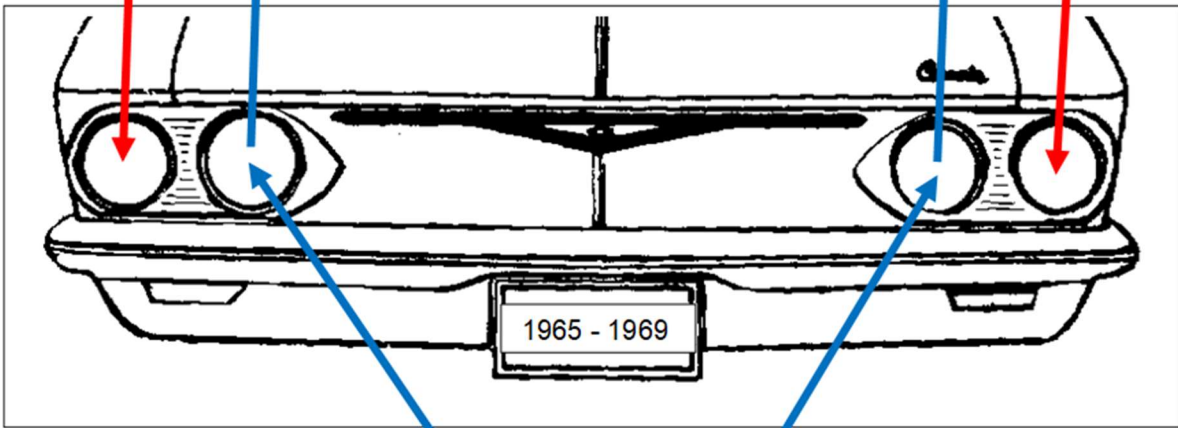
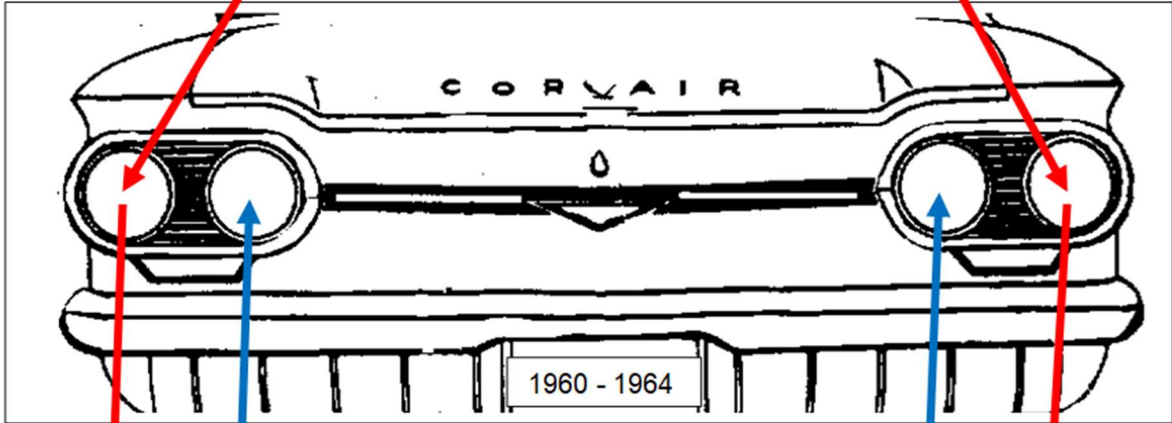
Quad Headlights – All Corvairs produced were equipped with the quad sealed beam headlight system. Four round 5.75" headlights were used that consisted of two outer headlights and two inner headlights.

- **Outer headlights** – Mounted on either side of the car, the outer headlights have separate high and low beam filaments. Either the low or high beam are illuminated, never both at the same time. There are three electrical terminals - low beam, high beam, and ground. The following page shows three series with different numbers used over the years. The halogen sealed beam headlight and was designed to produce the same low beam brightness with a lower wattage.
- **Inner headlights** - The inner headlights on either side of the car have a single high beam filament. There are two electrical terminals, high beam and ground. The following page shows three series of numbers. The 5001 wattage was increased compared to the first 4001 headlight and produces more illumination. The H5001 halogen sealed beam headlight produces even greater brightness per wattage.

The original sealed beam headlights - Sealed beam headlights contain the filament(s) and reflector inside a relatively large sealed housing. The gas inside the sealed housing optimizes the filament life. Prior to sealed beam headlights, headlights had a separate housing, glass lens, reflector, and bulb that were subject to reduced illumination from dirt and corrosion. The sealed beam was invented and implemented to overcome this issue. Each headlight has mounting tabs that fit in a housing allowing vertical and horizontal beam adjustment. The outer versus inner headlight mounting tabs are different to ensure headlights are located in the correct location.

Sealed beam vs. Halogen sealed beam – The halogen sealed beam uses a "H" prefix part number. The filaments are surrounded by Halogen gas (and minor amounts of other gases) inside a small glass envelop that is inside the sealed beam headlight, like a bulb inside a bulb. The advantage of halogen sealed headlights is greater illumination (brighter) per Watt compared to the original sealed beam.

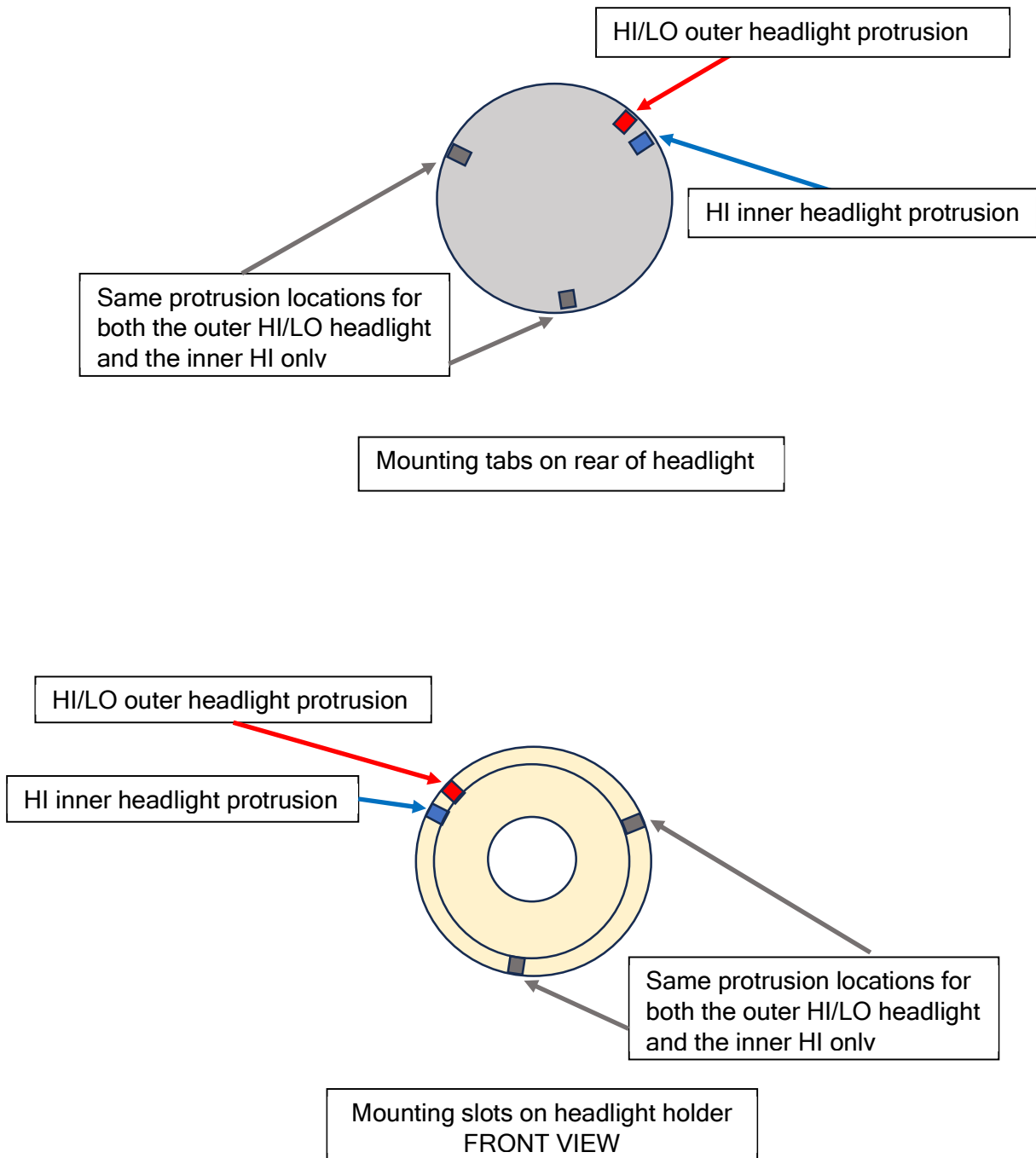
HI and LO beam Three prong connector # 4002 (obsolete) # 4000 (sealed beam) # H5006 (sealed beam Halogen)	HI beam wattage # 4002 = 37.5 Watts # 4000 = 37 Watts # H5006 = 35 Watts	LO beam wattage # 4002 = 55 Watts # 4000 = 60 Watts # H5006 = 35 Watts
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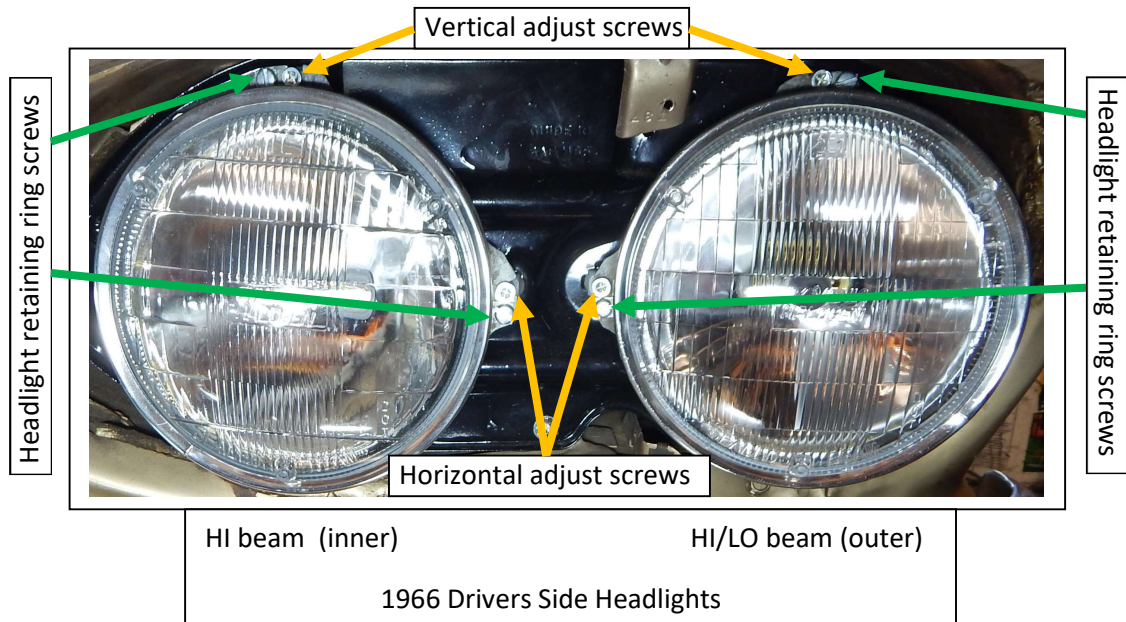
HI beam only Two prong connector # 4001 (obsolete) # 5001 (sealed beam) # H5001 (sealed beam Halogen)	HI beam wattage # 4001 = 37.5 Watts # 5001 = 50 Watts # H5001 = 50 Watts
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Inner versus outer headlight mounting – To prevent mixing up the outer (HI/LO beam) and inner (HI only beam) headlights, the back of the headlight has three protrusions that fit into three slots in the headlight holder. One of the three protrusions is in a different position on the outer versus inner headlight.

Note that some aftermarket headlight H4 housings are made to fit either the outer or inner position. This is done to allow use of the H4 bulb in the inner position, although only the high beam can be legally illuminated on the inner “main” headlights. The following illustration is not to scale, but shows the headlight protrusion and headlight holder slot positions.



Hardware – The headlights are mounted in an aiming housing and retained with a stainless-steel ring held in place with two small screws and a spring. The housing has screws to adjust the beam horizontally (side to side) and vertically (up and down). The spring on the stainless-steel headlight retaining ring provides tension against the adjusting screws. NOTE: pulling the retaining ring over the headlight is difficult. Some mount the ring with the screws without the spring attached, then attach the spring to the stainless ring with a tool.



Power consumption, wire gauge, and illumination – All the DOT approved sealed beam headlights will work with the original Corvair headlight electricals. When you want to change to different headlights you must determine if they will exceed the Corvair electrical system capability.

Headlights are typically rated in Watts. A watt is work done by electricity. Wattage is calculated by multiplying voltage times amperage (formula $W = A \times V$). Headlight watts are specified at a certain voltage by the headlight manufacture. You need to determine the amperage since the Corvair has a maximum 15 Amp limit with all the headlights on either high or low beam. This is done by the formula $A = W/V$.

The Corvair headlight switch contains a “thermal circuit breaker” that interrupts electrical power to the headlights when amperage exceeds about 15 Amps. Chevrolet did not state any tolerance in the manuals and 15 Amps is an “about” value. The thermal circuit breaker opens the circuit when a metal blade gets hot from excess amperage. When the blade cools (about 1-2 seconds) the circuit is closed and the headlights come back on. This can be disconcerting on a dark road at night. Now many vehicles have separate fuses or circuit breakers for the headlights on each side of the car to prevent total loss of headlight illumination.

Keep in mind the headlight switch thermal breaker 15Amp limit is to PROTECT THE WIRING from starting a FIRE. Headlights that exceed the 15 Amps require improved wiring and relays. An example is the H4/9003 headlight bulb. It is rated at 55 Watts at 12VDC resulting in $A = W/V$ or 4.6 Amps = 55/12 (rounded up to be conservative). On high beam that is $4 \times 4.6 = 18.4$ Amps that exceeds 15 Amps. An upgrade to relays and larger diameter wire is needed.

Relays – If you determine the headlights you want to use require more amperage than the stock Corvair wiring and headlight switch can deliver, then relays can be installed. Companies make aftermarket wire harnesses with relays for quad headlight vehicles, or you can design and build your own. The headlight switch and dimmer provide low amperage power to control HI and LO beam relays that conduct power via a larger gauge wire from the battery/alternator or generator to the headlights. Since the Corvair is rear engine this requires running a separate wire all the way from the battery/alternator-generator to the relays in the front trunk. One concern is what relays are used and if you can get a spare! Caution, these relay systems typically fuse only the high or low beam for BOTH sides. If a fuse opens (blows), then you lose all lighting on either low or high beam! If you design your own wiring harness you can select a common relay and fuse either side of the vehicle headlights separately.

Wiring gauge – The gauge of the wire is the physical diameter of the conductor. The bigger the wire diameter the more amperage a wire conducts safely. Wire gauge numbers decrease as wire diameter increases. Gauge vs. amperage information is available in books or online. In a factory stock Corvair the headlight wiring, contacts, and headlight switch can handle a total amperage of about 15 Amps.

The GROUND – One often overlooked issue is the electrical amperage to the headlight must return via the vehicle ground. An undersized ground wire or poor connection reduces electrical power at the headlights resulting in dimmer headlights. The headlight has a ground terminal because the headlight enclosure is glass and does not conduct electricity when mounted in the vehicle. The headlight ground terminal plugs into a connector with a wire usually attached to the headlight mechanism frame. This frame is screwed/bolted to the body ground. With years of corrosion and body flexing the ground path is often not optimal. To improve the ground you can connect the headlight connector ground wire to a wire (adequate gauge) routed into the trunk. Install an eyelet connector on the wire and use a sheet metal screw to attach it to the steel body inside the trunk. Wire splices and the eyelet should be soldered for durability.

Tools – Replacing the Corvair headlight requires the proper tools and understanding.

- **Phillips screw driver** - Remove the headlights surround trim by locating and removing the Phillips screws. The screws can be corroded and difficult to remove. If needed use a penetrating lubricant. The aiming screws are also Phillips.
- **Blade screw driver** - The headlight is held into an alignment housing by a circular stainless steel frame around the outside of the headlight. The stainless steel frame is held in place by two small screws and a high tension spring. Removing the two small slotted screws can be difficult due to corrosion. The screw heads might break off if excessive force is used. Sometimes penetrating oil and patience are required to remove the screws.
- **Spring hook** - Once the screws are removed, the high tension spring will make it difficult to move the circular steel frame off the headlight. A robust spring hook tool (a "T" handle with shaft ending in a hook) will allow the spring to be pulled enough to partially remove the headlight and access and unplug electrical connector. The round headlight retaining frame can be detached from the spring. Some mount the retaining frame on the headlight with the screws first, then attach the spring to the stainless ring with a spring hook.

Regulations – DOT (Department of Transportation) regulations are primarily used to stipulate what kind of headlights can be installed on newly manufactured cars. The NHTSA (National Highway Traffic Safety Administration) issues regulations and laws mandated by Congress via the FMVSS (Federal Motor Vehicle Safety Standards).

The 1940 vehicle models were required to use sealed beam 7" round headlights. Quad 5.75" headlights were allowed on 1957 vehicle models (although many state regulations did not allow them until the 1958 models). It was not until the 1980's that Halogen bulbs and corresponding housings were allowed on U.S.A vehicles for main lighting. Per the FMVSS rules, LED lighting is legal for all vehicle lighting, EXCEPT the "main lighting" headlights unless the vehicle was equipped with OEM LED lighting. There is an exception. If the headlights are designed to replace existing headlights and are DOT and SAE approved, they are legal. State or local governments can use these regulations as enforcement guidelines, but can implement their own regulations/laws.

If a person makes the effort to look at all the lighting regulations for the area they live in, they may discover wide variations and contradictory rules. Many lighting products are sold as "OFF ROAD" use, implying they do not comply with public road laws. One can literally find themselves using lights that are legal in one city/county or state and illegal in another.

Basically, local law enforcement officers determine if your headlights violate laws in their jurisdiction. Does this sound subjective and confusing? Yes, it is. The reality is law enforcement will probably ignore your headlights unless they are "blinding" to other drivers due to intensity and aiming, or the light color does not conform to local laws.

Upgrading headlights – The original headlights were sealed beam with a tungsten filament. The following describes brighter headlight alternatives:

- Halogen sealed beam
- Bulb and housing
- LED (Light Emitting Diode)

Halogen Sealed Beam Headlights –. This is the easiest improvement. The DOT approved Halogen replacement unit part numbers are H5006 (outside HI/LO beam) and H5001 (inside HI beam). The "H" prefix designates the sealed beam as Halogen. Halogen lights produce more light for a given wattage. The H5006 wattage is less on HI or LO beam than the older sealed beam but produce at least the same illumination. The H5001 wattage does not exceed that of the older sealed beam, but produces more light. H5006 and H5001 used together are compatible with the Corvair headlight electrical system that is in good condition and they fit the same as the old sealed beam.

NOTE: Due to lower demand, the 5.75" round headlights are now primarily manufactured "offshore" resulting in quality complaints. A review of brand names indicates the Wagner H5006 and H5001 have the least number of user complaints.

Bulb and housings – A replaceable bulb fits in a headlight housing made of a reflector and clear lens. In the last few decades DOT rules have allowed separate housings and bulbs for "main lighting". There are several types sold, but note not all are DOT approved as main headlights.

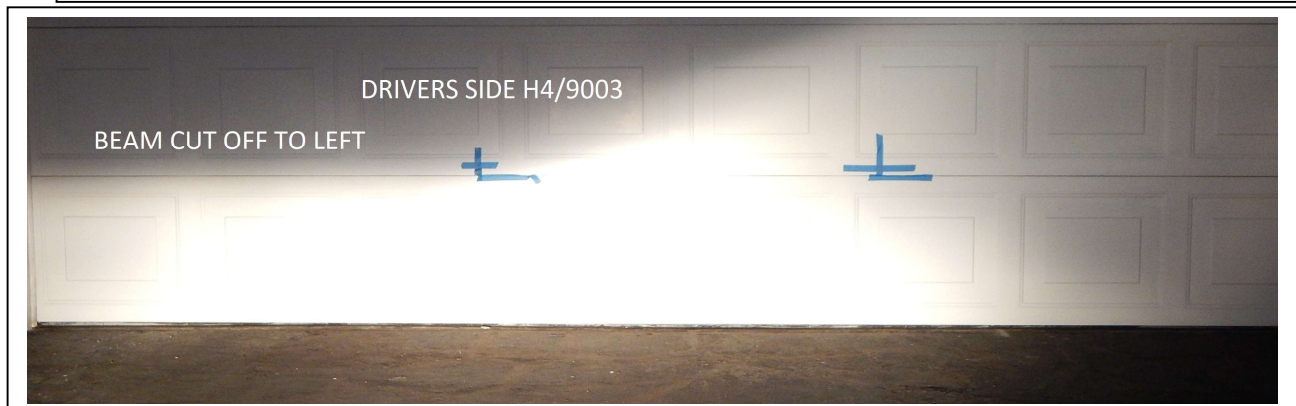
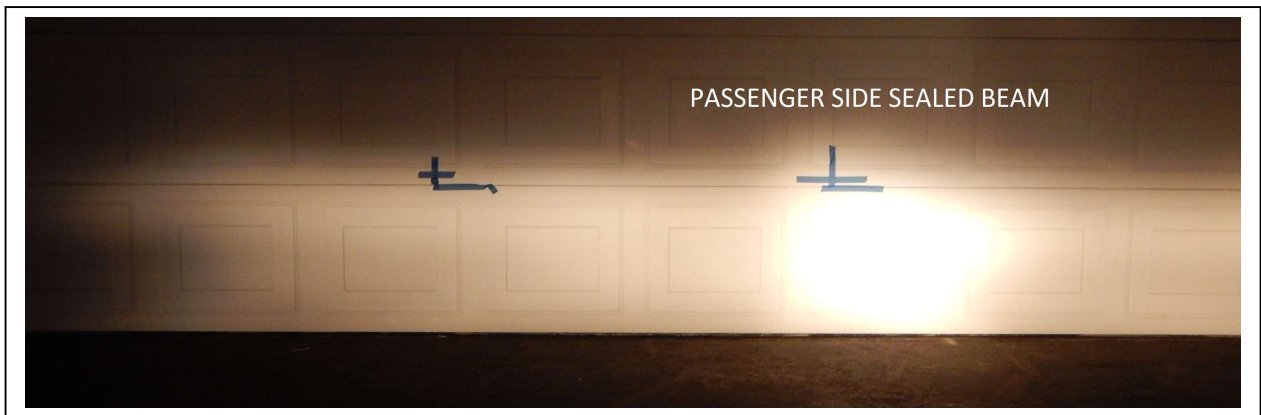
- H4 (9003) bulb
- H1 bulb
- 9007 bulb

H4 (9003) –The H4 system was implemented in most of the world decades ago, but initially in the U.S.A only for “auxiliary lighting”. Now DOT versions are legal for use as main lighting here. The H4 bulb has high beam and low beam filaments and fits in an H4 reflector/lens housing. The electrical connectors on the bulb are like the old sealed beam headlight connectors on Corvair models. H4 housings vary and may not fit in the Corvair alignment housing. H4 headlights are typically used as the outer headlights for low and high beam in a quad system, but some are made to fit inner headlight housings, but only the high beam can be used per regulations.

The 9003 bulb (DOT approved H4) is limited to a maximum of 60 Watts per filament. This exceeds the capacity of the Corvair headlight switch and wiring. Relays and fuses are required. Some 9003 bulbs use a filament that produces more light per watt vs standard 9003 bulbs. An example is the Philips 9003NGPS2 Nightguide Platinum that can be up to 130% brighter than your basic H4 halogen bulb. These are legal if properly aimed.

H4/9003 headlight housing light patterns. There are two issues worth mentioning. RHT and LHT lens and the low beam pattern:

- **H4/9003 lens** - The H4 housing lens is different for Right Hand Traffic (steering wheel on left side of car like the U.S.A.) versus Left Hand Traffic countries (steering wheel on right side of car). To make sure the headlight lens is for U.S.A traffic, you must confirm the housing lens is DOT approved. If the housing with the wrong lens is installed the low beam will blind oncoming drivers!
- **H4/9003 low beam pattern.** To prevent blinding drivers, the H4/9003 low beam pattern cuts off abruptly on the side towards oncoming vehicles. The low beam pattern is spread wider and does not seem as bright as the more concentrated sealed beam light pattern on lighted city streets. A brighter low beam is available using a brighter 9003 bulbs like the Phillips 9003NGPS2 Nightguide Platinum. See the following illustrations.



WARNING: It is tempting to use higher wattage H4 bulbs sold for off road use "axillary lighting". They are not legal in the U.S.A for "main lighting". The other issue is the increased wattage can be up to DOUBLE the 9003 bulb requiring high temperature sockets and wiring. These brighter and higher wattage lamps are not intended for use in quad headlights. Four bulbs on high beam would equal about 33 Amps or nearly the peak output of the Corvair 35 Amp alternator!! Simply put – DO NOT USE the high wattage H4 bulbs in a quad headlight system.

H1 bulb – This bulb was developed for the 5.75" quad headlight system inner headlights. The bulb has a single filament for high beam only use. It works in conjunction with the H4 outer HI/LO beam headlight systems. The H1 bulb requires a H1 high beam only headlight reflector/lens housing to fit the inner headlight position. The connector is different than the H4 or sealed beam connector. There is a DOT approved version of the H1 bulb rated at 55 Watts.

9007 Bulb – Manufacturers are now making round 5.75" housings to use the 9007 bulb. This bulb has high and low beam filaments. The bulb was used on some vehicles in the early 2000's. The connector might NOT fit in the Corvair headlight housing.

LED lighting – As noted in the "Regulations" herein, a LED main headlight must meet DOT and SAE design requirements. Plugging a LED bulb into a H4 housing designed for a H4 halogen bulb is not legal! There are LED bulb and housings that are DOT/SAE approved to fit the Corvair 5.75" quad headlight housing (see Holley LED below). FMVSS prohibits installing LED main headlight assemblies from a different vehicle brand/model. This is logical to prevent someone customizing a car using LED headlights from another car since the mounting height/aiming could be off.

LED H4 bulbs – These are intended to fit the H4/9003 headlight housings. At this time, they are ONLY approved for OFF ROAD or "auxiliary lighting" use. The early LED H4 bulbs had many LED chips on them that did not align with the housing reflector or lens creating poor light patterns with patchy bright and dark spots.

The latest generation uses fewer and smaller chips mounted in a location closer to the filament position of the old incandescent bulbs to improve the light pattern. While improved, at this time the U.S.A and Europe have not approved these bulbs for use in "main lighting" H4 headlight housings, only for use in "auxiliary" driving and fog lamps.

Another issue with LED H4 bulbs is they vary in illumination and power consumption. Low power versions use a passive heat sink, but are typically no brighter than a standard H4 halogen bulb. Brighter LED H4 bulbs use a heat sink on the back with a small fan. The fan draws additional amperage and makes noise. The brighter LED bulbs typically use as much, or more, amperage vs. the sealed beam headlights. They may also not fit in the Corvair headlight buckets.

Holley LED - These are relatively new and Holley claims they are DOT and SAE approved for use as main lighting in cars manufactured with the 5.75" quad sealed beam headlights. The Holley LED headlight has similar appearance to the original sealed beam headlight. It uses a "cartridge" LED assembly implying it can be changed without replacing the entire bulb. The power ratings are 25 Watts on low beam and 30 Watts on high beam which is compatible with Corvair headlight wiring and switches. Holley infers these are brighter than sealed beam headlights. They are relatively expensive.