

# 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.

**AES/EBU Digital Audio Cable**

Single- and Double-Pair Cables



Description	Part No.	UL NEC/ C(UL) CEC Type	No. of Pairs	Color Code	Standard Lengths		Standard Unit Weight		Nom. DCR		Nominal OD		Nom. Imp. (Ω)	Nom. Vel. of Prop.	Nom. Capacitance			
					Ft.	m	Lbs.	kg	Cond.	Shield	Inch	mm			* pF/ Ft.	* pF/ m	** pF/ Ft.	** pF/ m

**110 Ohm • 26 AWG** Stranded (7x34) .018" TC Conductors • Twisted Pair • Beldfoil® Shield (100% Coverage) • 26 AWG Stranded TC Drain Wire**Datalene® Insulation • Chrome or Purple PVC Jacket**

2-Conductor Digital Video Time Code Cable 75°C	<b>9180</b>	NEC: CMR CEC: CMG FT4	1	Black, White	1000	304.8	10.0	4.5	37.3Ω/M'	23.1Ω/M'	.144	3.66	110	76%	13	43	26	85
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Shorting Fold

For cross-connect use with 7891A (et al.)  
Digital Audio Snake Cables, see page 19.28.**24 AWG** Stranded (7x32) Tinned Copper Conductors • Twisted Pairs • Overall Beldfoil Shield (100% Coverage) • 24 AWG Drain Wire**Datalene Insulation • Gray or Purple PVC Jacket**

60°C	<b>1800B</b>	NEC: CMG CEC: CMG FT4	1	Black, Red	500*	152.4	8.0	3.6	23.7Ω/M'	18.9Ω/M'	.177	4.57	110	76%	12	39	26	85
					U-1000	U-304.8	17.0	7.7	77.7Ω/km	62.0Ω/km								
					1000	304.8	16.0	7.3										
					5000*	1524.0	90.0	40.8										

For cross-connect use with 1803F (et al.)  
Digital Audio Snake Cables, see page 19.28.  
For Plenum version of 1800B, see 1801B.\*500 ft. put-up available in Gray only. 5000 ft. put-up available in Purple only.  
The jacket and shield are bonded so both can be removed with automatic stripping equipment.**24 AWG** Stranded (42x40) HC BC Conductors • Conductors Cabled with Fillers • TC "French Braid" Shield (95% Coverage) • BC Drain Wire**Datalene Insulation • Matte PVC Jacket** (Available in Red, Yellow, Green, Blue, Gray or Black)

Digital Mic Cable High-Flex 60°C	<b>1800F</b>	NEC: CL2R	1	Black, Red	500*	152.4	12.0	5.5	23.7Ω/M'	5.0Ω/M'	.211	5.36	110	76%	12	39	26	85
					U-1000	U-304.8	26.0	11.8	77.7Ω/km	16.4Ω/km								
					1000*	304.8	24.0	10.9										



French Braid

\*500 ft. and 1000 ft. put-ups available in Black only.

**24 AWG** Stranded (7x32) TC Conductors • Twisted Pairs • Overall Beldfoil Shield (100% Coverage) • 24 AWG TC Drain Wire**Plenum • Foam FEP Teflon® Insulation • Flamarrest® Jacket** (Available in Natural White or Purple)

75°C, Non-conduit	<b>1801B</b>	NEC: CMP CEC: CMP FT6	1	Black, Red	500	152.4	6.0	2.7	23.7Ω/M'	18.9Ω/M'	.165	4.19	110	78%	12	39	26	85
					U-1000	U-304.8	14.0	6.4	77.7Ω/km	62.0Ω/km								
					1000	304.8	12.0	5.5										

**24 AWG** Stranded (7x32) TC Conductors • Dual Twisted Pairs • Overall Beldfoil Shield (100% Coverage) • 24 AWG TC Drain Wire**Datalene Insulation • Purple PVC Jacket in Zip-Cord Construction**

60°C	<b>1802B</b>	NEC: CMG CEC: CMG FT4	2	Black, Red	500	152.4	16.5	7.5	23.7Ω/M'	18.9Ω/M'	.180	4.57	110	76%	12	39	26	85
					U-1000	U-304.8	35.0	15.9	77.7Ω/km	62.0Ω/km	x	x						
					1000	304.8	37.0	16.8			.360	9.14						



The jacket and shield are bonded so both can be removed with automatic stripping equipment.

**22 AWG** Stranded (7x30) TC Conductors • Twisted Pair with Fillers • Overall Beldfoil + TC Braid Shield (90% Coverage) • 24 AWG Drain Wire**Datalene Insulation • Black High-Flex Matte PVC Jacket**

DMX512 Type High-Flex 60°C	<b>1696A</b>	—	1	Blue, White	250	76.2	8.0	3.6	17.8Ω/M'	4.6Ω/M'	.234	5.94	110	76%	13	43	26	85
					500	152.4	14.5	6.6	48.5Ω/km	15.2Ω/km								
					U-1000	U-304.8	30.0	13.6										
					1000	304.8	32.0	14.5										



Z-Fold®

BC = Bare Copper • DCR = DC Resistance • FEP = Fluorinated Ethylene Propylene • HC = High-conductivity • TC = Tinned Copper

\*Capacitance between conductors.

\*\*Capacitance between one conductor and other conductors connected to shield.

Teflon is a DuPont trademark.

**BELDEN**

For more information, contact Belden Technical Support: 1-800-BELDEN-1 • www.belden.com

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# AES/EBU Digital Audio Cable

## Multi-Pair Snake Cables

### Individually Shielded and Jacketed Pairs



#### Individually Shielded and Jacketed Pairs

NEC: CMG (CEC: CMG FT4)

#### Product Description

**26 AWG or 24 AWG** stranded tinned copper conductor. Datalene® insulation. Pairs individually shielded with bonded Beldfoil® with a drain wire and have numbered and color-coded PVC jackets (see Chart 7 in Technical Information Section for colors). Pair jackets and shields are bonded so both strip simultaneously with automatic stripping equipment. Overall Beldfoil shield/drain wire plus overall Purple PVC jacket and nylon rip cord.

Datalene insulation features include low dielectric constant and a dissipation factor for high-speed, low-distortion data handling. Physical properties include good crush resistance and light weight.

**Color Code:** Black, Red.

#### Specifications

##### Nominal OD — Conductor

26 AWG	.019" (.48mm)
24 AWG	.024" (.60mm)

##### Nominal OD — Insulation

26 AWG	.054" (1.37mm)
24 AWG	.070" (1.78mm)

##### Inner Pair Jacket OD

26 AWG	.136" (3.45mm)
24 AWG	.167" (4.24mm)

##### Approvals

NEC	CMG
CEC	CMG FT4

##### Nominal DCR (26 AWG)

Conductor	37.3Ω/M' (122.3Ω/km)
Shield	25.5Ω/M' (83.6Ω/km)

##### Nominal DCR (24 AWG)

Conductor	23.7Ω/M' (77.7Ω/km)
Shield	18.9Ω/M' (62.0Ω/km)

##### Nominal Impedance

110Ω ±10Ω

##### Nominal Velocity of Propagation

76%

##### Nominal Capacitance (26 AWG)

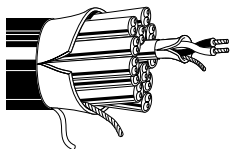
Between Conductors	12.5 pF/Ft. (41 pF/m)
Between Conductor/Shield*	25 pF/Ft. (82 pF/m)

##### Nominal Capacitance (24 AWG)

Between Conductors	12 pF/Ft. (39 pF/m)
Between Conductor/Shield*	26 pF/Ft. (86 pF/m)

DCR = DC Resistance

\*Capacitance between one conductor and other conductors connected to shield.



Part No.	No. of Pairs	Standard Lengths		Standard Unit Weight		Nominal OD	
		Ft.	m	Lbs.	kg	Inch	mm

#### Individually Shielded & Jacketed NEC: CMG (CEC: CMG FT4)

##### 26 AWG (7x34)

<b>7891A</b>	2	500	152.4	28.0	12.7	.343	8.71
		1000	304.8	56.0	25.5		
<b>7890A</b>	4	100	30.5	8.2	3.7	.399	10.13
		250	76.2	18.0	8.2		
		500	152.4	31.0	14.1		
		1000	304.8	61.0	27.7		
<b>7880A<sup>†</sup></b>	8	250	76.2	28.0	12.7	.541	13.74
		500	152.4	57.0	25.9		
		1000	304.8	142.0	64.4		

Fits metal shell 25-pin D-sub connectors.

<b>7892A</b>	12	500	152.4	85.5	37.9	.679	17.25
		1000	304.8	174.0	79.1		
<b>7893A</b>	16	500	152.4	109.5	49.8	.770	19.56
		1000	304.8	240.0	109.1		

#### Individually Shielded & Jacketed NEC: CMG (CEC: CMG FT4)

##### 24 AWG (7x32) • Flexible

<b>1803F</b>	4	500	152.4	57.5	26.1	.488	12.39
		1000	304.8	107.0	48.6		
<b>1805F</b>	8	500	152.4	106.5	48.3	.661	16.79
		1000	304.8	211.0	95.7		
<b>1806F</b>	12	500	152.4	160.0	72.6	.829	21.06
		1000	304.8	330.0	149.7		
<b>1850F</b>	16	500	152.4	208.0	94.4	.944	23.98
		1000	304.8	407.0	184.6		
<b>1852F</b>	24	500	152.4	321.0	145.6	1.205	30.61
		1000	304.8	644.0	292.1		
<b>1854F</b>	32	1000	304.8	841.0	381.5	1.346	34.19

<sup>†</sup>7880A is designed to fit in 25-pin D-sub connectors used in digital console board equipment.

**AES/EBU Digital Audio Cable**Multi-Pair Snake Cables  
Individually Shielded Pairs**Individually Shielded Pairs**

NEC: CM (CEC: CM)

**Product Description**

**24 AWG** stranded (7x32) tinned copper conductors. Datalene® insulation. Twisted pairs individually Beldfoil® shielded (100% Coverage). Overall Chrome PVC jacket and 24 AWG stranded tinned copper drain wire.

Datalene insulation features include low dielectric constant and a dissipation factor for high-speed, low-distortion data handling. Physical properties include good crush resistance and light weight.

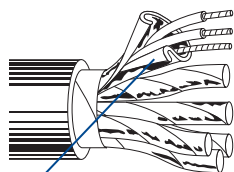
**Color Code:** See Chart 3 (in Technical Information Section)

**Specifications**

<b>Nominal OD — Conductor</b>	.024" (.60mm)
<b>Nominal OD — Insulation</b>	.061" (1.55mm)
<b>Approvals</b>	
NEC	CM
CEC	CM
<b>UL Ratings</b>	UL AWM Style 2493
<b>Voltage Rating</b>	300V
<b>Temperature Rating</b>	60°C
Non UL Temperature Rating	80°C
<b>Nominal DCR</b>	
Conductor	24.0Ω/M' (78.7Ω/km)
Shield	15.0Ω/M' (49.2Ω/km)
<b>Nominal Impedance</b>	100Ω
<b>Nominal Velocity of Propagation</b>	76%
<b>Nominal Capacitance</b>	
Between Conductors	12.5 pF/Ft. (41.0 pF/m)
Between Conductor/Shield*	23.2 pF/Ft. (76.1 pF/m)

DCR = DC Resistance

\*Capacitance between one conductor and other conductors connected to shield.



Z-Fold®

Part No.	No. of Pairs	Standard Lengths		Standard Unit Weight		Nominal OD	
		Ft.	m	Lbs.	kg	Inch	mm

**Individually Shielded Pairs** NEC: CM (CEC: CM)

<b>24 AWG</b>							
<b>9729</b>	2	100	30.5	4.3	2.0	.266	6.76
		500	152.4	20.5	9.3		
		1000	304.8	39.0	17.7		
		10000 <sup>†</sup>	3048.0	390.0	176.9		

For Plenum version of 9729, see 89729 or 82729.

<b>9730</b>	3	100	30.5	5.1	2.3	.334	8.48
		500	152.4	24.5	11.1		
		1000	304.8	46.0	20.9		
		10000 <sup>††</sup>	3048.0	520.0	236.4		

For Plenum version of 9730, see 89730.

<b>9728</b>	4	100	30.5	6.0	2.7	.363	9.22
		500	152.4	29.0	13.2		
		1000	304.8	51.0	23.1		

For Plenum version of 9728, see 89728.

<b>9731</b>	6	100	30.5	7.4	3.4	.421	10.69
		500	152.4	42.0	19.1		
		1000	304.8	83.0	37.7		

For Plenum version of 9731, see 89731.

<b>9732</b>	9	100	30.5	9.9	4.5	.488	12.40
		500	152.4	57.0	25.8		
		1000	304.8	106.0	48.1		

For Plenum version of 9732, see 89732.

<b>9733</b>	11	500	152.4	75.0	34.1	.575	14.61
<b>9734</b>	12	500	152.4	79.5	36.1	.575	14.61
		1000	304.8	154.0	70.0		

For Plenum version of 9734, see 89734.

<b>9735</b>	15	500	152.4	95.0	43.2	.639	16.23
		1000	304.8	185.0	84.1		

<b>9736</b>	17	500	152.4	103.5	47.0	.671	17.04
		1000	304.8	210.0	95.5		

<b>9737</b>	19	1000	304.8	231.0	105.0	.671	17.04
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<b>9738</b>	27	1000	304.8	334.0	151.8	.797	20.24
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<sup>†</sup> Total length may vary -10 to +5% from length shown and may contain 2 pieces.  
Minimum length of any one piece will be 1500 ft.

<sup>††</sup> Total length may vary -10 to +20% from length shown and may contain 2 pieces.  
Minimum length of any one piece will be 1500 ft.

## AES/EBU Digital Audio Cable

Plenum-Rated, Multi-Pair Snake Cables  
Individually Shielded Pairs



### Individually Shielded Pairs

NEC: CMP (CEC: CMP FT6)

### Product Description

**24 AWG** stranded (7x32) tinned copper conductors. Foam FEP insulation. Twisted pairs individually Beldfoil® shielded (100% Coverage). Overall Gray fluorocopolymer jacket (except 82729 which has Natural Flamarrest® jacket). 24 AWG stranded tinned copper drain wire.

**Color Code:** See Chart 5 (in Technical Information Section)

### Specifications

**Nominal OD — Conductor** .024" (.60mm)

**Nominal OD — Insulation** .062" (1.57mm)

#### Approvals

NEC CMP  
CEC CMP FT6

**UL Ratings** Non-conduit

**Voltage Rating** 300V RMS

#### Nominal DCR

Conductor 23.3Ω/M' (76.4Ω/km)  
Shield 14.4Ω/M' (47.2Ω/km)

**Nominal Impedance** 100Ω

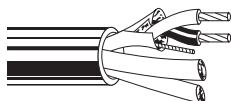
**Nominal Velocity of Propagation** 76%

#### Nominal Capacitance

Between Conductors 13.5 pF/Ft. (44 pF/m)  
Between Conductor/Shield\* 22.5 pF/Ft. (73.8 pF/m)

DCR = DC Resistance • FEP = Fluorinated Ethylene Propylene

\*Capacitance between one conductor and other conductors connected to shield.



Part No.	No. of Pairs	Standard Lengths		Standard Unit Weight		Nominal OD	
		Ft.	m	Lbs.	kg	Inch	mm

### Plenum Individually Shielded NEC: CMP (CEC: CMP FT6)

24 AWG							
82729	2	U-1000	U-304.8	26.0	11.8	.255	6.48
		1000	304.8	28.0	12.7		
89729	2	500	152.4	17.0	7.7	.261	6.63
		1000	304.8	31.0	14.1		
89730	3	500	152.4	21.5	9.8	.278	7.06
		1000	304.8	40.0	18.2		
89728	4	500	152.4	26.5	12.0	.307	7.80
		1000	304.8	50.0	22.7		
89705	5	500	152.4	30.5	13.9	.333	8.46
		1000	304.8	62.0	28.2		
89731	6	500	152.4	35.0	15.9	.361	9.17
		1000	304.8	71.0	32.3		
89757	7	500	152.4	39.5	18.0	.361	9.17
		1000	304.8	80.0	36.4		
89732	9	1000	304.8	108.0	49.0	.433	10.99
89734	12	500	152.4	71.0	32.3	.498	12.65
		1000	304.8	140.0	63.6		
89758	18	500	152.4	100.5	45.7	.616	15.65
		1000	304.8	204.0	92.7		

Spools are one piece, but length may vary ±10% from length shown.  
Unreel® carton may vary -5% to +10% from length shown.