

Considerations When Configuring and Selecting Cables for Microphone Systems

With the growing demand of recent years for both greater physical comfort and savings in energy consumption, systems incorporating digital control based on the latest advances in electronics are coming into wider use for air conditioning and lighting systems. As all these systems come on line, we cannot help but be reminded of the fact that the wiring used for these digital control systems generates pulse-based electromagnetic noise of the kind that affects the very delicate signals used in microphone lines.

Microphone cables are designed to carry a range of signals that span the spectrum from 1/100 of a volt (10 mV) to 1/1,000,000 (1 µV). One small error in wiring procedure or cable selection and the entire microphone system turns into an antenna collecting the surrounding noise.

The following section uses a question and answer format to cover a list of the essential points for configuring microphone systems.

Q1 Under what sort of conditions should a two-conductor microphone cable be used?

The two-conductor microphone cable is suited to environments where noise is not such a great factor and the audio signals are in the comparatively high -20 dB to 0 dB level range. In such cases, the two-conductor cable offers the advantages of smaller diameter and lower cost. Of course if microphone level, rather than line level, is the criterion being used, star quad cable should be used instead.

Q2 Under what conditions should star quad microphone cable be used?

This type is used for environments with a higher noise factor and where audio signals are in the low -50 dB or less range. This type of cable performs well under noise conditions that exceed the capacity of the two-conductor shielded cable, effectively shielding out over ninety percent more noise. (See Figs. 1, 2)

However, should this type be routed alongside a power cable of any significant capacity it should probably be encased in metal conduit just to be safe.

Q3 Isn't star quad cable expensive?

The cost for this type of cable has fallen significantly in recent years. Several decades ago, cost was so prohibitive a factor that only large musical auditoriums and broadcasting facilities could afford them. Canare succeeded in developing a low-cost star quad cable using aluminum foil in 1981. In addition to traditional professional facilities, this type gained wide use in such non-traditional areas as wedding halls and school lecture rooms.

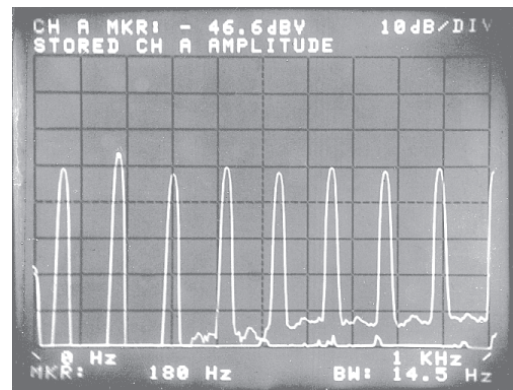


Fig. 1 Noise induced in star quad cable (Canare L-4E5AT)

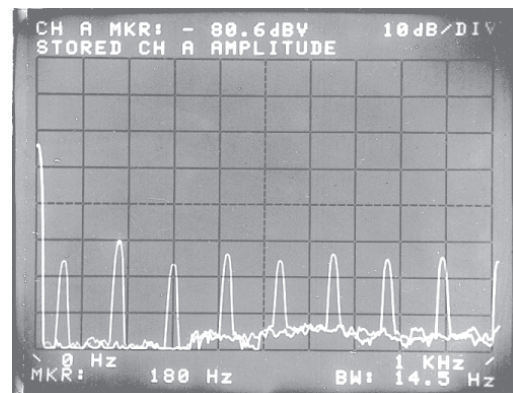
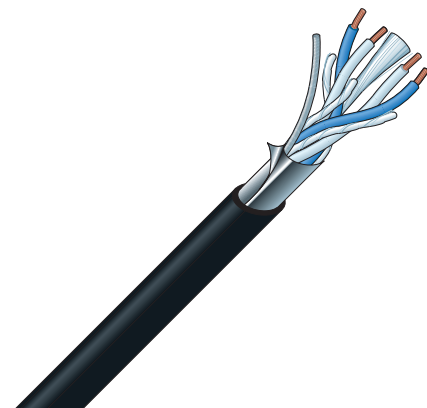


Fig. 2 Noise induced in two-conductor shielded cable (MVVS)

<Test conditions>

1. Flush along power cables for 20 m distance
2. Power cable connected to lighting fixture dimmed to 50% capacity with load of 1 kW.
3. The noise induced in the audio cable was boosted by 50 dB in the head amplifier and viewed on a spectrum analyzer.



Star quad cable with aluminum foil shield

Q4 When avoiding use of metal conduit, how far away should microphone cable be from power cables?

When foregoing the use of protective metal conduit, use the graph shown in Fig. 3 as a general guide for distancing cables. Note that ignoring basic guidelines for positioning cables can easily result in noise induction problems which are very difficult to deal with later. Encasing microphone cables in metal conduits is highly recommended for applications that utilize the delicate signal range.

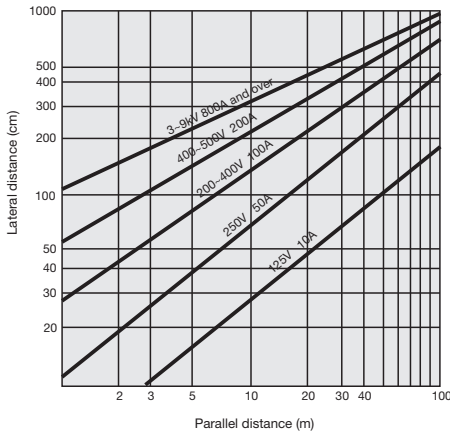


Fig. 3 Distances for positioning microphone and power cables

- <Requisite conditions>
 1. Cables are the star quad type.
 2. Power cables are in the circular cab tire configuration.

Q5 What considerations are required when using a rack for strong electric current?

The same as for the preceding question when metal conduit is not used.

Q6 Would there be any problem with routing the cables through a flexible metal conduit?

The flexible conduit would certainly help to reduce noise but would not be as effective as a rigid metal conduit. Use the graph in Fig. 4 as a guide for distancing cables.

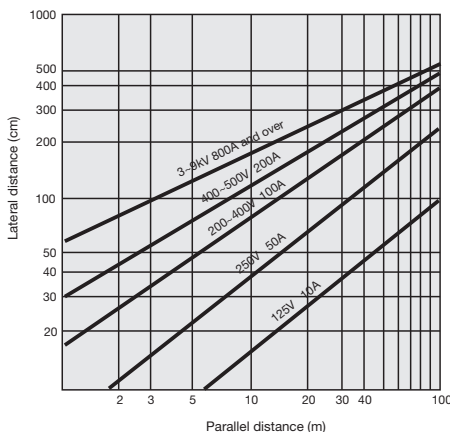


Fig. 4 Distances for positioning microphone and power cables when routing microphone cables via flexible metal conduit

- <Requisite conditions>
 1. Cables are the star quad type routed through flexible metal conduit.
 2. Metal conduit is grounded using appropriate level of resistance.
 3. Power cables are in the circular cab tire configuration.

Q7 What are the criteria for choosing between the many different types of microphone cables?

As all are designed to provide electromagnetic shielding there is not that much basic difference in shielding performance. However, they do differ in various specific characteristics. Cable type should be selected according to specific requirements. (See Fig. 5)

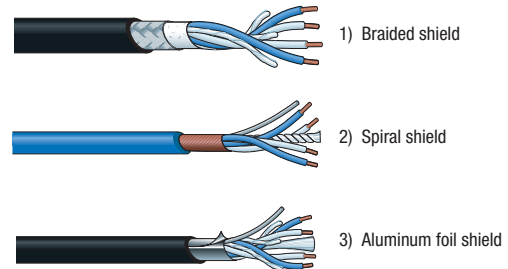


Fig. 5 Types of star quad microphone cables

• Braided Shield

The braided copper shield is designed to maintain effective shielding performance, regardless of how many times the cable is unwound, bent, twisted or rewound. It is ideal for use as handheld microphone cables or extension cables. This type is more expensive than other types as it is braided very finely to ensure a highly impenetrable shield. Cable termination requires seasoned expertise.

• Spiral Shield

The spiral shield consists of several copper wires wound tightly around the cable in a spiral wind. The shielding effect is heightened by winding the shield on twice, each time from different directions in what is referred to as the "double-spiral shield." The cost range for the spiral shield cable lies roughly mid way between the braided shield and the aluminum foil shield cable. Although cable termination operations are comparatively simple, the spiral shield tends to deteriorate when flexed too frequently. It is designed for stationary installation.

• Aluminum Foil Shield

The aluminum foil shield cable consists of aluminum foil fused onto a polyester film and wound around the cable in the form of a tape. Cable termination involves a simple operation and the cable is relatively inexpensive. The aluminum foil cable is recommended for use as stationary cabling.

Aluminum foil cable with a Kevlar cable filler is highly recommended for areas where cables will be routed through metal conduit. The Kevlar filler protects the cable as it passes through the conduit, preventing cable breakage or shorting, even when intense stress is applied to the cable. The aluminum foil cable is currently widely used in function halls and multipurpose track and field stadiums.

AWG is for Indicating conductor size

AWG is the abbreviation for American Wire Gauge. For solid center conductor, numbers are decided by conductor O.D. and for stranded center conductor, numbers are decided by conductor cross sectional area. The AWG numbers for conductors used at Canare are listed in Table 1.

AWG	Conductor cross sec. area (mm ²)	AWG	Conductor cross sec. area (mm ²)
13	2.81	22	0.34, 0.37, 0.39
14	2.18	23	0.29, 0.30, 0.31
15	1.75	24	0.20, 0.22, 0.23
16	1.27	25	0.18
18	1.0	26	0.14, 0.15
20	0.51, 0.56	28	0.08, 0.09
		31	0.04

Table 1: AWG Numbers for Cables Used by Canare

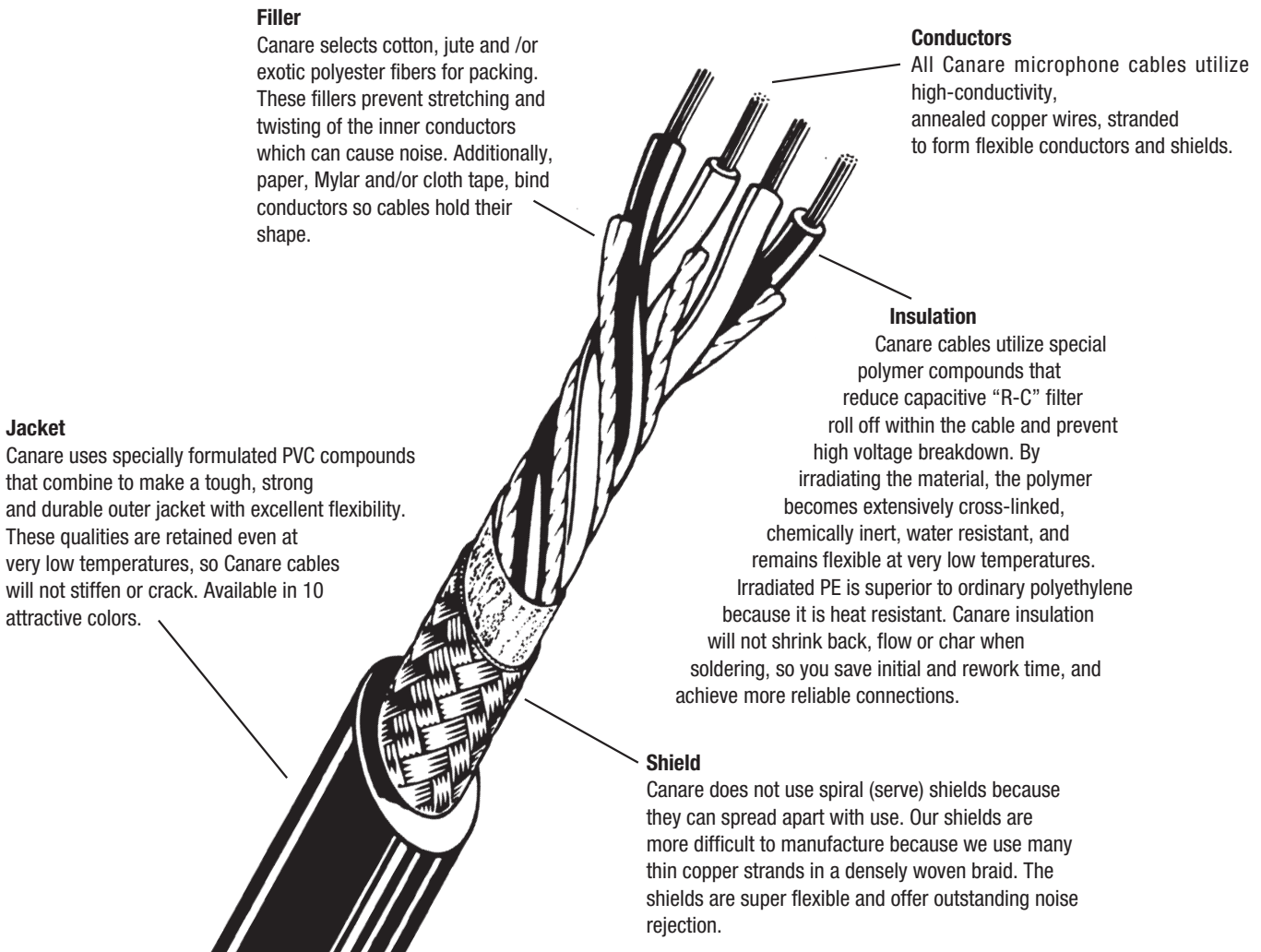
The Star Quad Story

Canare Star Quad obtains its name from the 4-conductor style construction that minimizes the “loop area” between twists of the conductors. This “double balanced” pairing, reduces susceptibility to electromagnetically induced noise. The improvement in noise rejection is so noticeable, that even SCR dimmer noise (stage lighting consoles), is reduced to less than 1/10 the level found in other 2-conductor microphone cables.

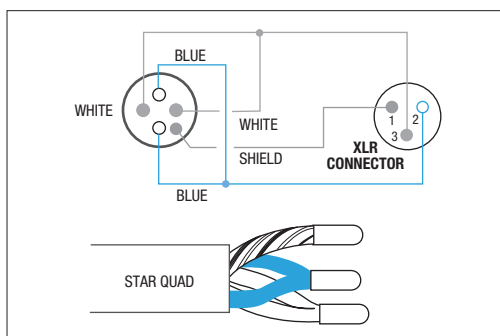
Canare Star Quad is designed for use with microphones but is also excellent for all line-level signals (e.g. mixer to power amps). The 4-conductor Star Quad arrangement, cancels electromagnetically induced

noise from SCR dimmer packs, fluorescent lighting ballasts and AC power transformers. Handling noise is prevented by use of cotton filler material. Excellent frequency response is maintained due to special irradiated polyethylene insulation which provides a low capacitance dielectric.

Canare Star Quad cable with braided shields is super flexible. We use large numbers of thin wire strands in the copper conductors and overall braided shield. We extrude a special compound PVC outer jacket that remains pliant at extremely low temperatures with no wait between cold shipping and installation.

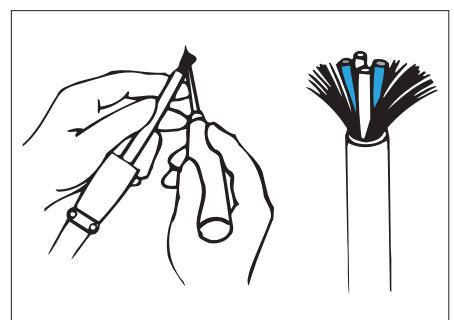


In order to maximize noise rejection, Star Quad must be properly wired to the XLR-3 connector (or terminal block).



Because the shield density on Canare Cable is very high, it is somewhat difficult to push back the braid and pull the inner conductors through.




Instead, we strongly recommend unbraiding the shield by “combing” it out with a pointed tool, beginning at the end of the cable.



Star Quad Microphone Cables (Single)

Effectively reduce noise levels to 1/10 that of general-purpose, 2-conductor shielded cables.

Aluminum Foil Shield

Type	Model	Sales units	Nom. O.D	Weight	Composition			Electrical characteristics			
					No. of cond.	Cross sec area (AWG) and cond. comp.	Twist pitch	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
		m	mm	kg/100m		mm ² /(AWG) Q'ty/mm	mm	Ω/100m	Ω/100m	pF/m	pF/m
 L-4E3AT Jacket color: gray	L-4E3AT	200 500	3.0	1.2	4	0.08(28) 7/0.12A	16	24.6	—	—	—
 L-4E5AT Jacket colors L-4E5AT, L-4E6AT: gray, black	L-4E5AT	100 200	5.0	3.3	4	0.18(25) 16/0.12A	21	10.7	—	164	222
	L-4E6AT	400	6.2	5.0	4	0.31(23) 12/0.18A	25	6.4	—	150	210
 L-4E5ATG Jacket color: gray, black	L-4E5ATG	100 200	5.0	3.3	4	0.18(25) 1/0.18(OFC)+30/0.08(OFC)	21	11.0	—	164	222
	L-4E6ATG	400	5.8	4.6	4	0.34(22) 1/0.18(OFC)+63/0.08(OFC)	35	5.5	—	150	210

Insulation: Cross-linked PE Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors **Capacitance between conductor and shield.

L-4E3AT

- Slim design for internal cabling connection on racks.

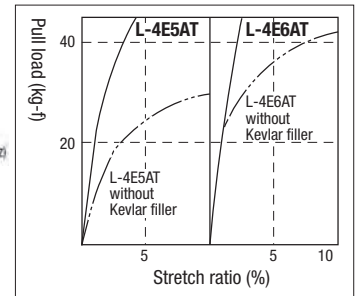
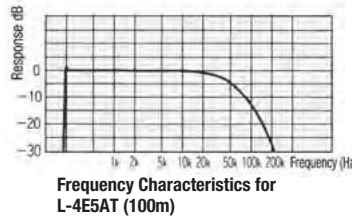
L-4E5AT, L-4E6AT

- The Kevlar* cable filler prevents damage due to excess stretching and stress that may occur when pulling the cable through conduits.
- Drain wire included




* Kevlar is the registered trademark of Dupont Corporation.

L-4E5ATG, L-4E6ATG

- OFC types of L-4E5AT/L-4E6AT



Braided Shield

Type	Model	Sales units	Nom. O.D	Weight	Composition			Electrical characteristics				
					No. of cond.	Cross sec area (AWG) and cond. comp.	Twist pitch	Shield Coverage (braid)	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
		m	mm	kg/100m		mm ² /(AWG) Q'ty/mm	mm	%	Ω/100m	Ω/100m	pF/m	pF/m
 L-4E5C Jacket colors L-4E6S: black, brown, red, orange, yellow, green, blue, purple, gray, white L-4E5C: black, red, orange, yellow, green, blue, gray	L-4E5C	100 200	4.8	3.4	4	0.15(26) 30/0.08A	18	96%	13.0	2.4	162	200
	L-4E6S		6.0	4.8	4	0.20(24) 40/0.08A	20	94%	9.8	3.0	150	185
 L-4E5 Jacket colors L-4E5: gray, black L-4E6: gray	L-4E5	100 200	4.8	3.5	4	0.15(26) 30/0.08A	18	96%	13.0	1.9	162	200
	L-4E6	100 200 400	6.5	6.1	4	0.23(24) 20/0.12A	25	96%	8.6	1.6	144	187
 L-4E6-WBS Jacket colors: gray	L-4E6-WBS	100 200	7.0	8.4	4	0.23 (24) 20/0.12A	25	96% & 95%	8.6	1.0	144	185

Insulation: Cross-linked PE Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors. **Capacitance between conductor and shield.

L-4E5C, L-4E6S

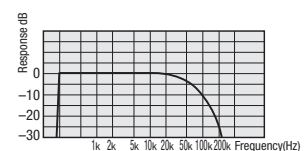
- Bend resistant design: the conductor consists of ultra-fine 0.08 mm strands offers excellent durability.
- High-density braided shield

L-4E5, L-4E6

- High-density braided shield
- Drain wire included

L-4E6-WBS

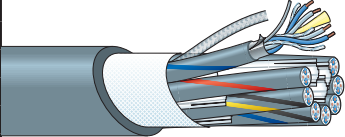
- High-density double-braided shield
- Drain wire included



Frequency Characteristics for L-4E6S (100m)

Multichannel Star Quad Microphone Cables

Aluminum Foil Shield

Type	Model	No. of ch.	Sales units	Nom. O.D	Weight	No. of cond.	Unit composition			Electrical characteristics			
							Cross sec area (AWG) and cond. comp.	Twist pitch	Ch. O. D.	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
							mm ² /(AWG) Q'ty/mm	mm	mm	Ω/100m	Ω/100m	pF/m	pF/m
 <p>L-4E4-8AT</p> <p>Jacket color: gray</p>	L-4E3-2AT	2	100 200 500	8.5	7.5	8	4E3AT Unit 0.08(28) 7/0.12A	16	3.0	24.8	—	—	—
	L-4E3-4AT	4		10.0	11	16							
	L-4E3-8AT	8		13.8	19	32							
	L-4E3-12AT	12		15.6	26	48							
	L-4E3-16AT	16		17.2	32	64							
	L-4E3-24AT	24		21.3	47	96							
	L-4E4-2AT	2		4E4AT Unit 0.18(25) 16/0.12A	10.5	12	8	21	3.7	10.8	—	164	222
	L-4E4-4AT	4			12.3	17	16						
	L-4E4-8AT	8			16.9	31	32						
	L-4E4-12AT	12			18.9	41	48						
	L-4E4-16AT	16			20.9	50	64						
	L-4E4-24AT	24			26.1	76	96						

Insulation: Cross-linked PE (blue-blue, white-white) Jacket, inner Jacket: PVC Dielectric strength: 500V AC/min. *Capacitance between conductors **Capacitance between conductor and shield.

L-4E3-**AT, L-4E4-**AT

- The multichannel microphone cable is the cable of choice for music auditorium and studio facilities where noise prevention and audio quality are the prime considerations.
- Each unit contains the highly pull-resistant Kevlar cable filler.
- Drain wire included in each unit.

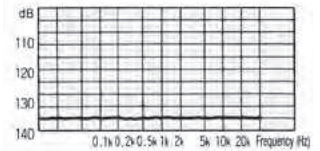
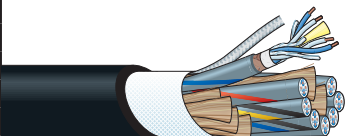


Fig. 1 Crosstalk Characteristics for L-4E4-4AT (100m)

Braided Shield

Type	Model	No. of ch.	Sales units	Nom. O.D	Weight	No. of cond.	Unit composition			Electrical characteristics				
							Cross sec area (AWG) and cond. comp.	Twist pitch	Shield coverage (braid)	Ch. O. D.	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
							mm ² /(AWG) Q'ty/mm	mm	%	mm	Ω/100m	Ω/100m	pF/m	pF/m
 <p>L-4E3-8P</p> <p>Jacket color: black (L-4E3-2H gray)</p>	L-4E3-2H	2	100 200 500	8.9	9.5	8	0.08(28) 7/0.12A	16	93%	3.4	24.9	3.4	145	170
	L-4E3-2P	2		8.9	8.2	8								
	L-4E3-4P	4		10.9	14	16								
	L-4E3-8P	8		15.3	26	32								
	L-4E3-12P	12		17.4	36	48								
	L-4E3-16P	16		18.9	43	64								
	L-4E3-24P	24		24.0	70	96								
	L-4E4-2P	2		0.15(26) 30/0.08A	11.1	13	8	16	95%	4.0	13.1	2.4	162	200
	L-4E4-4P	4			13.4	21	16							
	L-4E4-8P	8			18.2	37	32							

Insulation: Cross-linked PE (blue-blue, white-white) Jacket, inner jacket: PVC Dielectric strength: 500V AC/min. *Capacitance between conductors **Capacitance between conductor and shield.

L-4E3-2H, L-4E3-**P, L-4E4-**P

- Ideal multichannel cable for PA and live events where cables are laid down and taken back up on a regular basis.
- Each unit of L-4E3-*P and L-4E3-2H contains the highly pull-resistant Kevlar cable filler.
- The L-4E3-2H is the reinforced version containing a stainless steel wire support.

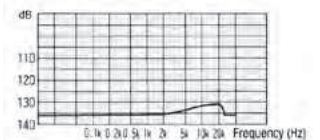
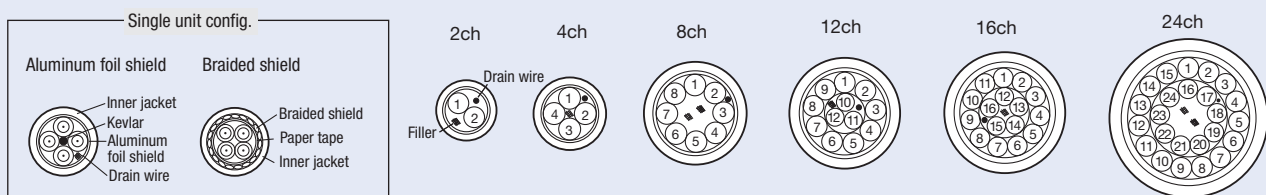


Fig. 1 Crosstalk Characteristics for L-4E4-4P (100m)

Cross-sectional View









Channel color code: Spiral marks on inner jacket (gray).

Unit no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Spiral mark	RED	BLU	YEL	GRN	BRN	-	BLU/BLK	YEL/BLK	GRN/BLK	BRN/BLK	BLK	BLU/ORN	YEL/ORN	GRN/ORN	BRN/ORN	ORN	BLU/PNK	YEL/PNK	GRN/PNK	BRN/PNK	PNK	BLU/WHT	YEL/WHT	GRN/WHT

Two-Conductor Shielded Cables (Single)

Aluminum Foil Shield

Type	Model	Sales units	Composition					Electrical characteristics			
			Nom. O.D	Weight	No. of cond.	Cross sec area (AWG) and cond. comp.	Twist pitch	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
			m	mm	kg/100m	mm ² /(AWG) Q'ty/mm	mm	Ω/100m	Ω/100m	pF/m	pF/m
 L-2B2AT Jacket colors: gray, black	 L-2B2AT	200 500	3.2	1.3	2	0.18(25) 16/0.12A	25	10.5	—	73	120
 L-2B2AL Jacket color: gray	L-2B2AL	200	3.2	1.2	2	0.18(25) 7/0.18TA Overall tin coated	20	11.3	—	—	—
 L-2E5AT Jacket colors: gray, black, sepia	 L-2E5AT	200	5.0	3.3	2	0.31(23) 12/0.18A	30	6.2	—	79	140
 L-2E5AL Jacket color: gray	L-2E5AL	200 500	5.0	3.3	2	0.29(23) 7/0.23TA Overall tin coated	30	6.8	—	—	—

Insulation: Cross-linked PE (polyethylene for L-2E5AL and L-2B2AL) Jacket: PVC Dielectric strength: 500V AC/min. *Capacitance between conductors **Capacitance between conductor and shield.

L-2B2AT, L-2E5AT

- Ideal for internal rack wiring.
- Drain wire included.
- The L-2E5AT contains the Tetoron cable filler reinforcement material. <Fig. 1>

L-2B2AL, L-2E5AL

- Cables for connecting devices with which wrapping tools can be used.
- Drain wire included.

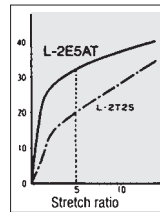


Fig. 1 Pull Load and Stretch Ratio for Cable

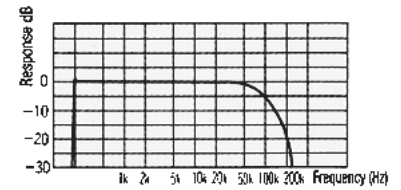
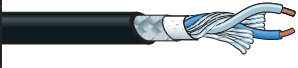



Fig. 2 Frequency Characteristics for L-2B2AT (100m)

Braided Shield

Type	Model	Sales units	Composition					Electrical characteristics				
			Nom. O.D	Weight	No. of cond.	Cross sec area (AWG) and cond. comp.	Twist pitch	Shield coverage (braid)	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
			m	mm	kg/100m	mm ² /(AWG) Q'ty/mm	mm	%	Ω/100m	Ω/100m	pF/m	pF/m
 L-2T2S	 L-2T2S	100 200	6.0	4.6	2	0.30(23) 60/0.08A	20	94%	6.4	3.1	70	106
Jacket colors for L-2T2S: black, red, orange, yellow, blue, gray for L-2E5: black	L-2E5	200	4.6	3.0	2	0.15(26) 30/0.08A	18	97%	12.7	2.2	—	—

Insulation: Cross-linked PE Jacket: PVC Dielectric strength: 500V AC/min.


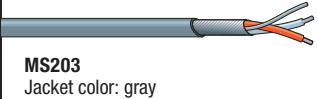
*Capacitance between conductors **Capacitance between conductor and shield.

L-2T2S, L-2E5

- Braid coverage of 94% and above provides dense shielding that blocks out electromagnetic noise.
- L-2T2S consists of 60 ultra-fine 0.08 mm strands (30 for L-2E5) in a stranded format that offers excellent durability.
- Highly pliable and durable PVC used for jacket. (Brittle temp. -49°C)

Two-Conductor Shielded Cables

■ Spiral Shield

Type	Model	Sales units	Composition						Electrical characteristics			
			Nom. O.D	Weight	No. of cond.	Cross sec area (AWG) and cond. comp.	Twist pitch	Shield coverage	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
			m	mm	kg/100m	mm ² /(AWG) Q'ty/mm	mm	%	Ω/100m	Ω/100m	pF/m	pF/m
 MS202 Jacket color: black	MS202	200	2.8	1.4	2	0.18 (25) 1/0.18TA + 30/0.08TA	25	91% (spiral)	11.0	3.2	74	145
 MS203 Jacket color: gray	MS203	200	3.5	2.1	2	0.31(23) 12/0.18TA	30	91% (spiral)	6.5	2.3	—	—

Insulation: Cross-linked PE Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors **Capacitance between conductor and shield.

MS202

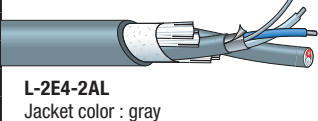
- Ideal for analog audio internal rack wiring.
- Composite conductors with 1 of 0.18 mm and 30 of 0.08 mm strands.
- Drain wire included.

MS203

- Ideal for internal rack wiring.
- Drain wire included.

Two-Conductor Shielded Multichannel Cables

■ Aluminum Foil Shield

Type	Model	No. of ch.	Sales units	Nom. O.D	Weight	No. of cond.	Unit composition			Electrical characteristics			
							Cross sec area (AWG) and cond. comp.	Twist pitch	Ch. O. D.	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
							mm ² /(AWG) Q'ty/mm	mm	mm	Ω/100m	Ω/100m	pF/m	pF/m
 L-2E4-2AL Jacket color : gray	L-2E4-2AL	2	100	8.6	7.6	4	0.29(23) 7/0.23TA Overall tin coated	30	3.7	6.9	—	81	144
	L-2E4-4AL	4		10.8	13	8							
	L-2E4-8AL	8		14.9	24	16							
	L-2E4-12AL	12		16.9	32	24							
	L-2E4-16AL	16		18.8	40	32							

Insulation: Cross-linked PE Jacket: PVC Dielectric strength: 500V AC/min.

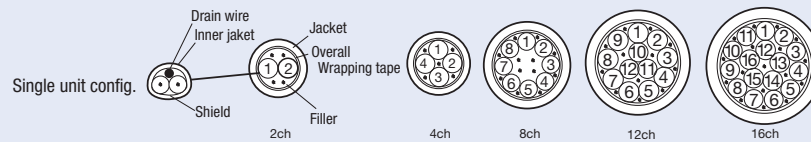
*Capacitance between conductors **Capacitance between conductor and shield.

L-2E4-AL Series

- Used as cables for connecting devices with which wrapping tools can be used.
- Drain wire included in each unit.

No.	Dot line markings
1	—
2	—
3	—
4	—
5	—
6	—
7	—
8	—
9	—
0	—


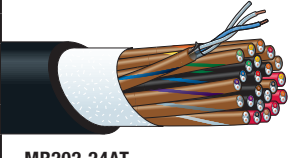
■ Cross-sectional View



■ Channel color code: color-coded insulation and dot line makings (ch 1 to 10: red, ch 11 to 16: blue) on inner jacket (gray).

Unit no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Insulation color	RED/ WHT	BLU/ WHT	YEL/ WHT	GRN/ WHT	BRN/ WHT	GRY/ WHT	BLK/ WHT	YEL/ BLK	GRN/ BLK	BRN/ BLK	GRY/ BLK	BLU/ BLK	YEL/ ORN	GRN/ ORN	BRN/ ORN	GRY/ ORN

Aluminum Foil Shield

Type	Model	No. of ch.	Sales units	Nom. O.D	Weight	No. of cond.	Unit composition			Electrical characteristics				
							Cross sec area (AWG) and cond. comp.		Twist pitch	Ch. O. D.	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
							mm ² /(AWG) Q'ty/mm							
 M202-24AT Jacket color: black	M202-2AT	2	100 200 500	6.5	4.6	4	0.18(25) 16/0.12A	30	—	10.5	—	75	135	
	M202-4AT	4		8.1	7.5	8								
	M202-8AT	8		11.1	13	16								
	M202-12AT	12		12.5	18	24								
	M202-16AT	16		13.8	22	32								
	M202-24AT	24		17.0	32	48								
	M202-32AT	32		18.6	40	64								
 MR202-24AT Jacket color: black	MR202-2AT	2	100 200 500	6.7	4.5	4	0.18(25) 7/0.18A	25	2.7	10.7	—	76	142	
	MR202-4AT	4		7.6	6.2	8								
	MR202-8AT	8		11.0	13	16								
	MR202-12AT	12		12.7	19	24								
	MR202-16AT	16		14.0	23	32								
	MR202-24AT	24		17.4	34	48								
	MR202-32AT	32		19.1	44	64								

Insulation: Cross-linked PE Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors **Capacitance between conductor and shield.

M202-AT Series

- Multichannel cable featuring light weight and slim form. At only 16kg for a 50 m length of 24 channel cable, the M202-AT achieves a 47% weight reduction over previous Canare cables.
- Each channel is individually isolated using insulated (PET) aluminum foil shield. <Fig. 1>
- Contains the highly pull-resistant Kevlar cable filler.
- Drain wire included.

Note:

This series does not have inner jacket, so it cannot be used for fantails.

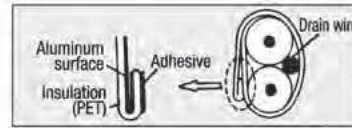
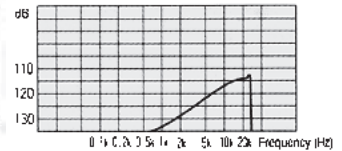


Fig. 1 Aluminum Foil Shield



Crosstalk Characteristics for M202-24AT (100m)

■ Cross-sectional View



■ Channel color code:

Unit no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Insulation color	RED/ WHT	BLU/ WHT	YEL/ WHT	GRN/ WHT	BRN/ WHT	GRY/ WHT	BLU/ BLK	YEL/ BLK	GRN/ BLK	BRN/ BLK	GRY/ BLK	BLU/ ORN	YEL/ ORN	GRN/ ORN	BRN/ ORN	GRY/ ORN	BLU/ PNK	YEL/ PNK	GRN/ PNK	BRN/ PNK	GRY/ BLU	BLU/ RED	YEL/ RED	GRN/ RED	BRN/ RED	GRY/ BLU	BLU/ BLU	GRN/ BLU	BRN/ YEL	GRN/ YEL	BRN/ YEL	GRY/ YEL

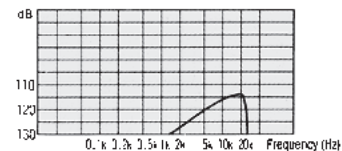
MR202-AT Series

Our bestselling two-conductor multichannel cable featuring AWG25 stranded conductor, 100% shielding by aluminum foil, and drain wire.

- Studio interconnect, portable snake system
- Each channel identified per resistor color-coding
- Aluminum foil shield and drain wire for easy terminate

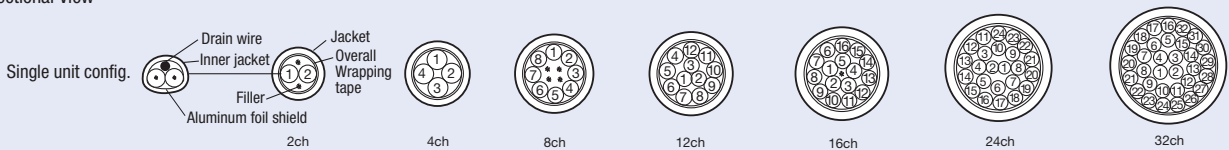
Note:

Not appropriate for heavy-duty applications.



Crosstalk Characteristics for MR202-24AT (100m)

■ Cross-sectional View




■ Channel color code: Inner jacket color coding and spiral markings.* Insulation inside units: one is clear and the other bears the same color as the spiral markings.

Unit no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Insulation color	BRN	RED	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	BRN	RED	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	BRN	RED	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	BRN	RED
Spiral markings	BRN	RED	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	—	RED	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	BRN	—	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	BRN	RED
Inner jacket color	BLK							BRN							RED							ORN										

Two-Conductor Shielded Cables

■ Spiral Shield

Type	Model	No. of ch.	Sales units	Nom. O.D	Weight	No. of cond.	Unit composition				Electrical characteristics			
							Cross sec area (AWG) and cond. comp.	Twist pitch	Shield coverage	Unit O.D.	Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
							mm ² /(AWG) Q'ty/mm	mm	%	mm	Ω/100m	Ω/100m	pF/m	pF/m
	MS202-2P	2	100 200 500	7.1	5.9	4	0.18 (25) 1/0.18TA + 30/0.08TA	25	91% (spiral)	2.8	11.0	3.2	74	145
	MS202-4P	4		8.2	9.2	8								
	MS202-8P	8		10.9	16.0	16								
	MS202-12P	12		13.6	24.2	24								

Jacket color: black

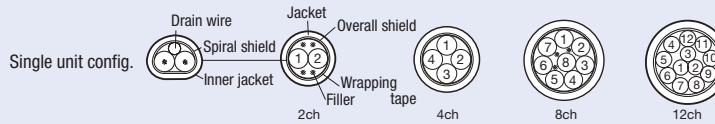
Insulation: Cross-linked PE, Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors **Capacitance between conductor and shield.

MS202-P Series

- Multichannel cable for analog audio.
- Composite conductors with 1 of 0.18 mm and 30 of 0.08 mm strands.
- Easy-to-use color-coded units and spiral shield.
- Drain wire included in each unit.

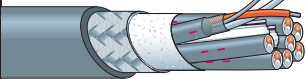
■ Cross-sectional View



■ Channel color code:

Unit no.	1	2	3	4	5	6	7	8	9	10	11	12
Insulation color	BRN	RED	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	BRN	RED
Spiral markings	BRN	RED	ORN	YEL	GRN	BLU	PPL	GRY	WHT	BLK	-	RED
Inner jacket color	BLK										BRN	

■ Spiral Shield

Type	Model	No. of ch.	Sales units	Nom. O.D	Weight	No. of cond.	Unit composition				Overall shield coverage (braid)	Electrical characteristics			
							Cross sec area (AWG) and cond. comp.	Twist pitch	Shield coverage	Unit O.D.		Cond. D.C.R.	Shield D.C.R.	Nom. cap.*	Nom. cap.**
							mm ² /(AWG) Q'ty/mm	mm	%	mm		Ω/100m	Ω/100m	pF/m	pF/m
	MS203-2BS	2	100 200 500	8.9	11.0	4	0.31(23) 12/0.18TA	30	91% (spiral)	3.5	79%	6.6	2.3	—	—
	MS203-4BS	4		10.3	15.8	8					80%				
	MS203-8BS	8		13.5	27.0	16									

Insulation: Cross-linked PE (orange, white) Jacket: PVC Dielectric strength: 500V AC/min.

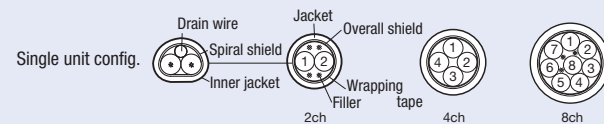
*Capacitance between conductors **Capacitance between conductor and shield.

MS203-BS Series

- Multichannel version of MS203. (See page 54)
- Overall braided shield enables robust shielding performance.
- Drain wire included in each unit.

No.	Dot line markings
1	—
2	—
3	—
4	—
5	—
6	—
7	—
8	—
9	—
0	—


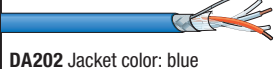




■ Cross-sectional View



■ Unit ID: by dot line markings

AES/EBU Digital Audio Cables

Ideal for conveying digital audio signals in conformance with AES/EBU and IEC standards.

Type	No. of ch.	Model	Sales units	Nom. O.D	Weight	Unit composition				Electrical characteristics				Charac-teristic impedance	Attenua-tion
						Cross sec area (AWG) and cond. comp.	Twist pitch	Shield cov-erage (braid)	Unit O.D.	Cond. D.C.R	Shield D.C.R.	Nom. cap.*	Nom. cap.**		
			m	mm	kg/100m	mm ² /(AWG) Q'ty/mm	mm	%	mm	Ω/100m	Ω/100m	pF/m	pF/m	Ω	dB/100m (3 MHz)
 DA206 Jacket color: blue	1	DA206	100 200	7.3	7.5	0.56(20) 7/0.32A	60	95%	—	3.3	1.4	48	73	110	2.6
 DA202 Jacket color: blue	1	DA202	100 200	5.0	3.7	0.18(25) 7/0.18A	32	95%	—	10.6	2.2	45	—	110	5.1
 DA202AT Jacket color: blue	1	DA202AT	100 200	4.0	1.6	0.18(25) 7/0.18A	38	—	—	10.6	—	45	—	110	6.7
 DA203AL Jacket color: blue	1	DA203AL	100 200	6.0	4.2	0.29(23) 7/0.23TA Overall tin coated	45	—	—	6.8	—	48	95	110	5.4
 DA202F-8P Jacket color: blue	2	DA202F-2P	100 200 500	7.7	6.7	0.18(25) 7/0.18TA	25	91% Spiral shield	3.0	11.3	3.0	47	95	110	5.6
	4	DA202F-4P		8.8	10										
	8	DA202F-8P		11.5	17										
 DA203-4AL Jacket color: blue	2	DA203-2AL	100 200 500	11.8	12	0.29(23) 7/0.23TA Overall tin coated	42	—	4.9	6.9	—	48	95	110	5.4
	4	DA203-4AL		13.8	18										
	8	DA203-8AL		19.3	33										
	12	DA203-12AL		21.9	44										

Insulation: Cross-linked PE (DA202F-P: Cross-linked foam PE) Jacket: PVC Dielectric strength: 500V AC/min. *Capacitance between conductors **Capacitance between conductor and shield.

DA206, DA202

- PE rod configuration ensures consistent 110 Ω impedance with large or small bends in cable during installation.
- DA206 ideal for digital audio paths up to 360 m*.
- DA202 ideal for digital audio paths up to 180 m*.
- DA202 contains a drain wire.

DA202AT

- Designed for internal cabling connections on racks.
- Ideal for digital audio paths up to 140 m*.
- Drain wire included.

*Condition: AES3 SR48kHz

DA203-AL Series

- Wrapping tool can be used.
- Ideal for digital audio paths up to 170 m*.
- Drain wire included in each unit.

DA202F Series

- Slim and lightweight.
- DA202F-8P designed to fit snugly with D-sub 25 pin connector.
- Cross-linked foam PE insulation.
- Ideal for digital audio paths up to 140 m*.
- Drain wire included in each unit.

Channel Color Coding

DA202F-P: by the insulator color & the spiral markings on the inner jacket (blue).

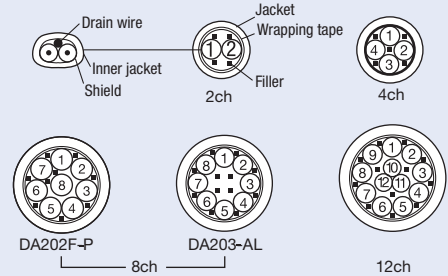
Unit no.	1	2	3	4	5	6	7	8
Insulator Color	BRN, WHT	RED, WHT	ORG, WHT	YEL, WHT	GRN, WHT	BLU, WHT	PUR, WHT	GRY, WHT
Spiral Markings	BRN	RED	ORG	YEL	GRN	—	PUR	GRY

DA203-AL: by the insulator color & the spiral markings on the inner jacket (gray).

Unit no.	1	2	3	4	5	6	7	8	9	10	11	12
Insulator Color	RED, WHT	BLU, WHT	YEL, WHT	GRN, WHT	BRN, WHT	GRY, WHT	BLU, BLK	YEL, BLK	GRN, BLK	BRN, BLK	GRY, BLK	BLU, ORG
Spiral Markings	RED	BLU	YEL	GRN	BRN	—	BLU, BLK	YEL, BLK	GRN, BLK	BRN, BLK	BLK	BLU, ORG

Cross-sectional View for DA202F-P & DA203-AL


Single unit config.



Speaker Cables (Single)

Four-conductor configuration minimizes noise and polyethylene insulation reduces induction rate to boost frequency characteristics

4-conductor Speaker Cable

Type	Model	Pair cross-sec mm ²	Sales units m	Nom. O.D mm	Weight kg/100m	Composition				Electrical characteristics	
						No. of cond.	Cross sec area (AWG) mm ² (AWG)	Cond. comp Q'ty/mm	Twist pitch mm	Cond. D.C.R. Ω/100m	Nom. capacitance* pF/m
 <p>4S8 Jacket color for 4S6: gray, black, red, blue, cream for 4S8, 4S11, 4S6G: gray, black for 4S8G, 4S11G: gray</p>	4S6	1.0	100 200 400	6.4	5.4	4	0.51(20)	20/0.18A	45	3.7	125
	4S8	2.5		8.3	9.5	4	1.27(16)	50/0.18A	70	1.5	145
	4S11	4.3		10.7	16	4	2.18(14)	41/0.26A	100	0.9	146
	4S6G	1.0		6.4	5.4	4	0.51(20)	20/0.18(OFC)	45	3.7	125
	4S8G	2.5		8.3	9.5	4	1.27(16)	50/0.18(OFC)	70	1.5	145
	4S11G	4.3		10.7	16	4	2.18(14)	41/0.26(OFC)	100	0.9	146

Insulation: polyethylene (red, translucent red, white, translucent white) Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors.

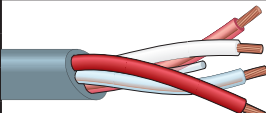
4S6, 4S8, 4S11

- High-performance PVC jacket, resistant to bending and twisting.
- 4S6 designed to fit snugly with Cannon XLR.

4S6G, 4S8G, 4S11G

- The G versions feature oxygen-free copper (OFC, JIS H3510) conductors.

4-conductor Speaker Cable for Fixed Installation

Type	Model	Pair cross-sec mm ²	Sales units m	Nom. O.D mm	Weight kg/100m	Composition				Electrical characteristics	
						No. of cond.	Cross sec area (AWG) mm ² (AWG)	Cond. comp Q'ty/mm	Twist pitch mm	Cond. D.C.R. Ω/100m	Nom. capacitance* pF/m
 <p>4S10F Jacket color for 4S10F, 4S12F, 4S14F, 4S18F: gray, black for 4S10FG, 4S12FG: gray</p>	4S10F	3.5	100 200 400 1000	9.6	15	4	1.75(15)	33/0.26A	100	1.1	144
	4S12F	5.6		11.6	22	4	2.81(13)	35/0.32A	120	0.7	152
	4S14F	8.0		14.0	32	4	4.0(12)	50/0.32A	120	0.5	—
	4S18F	14.2		17.5	53	4	7.08(9)	88/0.32A	150	0.3	—
	4S10FG	3.5		9.6	15	4	1.75(15)	33/0.26(OFC)	100	1.1	144
	4S12FG	5.6		11.6	22	4	2.8(13)	35/0.32(OFC)	120	0.7	152

Insulation: polyethylene (red, translucent red, white, translucent white) Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors.

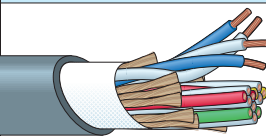
4S10F, 4S12F, 4S14F, 4S18F

- Special supple jacket designed for use in building conduits.

4S10FG, 4S12FG

- The G versions feature oxygen-free copper (OFC, JIS H3510) conductors.

Multichannel Speaker Cables

Type	Model	Pair cross-sec mm ²	Sales units m	Nom. O.D mm	Weight kg/100m	Unit composition				Electrical characteristics	
						No. of cond.	Cross sec area (AWG) and cond. comp. mm ² (AWG) Q'ty/mm	Twist pitch mm	Ch. O. D. mm	Cond. D.C.R. Ω/100m	Nom. cap.* pF/m
 <p>S410-4P Jacket color: gray</p>	S410-4P	2.0	100 200 500	15.0	26	16	1.0(18) 127/0.10(OFC)	50	5.1	1.9	165
	S410-6P	2.0		18.3	39	24					
	S410-8P	2.0		21.6	53	32					

Insulation: Polyethylene Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors.

S410-P Series

- Low crosstalk performance
- Ideal for use in multi-way speaker systems.
- Oxygen-free copper (OFC, JIS H3510) conductors.

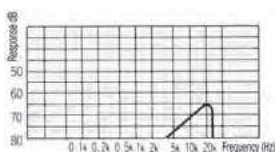



Fig. 1 Crosstalk Characteristics for S410-4P

■ Cross-sectional View of S410-4P and Channel color coding

Unit no.	1	2	3	4	5	6	7	8
Insulation color	RED/WHT/ RED/WHT	BLU/WHT/ BLU/WHT	YEL/WHT/ YEL/WHT	GRN/WHT/ GRN/WHT	BRN/WHE/ BRN/WHT	GRY/WHT/ GRY/WHT	BLU/BLK/ BLU/BLK	YEL/BLK/ YEL/BLK

2-conductor Speaker Cable

Type	Model	Sales units	Nom. O.D	Weight	Composition			Electrical characteristics		
					No. of cond.	Cross sec. area.	Cond. comp	Twist pitch	Cond. D.C.R.	Nom. capacitance*
		m	mm	kg/100m		mm ² (AWG)	Q'ty/mm	mm	Ω/100m	pF/m
 2S11F Jacket color: gray, black	2S7F	100 200 400	6.8	5.2	2	1.27 (16)	50/.018A	50	1.5	56
	2S9F		8.9	8.7	2	2.18 (14)	41/0.26A	60	0.9	56
	2S11F		11.1	14	2	3.62 (12)	45/0.32A	80	0.5	55
	2S14F		13.8	21	2	5.63 (10)	70/0.32A	90	0.3	55
	2S7FG		6.8	5.2	2	1.27 (16)	50/.018(OFC)	50	1.5	56
	2S9FG		8.9	8.7	2	2.18 (14)	41/0.26(OFC)	60	0.9	56
	2S11FG		11.1	14	2	3.62 (12)	45/0.32(OFC)	80	0.5	55
	2S14FG		13.8	21	2	5.63 (10)	70/0.32(OFC)	90	0.3	55

Insulation: polyethylene (orange, white) Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between conductors.

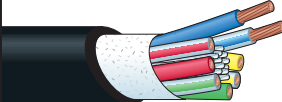
2S7F, 2S9F, 2S11F, 2S14F

- Special supple jacket designed for use in building conduits.

2S7FG, 2S9FG, 2S11FG, 2S14FG

- The G versions feature oxygen-free copper (OFC, JIS H3510) conductors.

Multicore Speaker Cable

Type	Model	Sales units	Nom. O.D	Weight	Composition		Electrical characteristics		
					No. of cond.	Cross sec. area and cond. comp.	Cond. O. D.	Cond. D.C.R.	Nom. capacitance*
		m	mm	kg/100m		mm ² /(AWG) Q'ty/mm	mm	Ω/100m	pF/m
 Jacket color: black	8S15G	100	14.9	33.0	8	2.49 (14) 98/0.18 (OFC)	3.26	0.7	51

Insulation: polyethylene Jacket: PVC Dielectric strength: 500V AC/min.

*Capacitance between adjacent conductors.

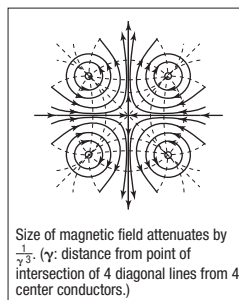
8S15G

- Eight-core speaker cable ideally suited for use with Neutrik speakON NL8 and a line array speaker.
- Oxygen-free copper (OFC, JIS H3510) conductors.

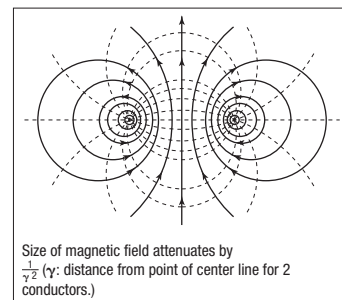
Technical Note

Four-conductor Configuration Minimizes Noise

Speaker cable must accommodate relatively high signal levels, typically tens to hundreds of watts of RMS power. Electromagnetic interference (EMI) can radiate from these speaker lines directly into adjacent low voltage cables (i.e. microphone, video, lines, etc.). Canare solves this problem by using a 4-conductor "Star Quad" configuration in all of our 4S-series speaker cables. Because every conductor is located the same distance from center, the opposing magnetic fields are cancelled out. Attenuation of magnetic field radiation is superior when compared to a standard 2-conductor speaker wire.



Four-conductor cable



Two-conductor cable

Selecting the Right Speaker Cable

Always try to keep speaker cables as short as possible and select cable models that offer a higher damping factor; 20-50 for music (i.e. connect sound) and 10-20 for speech (i.e. sport stadiums).

The greater the damping factor (DF), the better the ability to control speaker excursion to create sharp, clear quality in the low end frequency range.

$$\text{damping factor} = \frac{\text{speaker impedance}}{\text{power amp. output impedance} + \text{cable cond. resist. for total loop}}$$

As the above formula shows, a higher conductor resistance causes a lower damping factor, which prevents even top quality power amps from performing at peak optimum levels.

Speaker Cable Length obtained from the Damping Factor (reference)

Model	Cross-sec. Area	Cond. Resist.	Cond. Resist. for Total Loop	Cable Length (m)	
				DF = 20	DF = 50
4S6(G)	1.02/17 (pair)	1.85	0.037	9.5	3.0
4S8(G)	2.52/14 (pair)	0.75	0.015	23.3	7.3
4S11(G)	4.36/11 (pair)	0.45	0.009	38.9	12.2
4S10F(G)	3.50/15 (pair)	0.55	0.011	31.8	10.0
4S12F(G)	5.62/13 (pair)	0.35	0.007	50.0	15.7
4S14F(G)	8.00/12 (pair)	0.25	0.005	70.0	22.0
4S18F(G)	14.16/9 (pair)	0.15	0.003	116.7	36.7
S410-*P	2.00/18 (pair)	0.95	0.019	18.4	5.8
2S7F(G)	1.27/16	1.5	0.030	11.7	3.7
2S9F(G)	2.18/14	0.9	0.018	19.4	6.1
2S11F(G)	3.62/12	0.5	0.010	35.0	11.0
2S14F(G)	5.63/10	0.3	0.006	58.3	18.3
8S15G	2.49/14	0.7	0.014	25.0	7.9

Conditions: Speaker impedance = 8 Ω, Power amplifier output impedance = 0.05 Ω