

CABLE TROUBLE

Troubleshooting a poorly performing cable is an essential part of any MIG welding operation

by Travis Hall, Lightning MIG product manager and operations management, American Torch Tip





The cable is a key part of any MIG welding operation as it makes up the majority of the cost of the welding gun. It is surprising what goes into the MIG cable and where breakdowns can occur.

If your MIG welding gun is growing excessively hot under your standard welding conditions, you increasingly have to turn up the voltage to achieve the same weld, or you have variations in your weld appearance caused by an erratic arc, these are all signs of excessive electrical resistance somewhere in your welding application.

The first thing to check if you encounter any of these issues is all the power connections in the weld circuit, from the power source to the welding gun, inclusive of ground clamps, to make sure all connections are clean and tight. If anything is loose, it will cause major resistance and premature gun failure if not corrected.

Although checking the connections seems like an obvious first move, it is remarkable how many times a loose or dirty connection is the issue. Checking them first can save a lot of time and money. ▶

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replace the gun.**

After examining the connections, next check the condition of the outside of the cable. Does it have any cuts, tears or flat spots? Are there any copper strands exposed? Any exposed strands are live and conductive when welding, and that is a safety issue that has to be addressed. The outer jacket should be inspected daily for damage. Cable covers are available to add further protection.

WEAR AND TEAR

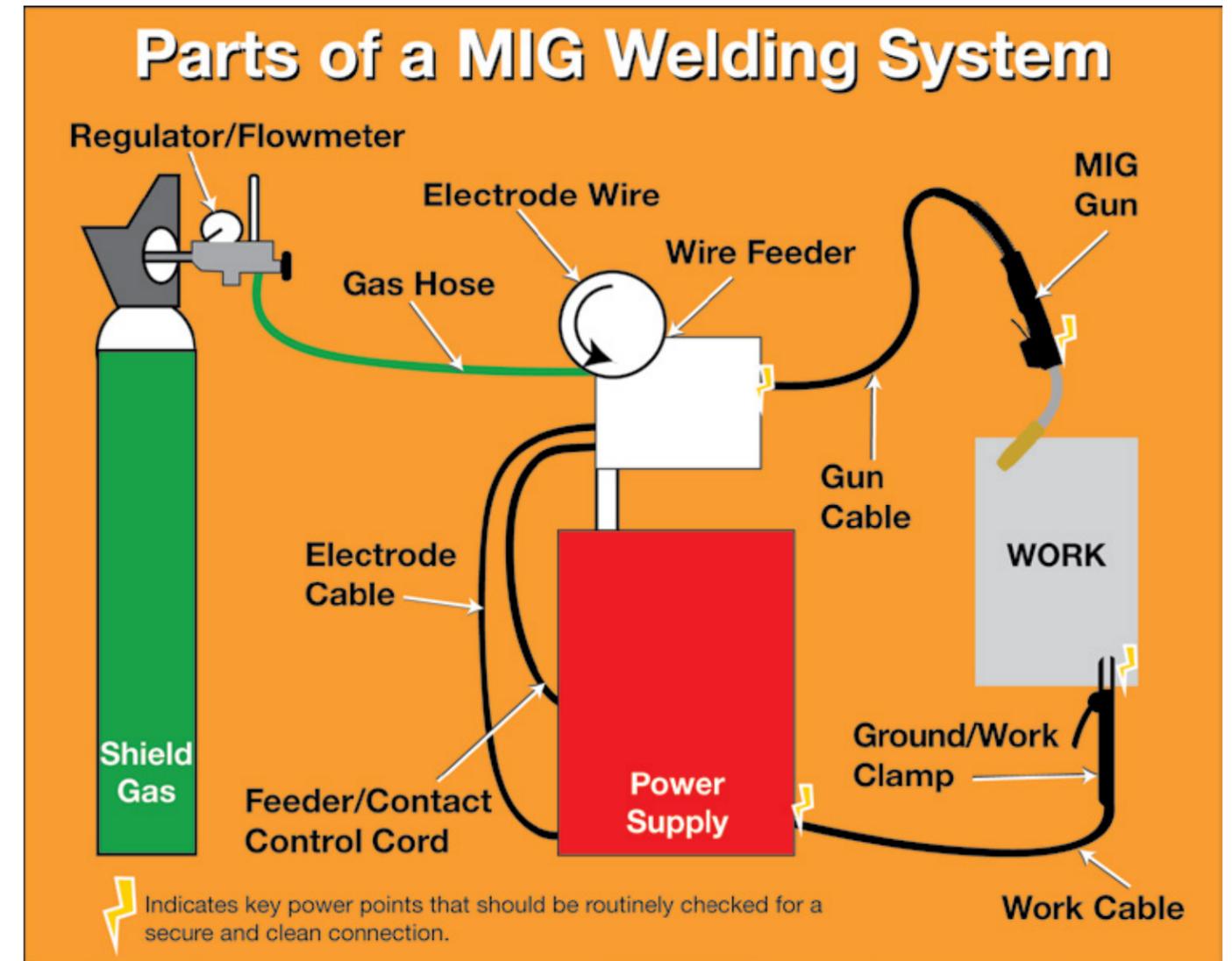
If the resistance problem is not coming from a bad connection or damage to the outside of the cable, it is most likely caused by wear and tear from the high heat and repetitive bending, twisting, stretching and flexing that happens when the welder is using the gun.

These issues can cause fraying, tearing and breakage of the internal copper strands, which causes them to lose their conductivity and create more resistance. Although this can be a hard problem to detect, you can determine if there is a problem with the strands if the cable is growing

hotter in a specific area. Or if the cable is extremely flimsy, there is a good chance the strands have started to break. Also, because electricity always takes the path of least resistance, a discolored gun liner is another sign of a degraded cable.

Some welding guns can be “flip-flopped” when the front end of the cable starts to wear. This allows the welder to take the “busy” end of the gun and flip it to the back end. This can be accomplished by simply switching out a few components. To do this, the front end and back end components have to be interchangeable. This can extend the life of the gun and cable significantly. However, if the copper strands have degraded too much, flip flopping will not solve the problem, and you will have to replace the gun or, possibly, cut back the cable.

Typically, the most worn part of the cable is the area right behind the handle of the gun. If you have a repairable gun, you can cut back the gun cable to see if it is the high flex point of the cable that is damaged.



Also, if there is noticeable cable damage and you do not mind a shorter gun, you can cut back the gun cable past the point of cable damage.

Cutting back the cable is not always an option, however. Some manufacturers use crimp connections, meaning the cable may not be able to be cut back and repaired. Typically, these are the lighter duty or less expensive guns, but some premium guns use crimp connections, as well. ▶



Manufacturers use crimp connections (right), set screws (left) or cone and nut compression-type fittings (middle) for cable guns.

Other manufacturers use a set screw or cone and nut compression-type fittings for a more repairable cable. These may come loose more easily but tend to not lose conductivity after heavy use like a crimp connection.

Again, if it is determined the cable cannot be repaired, you will need to replace the gun.

It is recommended to use a gun cable that is as short as possible and at the right amperage for the job at hand. A shorter gun allows for optimum electrical flow and wire feedability. Also, there is less cable to move around that can get damaged. Not using a higher amperage saves on cost and keeps the gun light weight, helping prevent welder fatigue.

CABLE CORE

To understand how to best care for a welding cable, it's important to understand what comprises the cable. Inside is the inner tube for the liner, welding wire and shielding gas. Annealed copper strands wind around the tube and a couple of trigger wires that connect to the

feeder. Next, a cloth wrap goes around the strands and then on the outside is a rubber jacket. Only premium cables tend to have the cloth wrap.

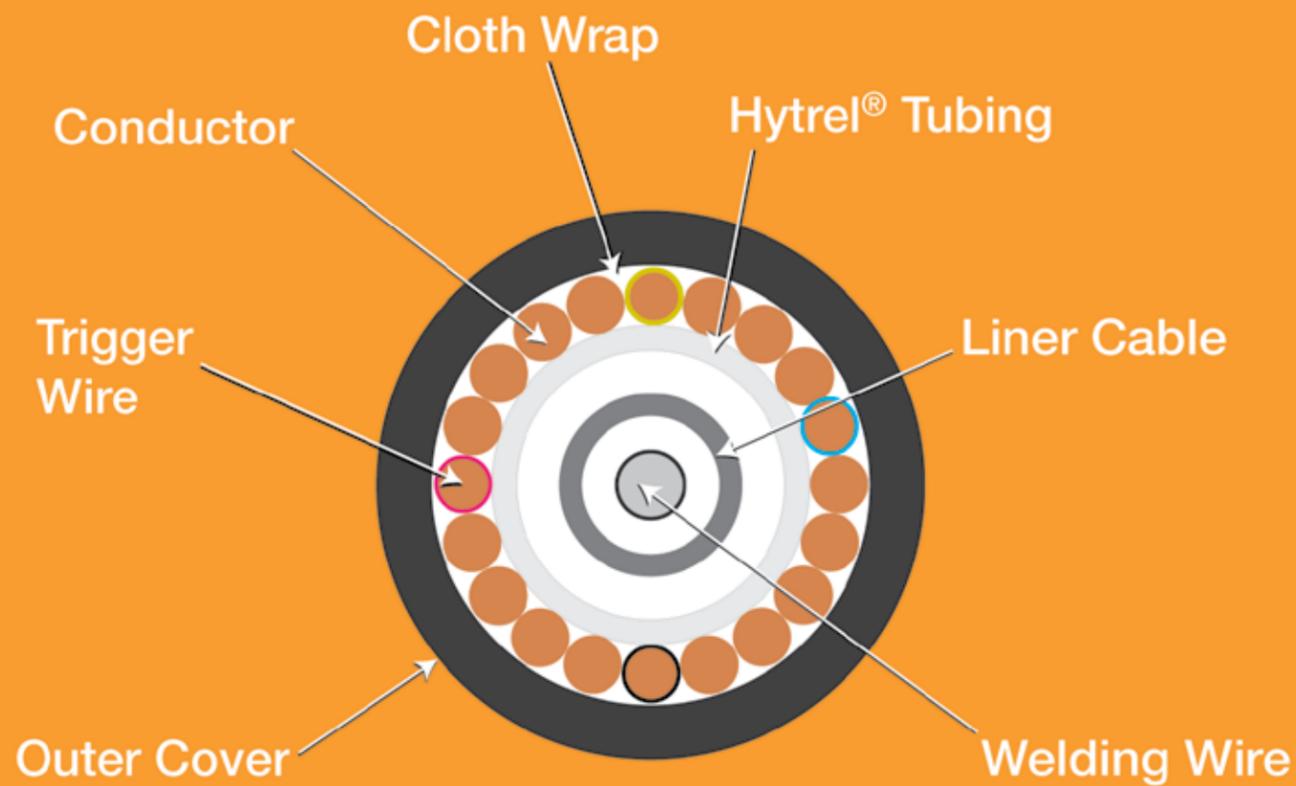
Issues that can arise from excessive sharp twists and turns of the cable include the welding wire rubbing against the gun liner, which creates metal shavings inside the gun. These shavings can lead to weld contaminants, which cause bad welds and premature wear of the liner.

To remove metal shavings and dirt, blow out the cable with compressed air weekly or, at minimum, when you change the gun liner. If not, you are putting a new liner in an already dirty environment.

Furthermore, if the inner tube and liner become kinked, it will lead to poor wire feedability.

To reduce the chance of damage, a high-quality inner tube is recommended. ATTC uses a Hytrel inner tube in its premium Lightning cable. Hytrel is a thermoplastic material that can flex in multiple directions with high ▶

Inside a Lightning® MIG Cable



ATTC's gun cables are gas; copper strands (conductors); two trigger wires; cloth wrap; and rubber jacket.

fatigue resistance. It also has strong impact resistance in case the cable is stepped on, run over or similarly abused.

Hytrel makes the inner tube much more kink and impact resistant, allowing for better wire feedability and gas flow. The cable can be twisted up like a pretzel but still feed wire and flow gas properly, although this is not something recommended for extended periods.

In some cases, a Hytrel inner tube might not be necessary. In many applications, a black synthetic rubber inner tube is still a good option.

STRANDS COUNT

Another feature a premium cable has is the high copper strand count and proper strand gauge to allow the cable to handle maximum amperage with optimum flexibility. If the cable has a thinner copper strand than recommended, while there would be more strands there would actually be less copper coverage. Too thick of strand gauge limits flexibility and causes the strands to break more readily.

Not all guns are created equal. For example, a welder could have a 400-amp gun but it may only provide a 60 percent or even 40 percent duty cycle but can still be considered a 400-amp gun because of how the manufacturer has rated its gun.

What you want to avoid is overamperage. A 400-amp Lightning gun could be noticeably heavier than a competitor's 400-amp gun, so you

may only need to use a Lightning 300-amp gun. It's all relevant to how the manufacturer rates its cable duty cycle, which comes back to the strand count and gauge in the cable.

Although less frequent, another source of interruption can be the trigger lead wires. Trigger wires that are cross-linked (electron beamed) are more heat resistant and have higher dielectric strength than wires that are not. In case of damage, some cables come with extra trigger wires.

The cloth wrap also plays a role in the lifespan of the cable as it helps bind the copper strands together. When the cable is initially heated and cooled the first few times, the copper could relax as much as 4 in. to 6 in. This can cause issues with the outer jacket pulling back. The cloth wrap helps hold the cable innards together as tight as possible, as well as provides another light layer of protection.

ON THE OUTSIDE

For further protection, a premium cable's outer jacket is made from a high-grade synthetic rubber ▶



For the MIG cable inner tube, Hytrel makes the inner tube kink resistant, although a black synthetic rubber inner tube is still a good option.

Any exposed strands are live and conductive when welding, and that is a safety issue that has to be addressed.

with several key additives that enhance the cable's tensile strength and flexibility and make it ozone, UV, heat, flame and spatter resistant. Some lower quality cables use more of a polypropylene mix with PVC additives and greater amounts of fillers, omitting those key additives that protect the cable.

Additionally, premium cables are sent through an electron beam irradiation process that crosslinks the polymer, changing the molecular structure of the cable. This makes the outer jacket more abrasion, stretch, heat and chemical resistant. Lower quality cables also typically go through the electron beam process, but do not benefit as greatly because of the inferior mix.

One final note is on gun and cable storage. Store your gun by winding it up loosely to keep it off the ground so it doesn't get stepped on or exposed to rough material. Wrapping the cable up tightly too often, especially when it is still hot, causes unnecessary flexing and bending of the cable. If your gun has a hook, use it to hang the gun vertically. Don't hang the gun by the trigger gooseneck or cable as this causes unnecessary stress and damage to these parts of gun.

[Electron Beam Technologies Inc.](#) is the premium cable supplier to American Torch Tip. All the cables are made to American Torch Tip design and specifications. ■

AMERICAN TORCH TIP