



RF Connectors

They are used to connect RF signals from or into a coaxial transmission system

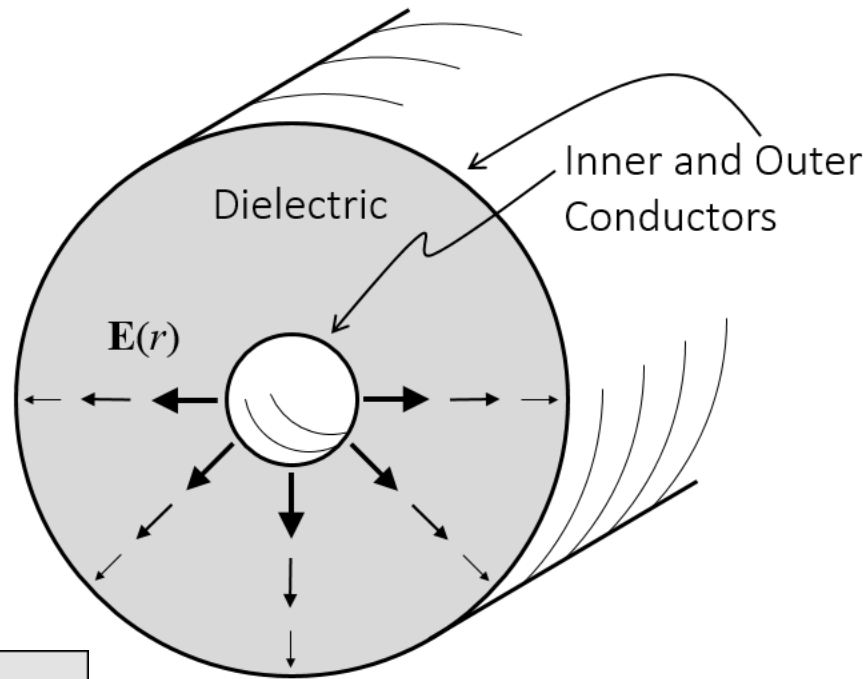


Coaxial Cable History

- Came into wide use during and after WWII.
- The term coaxial comes from the inner conductor and the outer shield sharing a geometric axis.
- Designed for wide bandwidth of RF signals from DC through microwave frequencies



Impedance of coaxial cable is determined by the ratio of the inside diameter of the outer conductor and the outer diameter of the center conductor



$$Z_0 = \frac{138 \log (D/d)}{\sqrt{\epsilon}}$$

The PL259 Connector

- PL-259 “**Plug #259**” and SO239 “**Socket #239**” are a military nomenclature commonly referred to as UHF Connectors.
- Designed in 1930’s by E. Clark Quackenbush who worked for Amphenol
- Intended for use up to 300 MHz
- Newer versions can be used up to 1,000 MHz
- Can Handle high power (1,500 + watts)
- Relatively low cost



UHF Connector Specifications

Electrical

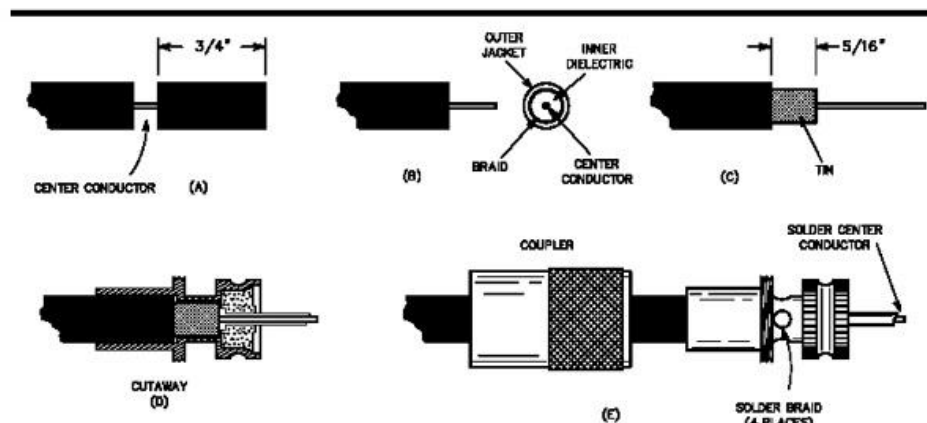
| | |
|-----------------|--|
| Impedance | Non-constant - Original design was for 300 MHz |
| Frequency Range | DC-300MHz; extended range to 1 GHz |
| Voltage Rating | 500 volts peak (1500 watts is approx. 275 volts RMS or Approx. 390 V peak) |

Environmental

| | |
|---|--|
| Temperature Range | |
| Mica-Filled Phenolic Insulators | -55°C to 149°C |
| TFE Insulators | -65°C to 165°C |
| Copolymer of Styrene and Polystyrene Insulators | -55°C to 85°C |
| Weatherproof | Most UHF connectors are not weatherproof |

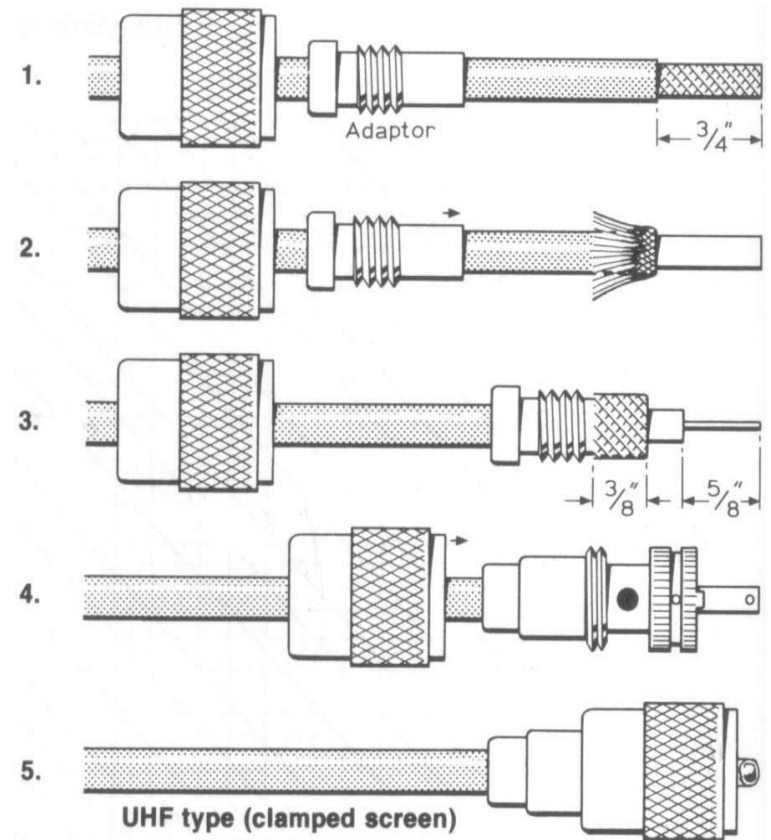
Installing PL259 Soldered connectors for RG8 or similar cables

- Prepare the cable as shown.
- Slide the knurled coupler on the cable (you will not be able to do this after you install the connector body)
- Screw connector base onto the Coax
- apply solder bead at 4 holes on the connector base Use high wattage small pointed soldering iron (65 watts or more)
- Trim center conductor flush with the center pin.
- Apply solder to the inside of the center pin and center conductor and let it flow inside.

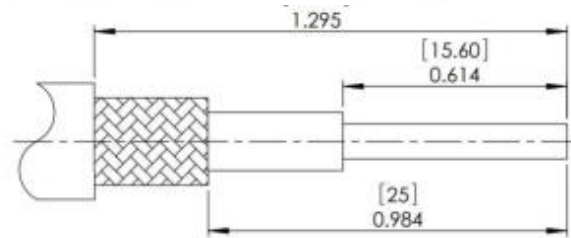
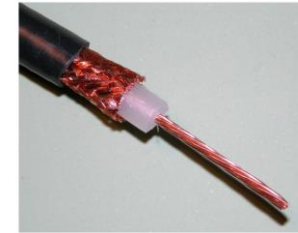
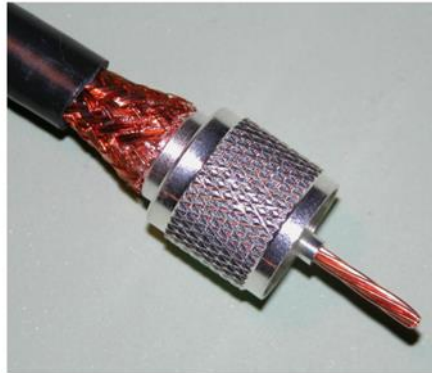
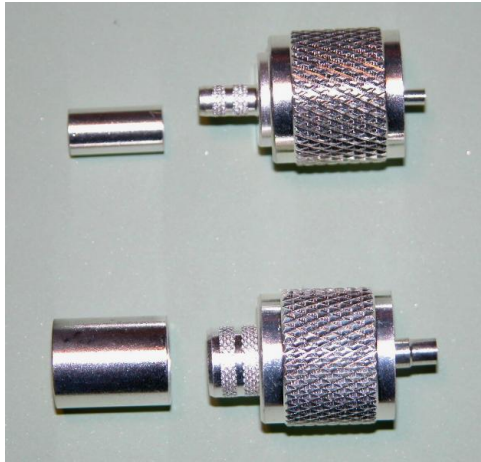


Installing PL259 Soldered connectors On RG8X or RG58 or similar cables

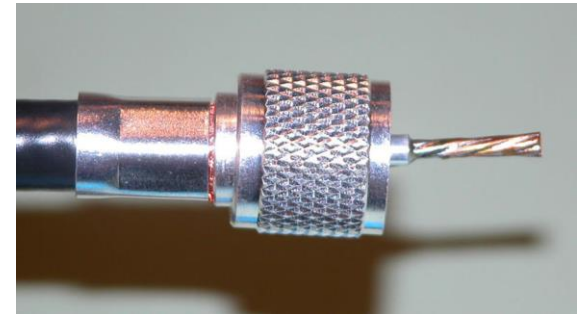
- Prepare the cable as shown.
- Slide the knurled coupler on the cable then install the cable adapter
- Fold the braid straight back and over the Adapter and trim to about 3/8"
- Screw on the coupler base securely against the adapter
- Apply solder to the 4 holes in the connector base
- Trim center conductor flush with the center pin.
- Apply solder to the inside of the center pin.



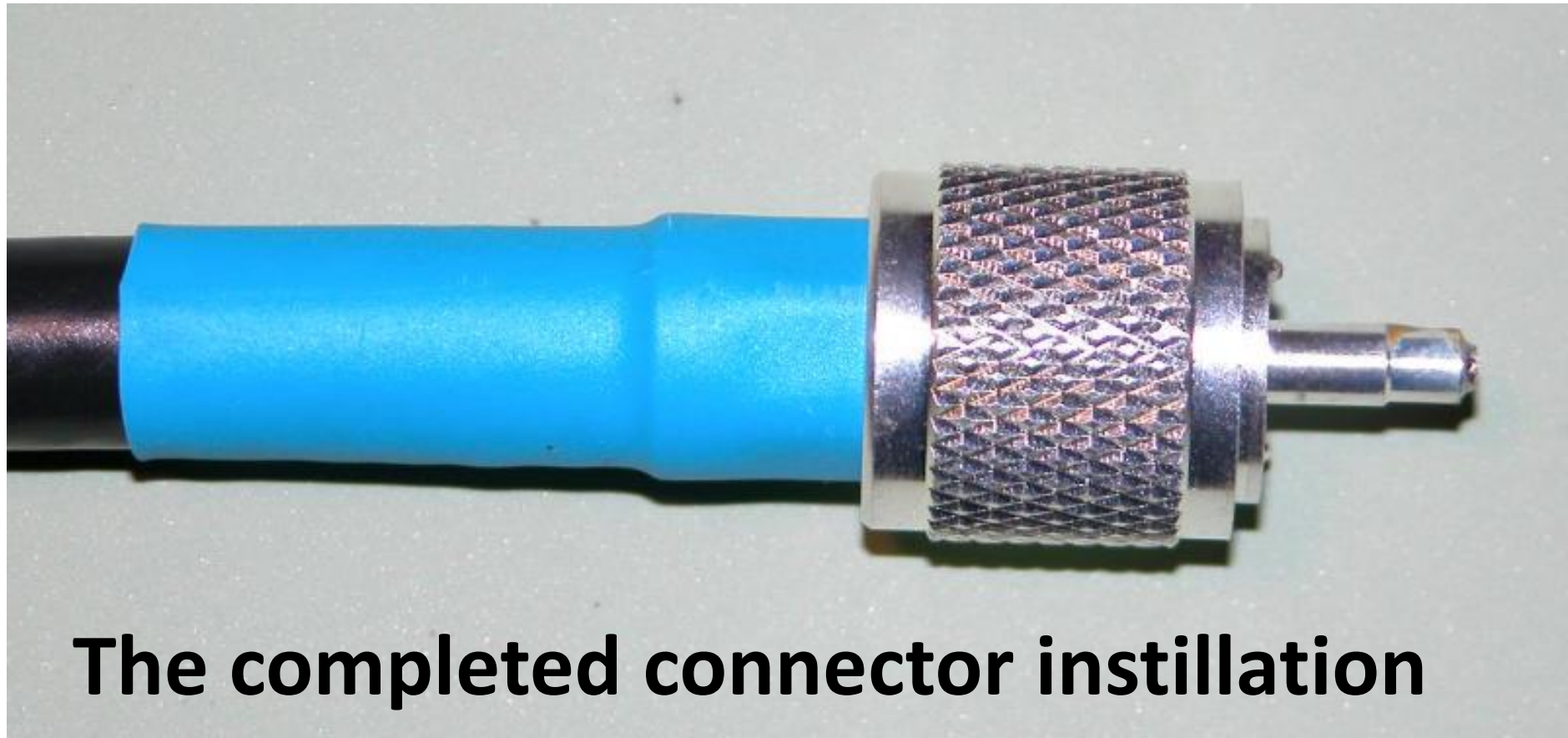
Installing Crimp on PL259 Connectors



RECOMMENDED CABLE
STRIPPING



- Slip crimp sleeve over the braid as far as it will go
- Crimp sleeve with a crimping tool
- Cut center conductor flush with connector pin
- Apply solder to the inside of the center pin and the center conductor



The completed connector installation

The Type N Connector



Type N

The N connector is a threaded, **weatherproof**, medium-size RF connector used to join coaxial cables. It was one of the first connectors capable of carrying microwave-frequency signals and was invented in the 1940s by Paul Neill of Bell Labs, after whom the connector is named.

Frequency range DC -11 GHz or DC -18 GHz (Precision type)



Installing type "N" connectors

COAXIAL CABLES: RG-8/U, RG-9/U, RG-144/U, RG-165/U
 RG-213/U, RG-214/U, RG-216/U, RG-225/U

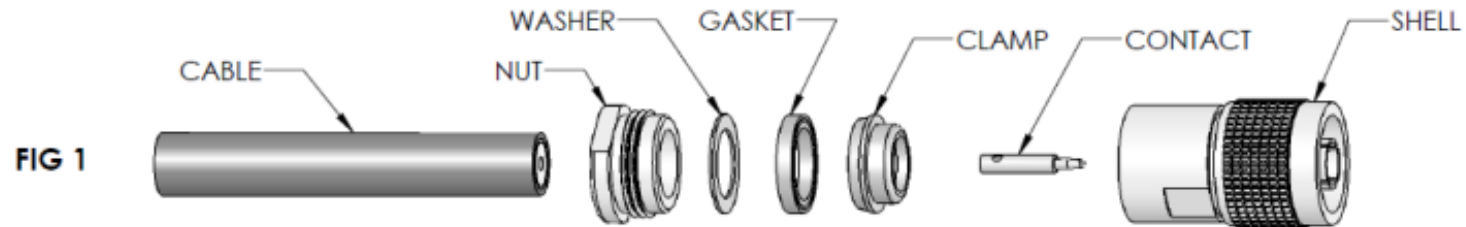


FIG 1

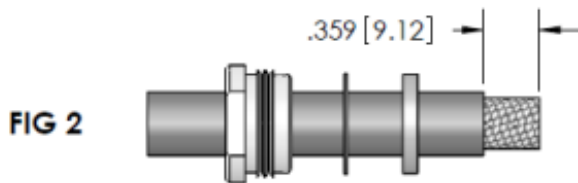


FIG 2

CUT CABLE END SQUARE. SLIDE NUT, WASHER, AND GASKET OVER CABLE. MAKE SURE "V" GROOVE ON GASKET IS TOWARD CUT END OF CABLE. CUT JACKET TO DIMENSION SHOWN AND REMOVE.

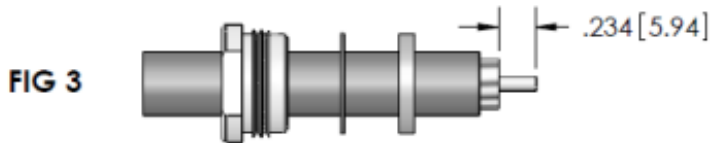


FIG 3

COMB OUT BRAID. CUT BRAID AND DIELECTRIC TO DIMENSION SHOWN. TAPER BRAID TOWARD CONDUCTOR.

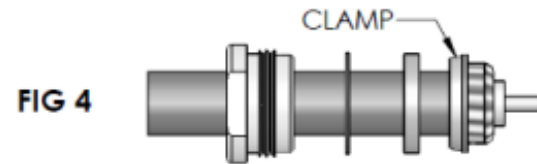


FIG 4

SLIDE CLAMP OVER BRAID SO THAT THE TAPERED END OF CLAMP FITS AGAINST THE END OF THE JACKET. FOLD BACK BRAID WIRES OVER CLAMP AS SHOWN. 60-40 TIN LEAD SOLDER THE EXPOSED CONDUCTOR. -DO NOT OVERHEAT-

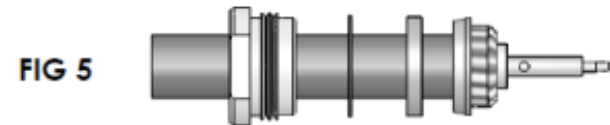
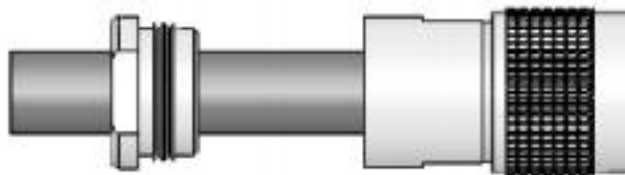


FIG 5

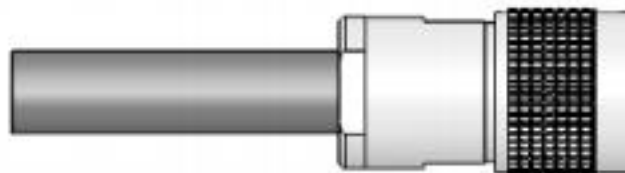
SLIDE CONTACT OVER CONDUCTOR AND SOLDER IN PLACE USING 60-40 TIN LEAD SOLDER. REMOVE EXCESS SOLDER FROM OUTSIDE OF CONTACT. -DO NOT OVERHEAT-

FIG 6



SLIDE SHELL OVER CABLE ASSEMBLY. PUSH CABLE ASSEMBLY INTO SHELL UNTIL CONTACT IS FIRMLY SEATED IN SHELL. MAKE SURE SHARP EDGE OF CLAMP SEATS PROPERLY IN GASKET.

FIG 7



SLIDE NUT INTO SHELL AND TIGHTEN IN PLACE WITH WRENCH. MAKE SURE TO HOLD CABLE AND SHELL RIGID WHILE ROTATING NUT.

Type n connectors are also available in crimp-on versions

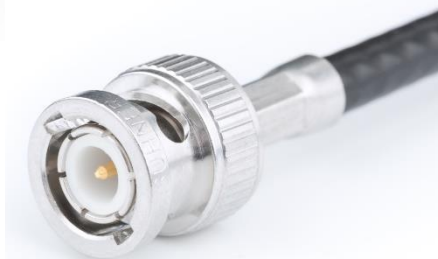
Installation is similar to UHF connectors but center pin slides over the center conductor and is soldered or crimped in place



10PCS

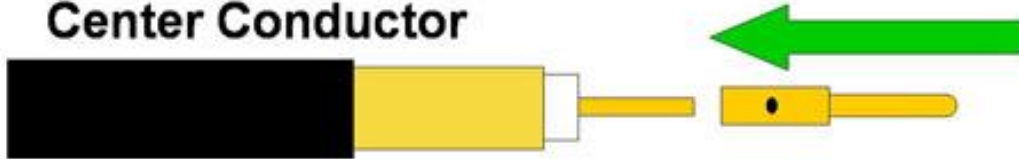
BNC (Bayonet Neill Concelman)

The BNC (Bayonet Neill–Concelman) connector is a miniature quick connect / disconnect RF connector used for coaxial cable. It features two bayonet lugs on the female connector; mating is fully achieved with a quarter turn of the coupling nut. These connectors are typically specified for use at frequencies up to 4 GHz



Installing BNC Crimp on Connectors

Slide Male Contact over Center Conductor

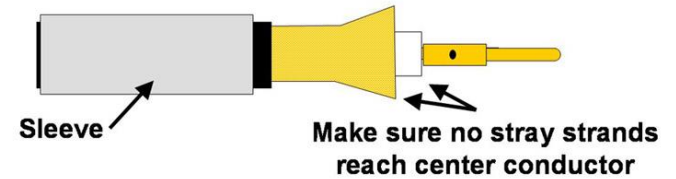


Male Contact butts directly against white dielectric

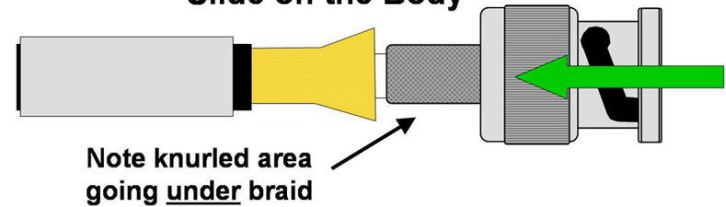


Carefully solder the male contact pin to the center conductor

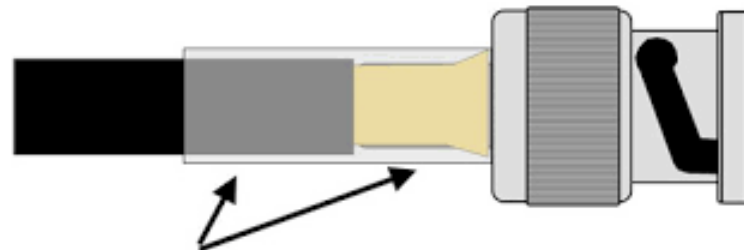
Flare the Braid



Slide on the Body



Final Crimps

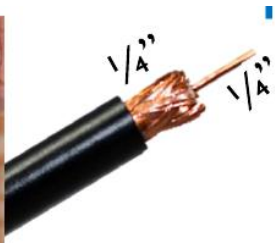


Crimp the Sleeve

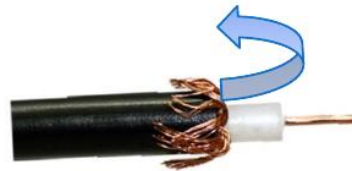
Tools for Installing Compression BNC Connectors on RG59 Cable or RG6



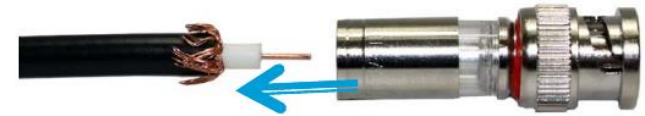
Installing Compression BNC Connectors on RG59 Cable or RG6



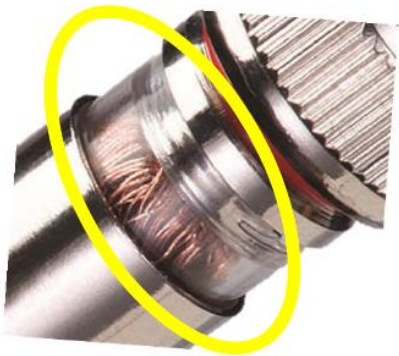
1) Use coax stripper to strip cable so 1/4" of conductor and 1/4" of braiding are exposed. (45-605 shown)



2) Fold back braiding, make sure no braids are touching the center conductor. Straighten conductor if needed. Do not remove foil that is attached to the white dielectric (RG6/6Q)



3) Center cable over back end of connector and push connector on to cable until fully seated.



4) Cable is fully seated when braiding is visible in the clear InSITE® window.



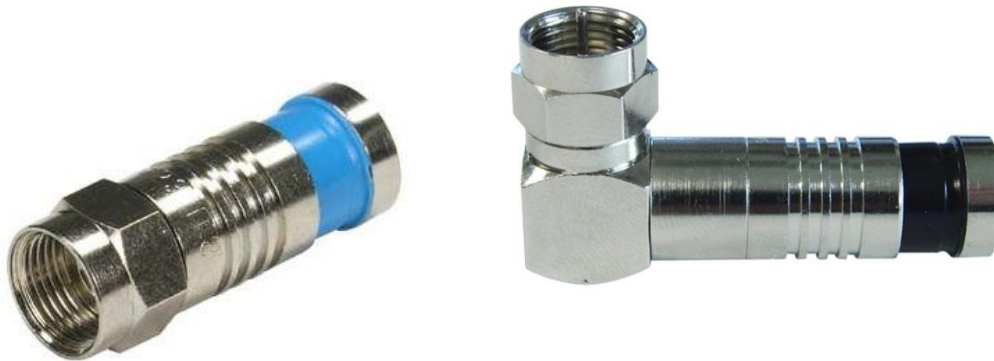
5) Place assembly in compression tool (30-793 shown) and compress.



6) Verify connector is fully compressed. Clear window should no longer be visible.

Compression Connectors Also Available for 75-ohm Type “F” Connectors

- They are available for Type RG-59 and RG-6 Cable
- They are installed similar to the way the BNC Compression Connectors are installed
- The center conductor is the connector pin, no separate center pin is used





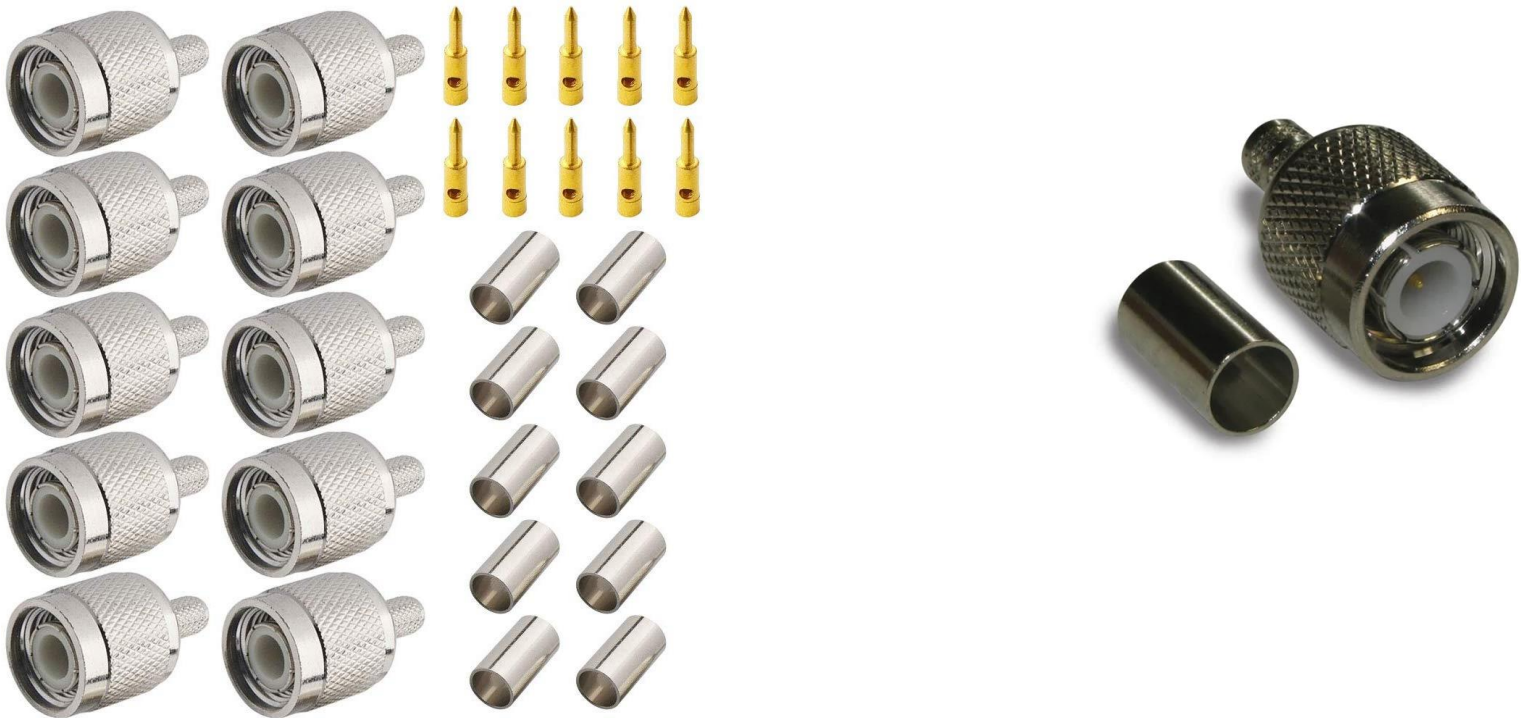
The TNC Connector

The **TNC (Threaded Neill–Concelman)** connector is a threaded version of the BNC Connector

- The connector has a 50 Ω Impedance and operates up to 11 GHz.
- It has better performance than the BNC connector at microwave frequencies.
- Invented in the late 1950s and named after Paul Neill of Bell Labs and Carl Concelman of Amphenol
- The TNC connector has been employed in a wide range of RF applications.
- The abbreviation TNC is sometimes given as standing for **Threaded Navy Connector**.

Installing TNC Connectors

- Procedure for installing crimp on TNC Cable connectors is the same as that used for crimp on BNC Connectors



Type SMA Connector

- SMA (**S**ub-**M**iniature Version **A**) connectors are semi-precision coaxial RF connectors.
- Developed in the 1960s.
- The SMA connector is typically rated for mode-free operation from DC to 18 GHz, though some versions are rated to 26.5 GHz.
- RP-SMA (Reverse Polarity SMA). It is a variation of the SMA connector which reverses the gender of the interface (used on Bao-Feng radios WI-FI modems) .



Installing SMA Connectors



- Slide the shrink tubing and Crimp sleeve onto the cable
- Prepare the cable by removing some of the cable insulation and trimming it back that approx. $\frac{1}{4}$ inch of the braid is exposed.
- Trim the center conductor insulator back flush with the exposed braid.

Installing crimp on connectors



- Insert the center pin on the center conductor and carefully solder in place. Slide crimp sleeve over cable.
- Push the cable with the attached center pin into the connector sliding it under the braid and slide the crimp sleeve over the braid and flush with the connector
- Crimp the crimp sleeve and slide shrink tubing over the crimp and shrink it in place.

DC Power Connections and Distribution



Standardization on Anderson Power Pole Connectors for Interoperability

- Standardize your DC connectors (Anderson Power pole recommended).
- Use common polarity convention (**red +** black -).
- Make Anderson Connector adapters to and from common connectors such as:

Open wire

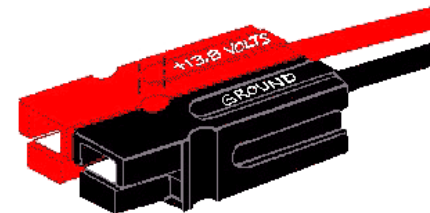
Cigarette lighter jack/plug

Common Radio Connectors

Binding posts

Vehicle connectors

Other?



Available in Different current Capacity

- **15/30/45A Same size housing/different contacts**
- **50 to 120 ampere larger size housings and contacts**
- **Available in multiple colors**



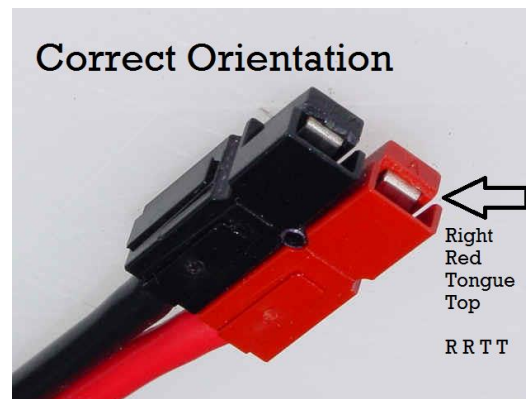
Powerpole® Connector Features & Benefits

- Genderless *Housings*: Provide simplified assembly
- *Stackable Modular Housings*:
- *Connection Versatility*: Contacts for different wire sizes all fit into the same housing
- Provides a low Resistance Connection
- Color Coded Housings
- Self Securing Design- Stainless steel springs create a robust force between the contacts that holds the connector in the mated condition, but allows it to be quickly disconnected



Connector Pin Installation

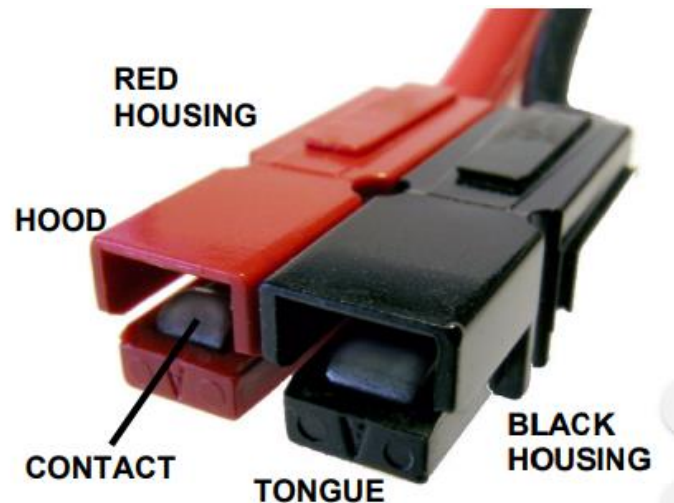
- Can be soldered or crimped onto wires
 - Crimping is the best and easiest but requires special tool
 - Both crimping and soldering are electrically equivalent
- Use standard configuration to insure compatibility with other power sources and radios.



Assembling Anderson Power Pole Connectors

- Anderson Power poles have been adopted by ARES and RACES units as the standard connector for emergency communications equipment.
- The connectors facilitate interoperability for Amateur Radio use
- The connectors are available in both 15, 30, and 45-amp models. The 15-amp model is for 16-20 AWG wire, 30-amp model for 12-16 AWG wire the 45-amp model is for 10 AWG wire.

- The connectors consist of a red and black plastic housing, two metal contacts and a roll pin (optional if housings are attached with a drop of glue).
- Before beginning assembly, observe the layout of the red and black housings. With the tongue down and hood up, the black housing is on the right and the red on the left. This is critical for proper polarity



- Cut DC power cord to length and separate the red and black wires about one inch. Strip 1/4-inch insulation from each wire.
- If you have a Powerpole crimping tool, place one contact over the on the end of the wire then into the appropriate contact size slot. The curved end of the contact faces down and the round end with the hole up.
- Squeeze the handles of the crimping tool firmly until it releases. Repeat for second contact and wire (you can carefully solder the wires to the contacts if a crimping tool is not available).
- Insert wires with contacts into housing and press firmly until they click in place



Some Suggested Adapters & Cables

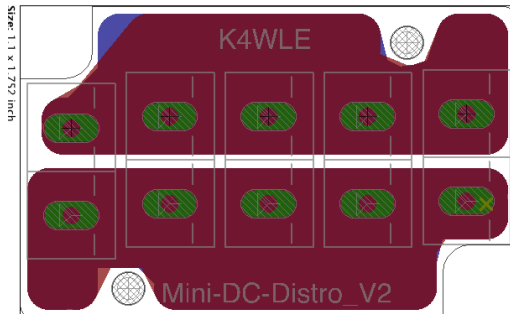
- A few power pole extension cables
 - i.e.: 6-inch, 12-inch, 24-inch, etc.
- DC power aux socket (Cigarette lighter) to power pole
- Power pole distribution block (1 in to 4-6 out)
- Power pole voltmeter or polarity checker
- Power pole to Binding Post connectors
- Connector from your radio(s) power jack to Power Pole

A Power Pole Distribution Block

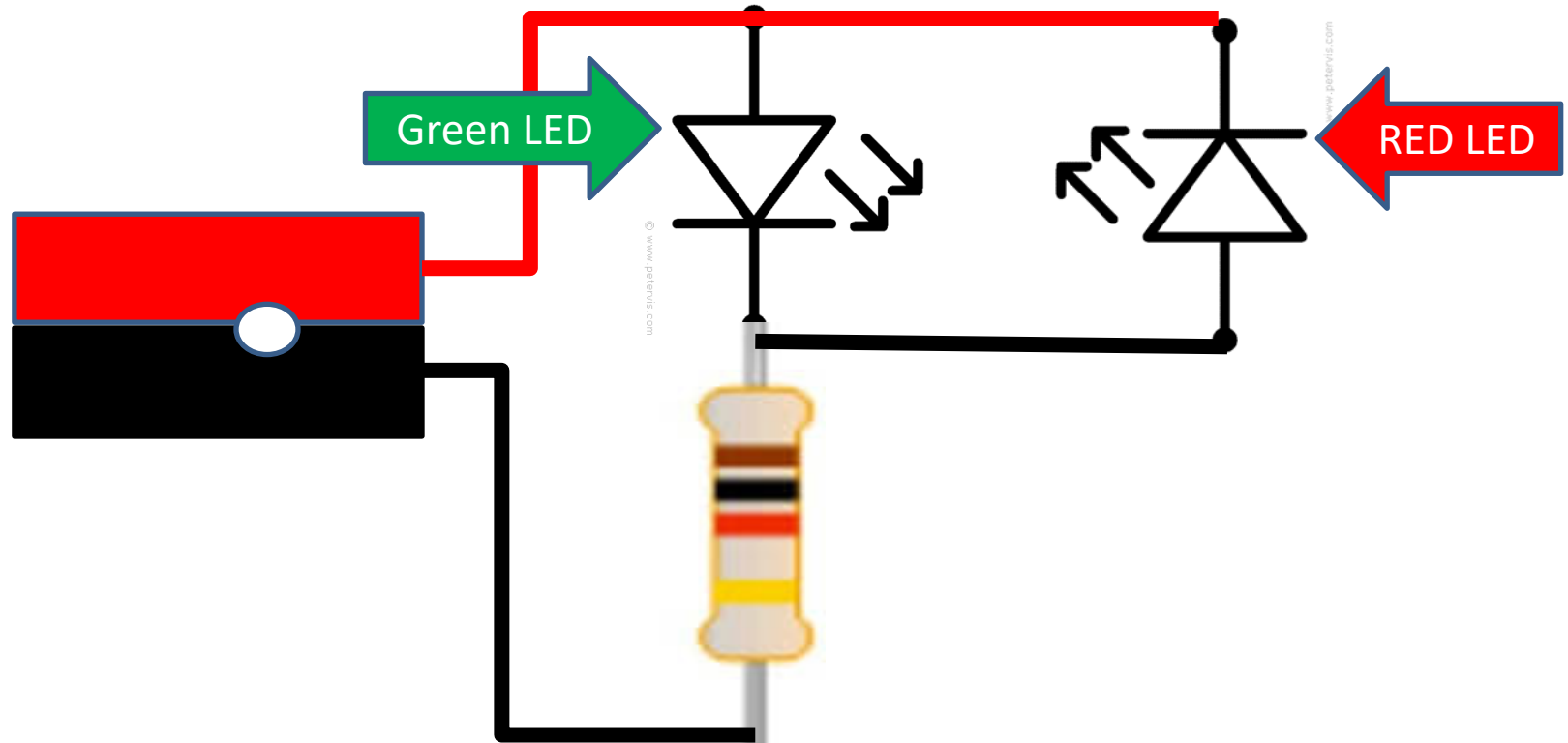
Commercially available



Home Built



Voltage Polarity Checker



Proper polarity lights green LED Improper polarity lights red LED. Resistor is 1,000-ohm ¼ watt



QUESTIONS?
COMMENTS?