

# Max-Gain Systems, Inc. Soldering Guide

SOLDERING PL-259 (our stock # i500) and Type N, cable end, 2 piece  
(our stock # i303) connectors  
Both fit **LMR-400** and **RG-8 coax**

Max-Gain Systems has sold PL-259 connectors for many years. We have been asked countless times about the correct way to install these connectors on various types of cables. Here we address these questions in a comprehensive installation and soldering guide. We hope you find it helpful!

PL-259 connectors are used in an extremely wide range of applications due to the versatility of this connector and ease of installation. It is by far the widest used series at frequencies under 400 mhz. There is, however, an equally wide range of quality (or lack of quality) in the PL-259 connectors that are available.

The best body material is brass (some are tin or aluminum or zinc ... ours are of course, brass). The best plating is silver, the lowest resistance electrical conductor, and one that takes solder like a wick, even without flux. Nickel plated connectors can be quite difficult to solder, even with a good flux. Many PL-259 connectors of inferior quality have the center pin come completely out when heated during installation.... Even some that are represented as having "teflon" dielectric. Worse, some with low temperature plastic dielectric will actually melt!

During our testing of prototypes, we "torture tested" our PL-259 connectors with a blow torch (do not do this at home ... PTFE / Teflon gives off many harmful gases if super heated!) After being super heated, the center pin was pulled with pliers and the center pin stayed true, the dielectric stayed completely unscathed, and the connector continued to perform without flaw.

Max-Gain Systems, Inc. has all of our connectors made to our own specifications and will never sell anything less than the highest of quality. Our PL-259 connectors have a solid brass body with silver plating and a silver plated brass center pin. Our PL-259 connectors also have only the highest quality PTFE ("teflon") dielectric. These high quality connectors will serve you well in whatever application you choose to implement them within their rated range of operating frequency.

## Recommended Tools

When soldering PL-259 connectors the first step is to make sure you have all of the tools necessary to complete the job. The tools we recommend include:

Soldering Iron – provides heat to the work to melting the solder

Solder – material used to fuse metallic surfaces

Pliers – for gripping things on which you need more leverage and force

Diagonal cutters – wire cutting pliers

Ohm meter – to check for resistance in the connector to be sure of no electrical shorts

Wire stripper or knife – to cut through the insulation, braid, and dielectric of the cable

Once you have acquired the necessary tools for the job then you can proceed to the next step of your PL-259 connector installation which is determining the coaxial cable type that will be used and the size adapters that may be necessary with some cable diameters.

## 1. Connectors / Adapters and Coax / Cable

Our PL-259 connectors (also known as UHF connectors) fit many different types of coaxial cable. Ours **WILL** fit LMR-400 (LMR-400 has a larger center conductor) as well as RG-8 and RG-213. Our PL-259 connectors will also fit RG-58 and LMR-195 with the use of our UG-175 adapter (our stock number i507S) as well as RG8X, Mini 8, and RG-59 with the use of our UG-176 adapter (our stock number i508S). We also offer nickel plated reducer adapters in both UG-175 (stock number i507N) and UG-176 (stock number i508N) for a reduced price. Once you have determined which coax / cable you have and have acquired the correct connectors and adapters we can begin the process of soldering on the PL-259 to your coax or cable.

We will begin by installing just the PL-259 connector on a piece of LMR-400. This process is the same for all the other types of cable that fit the PL-259 connector. First cut your cable to the desired length and then strip the cable back  $\frac{5}{8}$  of an inch all the way down to the center conductor through the insulation, braid, and the dielectric (FIG 1-1). Once that is completed strip the outer (black) insulation back another  $\frac{1}{2}$  of an inch, down to the braid (FIG 1-2).

When that is completed cut the braid/foil back  $\frac{1}{16}$ <sup>th</sup> of an inch (FIG 1-3) to insure that none of the braid or foil is touching the center conductor which could cause a short.

Once the cable is prepped, make sure to put the sleeve of the PL-259 on the cable before you put the body of the PL-259 on the cable, with the knurled end of the sleeve closest to the tip of the connector. (FIG 1-4).



**Soldering PL-259 connectors**



(FIG 1-1)



(FIG 1-2)



(FIG 1-3)



(FIG 1-4)

Put the PL-259 on the end of the cable and grip it with a pair of pliers and begin screwing it to the right till the center conductor is flush with the tip end of the center pin of the PL-259 connector itself (FIG 1-5).

This soldering guide is for soldering Max-Gain Systems, Inc. PL-259 connectors. These are approximate measurements for our PL-259 connectors, which adhere to industry standards for this type connector. If you choose to use this guide for connectors sold by others who do NOT adhere to these standards, the measurements could be off and result in a poor installation.

**Now we begin soldering the PL-259 connector to the cable.** Begin by applying heat to the center pin of the PL-259 connector with your soldering iron. Before proceeding, allow sufficient time for the soldering iron tip to reach full operating temperature and clean the tip of the iron by wiping it with a damp sponge. Be sure the soldering iron is on the bottom side of the center pin. The heat rises and heats up the pin faster. Once the pin is heated, apply the solder to the tip of the center conductor, allowing sufficient solder to flow to seal the center conductor inside the center pin. (FIG 1-6). Once the center pin is sealed with solder, move the soldering iron to the holes of the PL-259 (FIG 1-7).

Make sure to fill all four of the holes with solder flush with the top of each hole. Once all four holes of the PL-259 are filled with solder let the connector cool down. When the connector is cool take the sleeve (which should have been put on the cable before the PL-259 was screwed on the cable) and slide it up the cable onto the connector and screw it up into place (FIG 1-8).

When this is completed, as a final test, you should always check resistance from the center pin to the body with an ohmmeter in a low resistance scale. After verifying that there are no braid - to - center pin shorts on the other end of the coaxial cable, you should see infinite resistance (open).

As a final check, inspect the tip of the center pin to be certain that there is no excess solder present that could interfere with easy insertion of the tip of the PL-259 into the female (SO-239) connector. If there is a tiny bit of excess solder present, it can usually be easily removed by lightly scraping the soft solder with the edge of a knife blade until smooth. This completes your PL-259 installation, and the connector is ready for use!



(FIG 1-5)



(FIG 1-6)



(FIG 1-7)



(FIG 1-8)

## 2. Soldering PL-259 connectors with the “UG” adapters

This soldering guide is for soldering Max-Gain Systems, Inc. PL-259 connectors while using the UG-175 or UG-176 adapter. These are approximate measurements for our PL-259s, which adhere to generally accepted industry standards for this series. If you choose to use this guide for other connectors from sellers who do not adhere to these standards (such as body length) the measurements could be off and result in a bad install job.

We will begin by installing the PL-259 onto a piece of RG-59 using the UG-176 reducer (our stock # i508S) which will also fit RG8X or mini-8. This process is the same when using the UG-175 reducer (our stock #507S) for RG-58 or LMR-195.



First cut your cable to the desired length for your application. Once the cable is cut, make sure to put the sleeve of the PL-259 on the cable first, with the knurled end of the sleeve closest to the tip of the connector. Second, put your UG-176 adapter on the cable, with the larger, blunt end pointed away from the cable end. Next, simply strip back the black outer insulation  $\frac{3}{4}$  of an inch (FIG 2-1). Once the outer insulation is stripped back, cut through the braid and dielectric exactly  $\frac{1}{4}$  of an inch from the end. Take care not to cut or nick the center conductor (FIG 2-2).



(FIG 2-1)



(FIG 2-2)

Now that the braid is the desired length work very carefully and start to pull back the braid, folding it back on the UG-176 adapter. (FIG 2-3).

Once the braid is folded back on the adapter, it is time to trim the rest of the dielectric back so the center conductor can reach all the way up through the center pin of the PL-259 connector. With your knife or wire strippers, cut the dielectric material covering the center conductor back almost flush with the end of the braid fold. However, **DO NOT CUT IT QUITE FLUSH WITH THE END OF THE FOLDED BRAID.**



(FIG 2-3)

Leave at least an 1/8<sup>th</sup> of an inch of the dielectric protruding from the braid fold (FIG 2-4). This helps prevent accidental shorts during the screwing on of the PL-259 connector to the UG adapters.

Now that the cable is prepped, the adapter is ready to be screwed into the PL-259 connector. Grip the adapter firmly and also grip the PL-259 connector body. Hold the adapter still and screw the PL-259 down over the adapter. You may find pliers helpful to do the final tightening, taking care not to scar the connector finish. Your ending product is a PL-259 connector prepped and ready for solder (FIG 2-5).



(FIG 2-4)



(FIG 2-5)

Now we begin soldering the PL-259 connector and the UG adapter to the cable. Before beginning soldering, you should always check resistance from the center pin to the body with an ohmmeter in a low resistance scale. After verifying that there are no braid - to - center pin shorts on the other end of the coaxial cable, you should see infinite resistance (open). If not, you probably have allowed a stray strand of braid to touch the center conductor or center pin, and this must be corrected before soldering.

If your “shorts” test was successful, begin by applying heat to the center pin of the PL-259 connector with your soldering iron. Always allow sufficient time for the soldering iron to reach full operating temperature, and clean the tip of the iron by wiping it with a damp sponge. Be sure the soldering iron is on the bottom side of the center pin.

The heat rises and heats up the pin faster. Once the pin is heated, apply the solder to the tip of the pin to seal the center conductor inside the center pin of the PL-259 (FIG 2-6). However, be sure not to flood the PL-259 with solder from the center pin. Just enough to seal the center pin and make a good connection.

Once the center pin is sealed with solder, move the soldering iron to the holes of the PL-259 (FIG 2-7). Make sure to fill all four of the holes with solder flush with the top of each hole.

Once all four holes of the PL-259 are filled with solder let the connector cool down. Take care not to over heat the cable by leaving the iron in contact with the connector pin or the connector body too long. This could



(FIG 2-6)



(FIG 2-7)

cause the center dielectric to melt, causing many problems. This is avoided by having the iron up to full temperature, and using our SILVER PLATED bodies.

Solder flows readily onto silver, unlike cheap, nickel plated bodies. The UG adapter can be nickel plated with no problem, because you are not actually soldering to it ... it is simply a spacer. You are soldering braid to body, not braid to UG adapter. When the connector is cool take the sleeve (which should have been put on the cable before the PL-259 was screwed on the cable) and slide it up the cable onto the connector and screw it up into place (FIG 2-8).



(FIG 2-8)

When this is completed, as a final test, you should always check resistance from the center pin to the body with an ohmmeter in a low resistance scale. After verifying that there are no braid - to - center pin shorts on the other end of the coaxial cable, you should see infinite resistance (open). As a final check, inspect the tip of the center pin to be certain that there is no excess solder present that could interfere with easy insertion of the tip of the PL-259 into the female (SO-239) connector. If there is a tiny bit of excess solder present, it can usually be easily removed by lightly scraping the soft solder with the edge of a knife blade until smooth. This completes your PL-259 installation, and the connector is ready for use!

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