



FORD HYBRID ALTERNATOR INSTALLATION INSTRUCTIONS

CAREFULLY READ THESE INSTRUCTIONS BEFORE ATTEMPTING ANY MODIFICATIONS!

Proper installation of this alternator is the responsibility of the installer. Improper modification or installation will void your warranty and may result in vehicle damage or personal injury.

ALTERNATOR INSTALLATION INSTRUCTIONS

- 1 - Disconnect the ground cable from the battery.
- 2 - Disconnect all wire connections from the alternator and label wires for future replacement.
- 3 - Remove alternator belt(s).
- 4 - Loosen alternator mounting and tension arm bolts.
- 5 - Hold the alternator securely while removing the mounting bolts and spacers. Remove old alternator.
- 6 - Install new alternator and replace all mounting bolts and spacers. Do not fully tighten bolts.
- 7 - Replace drive belt(s) on pulleys. Adjust V-belt tension. V-belts should have $\frac{1}{2}$ " to $\frac{3}{4}$ " play as light pressure is applied at midpoint between pulleys.
- 8 - Tighten all alternator and bracket bolts.
- 9 - If installing an alternator with OEM wiring connections, reconnect alternator wires and battery ground cable. **If installing a 1-wire alternator, see wiring instructions at upper right.**
- 10 - **Make sure battery is fully charged before starting engine.**
- 11 - Reconnect the ground cable, start the engine and using a VOM meter, verify that the alternator is charging at least 13.8 volts @ 1,000 engine RPM's.

ALL ALTERNATORS REQUIRES A GOOD GROUND

In order for an alternator to charge properly, an alternator must be grounded to the engine block. If an alternator has paint or clear-coat on the mounting surfaces, it may not be grounded and will not charge. For these reasons, many Tuff Stuff alternators include a grounding tab that should be used to ground the alternator.

CORRECT WIRE SIZE IS CRITICAL

It is very important to use the correct wire size to connect the alternator to the battery. A wire size too small can allow the wire to overheat, melt the insulation and cause a fire or worse. Depending upon the maximum output of the alternator, use the following chart as a minimum wire size guide. Wire size is based on 4' battery cables. Trunk mounted batteries require heavier gauge battery cables - contact Tech Service for recommendation.

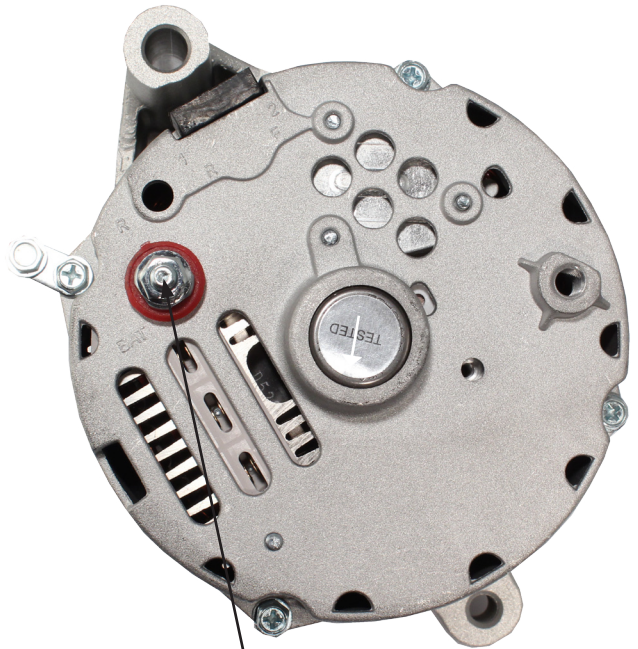
Alt Rating	Wire Size	Alt Rating	Wire Size
75 Amps	8 gauge	150 Amps	4 gauge
100 Amps	6 gauge	200 Amps	4 gauge

ROTATION SPEED

Alternators spin at approximately 2.5 times that of crankshaft RPM, so an engine at a 700 RPM idle would spin the alternator at 1,750 RPM. Note that the maximum RPM of any Tuff Stuff alternator should not exceed 18,000 RPM's (7,200 engine RPM's). There is no need to worry about use of an underdrive pulley system or an ignition regulator turn on with Tuff Stuff alternators. All Tuff Stuff alternators charge at very low engine RPM's. No other manufacturer in the industry has an alternator that produces more amps at low RPM's than Tuff Stuff. Also note that Tuff Stuff 1-wire alternators are bi-directional and will charge when spun in either direction

1-WIRE ALTERNATORS

1-Wire alternators require only 1-wire to operate. Simply run one wire from the alternator 'battery' terminal to the positive terminal of the battery or to the starter solenoid main lug, which is connected to the positive battery post. **Make sure that the battery is fully charged.** Reconnect the ground cable, start the engine and using a VOM meter, verify that the alternator is charging at least 13.8 volts @ 1,000 engine RPM's.



Simply connect one wire from the positive battery terminal to the positive alternator terminal. It's that easy!

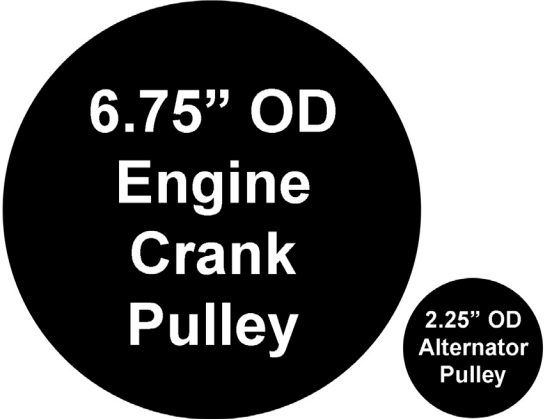
One wire alternators eliminate the unsightly factory wiring harness and simplifies installation by using only one wire for charging.

WARNING

THIS ALTERNATOR SHOULD NEVER EXCEED 18000 RPM's!

Alternator bearings and components are not designed for extremely high RPM's. Tuff Stuff strongly recommends that you calculate your pulley ratio to determine if your alternator will operate within the safe RPM range.

To calculate your alternator pulley ratio, divide the engine crankshaft pulley diameter by the alternator pulley diameter. Using the ratio that you calculated, multiply that number by the highest anticipated engine RPM to determine the maximum alternator RPM.



**6.75" OD
Engine
Crank
Pulley**

**2.25" OD
Alternator
Pulley**

ALTERNATOR PULLEY RATIO

Crankshaft pulley diameter ÷ alt pulley diameter = alternator pulley ratio

Example

$6.75 \div 2.25 = 3:1$ alternator pulley ratio

MAXIMUM ALTERNATOR RPM

Alt pulley ratio X Max engine RPM = Max alternator RPM

Example

3×6000 max engine RPM = 18000 max alternator RPM = SAFE

3×7000 max engine RPM = 21000 max alternator rpm = UNSAFE

If your max calculation is greater than 18000 alternator RPM's, increase the alternator pulley diameter or decrease the crank pulley diameter to compensate. If changing the alternator pulley is not possible, use an engine rev limiter to control maximum engine RPM's.

Excessive RPM's can cause the alternator fan to flex and contact the drive belt. Besides being unsafe, it could cause property damage and/or personal injury. Other factors that will substantially increase the likelihood of alternator fan-to-belt contact include:

LOOSE OR WORN BELTS

Loose or worn belts allow for movement and deflection which will decrease the gap between the fan and belt and increase the likelihood of contact.

INCORRECT BELTS

Tuff Stuff supplied V-belt pulleys are designed to accommodate a 3/8" wide V-belt. Wider belts will not fully seat into the pulley groove and will increase the likelihood of belt-to-fan contact. If the application requires a wider belt, use the original alternator pulley instead of the supplied pulley.

ALTERNATOR BRACKETS ALIGNMENT:

Loose, damaged or misaligned alternator brackets can reduce the clearance between the alternator fan and belt.

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