The 164 Cubic Inch Engine Clutch Assembly Changes versus the Earlier 140-145 Cubic Inch Engine Clutch.

REVISION 2.

By Dan Drommerhausen and Bob Nichols – with thanks to Corvair enthusiasts who supplied information.

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The Corvair is grouped into 1960 – 64 early model (EM) years and 1965 – 69 late model (LM) years. It is sometimes assumed no major changes occurred until the 1965 model year, however there were considerable changes to the drivetrain of EM 1964 models. The engine and the clutch assembly and associated hardware was revised and the changes were carried over into the LM Corvairs.

Note - Year designations in the following are model years, not calendar years.

UPDATE: This revision 2 includes new information about a star lock washer used under the clutch fork pivot ball stud only on model years 1960 to 1963. Update information is on page 6 and 7.

The first (1960 – 63) clutch assembly design versus the second (1964 – 69) design – The clutch assembly design changed when the engine size increased to 164 cubic inches. The following is a description of the component changes from the first design clutch assembly, used on the 140/145 cubic inch engine (1960 – 63), and second design used on the 164 cubic inch engine (1964 – 69).

- Note – Items not changed: The 9-1/8" clutch disc, throw-out bearing clutch fork (pivot lever), and the crankshaft seal were functionally the same on the Corvair (1960 – 69). Some Corvairs used an 8" clutch disc, which are typically replaced with the 9-1/8" version.

The clutch assembly parts that were revised for the larger 164 cubic inch engine are: the crankshaft gear, bellhousing, flywheel, pressure plate, and throw-out bearing. When repairs or changes are made, it is important to use the parts that are designed to work together properly.

Why was the clutch assembly changed? Numerous books agree the 60 to 63 Corvair had a clutch that was "reluctant" to engage at higher RPM after shifting due to centrifugal force effects on the pressure plate mechanism. This problem was first addressed with a modified pressure plate on the 1962 – 63 turbocharged drivetrain. A final solution was incorporated into the 1964 clutch assembly design. This 1964 design moved the flywheel closer to the engine which required changes to the bellhousing.

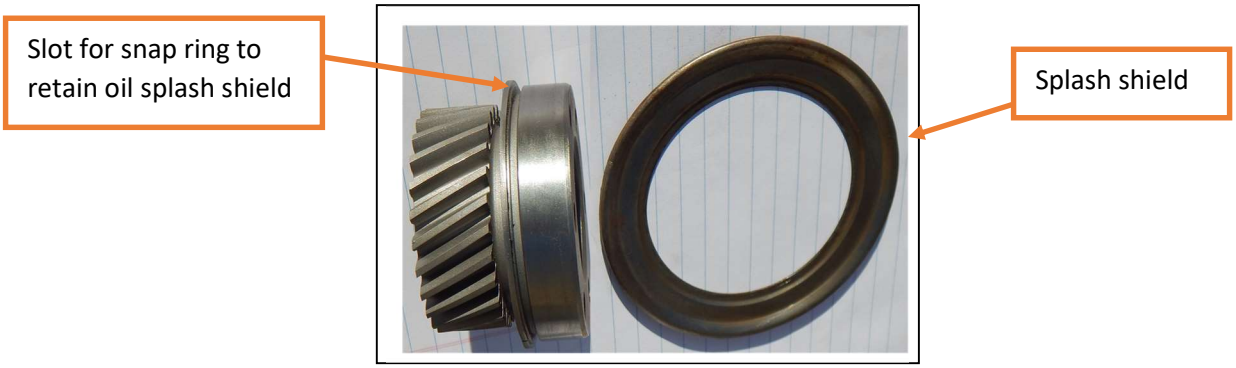
It is recommended that second design clutch assembly parts are used with the installation of the larger 164 cubic inch engine into 1960-63 Corvairs. The second generation bellhousing will bolt up to any year differential housing, although the 1960 – 63 clutch fork pivot ball on the differential should be changed to the 1964 – 69 style pivot ball.

WARNING: Over the years some have commented that you can mix the first and second design parts, typically when installing a 164 cubic inch engine in a 1960 – 63 Corvair. This is best avoided because it can compromise clutch assembly function and involve "modifications" that can make future repairs difficult due to unexpected parts combinations or modifications.

NOTE: Measurements herein were obtained from examining used parts or from information stated in Corvair literature. Design tolerances are NOT stated unless they are verified by Chevrolet engineering documents.

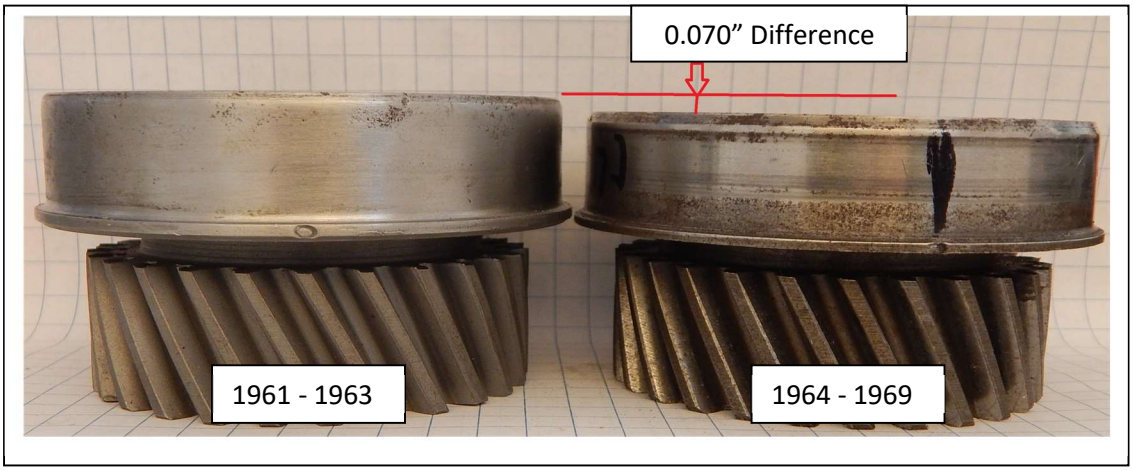
Crankshaft Gear – There are four types of crankshaft gear designs that the manual transmission flywheel, or Powerglide flex plate bolts to.

- **1960** – This gear was used on the 140 cubic inch engine. It is the dimensionally like the 1961 – 63 gear design, except it has a groove for a snap ring to retain a "splash shield". Chevrolet revised the seal for 1961 and deleted the splash shield and retaining clip. The original seal is obsolete. Remove the splash shield and retaining ring before installing the newer style seal!



- **1961 – 63** This gear was used on the 145 cubic inch engine crankshafts and is longer front to back at 1.700" compared to the 164 cubic inch engine crankshaft gear.
- **1964 – 69** This gear was used on the 164 cubic inch crankshafts and is shorter front to back at 1.630" compared to the earlier crankshaft gear. This shorter gear moves the flywheel 0.070" closer to the engine and bellhousing bolt heads. This was compensated for with a 1964 – 69 bellhousing design change.
- **1964 – 69 Powerglide 140HP engine.** This unique gear is only used on one engine and transmission combination. It is the same dimensionally as the crankshaft gear used on the other 164 cubic inch engines with one exception. Various Corvair books state the crankshaft gear teeth timing with respect to the keyway is moved 4 degrees to retard the camshaft timing. Keep in mind cam timing is stated in crankshaft degrees, not camshaft degrees (crankshaft rotates twice for every on camshaft rotation). This change combined with the 95 HP camshaft improved engine power below 4,000 RPM to enhance Powerglide drivetrain response.

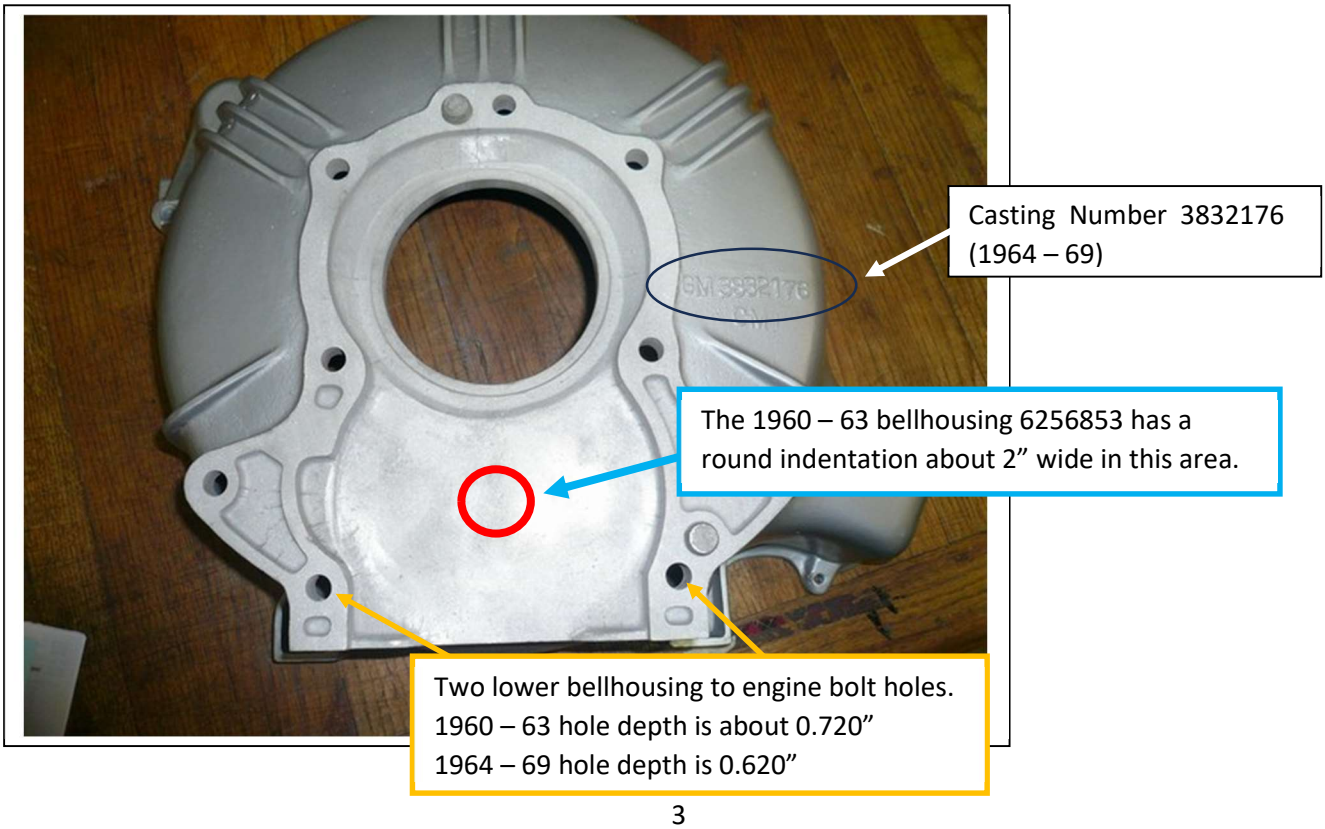
Refer to the following illustration of the 1960 – 63 versus 1964 – 69 crankshaft gears.



- **Bellhousing** – The manual and Powerglide transmission bellhousings are grouped into a first design (1960 – 63) and a second design (1964 – 69). The bellhousing mounting pattern to the differential case is the same for all years. All 1960 – 69 bellhousings use the same seal. WARNING – Bellhousing to engine bolts are different lengths, some use washers and some do not. Only use original factory bolts installed per the Corvair Chassis Shop Manual.

- **Bellhousing manual transmission** – The bellhousing was revised for the 1964 model year to accommodate the changed crankshaft gear. The crankshaft gear seal was moved and changes were made to allow for adequate clearance between the flywheel and lower bellhousing to engine bolts. Identification numbers stated here are the "casting" numbers on the housing, not the Chevrolet parts manual numbers. Chevrolet machined some 3832176 castings (used on 1964 – 69 engines) as replacements to fit 1960 – 63 engines. These units had blue paint over the casting number when new per the Corvair parts manual.

    - **1960 - 63** The bellhousing casting number is 6256583. It has a circular indentation about 2" wide below the seal area on the side facing the engine to accommodate the EM camshaft. All the bellhousing to engine bolt holes are 0.500" except the two lower bolt holes that have a measured depth of about 0.720". The two lower bolt hole surrounding flange is cast, not a machined surface, and depth varies depending on the casting. The two lower bolt heads will be too close to a flywheel mounted on a 1964 – 69 engine crankshaft resulting in intermittent contact, especially with rebuilt bolted flywheels. **Do not use the 1960 - 63 bellhousing on the 1964 – 69 engine!**
    - **1964 - 69** The bellhousing casting number is 3832176. The seal area was revised to move the seal 0.050" closer to the engine. There is no indentation below the seal area. All the bellhousing to engine bolt holes are the same depth as the 1960 – 63 bellhousing, except the two lower bolt holes. The area surrounding the two lower bolt holes is machined on the flywheel side so each hole depth is 0.620" to move the bellhousing to the engine bolt heads 0.100" closer to the engine to compensate for the crankshaft gear moving the flywheel 0.070" closer to the engine.



- **Bellhousing Powerglide** – The Powerglide bellhousing was also revised on the 1964 models to accommodate the revised crankshaft gear. The Powerglide bellhousing has open areas to allow air to cool the torque converter.
    - **1960 - 63** The bellhousing casting number is 6255599. Note it is designed to work with a first design flexplate (mounts the torque converter to the crankshaft) that only works with the 1960 – 63 crankshaft gear.
    - **1964 – 69** The bellhousing casting number is 3832517. It was revised to work with the changed 164 c. i. engine crankshaft gear. As with the second generation manual bellhousing, the area surrounding the two lower bolt holes is machined so each hole depth is 0.620" to move the bellhousing to the engine bolt heads 0.100" closer to the engine and compensate for the crankshaft gear moving the flexplate 0.070" closer. A second design 1964 – 69 flexplate must be used to avoid damaging the torque converter. The revised flex plate has a 1/8" hole drilled on the six bolt hole circle radius to identify it as different than the first generation flexplate.

- **Flywheel –T**he Corvair flywheel is a three-piece unit designed to provide harmonic damping for crankshaft longevity. One flywheel piece contacts the clutch disk and this part is connected to a center part that is a variable thickness flex plate that bolts to the crankshaft gear. The final piece is a back cover facing the engine that is a structural member. DO NOT REMOVE THIS PART TO LIGHTEN THE FLYWYEEL AS IT PREVENTS FRACTURING OF THE FLEX PLATE OUTER FINGERS AT THE RIVET HOLES. All three parts are riveted together along the outer edge of the flywheel. Note the rivets are known to loosen and are often replaced with nuts and bolts. The 1960 – 63 first generation flywheel is different compared to the 1964 – 69 second generation unit.
    - **1960 - 63** Sometimes referred to as the "flat flywheel". The clutch contact surface is even, on the same plane, with the pressure plate mounting surface.
    - **1964 - 69** Commonly referred to as the "stepped flywheel" due to its appearance. The flywheel was revised by recessing the clutch disk contact area 0.125" compared to the surrounding area the pressure plate bolts to. This change accommodates the revised pressure plate designed to enhance clutch engagement at higher RPM after a gear change.
- **Pressure Plate** – The first or second pressure plate design should be used with the corresponding flywheel first or second design. The first design pressure plate has spring diaphragm fingers that sit lower compared to the second design.
    - **1960 – 63** The pressure plate spring diaphragm is referred to as the straight finger type. It has been stated in Corvair books that when unbolted from the flywheel, the distance from the pressure plate clutch surface to the pressure plate mounting to flywheel surface will be approximately 0.200".
    - **1962 – 63 Turbocharged engines.** The turbocharged engine pressure plate had spacers welded to the mounting bolt holes to raise the pressure plate 0.125" off the flywheel surface to enhance higher RPM engagement. The pressure plate friction surface casting was heavier to promote smoother starts from a stop when engaging the clutch. Some references state a higher tension diaphragm spring was installed.
    - **1962 – 63 FC.** The forward control (95) vehicles were originally equipped with a higher tension diaphragm spring per Bob Helt's "The Classic Corvair". Clark's uses a higher tension diaphragm spring in all their rebuilt 1960 – 63 pressure plates.
    - **1964 – 69** This pressure plate is referred to as the bent finger type and the spring diaphragm fingers sit higher above the pressure plate frame compared to the 1960 – 63 pressure plate. This second design pressure plate is designed to work with the second

design “stepped flywheel” that has a clutch disc contact area recessed 0.125” with respect to the area the pressure plate bolts to. Statements indicate that when unbolted from the flywheel, the distance from the pressure plate clutch surface to the pressure plate to flywheel mounting surface will be approximately 0.100”. This pressure plate is a lighter unit using a clutch surface casting that is smaller and made from cast iron compared to the heavy duty unit on 140HP and turbocharged engines.

- **1964 – 69 140HP and Turbocharged engines**. The 140HP and turbocharged engines used a pressure plate with a heavier casting The pressure plate friction surface casting was heavier to promote smoother starts from a stop when engaging the clutch. The clutch friction surface is made from a more durable nodular cast iron. A higher tension diaphragm spring was used.

- **Clutch release bearing (throw-out bearing) –** The 1960-63 model clutch release bearing (commonly called a throw-out bearing) is different compared to the 1964–69 clutch release bearing. The different throw-out bearings have the same inner diameter that slides onto the support snout of the transaxle. Care must be taken to use the correct throw-out bearing.

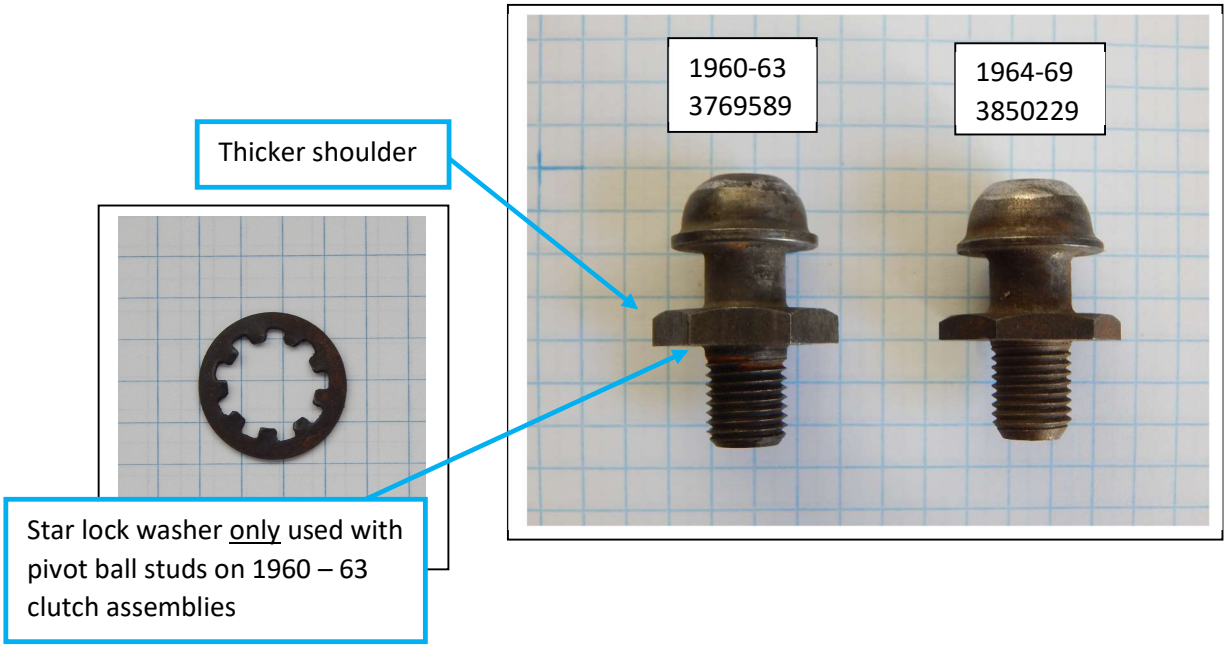
  - **1960 - 63** The throw-out bearing surface that contacts the pressure plate finger surface is rounded/convex to maintain proper contact with the fingers of the 1960 – 63 pressure plate when the bearing depresses the pressure plate diaphragm spring. This bearing is longer than the 1964 - 69 throw-out bearing, but stated values vary in different documents.
  - **1964 - 69** The throw-out bearing surface that contacts the pressure plate finger surface is flat to be compatible with the pressure plate diaphragm spring “bent finger” design during their depression. This bearing is shorter than the earlier throw-out bearing, but stated values vary in different documents.

Illustration from public posting.

- **Clutch Release Fork Pivot Stud -** The pivot ball stud for the clutch release fork is mounted on the differential case. The 1960 – 63 part (3769589) is slightly taller compared to the 1964 – 69 part (3850229). One way to identify one from the other is by the thicker shoulder on the 1960 – 63 part versus the 1964 – 69 part, refer to illustration. While the difference is minor, the 1960 – 63 part also has a star washer under it making it taller. Observations indicate the earlier 1960 – 63 part with the star washer is about 0.075" taller than the later 1964 – 69 part. The fulcrum pivot ratio of the clutch release fork multiplies the difference. While not considered critical, for optimal clutch operation use the correct parts.

  Per the factory assembly manual drawing notes, the star washer used under the 1960 – 63 and pivot ball stud was DELETED on 1964 – 69 vehicles in conjunction with the changed pivot ball stud. DO NOT use the star washer under the pivot ball stud on 1964 – 69 clutch assemblies.

  Note: In the 1970 Corvair parts catalog, both 3769589 and 3850229 were replaced with part 3850567 (Clark's sells this NOS part as C649A). Use shim washers as required with replacement 3850567 to match either 3769589 or 3850229.



Summary of problems mixing first and second design clutch assembly parts.

Over the years a few folks have come up with "modifications" that are claimed to allow the mis-matching of first and second design clutch related components. While things can be made to fit together, it does not mean they will function as well together as the proper combination of parts.

- **PROBLEM: First design bellhousing on a 164 cubic inch engine. –** The 1964 – 69 crankshaft gear flywheel mounting surface is closer to the engine resulting in seal and flywheel issues.
  - **Seal -** If you bolt a 1960 – 63 bellhousing to a 1964 – 69 engine the seal will ride on the crankshaft gear seal surface edge furthest from the engine resulting in poor sealing. There is a shim to move the seal back toward the engine (originally meant to move the seal to a non-worn gear sealing area).
  - **Flywheel** – The flywheel (either first or second generation design) is moved 0.070" closer to the bellhousing bolt heads on a 164 cubic inch engine. Flywheel strikes with the

two lowest bolts have been documented. The incidences noted the lower bolts DID NOT have washers under the bolts, so that was not the issue. The problem was caused by the flywheel being too close to the bolt heads. Note the three-piece flywheel contains a flex plate that allows some flywheel deflection and the crankshaft. Additionally, within crankshaft thrust bearing tolerances, the flywheel moves closer to the bellhousing bolts when the clutch pedal is depressed.

- **PROBLEM: Second design bellhousing on a 140/145 cubic engine.** – The second design bellhousing does NOT have the indentation at the camshaft area, however the measured casting depth in the cam area, allowing for casting irregularities, was the same depth as the depth of the indentation of the first generation bellhousing. A test fit was not performed for this article to determine adequate clearance. The clearance should be verified! The lower bolts will go about 0.100" further into the engine case. The two lower engine case bolt holes are blind, meaning they are not open and care must be taken to verify the bolts are not too long which would damage the engine block casting.

- **PROBLEM: Swapping first and second design flywheels and pressure plates.** – The second design pressure plate uses a design to enhance engagement at higher RPM. This required a change in geometer that resulted in a flywheel step down surface for the clutch disk with relation to the pressure plate bolting surface. Mixing the first and second design parts is either going to result in a non-working clutch or awkward operation due to compromised geometric relations. It has been suggested shimming a second design pressure plate 0.125" off a first design flywheel, as was done on the 1962 -63 turbocharged engine, might work. This is NOT recommended because the second generation pressure plate diaphragm spring is different than the first generation pressure plate design.

- **PROBLEM – Mixing first and second throw out bearings. –** As noted in this article the bearing area that contacts the pressure plate is different on first and second design. The first and second design bearing lengths are different. While the two designs both fit on the any differential shaft shout, not using the appropriate bearing with the first or second pressure plate design could result in less the satisfactory clutch operation.

- **PROBLEM - Clutch fork pivot ball stud –** Use the taller 1960 – 63 pivot ball stud with star lock washer on 1960 -63 clutch assemblies. Use the shorter pivot ball stud WITHOUT star lock washer on 1964-69 clutch assemblies. Note it has been suggested the shorter 1964 – 69 pivot ball stud could be used WITH the star lock washer on 1960 – 63 clutch parts. Warning: both parts are obsolete and the 1970 GM parts manual substituted another part that MUST be shimmed to appropriate height.

Bottom line - If you want the clutch to work optimally, use the correct combination of parts! Additionally, this avoids confusion during future repairs when "modification" details are lost or forgotten.

164 Cubic Inch Engine Swap into 1960 - 63 Corvairs – Replacing the 140/145 cubic inch engine with a bigger engine has been done for some time, especially popular is installing the four carburetor 140HP 164 cubic inch engine. When considering the purchase of a 1960-63 model year Corvair with a bigger engine installed, it is suggested that you ensure the bellhousing, flywheel, pressure plate, and clutch release bearing are the second design type. The correct clutch fork pivot bolt is recommended, but is not considered critical. The 1964 Corvair is already equipped with the bigger engine. The only change suggested when installing the 140HP engine in the 1964 model year Corvair is the installation of the heavier/heavy duty 140HP pressure plate. For competition use some use the lighter pressure plate used on lower horsepower 164 cubic inch engines with a higher tension diaphragm spring installed.