

Quabbin Makes Reliable Self-Coiling Data Cables a Reality

Sponsored by: Quabbin Wire & Cable Co., Inc.

Coil cables are unparalleled in certain applications: car charging, on electric guitars to give musicians mobility and as the wired connection between the body and receiver of pre-cordless phones.

Given the spring-like retraction, far reach and flexibility of coil cable design, there are certain applications where they are optimal. The extending design provides wired electronics a long range from components or power sources, while also organizing the excess wire and reducing tripping hazards for people. These cables are common for signals, power, data or all three. However, as intuitively beneficial as they could be for data applications, coil cables have been problematic.



Figure 1. An example of a coil Cat 5e Ethernet cable. Source: Quabbin

Traditionally, data-transmitting coiled cables have fallen short in electrical performance. This is because vendors have typically repurposed standard cable designs for this application, instead of developing a dedicated solution for the rigors of data transmission. The traditional approach can work in some cases. Yet, the shortcomings become evident when one or more components in the target system change, causing issues in the cord, ranging from malfunction to unreliability. Historically, it has been difficult to create coiled data cables compliant with standards, especially after numerous flexing cycles.

Potential Applications for Coil Cords

Although there are recognized problems for coil cord use outside of charging and connector-based applications, there are many uses where a coil cord is preferable.

- Workbench devices
- Diagnostics (automotive)
- Reel replacement cable
- Medical handheld devices
- Telescoping pole design
- Mobile signage

Data cords abound, but coil data cords that are reliable and meet existing standards have been missing from the scene – until now.

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- Machinery
- Industrial
- Test and measurement equipment
- Applications with space constraints
- Assemblers and assembly houses (for end applications)

All of these applications can benefit from a cord that extends and then neatly recoils itself. Unfortunately, there was no legitimate CAT 5e coil cord on the market, with legitimacy determined by conforming to standards. Data cords abound, but coil data cords that are reliable and meet existing standards have been missing from the scene – until now.

TIA Standards

TIA-568 is one of the most commonly used standard sets in this industry. These address commercial building cabling for telecom products and services, enabling the design and implementation of commercial-structured cabling systems.

At fast data rates, cords affect performance, error rates and channel throughput. Nearly 15 years ago, the Telecommunications Industry Association (TIA) issued the industry’s first patch cord test procedure (TIA/EIA-568-B.2-1, Annex J). The costly procedure was based on a network analyzer, complex fixturing and highly trained personnel. Patch cord assembly suppliers seldom invested in the equipment or staff necessary for proper testing and it was unlikely that their customers would test the cords as well. The result of the lack of testing is seen when open-market CAT 5e and 6 patch cords were finally tested, proving that 70% fail to meet the TIA’s performance requirements.

The availability of a simple, accurate and cost-effective cord test has changed the playing field and forced the patch cord market, including those claiming coil cord specifications, to become honest. Now, cord manufacturers can easily test and verify performance, the market can finally demand it and crucially, it is verifiable by installers and users.

When considering entering the data coiled cord market segment, Quabbin Wire and Cable questioned the quality, consistency and reliability of data cords currently on the market, and the new test ability allowed quick and accurate cord evaluation.

Quabbin Wire & Cable sought and developed a data-specific coiled cable from the product’s inception. The design targets purchasers and specifiers of handheld devices, users of cable-on-a-reel or other retractable cable devices and any industrial customer with space constraints, as well as cable assemblers and assembly houses. Most importantly, Quabbin innovated the only coil data cord on the market that is TIA-568B compliant.

A Unique Solution

Quabbin, a specialist in stranded copper data cables, created unique coiled cord products within that specialty. Quabbin coil cord is configured in a certain way so applications will

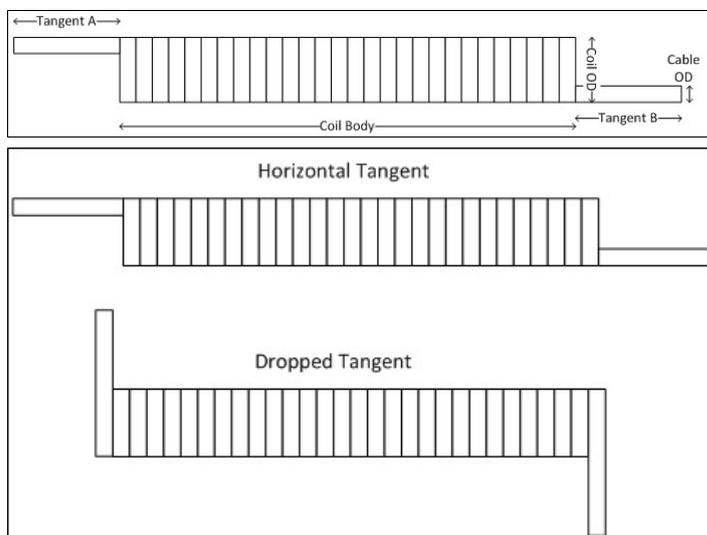
dictate how tightly wound the coil will be.

The following matrix is designed to assist engineers in establishing their requirements as to:

- Coil body length
- Stretch ratio
- Horizontal and dropped tangents
- Mandrel size
- Jacket material

Matrix

Mandrel (in)	Coil body length, contracted (ft)	Stretch ratio (max/contracted)	Jacket Material
3/8, 7/16, 1/2, 5/8, 3/4, 1	.05 ft to 8 ft	12 * (Mandrel OD in) - 1.5	TPU, ZHAL TPU



Important factors include:

- Coil body length: The portion of the cable that is self-wound. This length represents the cable retracted and is not inclusive of the tangents or straight-end sections.
- Stretch ratio: The stretch ratio provides users a scale factor to determine the extended length based on the coil body length.
- Horizontal and dropped tangents: Tangents, the non-coiled ends of the cable, are customizable and direction can be established by the user.
 - o Tangents that point upwards or downwards are called dropped tangents.
 - o Tangents that point straight from the coil body, without an upward or downward angle, are horizontal tangents.
- Mandrel size: The coils are formed by wrapping the bulk cable around a mandrel. The diameter of this mandrel determines the stretch ratio, the elastic deformation return characteristics and the coil OD.
- Electrical performance: Return loss and near-end crosstalk (NEXT) are critical electrical parameters that characterize the cord’s performance. The TIA sets standards that establish the maximum return loss and

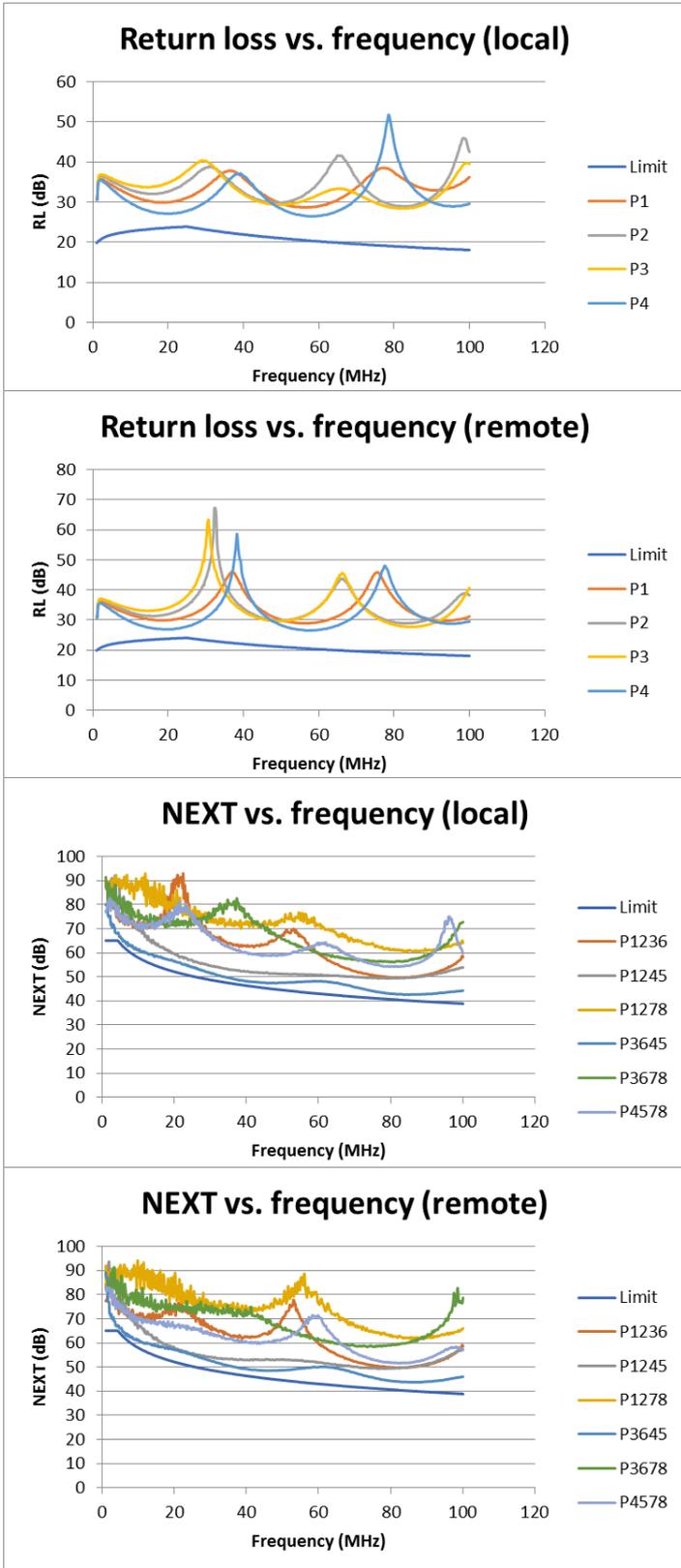
NEXT based on different cord lengths. The coil cord should meet the Cat 5e cord assembly specification.

- The 3/8 in, 5/8 in and 7/8 in mandrel sizes represent standards-compliant Quabbin capabilities at the current time (see cord data plots below).

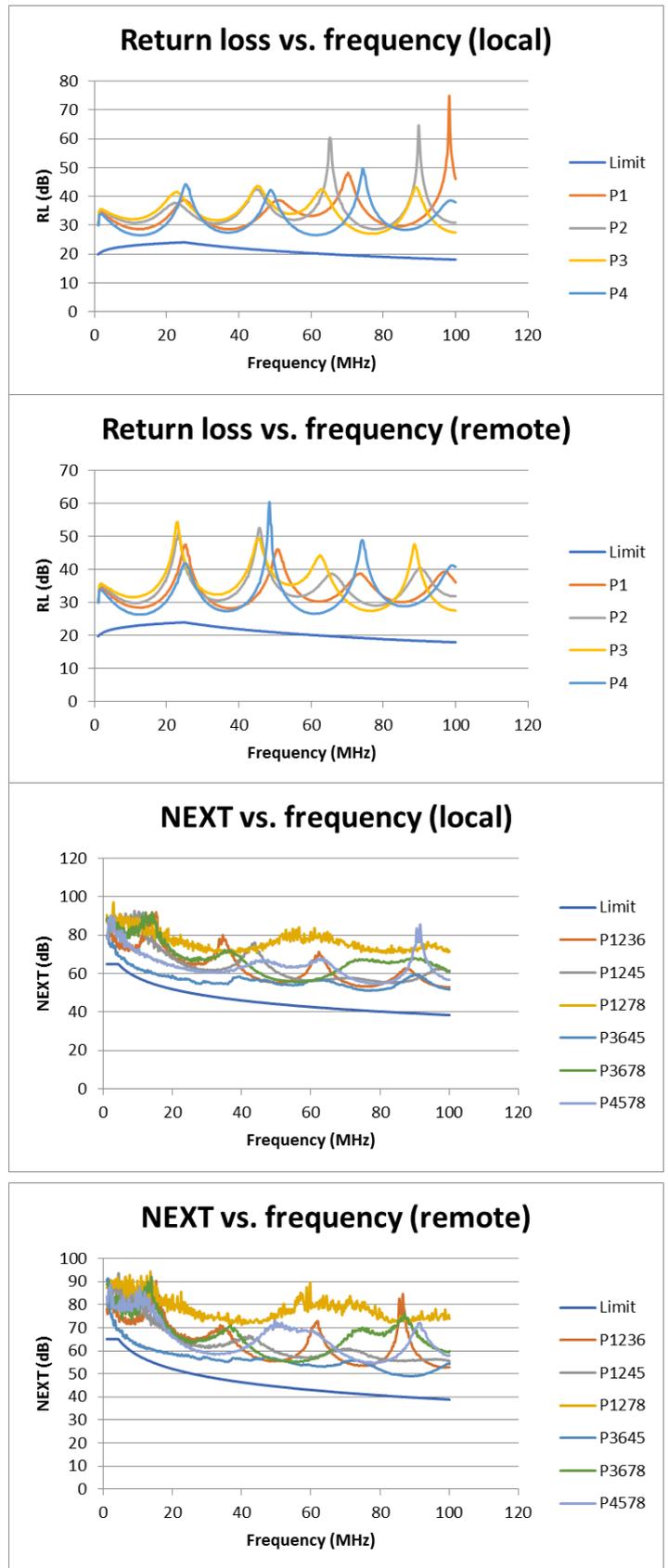
Quabbin Coiled Cord Data Plots

The following plots show that Quabbin coiled cables comply with the TIA standard:

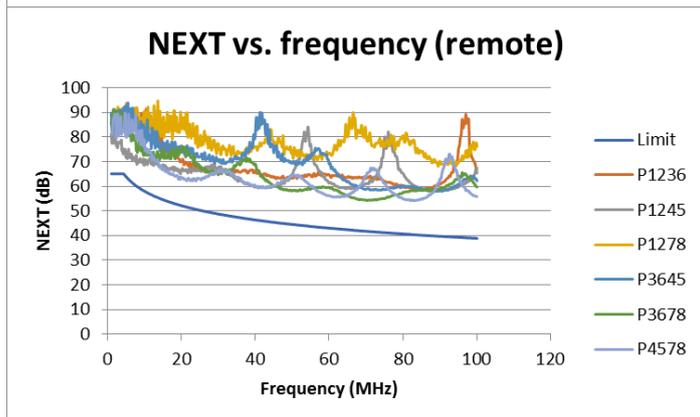
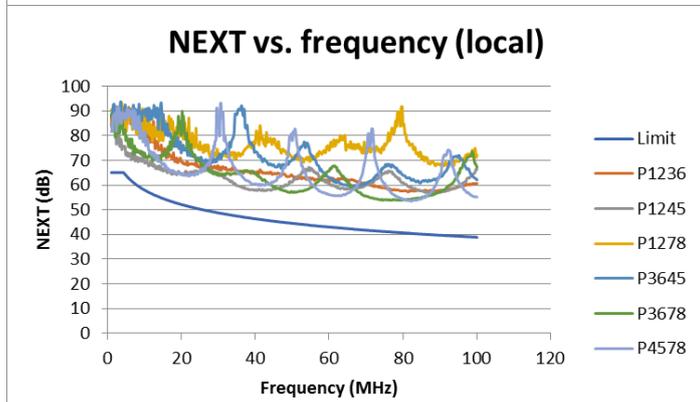
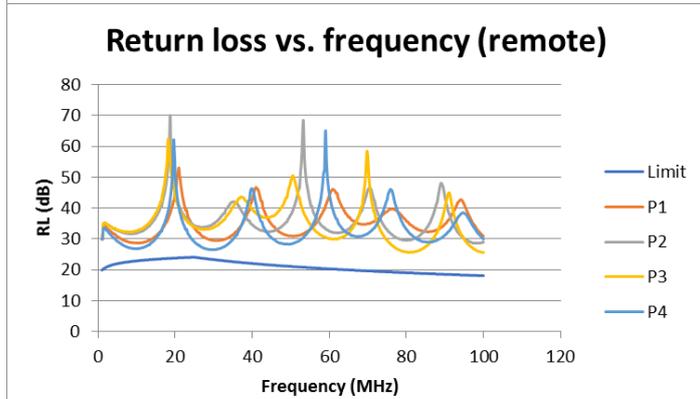
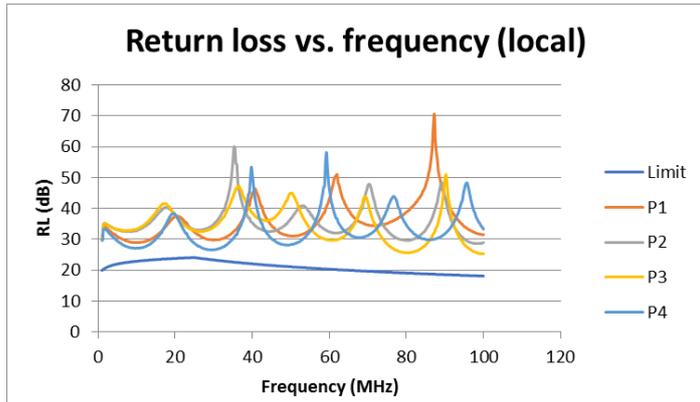
3/8 in Unshielded Cord



5/8 in Unshielded Cord



7/8 in Unshielded Cord



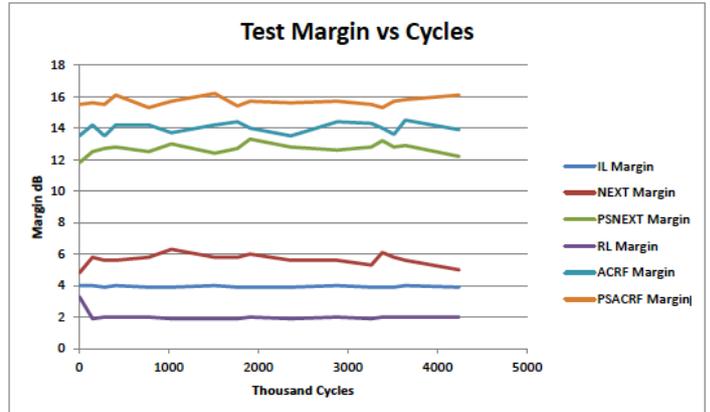
Quabbin Coiled Cord Data Plots

A recent [test report](#) proves that standards compliance focuses on the destructive forces induced on a coil cord, which exposed it to continuous extension and contraction over a period. The goal of the test is to determine the breaking point, where the cables no longer meet the electrical performance specifications or are mechanically compromised.

R&D0606 Coil Cord Flex Test:

4PR, 26AWG 7/34, TPU jacket

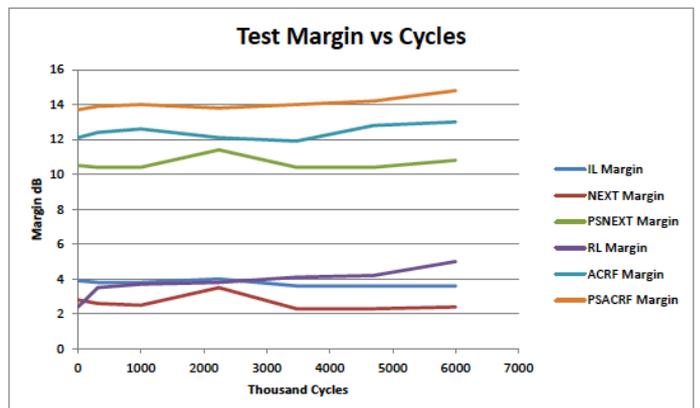
	0.5 million cycles	4 million cycles
Jacket wear	None	None
Conductor Failure	None	None
Electrical Testing	Pass	Pass



R&D0618 Coil Cord Flex Test:

4PR, 26AWG 7/34, Shielded, ZHAL TPU Jacket

	0.5 million cycles	6 million cycles	7.2 million cycles
Jacket wear	None	None	Yes
Conductor Failure	None	None	Yes
Electrical Testing	Pass	Pass	Fail



Quabbin is currently the only vendor able to provide test results that prove standards compliance. The Quabbin unshielded, TPU-jacketed cable passed electrical tests to a minimum of four million cycles. In comparison, the shielded, zero-halogen, TPU-jacketed cable passed electrical tests to six million cycles before the jacket cracked and the primes were damaged. The cables also had little to no deformation or sagging after the flex testing.

When installing these types of data cords, it is important to minimize stress concentration areas that can lead to electrical and mechanical failures.

The Future

Given the unreliability of coiled data cables, the marketplace has understandably avoided them. However, Quabbin's vast design experience and expertise, especially in bend radius, is providing a variety of standards-compliant coiled cable versions to meet market demands. Quabbin is also able to customize versions of its coiled cables to meet the demands of specific customers.

The innovation that resulted in Quabbin's unique cables raises the proverbial bar. Customers can demand data cords that endure the extra stretching and contracting without interfering with the quality or function of the cord itself.

Quabbin's coiled data cables are specifically designed to be coiled rather than repurposing existing cable for use in data applications. The company expects to rapidly expand its data coiled cable line based on the needs of customers and assemblers and assembly houses.

For more information on Quabbin's data coil cord options, and testing information, visit [Quabbin Wire & Cable](#).

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ABOUT QUABBIN WIRE & CABLE CO.

At Quabbin, the focus is on being the best we can be and manufacturing the best products on the market — not just compliant, better than compliant. That's who we are; the desire to produce world beating products is our foundation. After that it comes down to holding tighter tolerances in the manufacturing facility and we do it consistently.

We do this by having two dedicated plants, one designed to run Ethernet only, while the other is designated for General Purpose cable. This allows our operators to maximize efficiency and perfect every cable that is being made.

Designing and producing the cable is only half of the equation. Every employee from Engineering to Shipping works in unison to deliver the best cable for your application needs. We don't stop there — need assistance finding a connector or getting UL certification information? Quabbin's Inside Sales Representatives are a phone call away and can help you find the answers to your questions.