



US NATO Connector- What Does it Mean?!?!

What is the Most Universal Connector for a 2-Way Radio Headset? Great question, thank you for asking. Unfortunately, there is no correct answer. When developing our product offering we tried to create solutions for a wide variety of the 2-way radios in the marketplace. The best way to do this was to have a "modular" design. This way we can stock a certain amount of headsets, a certain amount of PTTs and a wide range of relatively low cost down leads. Then we could backfill stock as customer preference showed us what to keep on hand. Call it "Just In Time" or "Kanban" or "Product Flow" inventory control. It helps us keep a minimum amount of capital dollars invested in inventory while still being able to quickly satisfy our customer's needs.

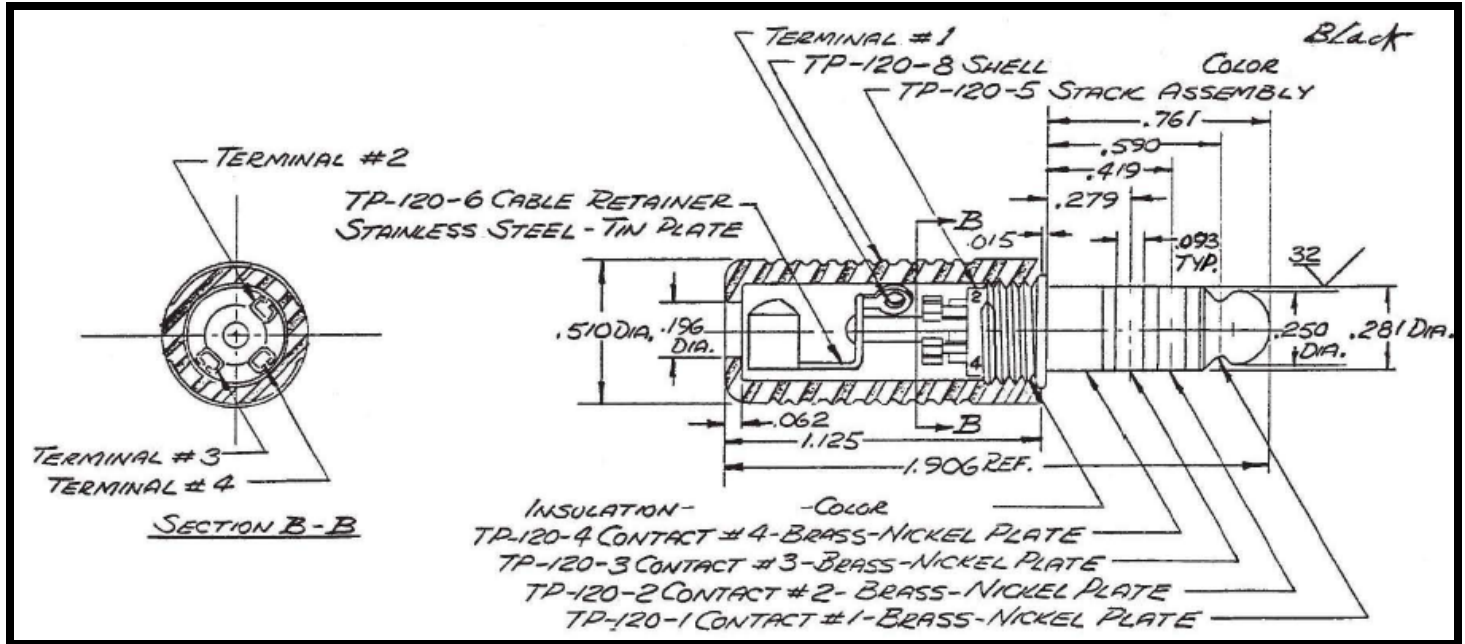
Right now you are probably thinking "Tech Bulletin? More like Business School 101", and you would be correct. But these business decisions have real-world implications. They define our product offering and make our products either a "proprietary" design or a more universal solution. Do we make our products work with other people's offerings or do we lock out the competition and only allow our products to work with our designs? Very sound arguments exist on both sides of this. Our Modular family of headsets is a good example of proprietary design. The headset attaches to the PTT and down lead with a proprietary 5 pin screw-on connector. I defy you to find another one exactly like it, it is unique. Our Pro and NX series are just the opposite. We adopted the US NATO standard for the headset connection. Like the NATO standard 7.62mm rifle round, it makes it so you can do quick re-supply anywhere in the world and have a high probability of success. But even with this universal solution, there are subtle variations. Here we get a little "techy" and dive into a little history, some industry differences and a review of our current design.

The US NATO connector seems generic, like the 3.5mm stereo connection, but differences do exist. There are mechanical considerations and electrical considerations, so let's discuss each one separately.



Mechanical Design

Mechanically the US NATO connector is generically called the TP-120 (Plug) and TJ-120 (jack). It actually stands for Telephone Plug and Telephone Jack, #120. It was designed way back in the '20s or '30s as the generic plug and jack used on large telephone switchboards. If you are too young to remember these, they were ubiquitous before the '70s. Every city and most large companies had a switchboard where a team of switchboard operators would receive your call, then connect you with the correct line in a manual fashion. You can look up Lily Tomlin playing Ernestine the Telephone Operator if you need a visual. The design for this plug/jack is currently owned by Amphenol who bought the Nexus company in 2008. For this reason, you will also see it referred to as the Nexus TP-120/TJ-120. To make things more confusing the, US Government will also refer to this same connector as the U-174/U. Mechanically they are all the same, see picture below.



Pic 1: This is a great "Old School" drawing from back before CAD and computers were even a concept. And the dimensions are in inches, remember those? It goes to show you how a good design will have utility far into the future.

This is the basic design. The typical US NATO connector has 4 circuits, sometimes called Tip-Ring-Ring-Sleeve. Some designs use 5 (or 2 to 3) but they are not very common. For a typical headset, you will need speaker positive, speaker negative, microphone positive, and microphone negative to keep electricity flowing to both functions. PTT function is handled inside the PTT. You can also group grounds together (common ground) but it is not usually a good idea. Ground plane interference can be a bugger. Which gives us a perfect segue into the electrical design.

Electrical Design

Electrically the US NATO connector has a single solution. It is specific and has to be correct so the headsets are interchangeable. Simple, right? Not so fast. The impedance (electrical resistance) of the speaker and microphone will have some implications as well. This is one of the reasons you can have a seemingly identical headset but it will not work with your system. A good example of this is how a Helicopter headset will not work with a typical 2-Way radio even if you get the adapters correct. And then Helicopter headsets differ from General Aviation headsets as well. For now we will focus on US NATO connectors for 2-Way radio headsets.

2-Way radios use low impedance microphones. Low impedance is generally considered anything below about 1000 ohms, high is typically between 10,000 and 100,000 ohms. Most microphones are low impedance, but some military and aviation applications will use high impedance. I am not sure why.

For wiring, the US NATO standard is: Tip = Mic-, Ring 1 = Spkr +, Ring 2 = Mic +, Sleeve = Spkr -. As you can see in the chart below, there are many different standards out there for the exact same connector. Peltor alone has 3 different ones. That said, the US NATO is by far the most universal. Just make sure you specify and receive the correct one. We only offer the Nexus TP-120 connector in the US NATO standard – keep it simple.

| | US NATO / IMSA | Some Peltor | Peltor - 47/-19 | Peltor -49 | Off road | NASCAR | CompCom / Stilo | FBI |
|--------|-------------------|----------------|--------------------|------------|----------|-----------|--------------------|-----------|
| Tip | Mic - | Mic | Mic - | Ground | Speaker | Mic + | Spkr | Ground |
| Ring 1 | Spkr + | Mic | Spkr + | Spkr Lt + | Mic | Speaker + | Mic | Spkr Lt+ |
| Ring 2 | Mic + | Speaker | Mic + | Mic + | Speaker | Ground | Mic | Mic + |
| Sleeve | Spkr - | Speaker | Spkr - | Spkr Rt + | Mic | NA | Spkr | Spkr Rt + |

CONCLUSION

The US NATO connection is a good, simple and robust interface. It is about as close to a “standard” as we have in the tactical electronics world. We have created several products that use this design standard and you can mix and match our PTTs and headsets with many other products on the market. Our product philosophy is simple: high quality, reasonable price and excellent customer service. Summing this up in one word – **Value**. Take a look at our website for available offerings and let us know if you have any questions.

GOOD LUCK!

codeRed Tech Support