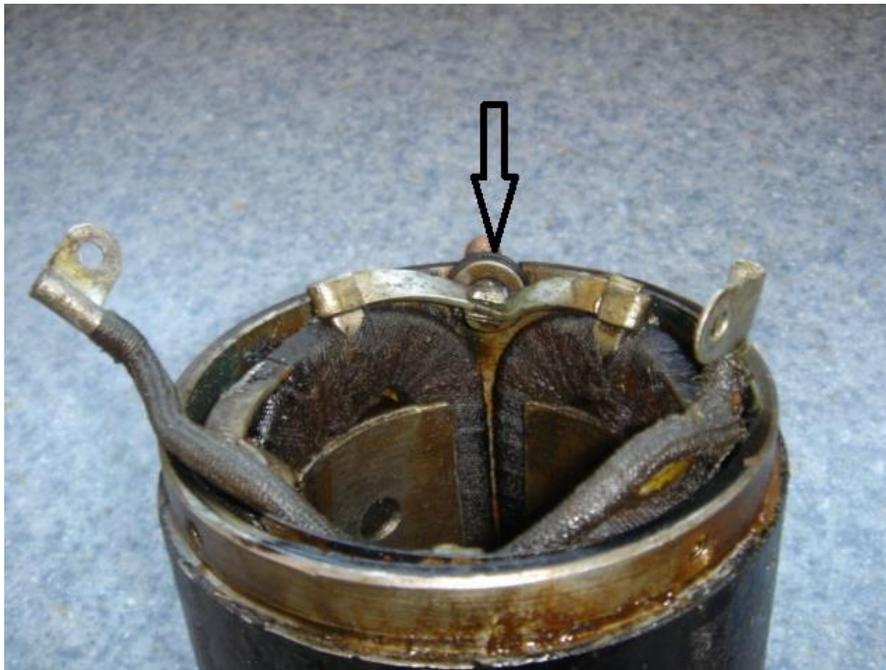


## Repairing a Common Model T Starter Problem

By far, the most common Model T Ford starting motor failure is the internal connection between the 3/8-16 terminal bolt and internal buss bar that connects to the ends of the two adjacent field windings as shown in Figure 1. When I disassemble starter cores for rebuilding, I usually find 90% of them have this problem.



**Figure 1 Failed Starter Terminal Bolt to Buss Bar Connection**

When this failure occurs, the starter turns the engine over very slowly because of the excessive current drawn by this high resistance connection. You can check if your Model T has this problem in one of two ways; cranking the engine with the starter continually for about 10-15 seconds and then carefully feeling (**Caution**) the terminal bolt to see if the bolt is hot. If the bolt is warm or hot to the touch a failed terminal bolt connection is the problem, the other way to check is to remove the top terminal bolt nut, cable, bottom terminal bolt nut, the thin brass washer and terminal bolt outer case insulator. With your thumb and forefinger try to wiggle the terminal bolt. If the connection has failed you can feel the bolt moving loosely on the buss bar.

Over the years mechanics over tighten the upper terminal bolt nut allowing the bolt to rotate and the constant vibration of the long cable 1/0 cable from the terminal bolt to the starter switch exacerbate this problem.

I have rebuilt over 500 Model T starter motors and, early on, realized the need for a solution to this common problem. Inside failed starters I also saw remnants of several attempts by others to solve this problem, but none of them appeared to be a reliable long term fix. This article describes how I developed a simple solution to the problem, explain the parts and tools required and show how easy it is for folks with average mechanical skills to implement a repair.

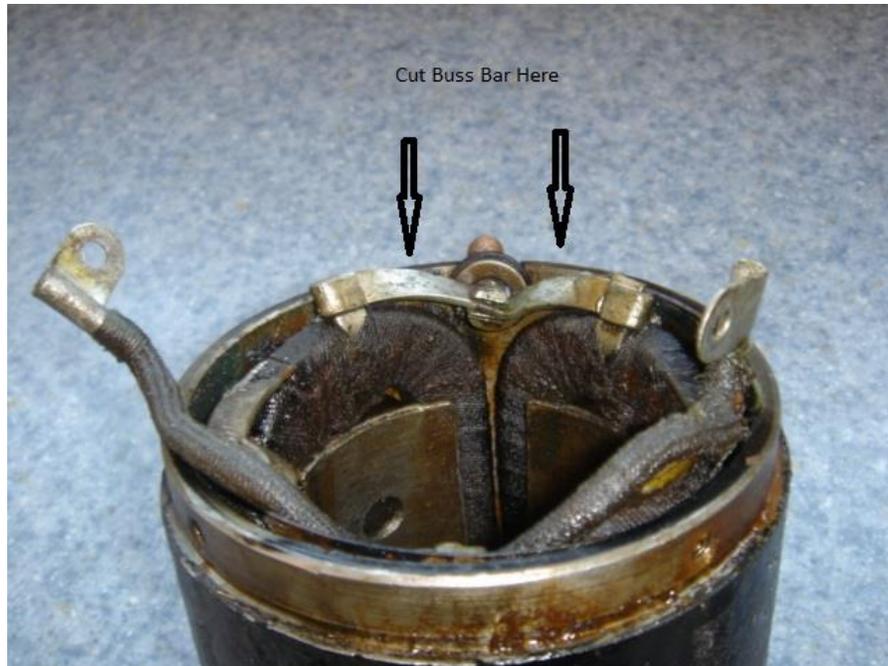
### **Preparation**

Remove the 10-32 brush and field pigtail screws in all four brush holders. **Caution:** the brush holders are soft white metal castings and it is easy to cross thread the screws when reinstalling. A holding screw driver works best when reinstalling. Carefully lift each brush up off the commutator just enough to lay the spring tip against the side of the brush to hold it in the brush holder. Remove the six 10-32 pan head screws and lock washers securing the starter mounting

bracket to the main starter case. Pull the armature and mounting bracket off the case and out of the starter case. Set the mounting bracket and armature aside for reinstallation later. Secure the starter case in an upright position (brush cap down) in the vice just tight enough to firmly hold it and not deform the case so you can work on the terminal bolt and buss bar.

### Removing the Failed Terminal Bolt and Buss Bar

The first step is to remove the failed terminal bolt. Figure 2 shows where to cut the buss bar with a Dremel cut off tool making it easy to remove the bolt from the remaining buss bar still soldered to the field winding tabs. After cutting the buss bar simply lift the terminal bolt and inner metal washer and fiber washer out of the thru wall relief in the starter case.



**Figure 2 Removing Failed Terminal Bolt**

The next step is to remove the remaining two pieces of buss bar connected to the field winding solder tabs. At this point a discussion about an appropriate soldering iron needed to unsolder and solder the new terminal bolt connections is in order. This is not a tool usually found in a hobbyist's shop. You will need at least a 250-Watt soldering iron for this repair. Don't waste your time with a soldering gun or an 80-Watt soldering iron; they simply don't have the heating capability for unsoldering/soldering these size connections. Any flame soldering techniques are not suitable for soldering in this environment unless you want to start a fire? You can probably borrow a 250-Watt soldering iron or find a cheap used one at an on line auction site. Figure 3 is a photo of the soldering iron I use.



**Figure 3 Typical 250-Watt Soldering Iron**

Unsolder and remove the two remaining short pieces of buss bar from the tabs on both adjacent field windings. While the tab is still hot remove any excess solder and thoroughly clean the field winding tabs for future use using a bristle brush. This is a very dirty environment so remember the first two rules of soldering: first cleanliness and second have a substantial mechanical connect before soldering. Figure 4 shows how your work should look at this point.



**Figure 4 Starter Case Ready for New Terminal Bolt Installation**

#### **New Terminal Bolt and Buss Bar Assembly.**

I found trying to reuse an existing damaged terminal bolt and buss bar was not a good solution. It is extremely difficult to remove and if you do, removing the existing hardened pin while still saving the already damaged buss bar is not practical. I found an entirely new and significantly more substantial terminal bolt and buss bar was the best solution as shown in Figure 5.



**Figure 5 New Terminal Bolt Assembly**

You are now ready to reinstall the new terminal bolt and Buss bar. The new 3/8-16 terminal bolt assembly shown in Figure 5 can be purchased from Lang's Old Car Parts. It consists of a modified OEM starter terminal bolt, a newly formed piece of annealed buss bar, new hardened pin, Silver soldered bolt/pin/buss bar connection, new metal backstopping washer, new inner insulating fiber washer, new through case wall outer insulator, new special thin support washer and two new terminal bolt nuts made to the specifications in the original Ford manufacturing print.

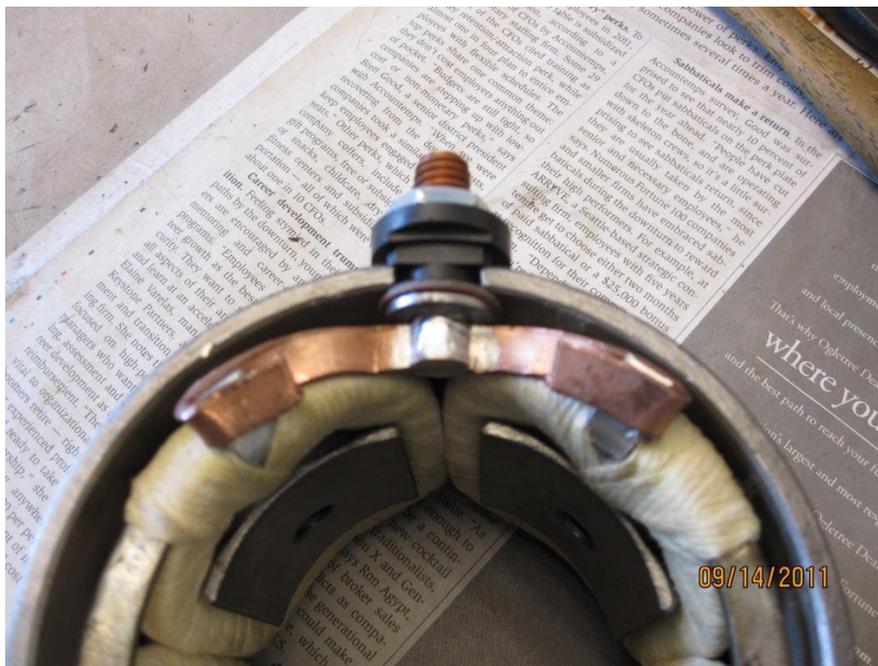
### **New Terminal Bolt Installation**

In the following steps remember the new buss bar has been annealed and will be very easy to form as shown in these examples. Properly form bolt/buss bar in case with support washer and fiber washer installed. Form the buss bar over field windings and under the two field winding solder tabs. Check that the terminal bolt is radially positioned equally in the case wall relief so the outer insulator fits correctly. Be sure the terminal bolt is perpendicular and at 90 degrees to the outer case wall. Install the outer insulator, thin washer and one terminal bolt nut, tighten nut to hold the terminal bolt in the correct position during soldering. See figure 6.



**Figure 6 Terminal Bolt Properly Positioned in Case Wall Relief**

Fold the buss bar over the two field winding solder tabs. Using vice grips tightly clamp buss bar fold over field winding solder tabs. See Figure 7.



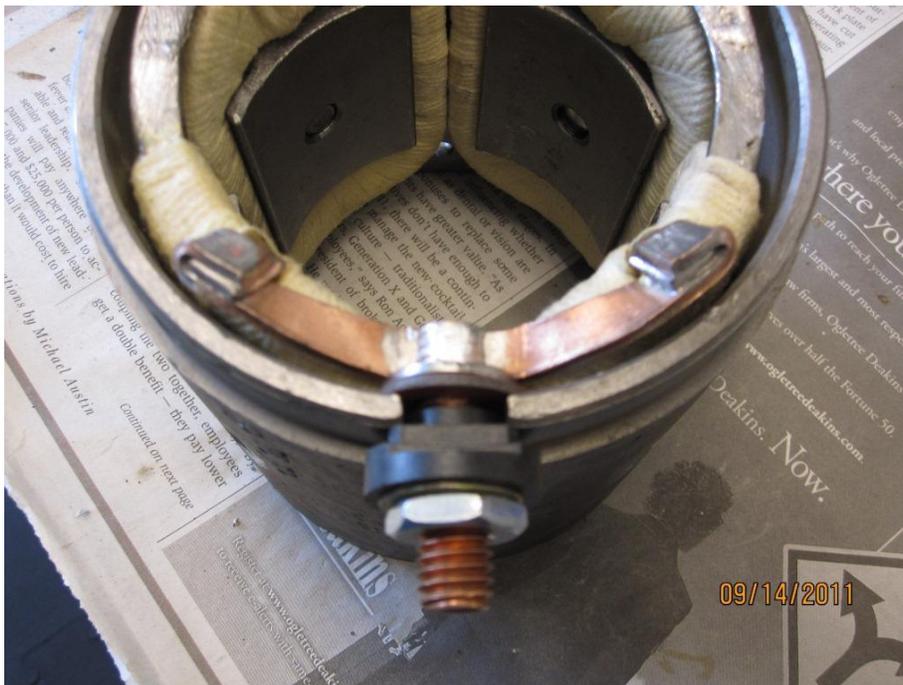
**Figure 7 Buss bar partially installed**

Trim excess buss bar material from top of buss bar/solder tab fold using Dremel tool and cutoff wheel. Be sure buss bar and field winding tab are pulled back toward inside of case and in the correct place allowing the armature to clear. See Figure 8.



**Figure 8 New Terminal Bolt Installed and Ready for Soldering**

Using the 250-Watt iron solder the buss bar/tab connections using Rosin core solder. Completed installation of the new starter terminal bolt is shown in Figure 9.



**Figure 9 Completed Terminal bolt and Buss Bar installation**

Reassemble the starter case, armature and mounting bracket. Install and tighten the six 10-32 pan head screws. Lift each brush spring and place the brushes against the commutator. Reinstall the four 10-32 brush holder screws with the brushes and field pigtails.