Exploring Coaxial Connectors for Amateur Radio

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1

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In this presentation we will examine the various areas where coaxial cable connectors are used; exploring their types, functionalities, and their applications.

Telecommunications



- Telecommunications
- **Broadcast and Entertainment**



Telecommunications Broadcast and Entertainment Aerospace and Defense

Telecommunications Broadcast and Entertainment Aerospace and Defense Medical Devices

- Telecommunications
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- **Industrial Automation**

Types of Coaxial Connectors

Coaxial cable connectors come in a diverse array of types. Each type is tailored to it's specific requirements and applications. So next, let's examine some of the most commonly used coaxial cable connectors in a bit more detail.



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Often also used as a DC power connector, an RF connector, a video connector, or a connector for loudspeaker cables.





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It's design includes many adapters for different coaxial cables.

• UHF Reducers:

- UG-175U RG-58, LMR 195, Belden 8219, RG-141
- UG-176U RG-59, RG-8x, LMR 240, Belden 9258
- UG-174U RG-174, RG-316, LMR 100A (used for 0.100 dia. coax)

There are no specifications or standards to govern the mechanical or electrical characteristics of the UHF connector system. This makes it effectively a deprecated design with no guaranteed usage in any specific electrical or mechanical application.

Testing done by the ARRL labs has revealed that both N connectors and BNC connectors are electrically superior to the UHF connector for modern UHF frequencies.

UHF Double Female or "Barrel" Connector



A Typical Reducer -- UG-175/U Adapter





UHF Jack





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It is both waterproof and has solid mechanical properties.

N Connector Reducers



Type N Jack


Type N "Barrel" Connector





The most prevalent coaxial connector used today in professional video and RF applications.

Maintains the same characteristic impedance of the coaxial cable on which they are used.

Both 50 ohm and 75 ohm types are available.

Used in video and radio frequency applications up to about 4 GHz and carrying up to about 500 volts.

It was once the standard for handheld radio antenna connections.

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Other impedance BNC connectors are available.

BNC Double Female Or Barrel Connector







The TNC (or Threaded Neill-Concelman) connector is similar to the BNC connector, except that it has a 7/16"-28 thread screw coupling instead of the bayonet coupling mechanism used in the BNC connector.

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- It is usable at microwave frequencies up to 11 GHz.

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- Typically used in high vibration environments.
- There is also a reverse-polarity TNC connector available (RP-TNC) which reverses the polarity of the interface.

A Reverse Polarity (RP-TNC) Connector



Because they were not readily available to consumers, RP-TNC connectors have been widely used by Wi-Fi equipment manufacturers to comply with specific government regulations.

They are designed to prevent consumers from connecting antennas which exhibit gain to their equipment.

An WiFi Antenna Using an RP-TNC Connector







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The type F connector was invented by Eric E. Winston while working for Jerrold Electronics in the early 1950s.

It provides a good 75 Ω impedance match for frequencies to well over 1 GHz.

Type F connectors mate using a 3/8"-32 UNEF (unified extra-fine thread standard) thread.



The type F connector is not weatherproof.

Some male F connectors are enhanced with an O-ring which seals between the mating faces of both connectors, providing some weather protection.

The SMA Connector Family





The SMA Connector Family

The SMA family of connectors are semi-precision coaxial RF connectors developed in the 1960s as a minimal connector interface for coaxial cables.

The connectors were originally designed for a 50 Ω impedance and for use from DC to 12 GHz.

They have been extended over time with variants available for both 18 GHz and 26.5 GHz.



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Female SMA connectors are typically used on Chinese handheld radio antennas and are incompatible with most standard antennas from mainstream brands.



SMB is short for "Subminiature Version B".

The SMB is not as common as the standard SMA connector.

It uses a snap-on coupling mechanism rather than a screw type.

It is primarily used where physical space is limited.



MCX connector is another variant of the SMA family.

Uses a snap-on coupling mechanism for frequent connections.

Primarily used in portable electronic devices, GPS modules, and test instruments.



Female MCX Connector



Installation Techniques

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- Testing and Quality Assurance

In order to maintain optimal performance and longevity, coaxial cable connectors require regular inspection and maintenance.

- Visual Inspection

- Visual Inspection
- Cleaning

- Visual Inspection
- Cleaning
- Tightening

- Visual Inspection
- Cleaning
- Tightening
- Environmental Protection

- Visual Inspection
- Cleaning
- Tightening
- Environmental Protection
- Professional Inspection

Which Connectors Should I Use?

Don't buy cheap. The old adage of *"you get what you pay for"* is very true for coaxial connectors.

Match the connector with your application. Based upon the type of coax that you plan to use, its power ratings, and its conductor material.

Remember that the proper use and installation of coaxial connectors is an investment and will provide good performance with a minimum amount of down time.