

Speaker Wire and Cable

Overview



Electrolytic Tough Pitch (ETP) High-conductivity Copper Speaker Cables

Speaker cables are used to connect receivers or power amplifiers to speakers and are also used for the internal wiring of the speakers themselves.

High-conductivity Copper

All Belden® speaker cables utilize only high-conductivity copper produced by a process called Electrolytic Tough Pitch. This refining process produces a conductor that is 99.95% pure copper resulting in high-conductivity per ASTM B115. The high purity obtained from ETP copper results in audio cable performance that is comparable to that of oxygen-free copper cables.

Gage Selection

Because the impedance of the loud-speaker is quite low (typically 3 to 10 ohms) much of the power conducted through the cable is carried in the current domain which is affected by conductor resistance. The resistance of the cable between the speaker and the amplifier turns some of the amplifier's power into heat and does not get to the speaker.

The feedback from the speaker is altered by the cable. This feedback is used by the amplifier to correct the speaker's non-linearity. It is measured as the Damping factor by amplifier designers and is called "Servoing" by the Hi-Fi community.

In general, the higher the cable resistance, the lower the power level getting to the speaker, resulting in "sloppier" speaker performance due to damping.

Ultimately, the system designer must decide how to compromise system performance against system cost. In general, one of the least expensive ways to squeeze more and better performance out of the system hardware is to use larger speaker cables and cut your losses where they occur rather than try to "Band-Aid" the system later with equalization or more power.

The Cable Selection Guide can aid in determining the proper gage selection depending on the speaker impedance, acceptable power loss and cable run length.

Speaker Cable Selection Guide

AWG	4Ω Speaker			8Ω Speaker			70V Speaker*		
	Power (%) / Loss (dB/Ft.)								
	11% .5	21% 1.0	50% 3.0	11% .5	21% 1.0	50% 3.0	11% .5	21% 1.0	50% 3.0
12	140	305	1150	285	610	2285	6920	14890	56000
14	90	195	740	185	395	1480	4490	9650	36300
16	60	125	470	115	250	935	2840	6100	22950
18	40	90	340	85	190	685	2070	4450	16720
20	25	50	195	50	105	390	1170	2520	9500
22	15	35	135	35	70	275	820	1770	6650
24	10	25	85	20	45	170	520	1120	4210

The number of feet of cable you can run for a given loss and performance budget.

How to Use the Guide

Step One	Select the appropriate speaker impedance column.
Step Two	Select the appropriate power loss column deemed to be acceptable.
Step Three	Select the applicable wire gage size and follow the row over to the columns determined in steps one and two. The number listed is the maximum cable run length.
Example	The maximum run for 12 AWG in a 4 Ohm speaker system with 11% or .5 dB loss is 140 ft.

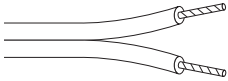
*70 volt line drive systems, while considered a potential for Hi-Fi performance, follow the same cable loss physics as the higher current (lower impedance) system. For the sake of this calculation a 25 watt 70 volts system (196Ω) was used.

Speaker Wire and CableElectrolytic Tough Pitch (ETP) High-Conductivity Copper Speaker Cables
Parallel Zip Constructions

Description	Part No.	UL NEC/ C(UL) CEC Type	No. of Cond.	Standard Lengths		Standard Unit Weight		Insulation Thickness		Nominal OD	
				Ft.	m	Lbs.	kg	Inch	mm	Inch	mm

24 AWG Stranded (7x32) ETP High-conductivity Copper Conductors • Parallel: (1) Tinned, (1) Bare**PVC Insulation** (Available in Clear, White, Brown or Chrome)

300V 60°C (Clear)	8782	—	2	U-1000 [▲]	U-304.8	7.0	3.2	.017	.43	.058	1.47
300V 75°C (Chrome, Brown, White)				1000 [◆]	304.8	6.0	2.7			x	x
										.116	2.95



▲U-1000 ft. put-up available in Brown or Chrome only.

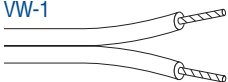
◆1000 ft. put-up available in White or Clear only.

22 AWG Stranded (7x30) ETP High-conductivity Copper Conductors • Parallel: (1) Tinned, (1) Bare**Clear PVC Insulation**

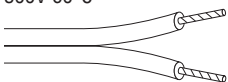
300V 60°C	9712	—	2	1000	304.8	9.0	4.1	.017	.43	.065	1.65
										x	x
										.130	3.30

**20 AWG** Stranded (7x28) ETP High-conductivity Copper Conductors • Parallel: (1) Tinned, (1) Bare**Clear or Chrome PVC Insulation**

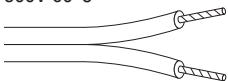
300V 60°C (Clear)	8649	—	2	1000	304.8	12.0	5.5	.018	.46	.073	1.85
300V 75°C (Chrome)										x	x
VW-1										.146	3.71

**18 AWG** Stranded (16x30) ETP High-conductivity Copper Conductors • Parallel: (1) Tinned, (1) Bare**Clear PVC Insulation**

300V 60°C	9708	—	2	U-500	U-152.4	11.0	5.0	.032	.81	.110	2.79
				500	152.4	10.5	4.8			x	x
				U-1000	U-304.8	21.0	9.5			.220	5.59
				1000	304.8	21.0	9.5				

**16 AWG** Stranded (26x30) ETP High-conductivity Copper Conductors • Parallel: (1) Tinned, (1) Bare**Clear PVC Insulation**

300V 60°C	9716	—	2	U-1000	U-304.8	27.0	12.2	.027	.69	.115	2.92
				1000	304.8	26.0	11.8			x	x
										.230	5.84

**14 AWG** Stranded (19x27) ETP High-conductivity Copper Conductors • Parallel: (1) Tinned, (1) Bare**Clear PVC Insulation**

300V 60°C	9717	—	2	U-1000	U-304.8	42.0	19.1	.035	.89	.146	3.71
				1000	304.8	42.0	19.1			x	x
										.292	7.42

**12 AWG** Stranded (65x30) ETP High-conductivity Copper Conductors • Parallel: (1) Tinned, (1) Bare**Clear PVC Insulation**

300V 60°C	9718	—	2	500	152.4	33.0	15.0	.045	1.14	.185	4.70
				1000	304.8	66.0	30.0			x	x
										.370	9.40



Speaker Wire and Cable

Electrolytic Tough Pitch (ETP) High-Conductivity Copper Speaker Cables
Open Twisted Construction



Description	Part No.	UL NEC/ C(UL) CEC Type	No. of Cond.	Standard Lengths		Standard Unit Weight		Insulation Thickness		Nominal OD	
				Ft.	m	Lbs.	kg	Inch	mm	Inch	mm

22 AWG Stranded (7x30) ETP High-conductivity Copper Conductors • Cabled: (1) Tinned, (1) Bare

PVC Insulation • (Color Code: White)

UL Listed. Wires Misc. 90V 90°C VW-1	9151	—	2	U-1000	U-304.8	7.0	3.2	.012	.30	.108	2.74
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18 AWG Stranded (7x26) ETP High-conductivity Tinned Copper Conductors • Cabled

PVC Insulation • (Color Code: Black, Natural)

UL AWM Style 1007 (300V 80°C) VW-1	8460	—	2	U-1000 1000	U-304.8 304.8	18.0	8.2	.020	.51	.180	4.57
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18 AWG Stranded (19x30) ETP High-conductivity Bare Copper Conductors • Cabled

Plenum • Flamarrest® Insulation • (Color Code: Black, Natural)

75°C	1863A	NEC: CL2P	2	1000	304.8	19.0	8.6	.022	.56	.178	4.52
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16 AWG Stranded (19x29) ETP High-conductivity Tinned Copper Conductors • Cabled

PVC Insulation • (Color Code: Black & Natural for 8470; Black & Orange for 9497)

UL AWM Style 1007 (300V 80°C) VW-1	8470	—	2	500 U-1000	152.4 U-304.8	13.0	5.9	.023	.58	.210	5.33
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	9497	—	2	1000	304.8	30.0	13.6	.023	.58	.210	5.33
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16 AWG Stranded (19x29) ETP High-conductivity Bare Copper Conductors • Cabled

Plenum • Flamarrest Insulation • (Color Code: Black, Natural)

75°C	1862A	NEC: CL2P	2	1000	304.8	26.0	11.8	.022	.56	.202	5.13
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Speaker Wire and Cable

Electrolytic Tough Pitch (ETP) High-Conductivity Copper Speaker Cables
Open Twisted Construction



Description	Part No.	UL NEC/ C(UL) CEC Type	No. of Cond.	Standard Lengths		Standard Unit Weight		Insulation Thickness		Nominal OD	
				Ft.	m	Lbs.	kg	Inch	mm	Inch	mm

14 AWG Stranded (19x27) ETP High-conductivity Bare Copper Conductors • Cabled

Plenum • Flamarrest® Insulation • (Color Code: Black, Natural)

150V RMS 75°C,	1861A	NEC: CL2P	2	1000	304.8	36.0	16.3	.022	.56	.236	5.99
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12 AWG Stranded (19x25) ETP High-conductivity Bare Copper Conductors • Cabled

Plenum • Flamarrest Insulation • (Color Code: Black, Natural)


150V RMS 75°C,	1860A	NEC: CL2P	2	1000	304.8	58.0	26.4	.022	.56	.270	6.86
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Speaker Wire and CableElectrolytic Tough Pitch (ETP) High-Conductivity Copper Speaker Cables
Twisted Jacketed Construction


Description	Part No.	UL NEC/ C(UL) CEC Type	No. of Cond.	Color Code	Standard Lengths		Standard Unit Weight		Insulation Thickness		Jacket Thickness		Nominal OD	
					Ft.	m	Lbs.	kg	Inch	mm	Inch	mm	Inch	mm

22 AWG Stranded (7x30) Tinned Copper Conductors • Conductors Cabled**PVC Insulation • Chrome PVC Jacket**


300V RMS 60°C	8442	NEC:	2	Black,	100	30.5	2.4	1.0	.015	.38	.025	.64	.170	4.32
		CMG:		Red	U-500	U-152.4	7.5	3.4						
		CEC:			500	152.4	7.5	3.4						
		CMG FT4			U-1000	U-304.8	15.0	6.8						
					1000	304.8	15.0	6.8						
					10000	3048.0	150.0	68.2						

For Plenum versions of 8442, see 88442 or 82442.


20 AWG Stranded (7x28) Tinned Copper Conductors • Twisted Pair**PVC Insulation • Chrome PVC Jacket**

300V RMS 80°C	8205	NEC:	2	Black,	100	30.5	2.6	1.2	.013	.33	.025	.64	.180	4.57
		CMG:		Red	U-500	U-152.4	9.0	4.1						
		CEC:			500	152.4	9.0	4.1						
		CMG FT4			U-1000	U-304.8	17.0	7.7						
					1000	304.8	18.0	8.2						


18 AWG Stranded (7x26) Tinned Copper Conductors • Twisted Pair**PVC Insulation • Chrome PVC Jacket**

300V RMS 80°C	8461	NEC:	2	Black,	100	30.5	3.2	1.4	.022	.56	.028	.71	.234	5.94
		CMG:		White	U-500	U-152.4	13.5	6.1						
		CEC:			500	152.4	13.5	6.1						
		CMG FT4			U-1000	U-304.8	26.0	11.8						
					1000	304.8	27.0	12.2						

16 AWG Stranded (19x29) Tinned Copper Conductors • Twisted Pair**PVC Insulation • Chrome PVC Jacket**


UL AWM Style 2598 (300V 60°C) (80°C non-UL)	8471	NEC:	2	Black,	U-500	U-152.4	20.0	9.1	.023	.58	.032	.81	.274	6.96
		CMG:		White	500	152.4	20.0	9.1						
		CEC:			U-1000	U-304.8	38.0	17.2						
		CMG FT4			1000	304.8	40.0	18.2						

14 AWG Stranded (42x30) Tinned Copper Conductors • Twisted Pair**PVC Insulation • Chrome PVC Jacket**

UL AWM Style 2587 (600V 90°C)	8473	NEC:	2	Black,	U-500	U-152.4	29.0	13.2	.031	.79	.032	.81	.340	8.64
		CL3		White	500	152.4	30.5	13.9						
		CEC:			1000	304.8	58.0	26.4						
		FAS 90 FT4												

See NEC Guidelines for applicable CL3 voltage ratings (300V RMS).

12 AWG Stranded (65x30) Tinned Copper Conductors • Twisted Pair**PVC Insulation • Chrome PVC Jacket**

UL AWM Style 2587 (600V 90°C)	8477	NEC:	2	Black,	U-500	U-152.4	41.5	18.8	.032	.81	.035	.89	.386	9.80
		CL3R		White	500	152.4	43.5	19.7						
					1000	304.8	85.0	38.6						

See NEC Guidelines for applicable CL3 voltage ratings (300V RMS).

Speaker Wire and Cable

Low-Capacitance Oxygen-Free, High-Conductivity (OFHC) Speaker Cable
Twisted Jacketed Construction




Description	Part No.	UL NEC/ C(UL) CEC Type	No. of Cond.	Standard Lengths		Standard Unit Weight		Insulation Thickness		Jacket Thickness		Nominal OD		Nominal Capacitance*	
				Ft.	m	Lbs.	kg	Inch	mm	Inch	mm	Inch	mm	pF/Ft.	pF/m

Low Cap • 16 AWG Stranded (65x34) Oxygen-free High-Conductivity Bare Copper Conductors • Conductors Cabled • Unshielded

Polyolefin Insulation • PVC Jacket (Available in Black, White, Gray, Blue or Green)

	1307A new	NEC: CMR, CL3R CEC: CMG FT4	2	U-500 1000†	U-152.4 304.8	15.0 29.0	6.8 13.2	.013	.32	.022	.56	.210	5.33	19.9	65.3
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Suitable for Direct Burial applications. White and Black jackets are Sunlight-resistant.

	1308A new	NEC: CMR, CL3R CEC: CMG FT4	4	U-500 1000†	U-152.4 304.8	26.5 54.0	12.0 24.5	.013	.32	.026	.66	.270	6.86	19.9	65.3
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Suitable for Direct Burial applications. White and Black jackets are Sunlight-resistant.

Low Cap • 14 AWG Stranded (105x34) Oxygen-free High-Conductivity Bare Copper Conductors • Conductors Cabled • Unshielded

Polyolefin Insulation • PVC Jacket (Available in Black, White, Gray, Blue or Green)

	1309A new	NEC: CMR, CL3R CEC: CMG FT4	2	U-500 1000†	U-152.4 304.8	22.5 46.0	10.2 20.9	.016	.39	.027	.69	.264	6.71	20.5	67.3
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Suitable for Direct Burial applications. White and Black jackets are Sunlight-resistant.

	1310A new	NEC: CMR, CL3R CEC: CMG FT4	4	U-500 1000†	U-152.4 304.8	41.5 84.0	18.8 38.1	.016	.39	.033	.94	.319	8.10	20.5	67.3
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Suitable for Direct Burial applications. White and Black jackets are Sunlight-resistant.

Low Cap • 12 AWG Stranded (168x34) Oxygen-free High-Conductivity Bare Copper Conductors • Conductors Cabled • Unshielded

Polyolefin Insulation • PVC Jacket (Available in Black, White or Gray)

	1311A new	NEC: CMR, CL3R CEC: CMG FT4	2	U-500 500 1000†	U-152.4 152.4 304.8	36.5 36.5 74.0	16.6 16.6 33.6	.018	.46	.036	.91	.352	8.94	22.3	73.2
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Suitable for Direct Burial applications. White and Black jackets are Sunlight-resistant.

	1312A new	NEC: CMR, CL3R CEC: CMG FT4	4	500 1000†	152.4 304.8	66.5 132.0	30.2 59.9	.018	.46	.043	1.09	.423	10.74	22.3	73.2
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Suitable for Direct Burial applications. White and Black jackets are Sunlight-resistant.

Low Cap • 10 AWG Stranded (259x34) Oxygen-free High-Conductivity Bare Copper Conductors • Conductors Cabled

Polyolefin Insulation • PVC Jacket (Available in Black, White or Gray)

	1313A new	NEC: CMR, CL3R CEC: CMG FT4	2	500 1000†	152.4 304.8	55.0 109.0	25.0 49.5	.019	.48	.044	1.12	.428	10.87	23.2	76.1
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Suitable for Direct Burial applications. White and Black jackets are Sunlight-resistant.

OFHC = Oxygen-Free High-Conductivity

*Capacitance between conductors.

†1000 ft. put-ups not available in Blue or Green.

Color Code Chart

Cond.	Color
1	Black
2	Red
3	White
4	Green