Belden

Technical Papers

Conduit and MediaTwist™

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ABSTRACT

This white paper deals with using MediaTwist in conduit. As MediaTwist is not round but crescent-shaped, this has led to some confusion about conduit fill percentages and determining the space available for other non-MediaTwist Cables.

MEDIATWIST AREA

As this concerns conduit, no plenum-rated cables were considered and only non-plenum cables are mentioned below. Since MediaTwist is not circular, the area cannot be determined by standard geometry. The area of a single four-pair non-plenum MediaTwist cable is 0.0441 square inches. This leads to standard conduit fill in the following chart:

MediaTwist Area and Conduit Fill							
Conduit Size	Equivalent Square Inches	30% fill	Number of MediaTwist Cables	40% fill	Number of MediaTwist Cables	50% fill	Number of MediaTwist Cables
2	.304	.101	2	**.122**	**2**	.152	3
:	.533	.16	3	**.213**	**4**	.267	6
1	.864	.259	5	**.346**	**7**	.432	9
13	1.496	.449	10	**.598**	**13**	.748	16
1 2	2.036	.611	13	**.814**	**18**	1.02	23
2	3.356	1.01	22	**1.34**	**30**	1.68	38
2 2	5.858	1.76	39	**2.34**	**53**	2.93	66
3	8.846	2.65	60	**3.54**	**80**	4.42	100
3 2	11.545	3.46	78	**4.62**	**112**	5.77	130
4	14.753	4.43	100	**5.09**	**133**	7.38	167

MIX AND MATCH

Combining MediaTwist with other cables is not as difficult as one might imagine. You simply have to determine the area of the conduit and add up the area of every cable. Here's an example from an actual construction site.

THE PROBLEM: The contractor was wiring up a hotel. He wanted to run eight 4-pair MediaTwist and he wanted to know what other UTP data/phone cable he could run with it. He was limited to 40% fill of a 1 ¼" conduit. 16 MediaTwists would be .706 fill or 47%, so he couldn't run all MediaTwist. He had to run at least two pair to the same eight destination, meaning he wanted to add eight 2-pair or eight 4-pair cables to the eight MediaTwist cables.

Here's how it ended up:

1 ¼" conduit = 1.5 sq. inches.

40% fill = 0.598 sq. inches

8 MediaTwists = 8 X .0441 = .352 sq. inches

Space remaining = .246 sq. inches.

Possible cables are listed below. Information in the first four columns is available from the Belden catalog. The fifth column can be determined by using the "$\pi\ r_2$" formula or by taking the O.D., multiplying it by itself and then by 0.7854 which will give you the area .

Below are some typical cables with the area of each. The last column is the area in the previous column multiplied by eight. In our example, where the space remaining is .246 sq. in., any total in the last column past .246 exceeds 40% fill.

Type	Belden Part #	Pairs	O.D.	Cable Area	8 X cable area
Category 3	1227A1	2-pair	.140	.0154	.112
Category 3	1229A1	4-pair	.170	.0227	.182
Category 5	1588A	2-pair	.183	.0263	.210
Category 5	1583A	4-pair	.214	.036	.288
DataTwist 350	1700A	4-pair	.200	.0314	.251

The last two cables do not pass the .246 area which remains. However, the contractor ended up using DataTwist 350. The total fill was .352 (8 MediaTwist) plus .251 (8 DataTwist 350) for a total of .603 square inches. This gave a conduit fill of .603/1.496 = 40.3%, so close to 40 % that it could be ignored. The contractor "future-proofed" the installation. If he had installed Category 3, it would not perform much past 10baseT or similar performance. DataTwist 350 opened up his "low quality" portion to future upgrades without the need for rewiring.

NEC CONSIDERATIONS

There has been considerable discussion about the shape of MediaTwist and the NEC regarding its shape. In the NEC Code book Chapter 9, Table 1 (Page 70-879), Note 5 states:

> For conductors not included in Chapter 9, such as multiconductor, the actual dimension shall be used.

Further, in Note 9, it states

> A multiconductor cable of two or more conductors, shall be treated as a single conductor for calculating percentage of conduit fill area. For cables

that have elliptical cross sections, the cross-sectional area calculation shall be based on using the major diameter of the ellipse as a circle diameter.

Since MediaTwist is not an ellipse, but rather a crescent, it is our belief that Note 9 does not apply and Note 5 applies instead. So the stated cross-sectional area of MediaTwist (0.0441 sq. in.) can be used for conduit fill calculations.

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