CRIMP vs SOLDER: PROS & CONS

Connections More Vital Than Ever

Today, a flawed coaxial connection can severely reduce performance on digital systems like ThinNET (EtherNET), Wireless networks like WiFi and WLAN's and high-end video like SDTV, DTV and HDTV. Where just a few years ago a poorly installed CCTV connector might have yielded a 1dB or less loss on a CCTV system, the same bad connection can now yield a 10dB loss on a > 1GHz system. That could mean that only about a third of the signal would get through the connection.

Let's review a few of the factors to be considered when building coaxial connections and cable assemblies.

First of all, whether using solder or crimp as your attachment method, you must bring the right tools and skills to the table.

Good tools are not optional. The proper instruments and components, along with the knowledge gained from training and experience, set the stage for success in field and bench installations.

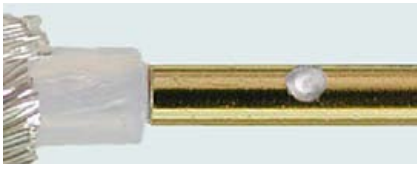
Installing the connector's center contact to the cable's center conductor is more reliably achieved using either solder or crimp methods. Push-on, twist-on or wire-wrap methods can be very problematical and should not be considered for any assembly needed to perform over 1 GHz.

Both crimp and solder types of connection allow for solid mechanical and electrical connections. Whichever method is used, you must practice your technique.

Solder

This fabrication method is often considered the most labor-intensive because the connector's center contact is soldered to the cable's inner conductor. Performed properly, it is also one of the most reliable connections and can be used on cable with solid or stranded center conductors. If metals and plating of contact and cable are compatible and solder-able, and, if the technician is skilled in this type of installation, solder connections can be expected to perform for long periods of use.

The solder method offers several advantages for connectorization.



PREFERRED

1. Solder around joint is smooth and shiny
2. No evidence of solder flow outside joint region
3. Solder hole is filled flush with outside pin surface

- Tooling is simple: the main tool is a low-wattage solder iron with an assortment of tips and installation is aided by the use of a decent vise to hold the work in place while applying solder. Beyond that, the materials consumed are solder and flux.

REFERENCE

	PREFERRED 1. Solder around joint is smooth and shiny 2. No evidence of solder flow outside joint region

- Soldering is much more tolerant of non-optimum technique.

Disadvantages of this method:

- It takes more time to terminate than other methods.
- "Cold" solder joints can cause problems if the connector is not soldered properly to the cable, observing solder flow through the contact solder hole.

	NONCONFORMING 1. Visible braid indicates solder fill less than 75% minimum 2. Cavity changes contour of pin 3. Electricals will be affected
	NONCONFORMING 1. Excess solder flow onto body of pin 2. Excess solder changes contour of pin 3. Electricals will be affected

- Soldered joints between contact and center conductor can work harden if subjected to excessive vibration during use and develop micro-cracks followed by solder fatigue.
- Soldering can be inconsistent and subject to failure as a result of mechanical or temperature stresses.
- Care must be taken to control heat applied during the soldering process and not allow solder to wick or distort the cable dielectric.

	NONCONFORMING 1. Dielectric melted past OD + 20% maximum 2. Flare of dielectric will interfere with assembly 3. Pin has melted into dielectric 4. Pin will not meet interface
	PREFERRED 4. Dielectric shows clean 90 degree stripping 5. No evidence of melting

REFERENCE

Crimp-on

This fabrication method has always been the workhorse of the industry, and is probably the most frequently used method of terminating connectors on coax cable.

The crimp method is the most popular because:

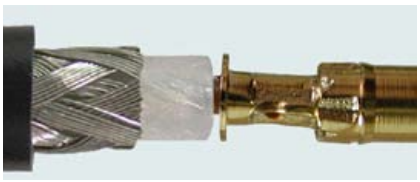
- There is no need for soldering; therefore, installation time is reduced.

	PREFERRED 1. Equal compression on all 6 crimp surfaces 2. Crimp die positioned within pin step down

- It takes an experienced technician about 15 seconds to install a crimp-crimp connector, thereby greatly reducing the time required to create cable assemblies. This is very important in today's cabling market where time is of the essence and fewer technicians are being asked to maintain more and more equipment. Digital video, computer and network cabling is almost universally crimped today.
- Crimped connections, done correctly, can be superior to soldered connections.
- A good crimped connection deforms the metal sufficiently past the yield point, but not too much, so that the "spring back" keeps the connection secure, even under thermal cycling (the coefficient of expansion of the two metals might be different) and vibration.
- A good crimp connection is gas tight and won't wick: it is sometimes referred to as a "cold weld".
- Like the solder method, it can be used on solid or stranded conductors, and provides a good mechanical and electrical connection.

Disadvantages of the crimp method are:

- If done poorly, the crimped contact will not seat properly within the connector taking the interface out of specification. Both signal continuity and quality will suffer.

	NONCONFORMING 1. Position of crimp die is outside crimp area 2. Body of pin is no longer concentric 3. Impedance of connector will be affected
	NONCONFORMING 1. Pin has been distorted, is no longer straight 2. Pin has begun to break at crimp Pin shows "dog ear" of excess material 3. Possible cause: wrong crimp die or too much pressure applied

- Crimped contacts cannot be un-crimped and re-installed. In many cases, this means the entire connector assembly must be scrapped and replaced by a new one.
- Crimped connections on solid wire can be poor and prone to failure, unless crimped with the proper dies using professional crimp handles.
- Sometimes, although rarely and under conditions of frequent flex, stranded wire can shift within the crimped joint and loosen. This occurs more frequently with clamp connectors than connectors with crimped ferrule studs.
- Some important points to remember when using the crimp method are to select the proper connector for the coax you are using. A tight fit on the inner conductor before crimp and the proper ratio of ferrule stud ID to cable dielectric OD and ferrule stud OD to ferrule ID is important to avoid a substandard crimp. Avoid double crimping, especially on the contact; this is known as "flagging" or "dog ears".

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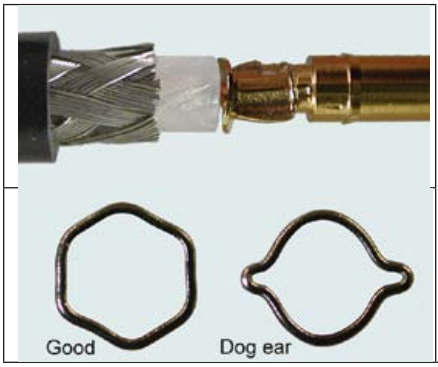
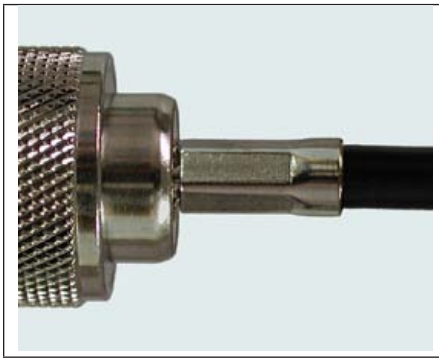


FERRULE CROSS SECTION

1. Good ferrule crimps into hexagon shape with equal pressure on all sides
2. Reject "dog ear" causes unequal pressure and excess material forms "ears"
3. Possible cause is wrong crimp die, too much pressure applied or ferrule material too hard

When crimping connector contacts and ferrules, careful selection of proper tools is critical. It is an investment of time and money, which increases productivity while decreasing effort. Use a ratchet crimp tool like the RFA-4005-20; or, if you anticipate thousands of crimps over the tool's anticipated use, invest in a heavy duty, piston driven crimp handle such as the RFA-4009-20. Select the correct crimping die for your cable, connector and crimp handle. Coaxial crimpers are designed to place the pressure of the crimp evenly around the connector.

A properly crimped connector will be slightly flared at the mouth. This is called the bell-mouth condition and helps relieve stress on the coax. If you are precutting for very large commercial jobs, substantial savings can be gained by having your supplier prepare your cables in advance.



PREFERRED

6. Crimp die positioned at front of ferrule, near connector
7. Equal pressure from crimp die on all sides
8. "Bell" at rear of ferrule allows cable flexibility

Some technicians prefer a combination of the two contact installation methods where an assembly will be used in rough conditions or when assembling test probes. The contact connection is first carefully crimped and then solder is flowed into it. Although a technique that can be difficult to master, it creates a connection that will never fail except under conditions of extreme mechanical damage or heat. Never crimp a soldered joint! Solder has no compression strength.

Whichever method is used, the cable must first be carefully prepared and stripped according to installation instructions for your

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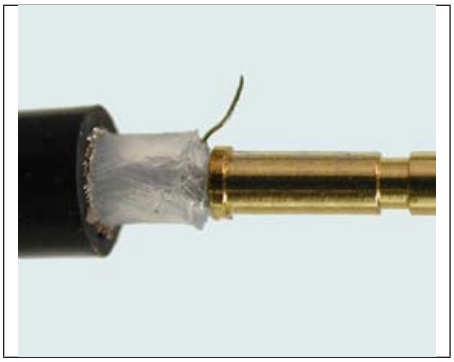
connector.

- Jacket, braid and dielectric should be stripped at 90 degrees.
- Materials cannot be damaged or distorted.

	PREFERRED 9. Jacket, braid and dielectric stripped at 90 degrees 10. No damage or distortion to materials 11. Diameter of braid less than diameter of jacket

- Diameter of braid should be less than diameter of the cable jacket.



- Braid strands must be completely and cleanly stripped to prevent shorting.
- Any flare on center conductor and braid is acceptable only if it can be twisted back into position prior to assembly.

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