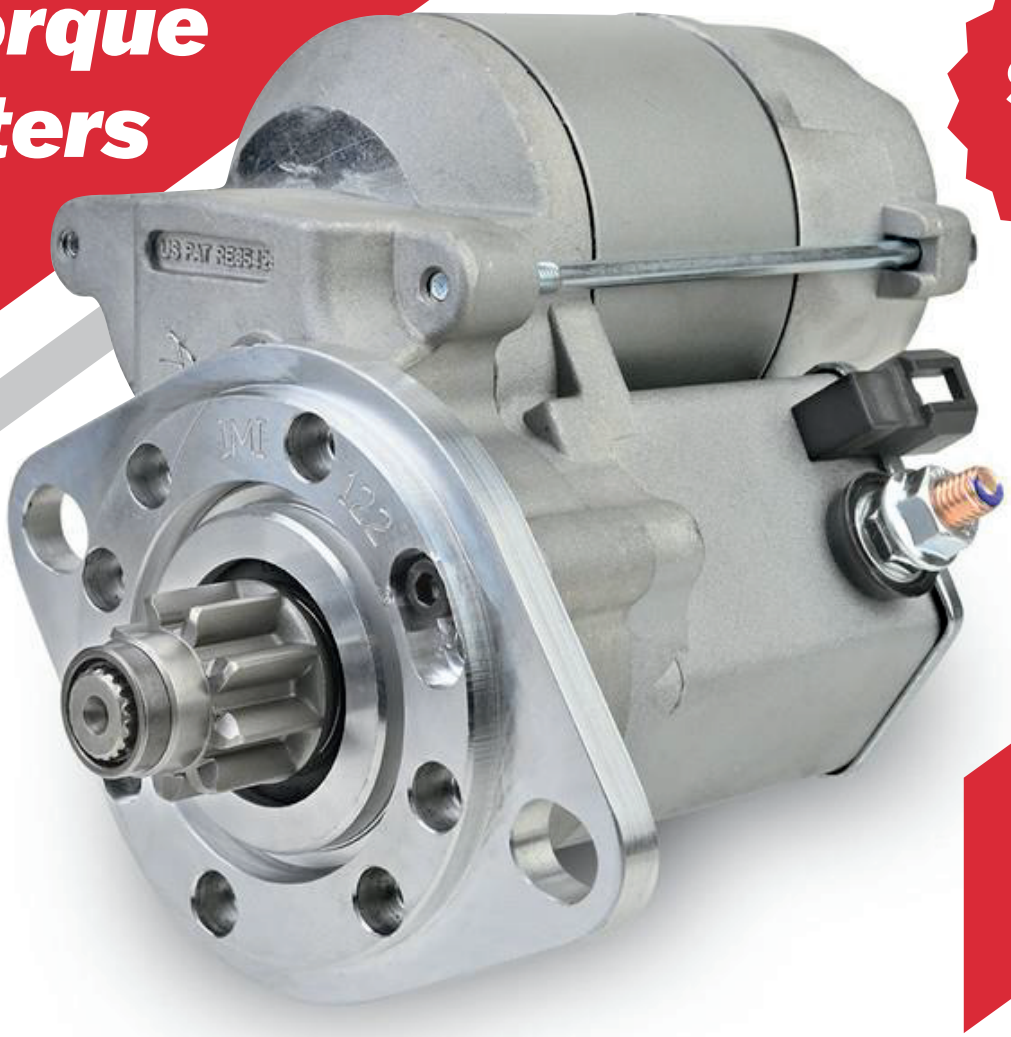
VINTAGE
Auto Garage

Complete Book on Hi-Torque Starters



$15

How to install and troubleshoot Hi-Torque Starters for American Classic Cars and Trucks

First Edition Written by:
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TABLE OF CONTENTS

Chevrolet and GMC Starter Overview and Fitment.

First, check the mounting holes on your old starter. Most of these have two mounting holes that are 180 degrees apart (straight across from each other). The two holes from the factory are either 4 1/8" or 4 1/4" depending on the make and year (measured from the center to center of both holes). Vintage Auto Garage starters will fit both, as the holes are slightly widened or elongated to fit all applications.

Next, confirm starter pinion gear to flywheel ring gear compatibility.

Chevrolet and GM cars and trucks:

- 1954 and earlier Chevrolet cars and trucks used 139 teeth flywheels.
- 1955 and later Chevrolet used 168 teeth flywheels,
- 1956 and later GMC trucks went to 168 teeth flywheels.
- Note: Early '50's to early '60s GMC Trucks with the Hydramatic Transmission use entirely different starters than your typical Chevy or GMC starter. Two different types of starter depending on the year it was produced. Consult Vintage Auto Garage for fitment details.

Note: Don't get fooled by the year of the car or truck as engines were commonly changed and different year engines were replaced. You may have a 1941 vehicle with a 1956 engine and you could order the wrong starter. If there's any doubt, get the numbers off the engine block to research what year engine, Internet search with help you find this information.

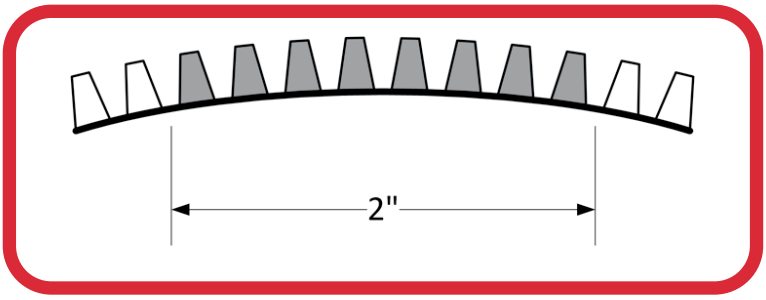
Starter Clearance: Hi Torque starters have four mounting positions for motor clearance purposes. To re-clock your starter, simply remove the two Allen bolts and clock the starter mounting plate to the desired location then re-install the two bolts.

Caution do not remove the two long bolts that hold the motor to the adaptor plate, these should stay in place.

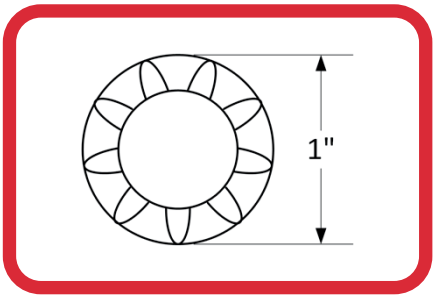
Checking what Chevrolet or GMC ring gear you have:

Use these two diagrams to determine how many teeth your flywheel ring gear have. Measure a section of the ring gear as shown below.

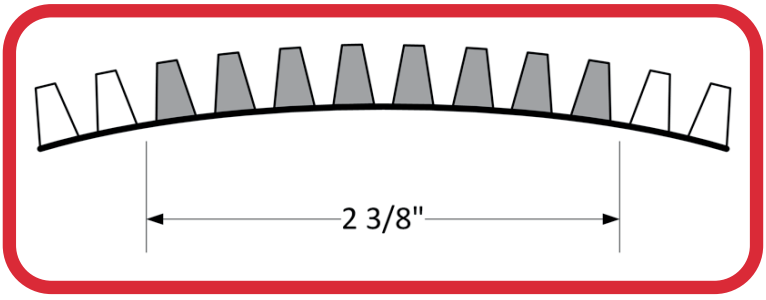
Flywheel ring gear with 8 teeth in 2" = 168 teeth



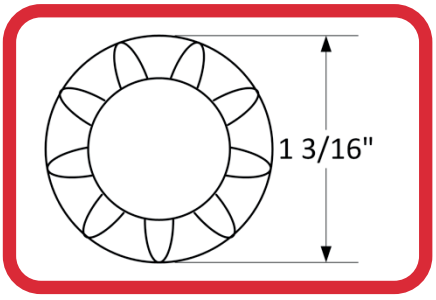
Matching Starter Gear 1" OD - 9 teeth / 12 pitch



Flywheel ring gear with 8 teeth in 2 3/8" = 139 teeth flywheel



Matching Starter Gear 1 3/16" OD - 9 teeth / 10 pitch



Chevrolet and GMC foot pedal starter linkage.

Early Chevrolet cars and trucks used mechanical foot pedal starter systems. When the foot pedal was depressed the mechanical linkage engage the starter pinion into the flywheel, then an electric switch that was part of the linkage activated the starter motor. See image below.

Note: when installing new Hi Torque starter you are not able to use this mechanical pedal and will need to install key switch that has start position. See Vintage Auto Garage key switch kits.

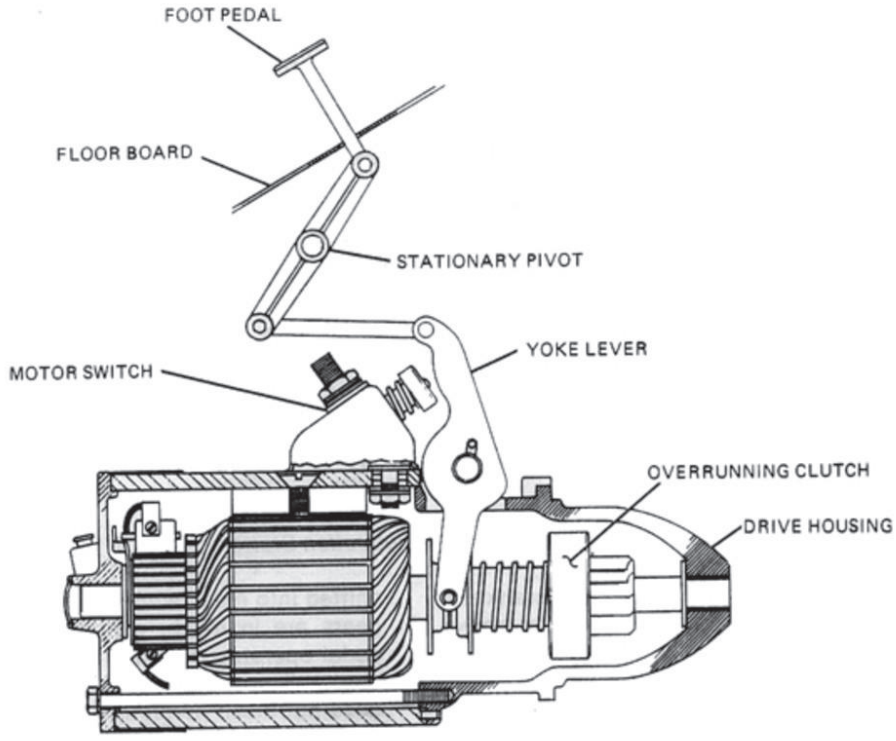
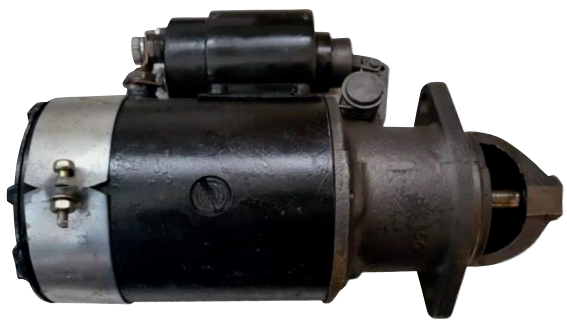


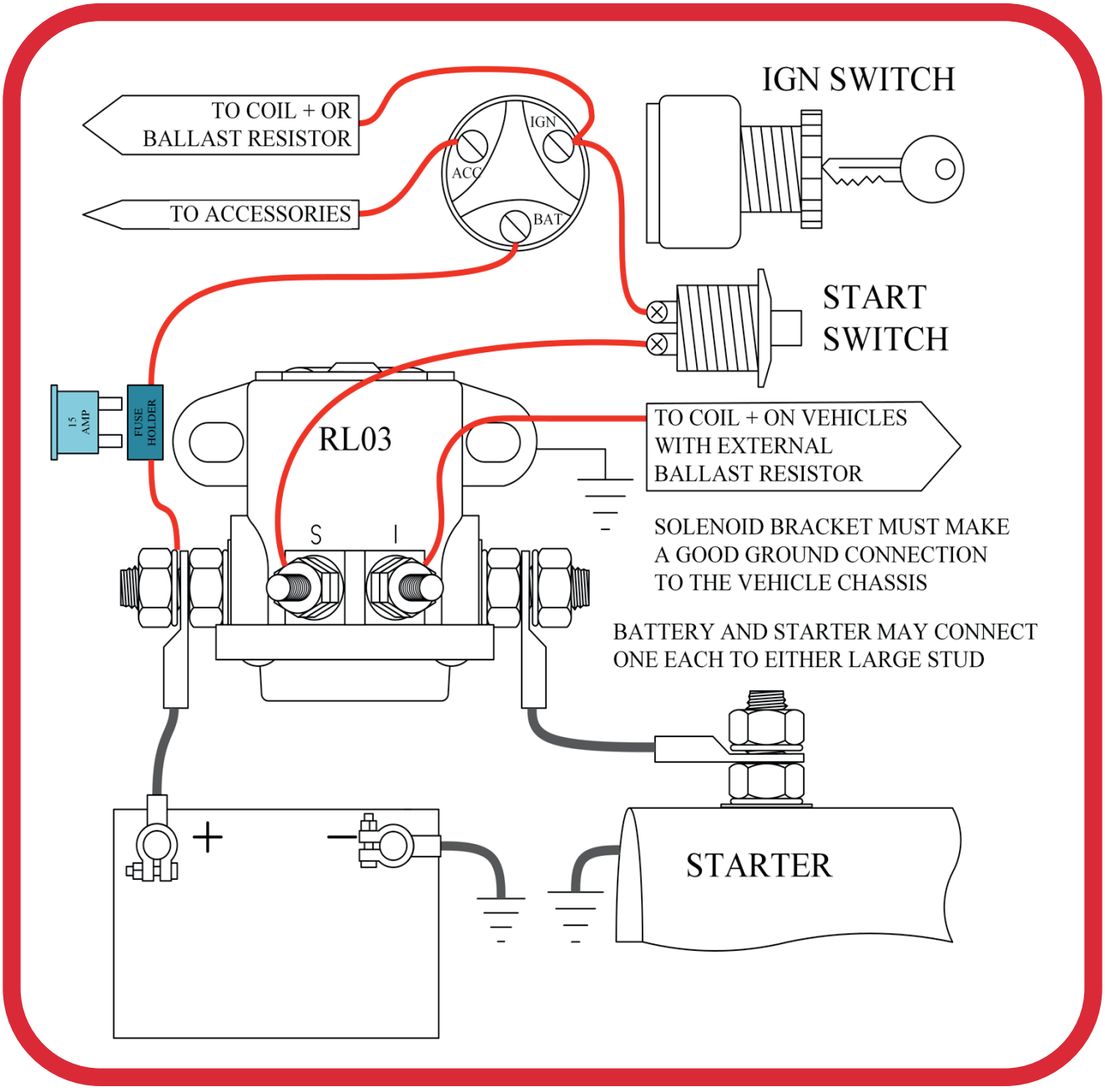
Figure 14-8. Pedal Shift Starter.

Original starter vs. new Hi-Torque Starter, far lighter with higher torque and 30% more cranking power.



Ford Starters and Solenoid Overview

How to connect the Ford RL03 or SW3 solenoid to original starters with key switch and push button.

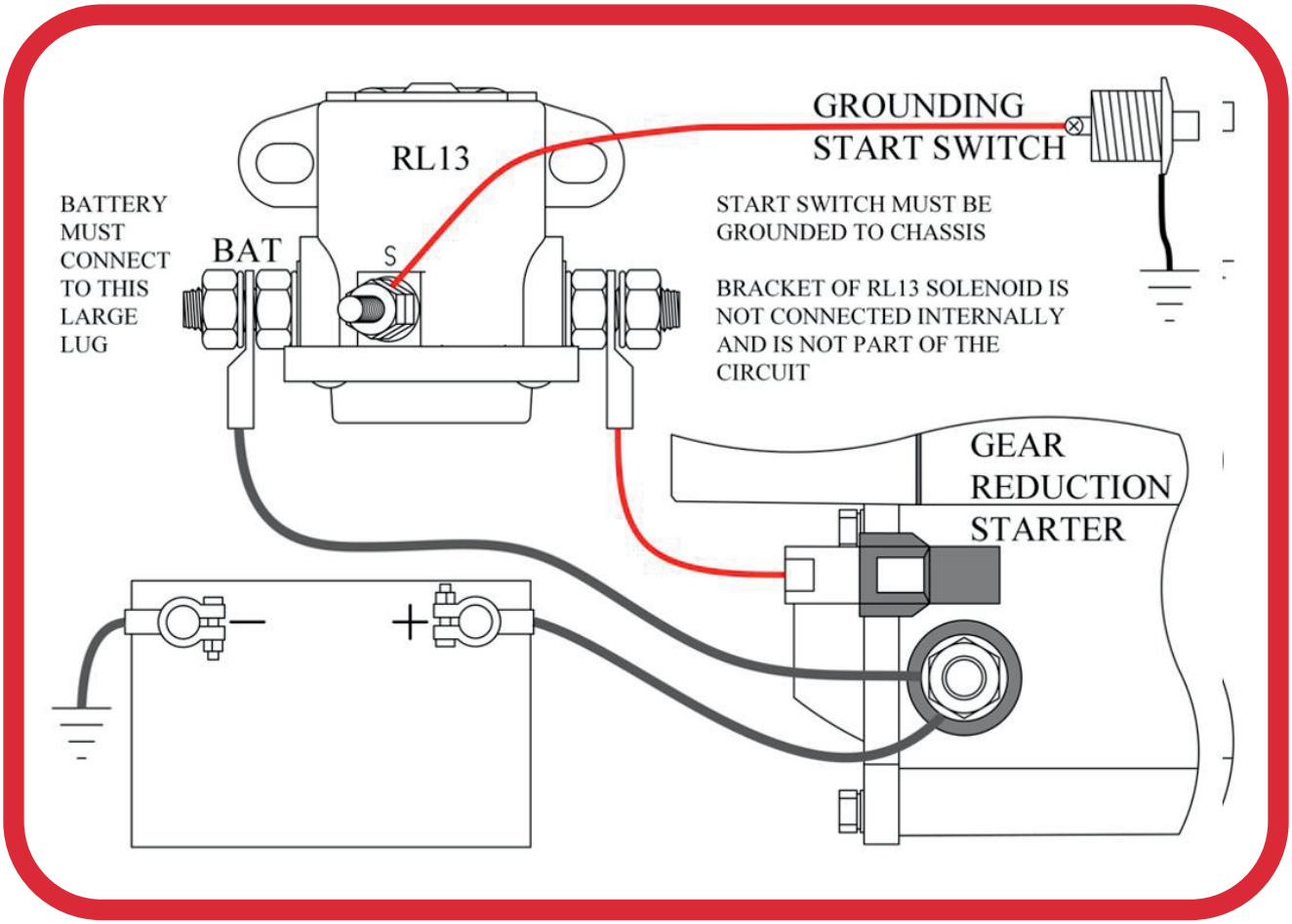


Note: If there is no START SWITCH, simply run the wire from the IGN Terminal, straight to the S Terminal on the RL03 Solenoid

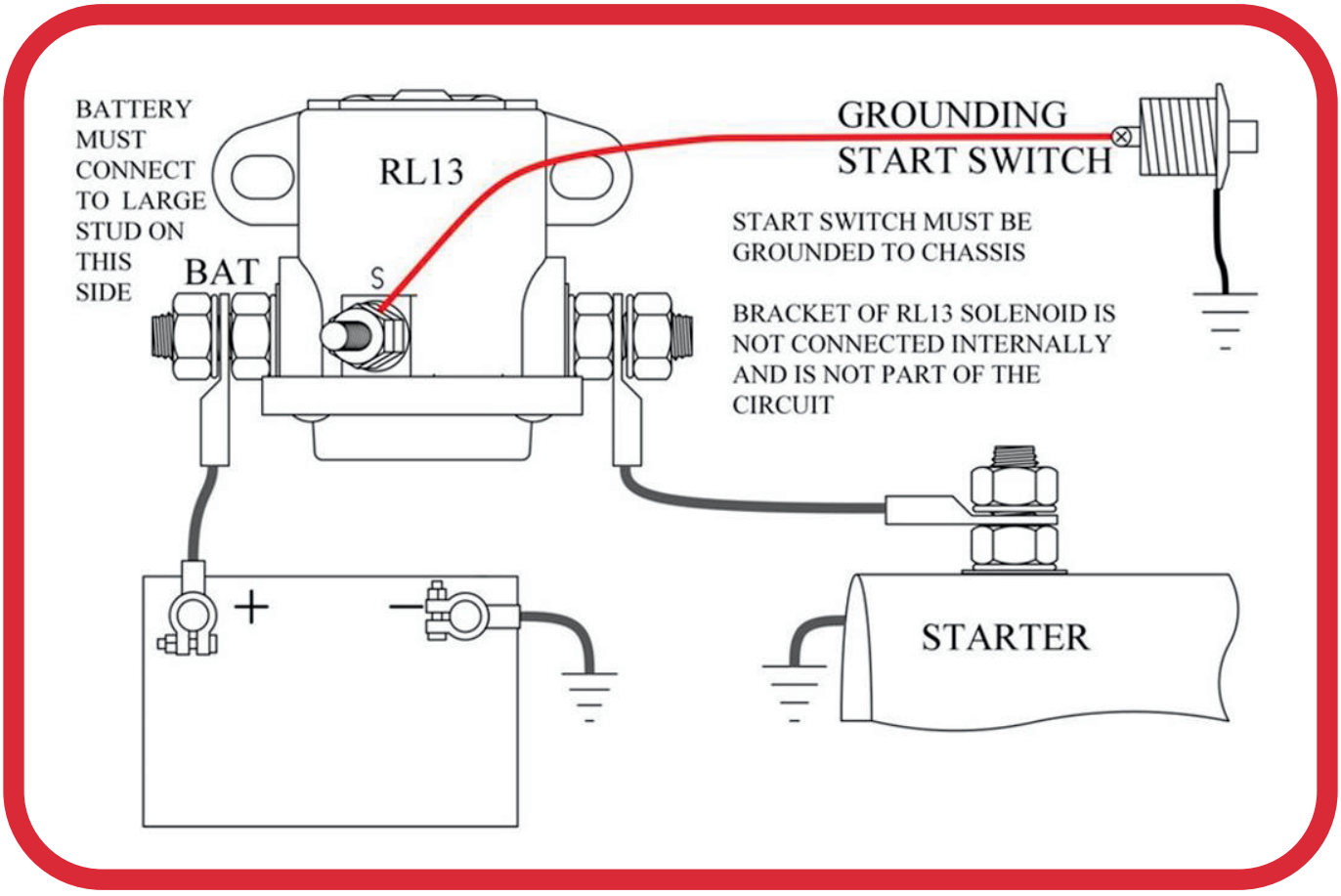
How to connect the Ford RL13 solenoid to the new Hi Torque starters with push button.

Note: Early Ford Flathead V8's wired their cars and trucks with an on/off ignition switch and a dash starter button. The dash button only has one wire that goes to the starter solenoid and the other side of the button simply grounds to the dash. When changing to 12 volt you will use the 12 volt RL13 solenoid which is similar to the old 6 volt solenoid just in 12 volts. See the diagram below.

It matters which side the battery is connected to the RL13, if backwards solenoid will not work.

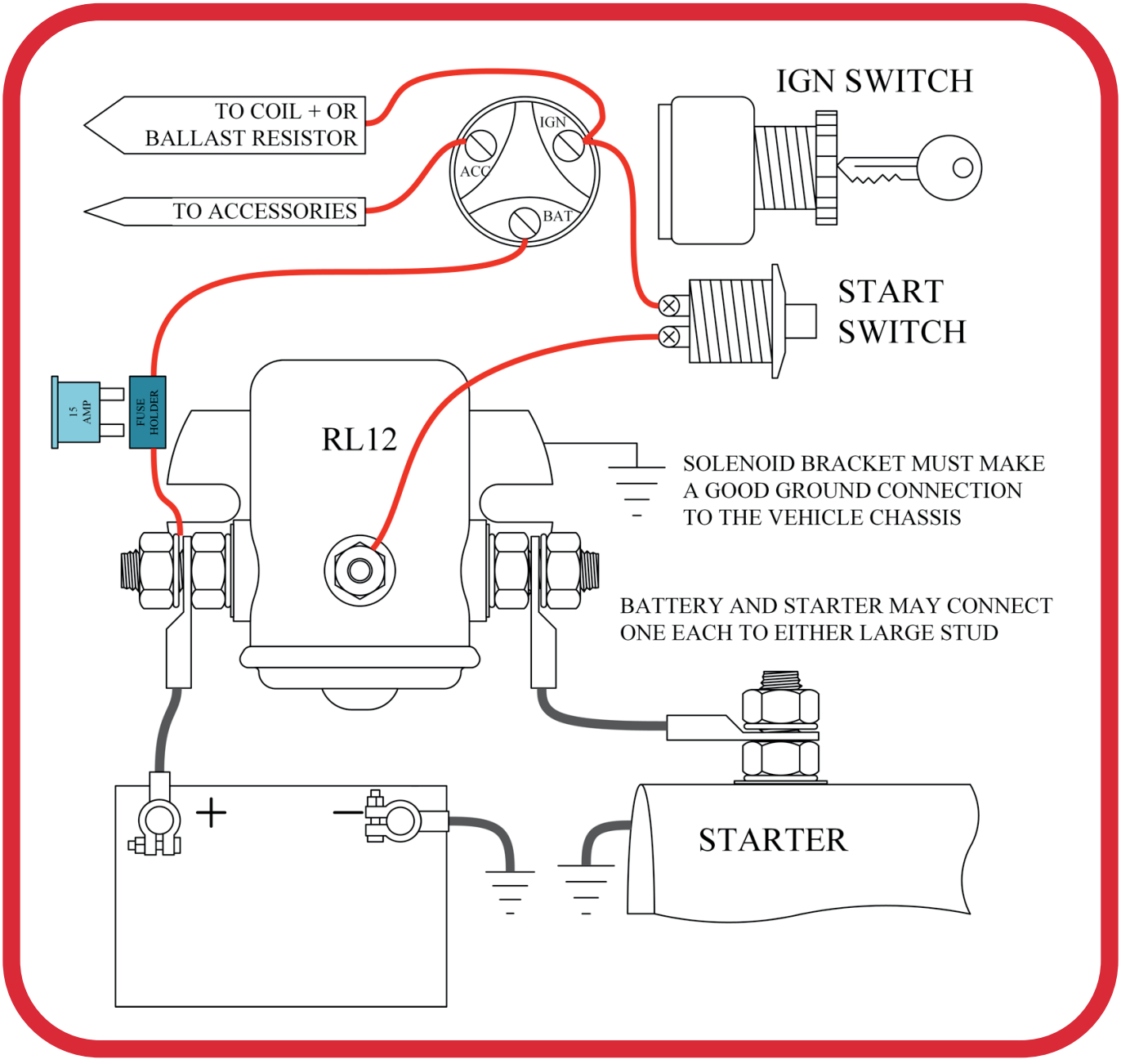


How to connect the Ford RL13 solenoid to the original starters with push button.



Mopar Starter and Solenoid Overview.

How to connect Dodge, Plymouth RL12 or 7-1012 solenoid to original starters with key switch and push button. If no starter button, then wire direct from IGN to RL12 small terminal.



Questions and Answers to common starter problems:

Q: My starter doesn' t fit or interference:

A: There are four mounting clock positions for clearance purposes. To re- clock simply remove the two Allen bolts and clock the starter mounting plate to the desired location then re-install the two bolts. Caution do not remove the two long bolts that hold the motor to the adaptor plate, these should stay in place.

Q: My starter does not crank or cranks slow:

A: Verify battery condition and battery voltage. A fully charged battery is 12.6 volts, 12.4 volts or below is too low of voltage to operate the starter. The single most common cause of starter motor failure is low battery voltage, corroded and or battery terminals and cables along with poor grounds.
Check your battery against this chart batteries below 12.6 volt need to charge battery with external battery charger,

State of Charge	Battery Voltage
Fully Charged	12.6V or higher
75% charged	12.4V
50% charged	12.2V
25% charged	12.0V
0% charged	11.9V or lower is a fully discharged

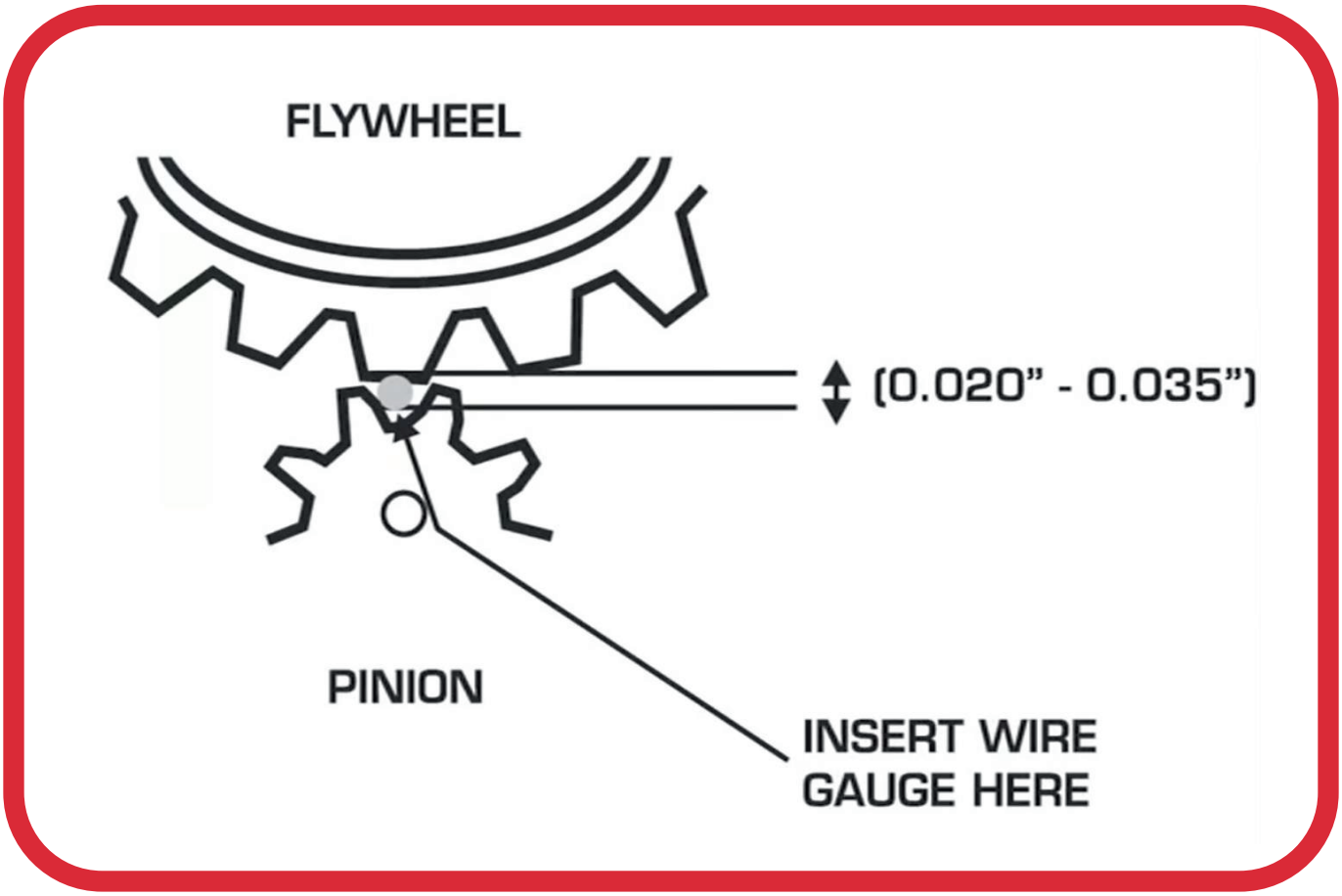
Q: Starter engages but noisy.

A: Follow the instructions below.

1. Make sure starter mounting bolts are tight and starter is flush against the bell housing.
2. Remove the starter and check the wear pattern on the pinion drive teeth. The friction pattern (or shiny areas) should be about ¾ of the tooth length. They should not bottom out or just wear on the tips of the teeth. If either is the case, you may have a worn-out starter, bad flywheel, or the starter is not the correct one for your application.
3. If the starter pinion gear shows damage and excessive wear, this indicates the gear was not able to match up with certain areas of the ring gear or it is very worn out and you should then check the ring gear for wear or damage.
4. Check the ring gear all the way around the whole circumference. With four-cylinder engines, there are two areas where the engine stops after it shuts off. With six-cylinder engines there will be three areas where the flywheel comes to rest. In eight-cylinder engines there are four areas where the engine stops after it shuts off. This is because of the compression of the inactive cylinders after the engine shuts off, always stops in the same places on the ring gear. These areas will see the most wear, when starting back up.
5. If necessary, replace the ring gear or flexplate and if this is not possible, you may be able to re-clock the ring gear so that it doesn't come to rest in the same position as before. This is possible with some transmissions and not possible with others. You will have to remove the ring gear from the flexplate or flywheel, marking where it used to be and then rotating it when putting it back on, so there are fresh teeth for the starter.
6. If there are no replacement ring gears, it is possible to weld a bead over the damaged teeth and then shape them the same as the undamaged teeth (difficult but possible).
7. Also check for flywheel runout (or wobbling) and or a loose ring gear. Ring gears are pressed on and can become loose or broken

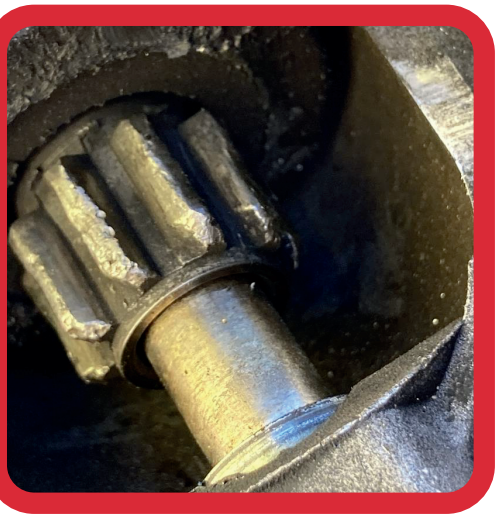
Q: How do I check the clearance between the teeth of the Pinion Gear and the teeth of the Ring Gear.

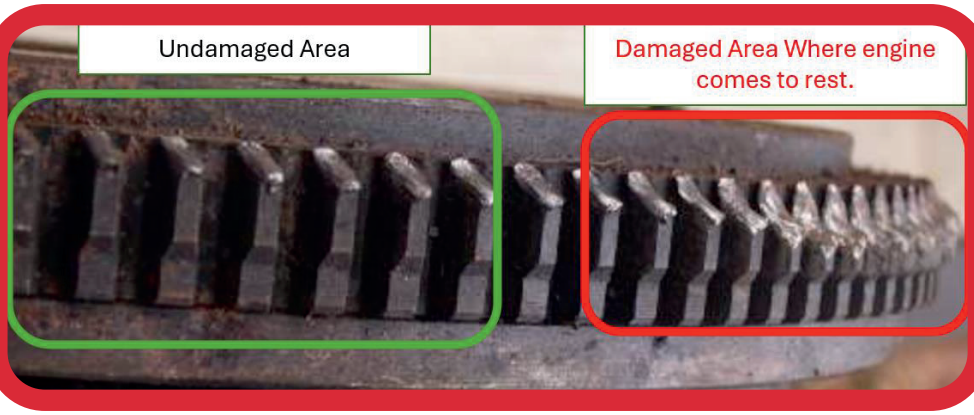
A: The other critical measurement with starters is the mesh, which is how far into the teeth the pinion gear meshes with the ring gear. Typically, you're looking for between .020 and .035 between the teeth on the ring gear and the pinion. A **paperclip works fine** for measuring this distance. Just slip it between the teeth. It should feel snug going in. If it's too tight, you'll need to correct the clearance.



SEE DAMAGE TO THE STARTER AND RING GEAR BELOW:

Damage to Starter Pinion Gear
(Worn and chipped teeth)





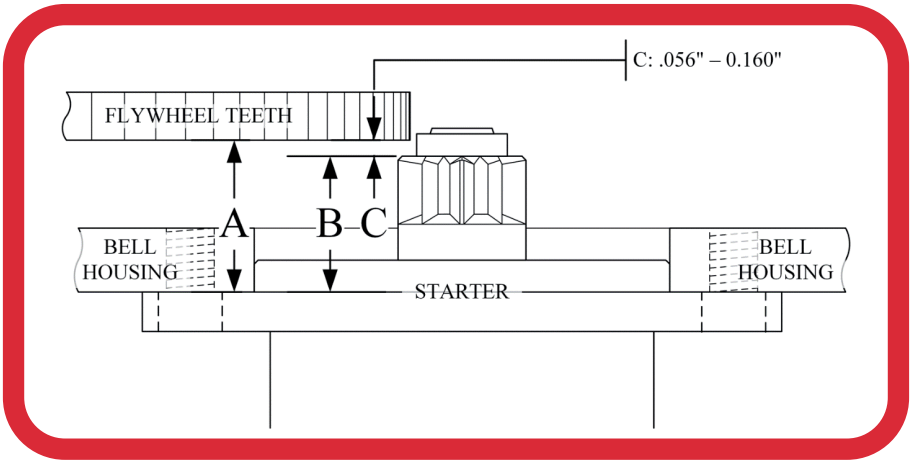
Damage to Certain Areas of the Ring Gear
(Engine Rest Areas)

Last Resort Repair

Welding and Shaping: Look up “Welding Gear Teeth” to see examples. Not an easy process nor inexpensive but maybe the only alternative.

How to determine the A, B and C dimensions for any Hi Torque starter replacement:

Remove the original starter and measure these distances. See illustration below. Accuracy should be within 1/16" using an adjustable carpenter square or depth gauge.

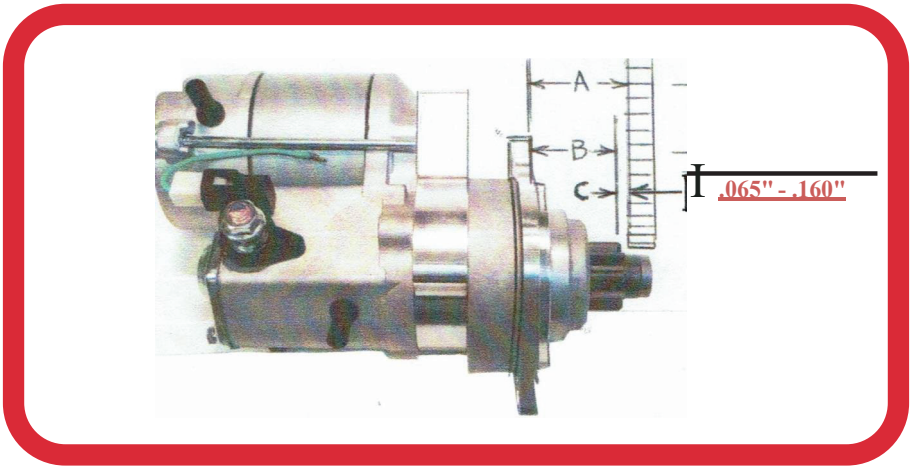


The ‘A’ dimension is the distance between the starter mounting flange on the bell housing to the flywheel ring gear. See image with yellow tape measure.

The 'B' dimension is the distance between the starter mounting surface to the at-rest pinion gear.

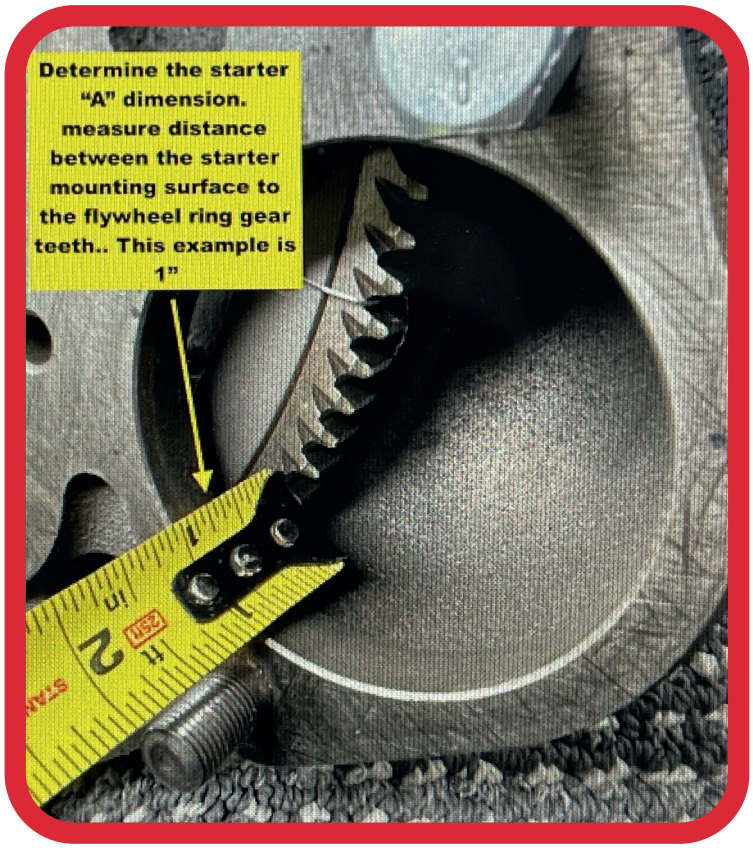
The 'C' dimension is the clearance between the teeth of the starter gear at rest and the teeth of the flywheel ring gear.

Good Clearance Formula: A - B = C, So “C” Clearance = .065" - .160"



Note: Vintage Auto Garage starters are shipped with the correct OEM spacing from the front of the pinion gear to the flywheel ring gear, this is shown as “C” In the image above. In the event more “C” clearance is needed. You can install a 2 MM thick shim between the mounting plate and the motor assembly by removing the 2 Allen screws. This added shim will increase the distance from the pinion and ring gear by 2MM.
How to determine the “A” Dimension Measurement.
Remove the starter and measure as shown below.

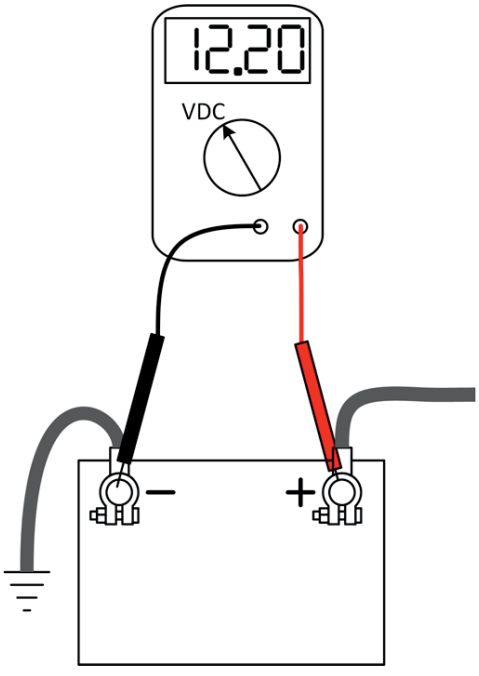
How to determine the “A” Dimension Measurement. Remove the starter and measure as shown below.



Testing the Starter System for voltage drop can be caused by high resistance cables or corrosion.

Performing voltage drop tests on both positive and ground sides of the circuit is important to determine possible fault. The most common places for voltage drop to occur is at the battery connection, the solenoid, the starter and along the cables.

Minimum Battery Load Test Voltage	Battery Temp °F
9.90V	100°F
9.80V	90°F
9.70V	80°F
9.60V	70°F
9.50V	60°F
9.40V	50°F
9.30V	40°F
9.10V	30°F
8.90V	20°F
8.70V	10°F
8.50V	0°F

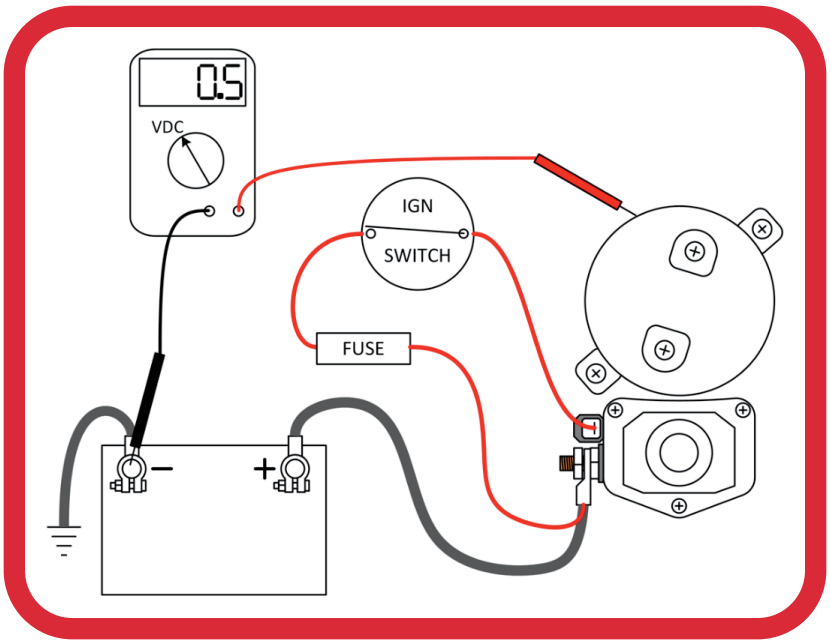


Connect a voltmeter to the battery cable post on the starter and crank the engine. The voltage should be 9.6 volts or higher. Lower voltage usually means battery, cable or possibly grounding issues.

Voltage drop test negative battery side,

While CRANKING the starter the voltage drop is IDEAL at .5 volts.
If higher check all the neg battery cables as shown below.

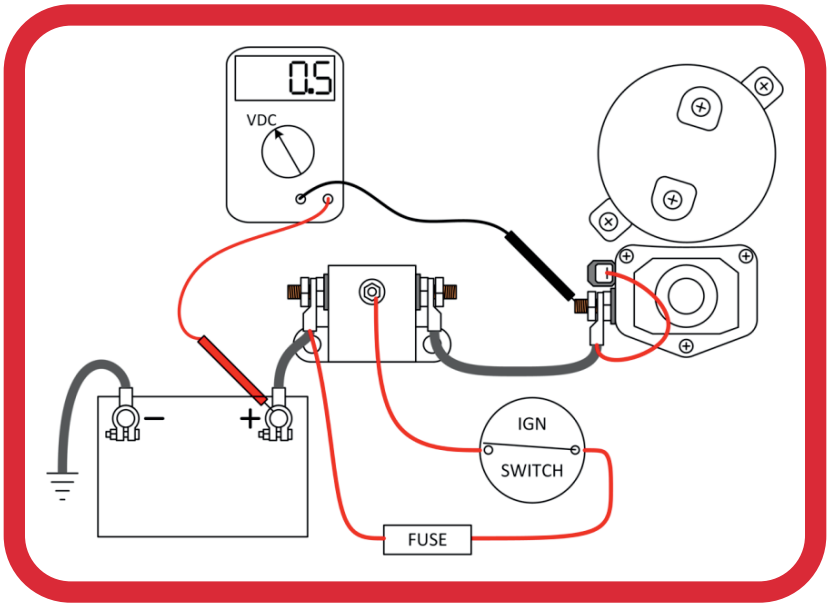
Note: during this test disable the distributor so engine does not start.



Voltage drop test positive battery side,

While CRANKING the starter the voltage drop is IDEAL at .5 volts.
If higher check all the pos battery cables as shown below.

Note: during this test disable the distributor so engine does not start.



This book is dedicated to the hard-working men and women that built the American Automobile Industry and the preservation and restoration of these Classics.

VINTAGE

Auto Garage

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Always use caution when working around your vehicle and be safe!