The Lineman’s Splice: How to Make Reliable Electrical Connections in Your Vehicle’s Wiring Harness

Posted by Paul Sakalas on January 9, 2022 at 9:37 am

Whether you’re retrofitting an EFI kit, replacing a crusty bulb socket, or installing a new stereo, if you work around cars long enough, you’ll eventually have to splice some wires. And if you’ve ever dealt with intermittent electrical gremlins, you already know that making foolproof electrical connections is vital.

The good news is, splicing electrical wire is pretty easy with some basic tools and know-how. In fact, folks have been making reliable wire splices for over a century, which brings us to…

The Lineman’s Splice

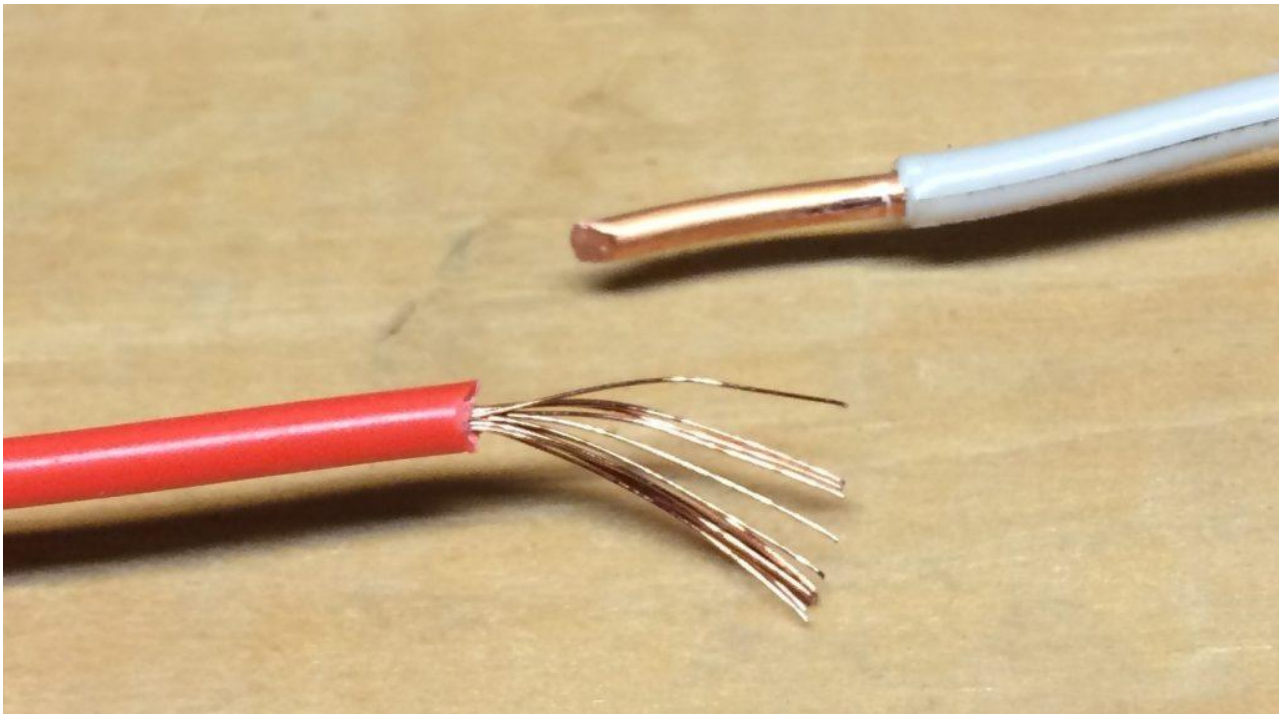
A Lineman was the person who had to climb up the telegraph pole to make and repair connections to the telegraph line. Suffice it to say, this photograph pre-dates OSHA. (Image/Public Domain)

Back in the 1800s, if a telegraph line broke, it could sever communications between entire cities. So being able to connect telegraph lines reliably was kind of a big deal. That led the engineers at Western Union to develop what is known as the “Western Union” or “Lineman” splice. It’s simple, easy, and strong, and is so reliable that NASA even includes it as a standard for wiring up rocket ships.

In other words, the Lineman’s Splice is plenty good enough for your car or truck.

A strong splice won’t make up for poor wiring harness management however—first and foremost, always make sure your wire runs are neat, properly secured, and out of the way. Putting your wiring in looms, wraps, or convoluted tubing is a smart move too.

Stranded vs. Solid Core Wires



Here's an easy visual comparison between stranded (red) wire and solid core (white) wire. Both are still very much in use today, just for different applications. (Image/OnAllCylinders)

Before we dive in, let's quickly understand the difference between stranded and solid core wires, because the Lineman's Splice was originally developed for the latter. That means many of the Lineman's Splice examples you'll find online use solid core wire. The process for making the splice with stranded wire however, is pretty much identical. So without digressing too much, here's the distinction in a nutshell:

A solid core wire is a single piece of conductor (usually copper) wrapped in an insulator. Since it can handle a lot of current over longer distances relative to its size when compared to stranded wire, solid core wire is common in home electrical wiring. Yet it's more prone to break when subjected to excessive flexing and vibration.

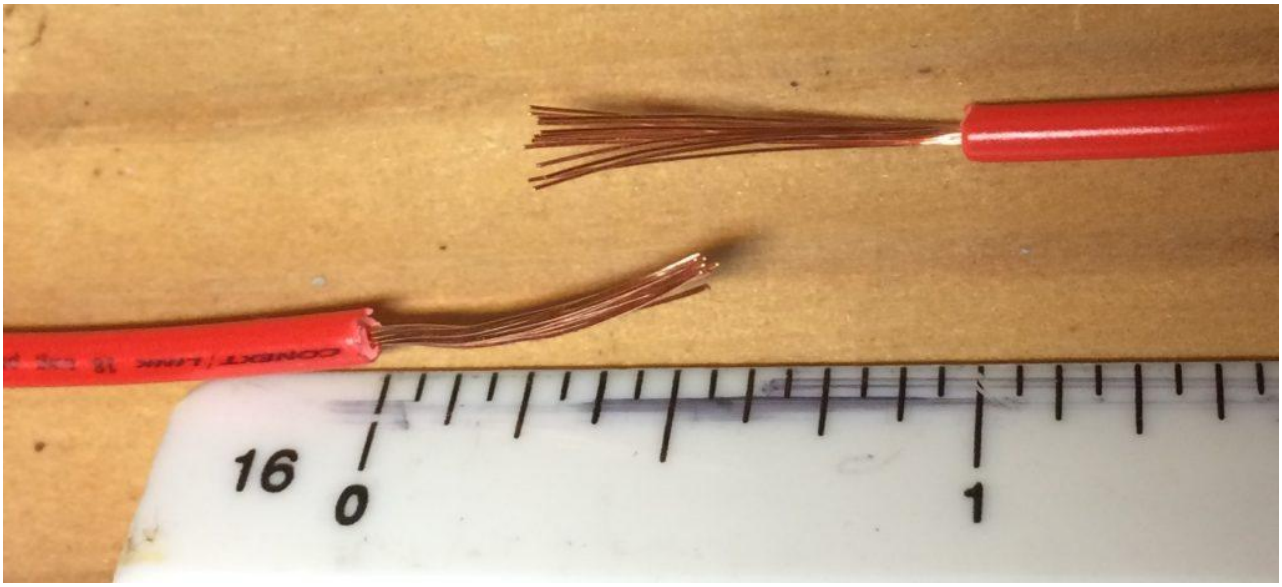
For that reason, you'll likely find stranded wiring in your automotive electrical harness. Stranded wire is made up of tiny strands of conductor (again, usually copper), making it more flexible and resistant to breakage from stress and vibration.

"Conductor" is the fancy word for the metal part of the wire that carries the electricity.

Now, without any further ado…

How to Make a Lineman's (Western Union) Splice

1. Strip Away the Insulator



When we're working around cars, we typically strip about a half to three-quarters inch from the wire ends for a basic Lineman's Splice—but your mileage may vary. (Image/OnAllCylinders)

Grab our old pal the wire stripper tool, and remove about a half to three-quarters inch of insulation from each end. Just remember to use the right wire stripping die for the wire gauge you're working with, as it's easy to cut the tiny strands within.

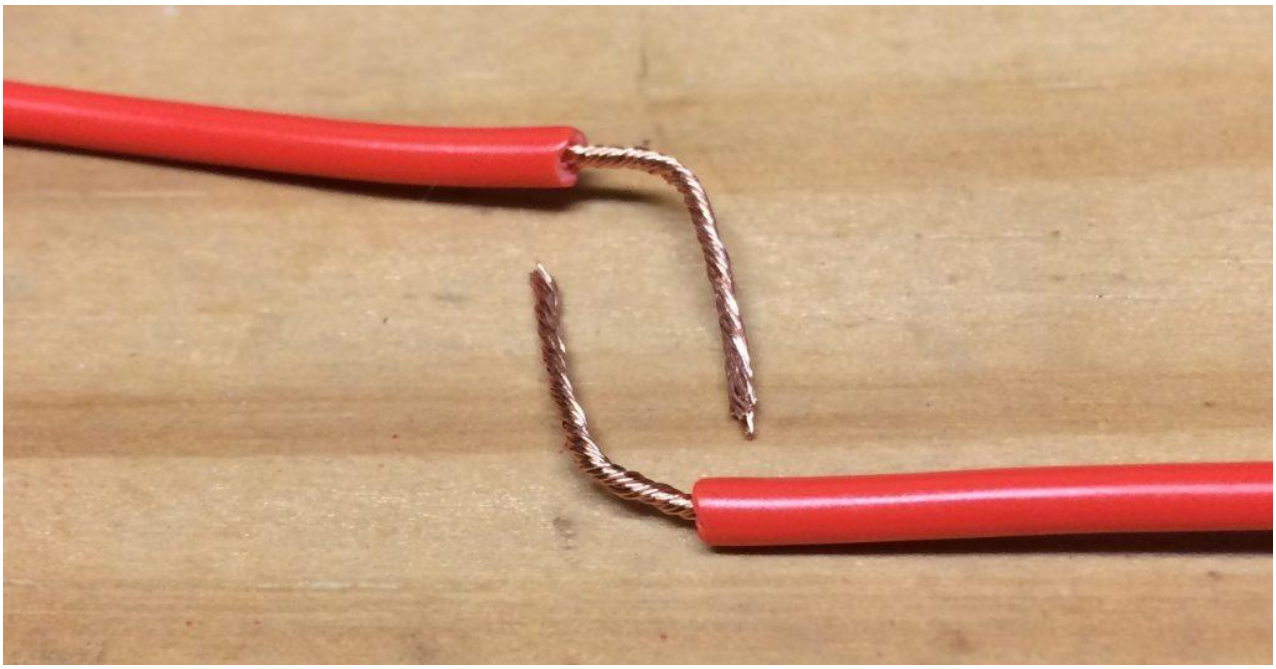
2. Twist Each Wire's Strands Together Tightly

Tightly twisting the stranded wire together on each individual end makes the next few steps in the splicing process a bit easier. (Image/OnAllCylinders)

Again, you'll more than likely find stranded wire in your automotive wiring harness. So to make it easier to work with for the splice, you want to twist the individual strands together tightly—basically, you're going to imitate a solid core wire here.

Note: If you nerded-out and read those NASA specs, it calls for the wire to be tinned (EG, coated with solder) during this step too. But we're skipping that part because (A) we're not using solid core wire, and (B) leaving it stranded makes it a bit easier to wrap around the other connecting wire during the next few steps.

3. Make a 90ish Degree Bend in Each Stripped Wire End

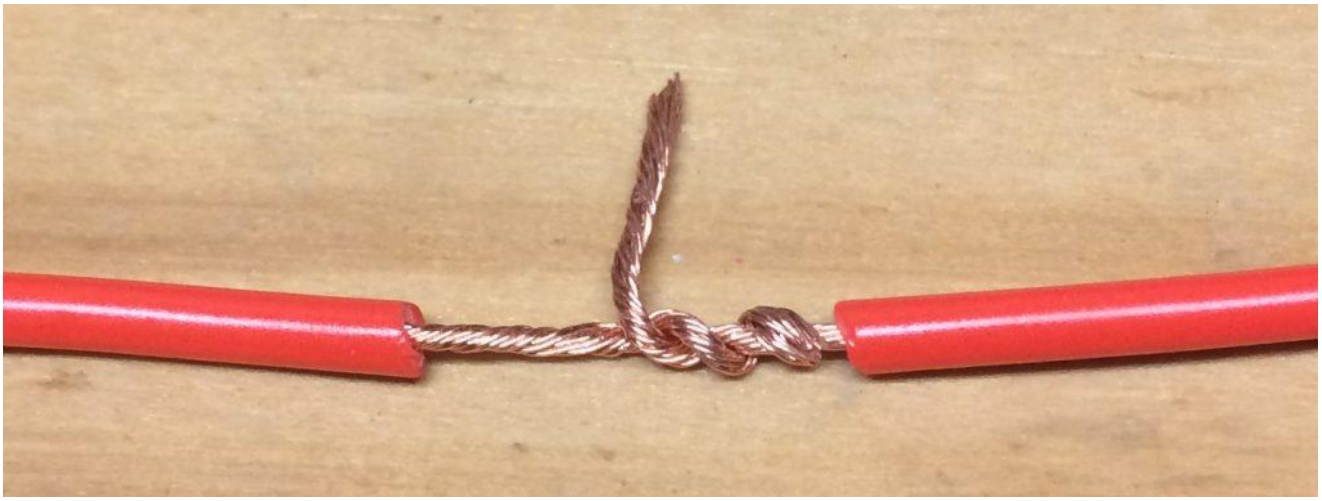


The goal here is to somewhat hook the two ends together. (Image/OnAllCylinders)

Make a right angle bend in each stripped end to create makeshift hooks. You can make the bend around the middle of stripped part, perhaps starting it a bit closer to the insulator as shown in the pic above. This'll give you more wraps around the opposite end during the next step.

Tip: Now's the time to slip your heat shrink sleeve over the wire. You'll read more about that in step six.

4. Wrap Each End Around the Opposing Conductor

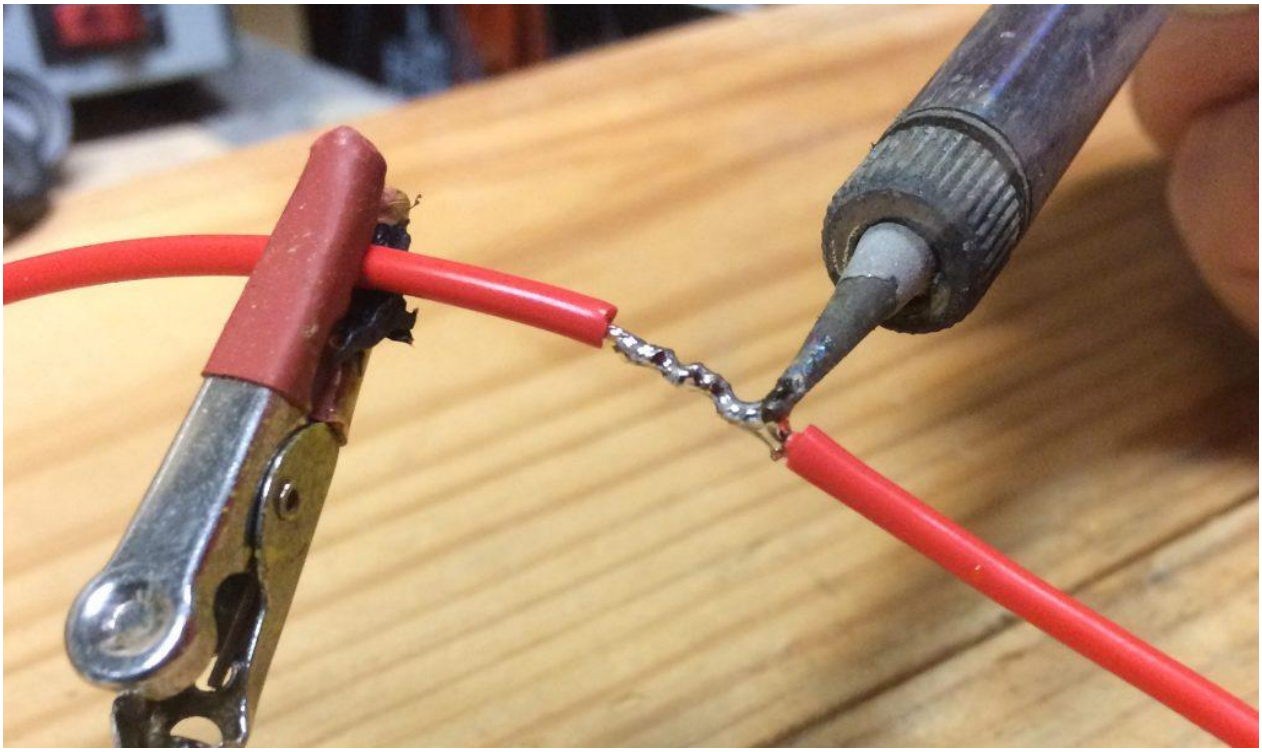


Halfway there…wrap the other end around the opposite side the same way and you'll create a strong grip between the two wires. (Image/OnAllCylinders)

Hers's a critical step, because it ensures a strong mechanical and electrical connection between the two wires. Tightly wrap the wire ends against the opposite side. This can be a bit tricky to do cleanly using stranded wire, but just make sure you don't have any loose stragglers or strands that pop out over the insulation.

We tightened up our wrap and zoomed-in a ton here, so you can see how the opposing ends snug around each other to add strength to the splice. (Image/OnAllCylinders)

5. Apply Solder to the Splice

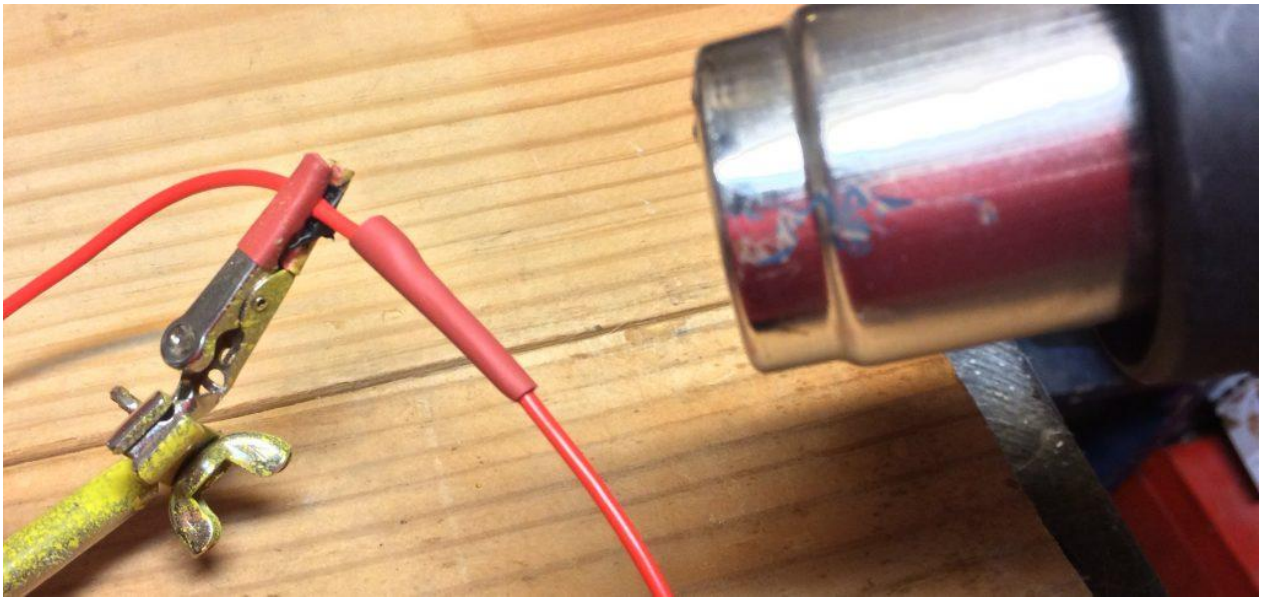


Once the solder is in the nooks and crannies of the joint, you can pass the iron over the splice one final time to remove any excess. (Image/OnAllCylinders)

Yes, you'll have to solder here. And if you don't know how to solder, now's the perfect time to learn. Here's a quick tip though, remember to touch the conductor with the iron first, to superheat it and make it ready to accept the solder. Properly heated, the solder will flow into the joint easily.

Shopping for soldering gear? Read this: Tools Under $30 Gift Guide: Soldering Irons & Soldering Guns

6. Insulate the Splice



After a few seconds under a heat gun, the sleeve will shrink tight and seal the Lineman's Splice. (Image/OnAllCylinders)

You're not done yet—keeping moisture and gunk out of the joint is critical to avoid corrosion.

There are essentially two ways to insulate a connection like this. First, you *could* wrap it in electrical tape. But the tape will gradually lose its adhesion, particularly if the spliced wire is outside of the vehicle, like on a frame or behind a bumper.

The far better method is to use a heat gun and shrink sleeve, AKA heat shrink tubing.

Just remember to slip the heat shrink sleeve up around the wire *BEFORE* you make the splice. (We still make this mistake at least once a month.) You can simply slide it up out of the way while you work, then push it back over the splice when you're ready. A few seconds under the heat gun will shrink the sleeve tight against the splice for a good, weather-resistant seal.

Tip: A small dab of dielectric grease inside the shrink sleeve ends prior to heating can also mitigate moisture ingress.

Inspecting Your Finished Lineman's Splice

Hooked up to a bench power supply via temporary electrical test leads, we run 12 volts through the splice and into a small LED bulb to ensure continuity. Wiggling the wires around the splice with the bulb lit will tell you if the connection is sound. (Image/OnAllCylinders)

One last thing, it's always a good idea to bench-test the splice while you have your iron heated up. But we're confident that if you follow the steps above, you'll be able to make foolproof connections in whatever electrical system you're working on, whether it's a hot rod, telegraph line, or Saturn V.