

Corvair Starter Diagnosis.

Changing a starter does not take a lot of work but with rebuilt units priced at \$85.00 and up, correct diagnosis of starting problems can ensure that when you complete your work, a turn of the key brings a smile!

Numbers to remember: Minimum battery voltage to run a starter is 9.6, anything less is an undercharged or bad battery or bad cables and clamps. Minimum voltage to pull in a solenoid is 7.7. Again, these numbers are a **minimum** industry standard, at the end of this article I will list what I actually find in 50 year old Corvairs.

If you want to check the starter with a voltmeter in a no crank situation, hook your positive voltmeter lead (negative lead to ground) to the stud on the solenoid where the large positive cable is bolted on and turn the key to start. If you have over 9.6 volts and no cranking, then the problem is in the starter or solenoid. If the solenoid clicks but the starter does not pull in, move the positive voltmeter lead to the output tab on the solenoid and again turn the key. If you find 9.6 volts or above at the output tab, then the problem is in the starter itself. If you had over 9.6 at the cable input (stud) and less at the solenoid output, then the problem is the solenoid.

The following is a quick check provided by turning the key to start and watching your dash board warning lights.

- **No starter sound of any kind and the red warning lights go out:** dead battery, loose cable, dirty battery cable end, or bad connection in the primary wiring. Use a voltmeter (negative lead to ground) to start at the battery terminals and work towards the starter with the positive probe; each time the key is turned you should find 12+ volts. When the voltage drops below 9.6 you have found the problem. This is the most common misdiagnosed area.
- **No starter sound of any kind and the red warning lights dim or flicker when you turn the key to start (but you can still see them):** you have power to the solenoid (voltage drop when you turn the key dims the lights) but the solenoid is not able to pull in the starter drive. You could have an internal solenoid problem or the voltage supplied to the solenoid is too low for the pull-in windings to work. More on that later. A badly worn lever between the solenoid piston and the starter drive collar can hang up and also cause this problem, but that is rare.

Don't overlook a problem in the grounding circuit such as a loose or dirty negative battery cable end, loose cable at the engine mount or that someone mounted the ground cable to the body instead of the engine which would cause the starter to ground through the clutch cable, shifter cable or some other high resistance connection.

If the starter pulls in but spins free without cranking then you probably have a failing starter drive clutch. The clutch has springs with rollers to let the ring gear override the starter when the engine starts which prevents damage. Correct this problem early to avoid damage to the ring gear; replace the starter drive assembly and check the other starter parts. A manual transmission vehicle can have broken welds on the ring gear or an out of round flywheel (knocking at idle) which will cause the starter drive gear to miss the ring gear (imitating a bad starter drive). A Powerglide equipped vehicle can have worn out teeth on the ring gear; this is usually caused by an owner continuing to operate the vehicle with a bad starter drive.

If the starter pulls in but chatters and jumps out, you may have an open in the solenoid hold in windings. The pull in windings work, but the solenoid cannot hold the drive gear in to the ring gear. This is similar to a bad starter drive clutch but the drive will actually crank a very short time before jumping out and chattering.

A common old age problem is too much voltage drop between the battery and the starter solenoid in the primary wiring. Each connector and switch in the wiring harness starting circuit can cause a 0.2 volt drop; if you have a Powerglide vehicle there are eight (including the battery cable and solenoid "S" stud). Theoretically you would start with 12.5 at the battery and end up with 10.9 at the solenoid. As soon as the starter motor is engaged the starting voltage is reduced to 10.9 which would now leave 9.3 at the solenoid. I checked three of my cars while cranking and found an average of 8.8 at the solenoid. As I mentioned above, the solenoid is designed to work with as little as 7.7 so there is a built in safeguard for aging switches and connectors up to when a no-start occurs.

The following are numbers I recorded during actual testing of starters in service:

Battery voltage during cranking (battery terminals):	10.8 - 11.0
Voltage at the solenoid connector during cranking:	8.7 - 8.9
Cranking amperage:	125 Rebuilt – 150 Older Unit

Starter check on the floor with jumper cables (no load): 11.0 Volts, 56 Amps (Shop Manual states 10.6 Volts, 58 – 80 Amps)

Once again: anytime your voltage at the battery terminals is 9.6 or lower during cranking, you have an undercharged or defective battery. Take corrective action because any further testing is useless.