

# AES/EBU Digital Audio Cable

## Overview



While digital audio has been around for over 25 years, only recently has there been an effort to standardize specifications. The Audio Engineering Society (U.S.) and the European Broadcast Union have established an international standard, called AES/EBU. The detailed specifications of this standard are:

**Sampling Rate:** from 32 KHz to 192 KHz  
**Bandwidth:** from 4.096 MHz to 24.5 MHz  
**Impedance:** 110Ω ± 20%

The key difference between twisted pair specifications for digital audio cable and standard analog audio cable is the impedance specification.

AES/EBU, with its broad tolerance, allows cables with impedances from 88 ohms to 132 ohms to be used. Standard analog audio cable impedance is 45 ohms to 70 ohms. This potential amount of mismatch can result in signal reflections and jitter, causing bit errors at the receiver. For this reason Belden recommends 100 to 120 ohm shielded twisted pair cable.

## Product Characteristics

Belden's product offering includes 110 ohm cable solutions and an entire line of single and multi-pair snake cable designed specifically for digital audio. These cables utilize Datalene® premium grade high density insulation. This provides exceptional crush resistance as compared to standard foam polyethylenes, making the new cables less susceptible to damage resulting from cable pulling or flexing. The high velocity of propagation further reduces capacitance and signal delay providing error-free transmissions over extended distances.

Belden's "Super Flexible" digital patch cable, part no. 1800F, utilizes Belden's patented "French Braid" shield technology and a special jacket compound formulation to provide the ultimate in flexibility and performance.

## Digital Audio Attenuation

Part Number	2 MHz		4 MHz		5 MHz		6 MHz		12 MHz		25 MHz	
	dB/100 Ft.	dB/100m	dB/100 Ft.	dB/100m	dB/100 Ft.	dB/100m	dB/100 Ft.	dB/100m	dB/100 Ft.	dB/100m	dB/100 Ft.	dB/100m
<b>9180, 7880A Series</b>	1.67	5.48	2.11	6.92	2.30	7.55	2.46	8.07	3.16	10.37	4.22	13.85
<b>1800F</b>	1.28	4.20	2.17	7.12	2.62	8.60	3.01	9.88	4.72	15.49	7.17	23.52
<b>1800B, 1801B, 1802B, 1803F Series</b>	1.30	4.27	1.56	5.12	1.70	5.58	1.81	5.94	2.28	7.48	3.08	10.10
<b>1696A</b>	.93	3.05	1.15	3.77	1.20	3.94	1.30	4.27	1.60	5.25	1.97	6.46
<b>179DT (coax)</b>	1.34	4.40	1.67	5.48	1.74	5.71	1.99	6.53	2.77	9.09	3.83	12.57
<b>1855A (coax)</b>	.57	1.86	.82	2.70	.92	3.02	1.00	3.29	1.30	4.27	1.80	5.91
<b>1505A (coax)</b>	.41	1.35	.58	1.89	.63	2.07	.69	2.25	.90	2.95	1.30	4.27
<b>1505F (coax)</b>	.34	1.11	.53	1.74	.60	1.97	.67	2.20	.98	3.22	1.44	4.72
<b>1694A (coax)</b>	.16	.52	.48	1.57	.54	1.77	.59	1.93	.80	2.62	1.00	3.28

Values reflect typical results.

## Maximum Recommended Transmission Distance at Digital Audio Data Rates (AES3-2003)\*

Part Number	2 MHz		4 MHz		5 MHz		6 MHz		12 MHz		25 MHz	
	Ft.	m	Ft.	m	Ft.	m	Ft.	m	Ft.	m	Ft.	m
<b>9180, 7880A Series</b>	1198	365	948	289	870	265	813	248	633	193	474	144
<b>7731A Series</b>	8889	2709	6349	1935	5882	1793	5479	1670	3774	1150	2817	859
<b>1800F</b>	1563	476	922	281	763	233	664	203	424	129	279	85
<b>1800B, 1801B, 1802B, 1803F Series</b>	1538	469	1282	391	1176	359	1105	337	877	267	649	198
<b>1696A</b>	2151	655	1739	530	1667	508	1538	469	1250	381	1015	309
<b>179DT (AES3)†♦</b>	1493	455	1198	365	1149	350	1005	306	722	220	522	159
<b>(AES-3id)††</b>	597	182	479	146	460	140	402	123	289	88	209	64
<b>1855A (AES3)†♦</b>	3521	1073	2427	740	2174	663	1992	607	1538	469	1111	339
<b>(AES-3id)††</b>	1408	429	970	295	869	265	796	242	615	188	444	135
<b>1505A (AES3)†♦</b>	4866	1483	3478	1060	3175	968	2911	887	2222	677	1538	469
<b>(AES-3id)††</b>	1946	593	1391	424	1270	387	1164	355	888	270	615	188
<b>1505F (AES3)†♦</b>	5882	1793	3774	1150	3333	1016	2985	910	2041	622	1389	423
<b>(AES-3id)††</b>	2353	717	1509	460	1333	406	1194	364	816	249	556	169
<b>1694A (AES3)†♦</b>	5882	1793	4184	1275	3704	1129	3407	1039	2500	762	2000	610
<b>(AES-3id)††</b>	2353	717	1673	510	1482	452	1363	416	1000	305	800	244

\* Longer transmission distances are achievable but are contingent upon system component quality of input/output voltages.

† Transmission distance calculations assume minimum allowable output signal amplitude (2V per AES3-2003) and minimum allowable input signal amplitude (200mV per AES3-2003).

†† Per AES-3id-2001, when using analog video distribution equipment to implement AES-3id, maximum transmission distances are 40% of AES3 values assuming a minimum allowable output signal amplitude of 1V and a minimum allowable input signal amplitude of 320mV.

♦ Implementation of AES3 with coaxial cable and 110-75Ω baluns can be achieved with transmission distances of 91% of the AES3 coaxial distances listed above.