The 140HP Engine - Four Carburetors

By Bob Nichols

Effective February 20, 2024

The 140HP engine was introduced in the 1965 model year, standard on the Corsa and optional in the other models. Unlike other Corvair engines with two carburetors, the 140HP engine uses four carburetors. Installing the 140HP engine in all models and years of Corvairs has become popular. This article will discuss some of the issues unique to the additional two carburetors and the revisions Chevrolet made to address the issues.

Keep in mind that after many decades the carburetors on the engine may not be original. Consult Bob Helt's "How to Identify and Rebuild Corvair Rochester Carburetors" book to identify model year and type of carburetor. Bob Helt's book is well regarded and still available for purchase. It does a good job of explaining the primary and secondary carburetors. Unfortunately, Bob Helt is no longer with us to revise his book as additional information became available. This article will use the latest information available to discuss the 140HP engine carburetor and linkage changes for model years 1965 – 1969.

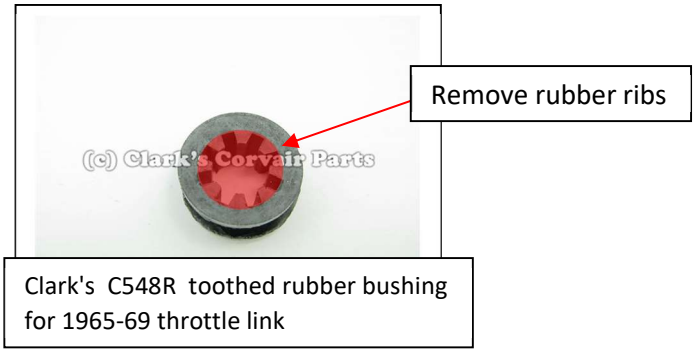
Many Corvair related books discuss 140HP engine and state Chevrolet engineering investigated different carburetion configurations during the engine's development. The goal was a solution that was reliable with a cost and horsepower between the 110HP engine and the 180HP turbo engine. The engine would have to perform well for daily use, run on pump grade premium gasoline, and require no special maintenance. Chevrolet design evaluations found the four-carburetor design worked as well, or better, than the other "normally aspirated" designs and had the advantage of using the basic Corvair Rochester carburetor design. Chevrolet engineering research showed the total CFM of the four carburetors was acceptable when combined with the 110HP engine camshaft and larger valve heads to produce a gross 140HP.

The two primary and two secondary carburetors - A good analogy is to think of the four-carburetor design as a spread out single four-barrel carburetor. Two "primary" carburetors provide good throttle response and fuel mileage, and the two "secondary" carburetors make additional horsepower at three-quarters to wide-open throttle application. The secondary is similar to the primary Rochester carburetor, but does not include features like a choke, power enrichment circuit, or adjustable idle mixture (fixed idle mixture circuit was added on Corvair model year 1968 – 1969 secondaries).

Proving grounds testing - Chevrolet testing of the 140HP engine was performed by accumulating a lot of mileage in a relatively short period using "aggressive" procedures. This resulted in a system that was durable. Unfortunately, this did not reveal problems encountered later due to infrequent, or brief, use of the secondaries by some owners. This article will describe the problems discovered and changes by model year.

Linkage bushing issue, secondaries will not fully open – A common complaint is all four carburetors will not fully open with the throttle pedal fully depressed. One issue is two ribbed rubber bushing used in the rear throttle linkage under the car. The replacement bushing C548R sold by Clark's Corvair "squishes" causing lost motion in the linkage. The Clark's online site shows where the

bushing is used. One suggested fix is to replace the bushing with a solid flexible piece of hose. Another option is cutting the "ribs" off C548R and cutting down C547 and gluing it (use synthetic rubber adhesive) inside of C548R.



Clark's C548R toothed rubber bushing for 1965-69 throttle link

Clark's c547 solid rubber bushing for 1960-64 throttle link. Insert in C548R

The following is a discussion of the 140HP carburetion and linkage for each model year:

1965 –The first issue arose when some owners complained about high engine speeds when the throttle pedal was released. Chevrolet determined the problem was one, or both, secondary carburetors not closing fully when the throttle was released. The problem was isolated to "sticky" secondary throttle plates that did not close fully due to an accumulation of dried fuel. The secondary carburetor had an accelerator pump circuit (like the primary carburetor) that were determined to be the cause. Chevrolet issued a bulleting advising dealers to **remove the accelerator pump cups** (the linkage and spring had to remain to close the throttle) so the pump could not squirt fuel into the carburetor throat when the throttle was opened. It was up to the dealer to perform this action. Note that only "some" drivers experienced this problem! A theory is presented in the following.

While the Chevrolet bulletin does not explain why removing the secondary accelerator pump cup eliminates the sticking secondary throttle, some ideas are presented in the following:

- **Passive secondary throttle closure -** Unlike the primary carburetors that rely on the positive throttle linkage return in combination with the accelerator pump spring, each secondary carburetor ONLY uses the accelerator pump spring to close the throttle plate (via linkage). The secondary throttle closing force is sometimes not adequate to overcome a sticky throttle plate and shaft resulting in the throttle plate that does not fully close.
- **Why does the secondary accelerator pump cause a sticky secondary throttle? -** Assumptions about why the accelerator pump with the cup was an issue are as follows:
  - Briefly opening the secondaries, then quickly backing off the throttle, would cause fuel injected into the bore by the accelerator pump to be trapped by the closed throttle plate (the plate is solid unlike the notched primary carburetor throttle plate). Heat converts the trapped fuel into a sticky substance.
  - Another theory is the mis-adjustment of the secondary carburetor linkage, or accelerator pump linkage, would allow the accelerator pump mechanism to "dribble" fuel from the accelerator pump well into the closed secondary carburetor.
  - Some suggest the drag of the secondary throttle linkage friction is enough to overcome the tension of accelerator pump spring and momentarily move the secondary throttle open when opening the primary carburetors.

    - **Note:** None of these theories has been confirmed. It is up to the individual Corvair owner to decide if they want to observe the Chevrolet advisory to remove the secondary accelerator pump cups, or keep them knowing about the possible negative consequences. Some report no issue with the secondary carburetors equipped with accelerator pump cups, but they avoid opening the secondaries for only a brief period.
- **Secondary carburetor accelerator pump spring -** The secondary carburetor accelerator pump return spring is visually different compared to the spring used in the primary carburetor, reference Bob Helt's Rochester book. The difference in spring tension is minor, per observation. One option to increase the throttle closing tension is to use Clark's Corvair auxiliary throttle return spring # C1916 that can be installed on the carburetor throttle shaft to increase the throttle plate closing force. While this is an effective modification it DOES increase the force to open the secondaries via the throttle linkage and as noted in the beginning of this article the throttle linkage can have the issue of not fully opening the secondaries. The C1916 springs should NOT be used on primary carburetors as this can overwhelm the throttle linkage.
- **Cold Engine Hesitation and Stalling –** Removing the accelerator pump cups fixed the "sticky" secondary problem, but without the accelerator pumps squirting in extra gasoline when the secondaries opened, the engine could experience hesitation or stalling if the engine had not reached normal operating temperature. This would lead to a revised linkage for the 1966 models.

1966 – All 1966 model year Corvair secondary carburetors were built without an accelerator pump cup. The accelerator pump mechanism and return spring are in place to close the throttle plate. The secondary throttle control linkage was revised by Chevrolet engineers. This linkage, generally called the "Secondary Lock Out Linkage", is not well regarded. The lock out linkage prevents the secondary carburetor from opening when the primary carburetor choke is engaged (choke plate not fully open). The secondary carburetor top was revised to contain a rod to transfer motion from the primary choke linkage to the secondary lock out mechanism. The rod is like the choke rod used in the primary, but has no butterfly plate. The purpose of the lock out linkage was to prevent the secondaries from opening under full throttle until the primary carburetor choke plate was open (engine warmed up) to prevent hesitation or a possible engine stall.

The linkage is a challenge to adjust and is sensitive to dirt or corrosion issues that can cause binding. The linkage requires the choke coil (at the exhaust manifold) to provide the mechanical force to both open the primary carburetor choke and release the secondary carburetor lock out mechanism. This requires the choke coil tension to be optimal. Some have reported the secondary linkage causes slow, or delayed, choke plate opening as the engine warms up.

1967 – Change documentation from Chevrolet is lacking because the 140HP engine was initially not offered for the 1967 model year. Around February of 1967 the 140HP became available and the following observations have been made by people familiar with these 1967 model year engines.

- The secondary carburetor lock-out lever, shouldered screw, and link were revised.
- There is an on-going debate about California vehicles with air pumps for emissions control. Some have stated the secondary linkage rods, springs, and pivot bracket were revised to clear the emissions equipment on 1966-67 California Corvairs.

1968-69 – All 140HP cars were equipped with air pump emission control equipment and the secondary linkage was revised to accommodate the emissions equipment. Some suggest this revised linkage was first used on 1967 California 140HP engines. Other changes are as follows:

- The secondary carburetor linkage control rods and springs were revised. The springs were contained in a tube.
- The pivot support that bolted to the top of the secondary was revised.
- Secondary carburetor accelerator pump fuel passages were eliminated (this means you cannot install an accelerator pump cup).
- A fixed idle mixture circuit was added to the secondary carburetor. Bob Helt stated this was to ensure fresh fuel would pass through the secondary fuel bowls to eliminate "fuel stagnation" if the secondaries were rarely engaged. Another reason was discovered by Steve Goodman of Rear Engine Specialists at Golden, Colorado. Steve's customers are required to pass emissions testing. Steve discovered the 65-67 140HP engines had an occasional mis-fire at idle, primarily on the driver's side, that would cause the emissions test to fail. Steve noted the 68-69 140HP engines did NOT have this issue. Steve theorized the addition of the idle mixture circuit in the 68-69 carburetors solved the mis-fire issue. Steve has installed the basic 62-63 primary carburetor base under the 65-67 secondary tops. The addition of the secondary carburetor idle mixture circuit in the 62-63 bases eliminated the occasional idle mis-fire, when properly adjusted.

One theory is the idle mis-fire is caused by a lean idle condition at the cylinders near the secondary carburetors. The problem is more prevalent on the driver's side and a possible cause is the vacuum balance tube between the two heads. On 140HP engines the vacuum balance tube connects to the primary carburetor pad on the passenger side, BUT (unlike two carburetor engines) the tube connects to the secondary carburetor pad on the driver's side. It is possible this creates a lean idle mixture condition at the driver's side cylinders near the secondary carburetor pad.

Summary and suggestions:

1965 – PROS - The 1965 model year linkage is preferred by many for its simplicity and ease of adjustment.

1965 – CONS – If the secondary carburetor accelerator pumps are installed there is a risk of the secondary throttle plates sticking open due to fuel accumulation if the secondaries are not held open for more than a brief moment.

1966-67 PROS – The "Lock Out Linkage" has the advantage of preventing the novice operator from opening the secondaries until the engine is "warmed up". There is no issue with fuel gumming up the secondary carburetor throttle plate because there is no accelerator pump cup.

1966-67 CONS – The linkage is not easy to adjust for proper secondary operation and requires maintenance to assure smooth operation.

1968-69 – PROS – The final revision added a fixed idle mixture for a smoother idle with reduced emissions. The throttle linkage is considered better vs. the 66-67 design.

1968-69 – CONS – This design is relatively scarce and replacements parts are hard to find. Accelerator pump cups CAN NOT BE USED since there is no fuel circuit.