MOGAMI

2017 • 2018

• PATCH CORDS • MICROPHONE CABLES • SNAKE CABLES (MULTICORE MIC. CABLES) • CONSOLE INTERNAL/EXTERNAL WIRING CABLES •
• SPEAKER CABLES • VIDEO CABLES & HIGH FREQUENCY COAX. CABLES • DIGITAL INTERFACE CABLES •
• OVERALL SHIELDED MULTICORE CABLES • GUITAR CABLES • HI-FI AUDIO CABLES • ULTRAFLEXIBLE MINIATURE CABLES •

MIT INC.

MOGAMI

MOGAMI cable products listed in this brochure are mostly comprised of major products designed by ex-president of Mogami Wire & Cable Corp., Koichi Hirabayashi, as a result of his own inventions, compromises and rediscoveries of past great works done by many predecessors step by step for 50 years of his career while being tossed about with economic strife, who could achieve deeper understanding of science and practical production technologies being affected by many attractive and emotionally impressive scientists such as Richard P. Feynman in a country called Japan where manufacturing industries have rapidly developed, depending heavily on the huge and flourishing American market and technologies introduced after World War II when the industrial world was greatly developed in so-called Western Countries, being supported by rapidly developing technology in electronics and petroleum chemical industries.

These products not found in standardized goods may certainly embody a side of the present condition of Japanese manufacturing industries, because there are now few items from Japan which are still competitive in the world market after 2000.

Most of the products listed in this brochure are centered around the professional audio, video and digital interface market such as recording studios, broadcast stations, theatres, halls etc. The basic design idea puts importance on sound quality for audio applications and on economy for other applications. There are some items which are available only from MOGAMI, and a common design idea through the whole line lies in the flexibility of the cable, considering handiness and efficiency for wiring and installation.

2017

MIT INC.

CONTENTS

PATCH CORDS

BANTAM TT PATCH CORDS

LONGFRAME PATCH CORDS

HIGH DEFINITION 75Ω AUDIO VIDEO PATCH CABLES AND BALANCED 1/4" PLUG PATCH CORDS

MOGAMI BANTAM AND LONGFRAME PATCH CORDS are the first high definition audio cables specifically designed for recording studio engineers and broadcast professionals, and offer the following outstanding features:

- Super-flexible Quad-Balanced NEGLEX OFC wiring and Overall Served (Spiral) Shield provide maximum definition, detail and signal transparency in addition to giving excellent protection from electro-magnetic noise.
- Both analog audio and digital audio patch cables are available.
- Maintenance free with durable nickel plated tip / ring / sleeve connector preventing from tarnishing. Degradation of the sound quality caused by secular change becomes extremely low on account of it.
- Compact refined mold design permits use in high density jack fields.
  BANTAM PLUG : Overall Diameter 7.8mm (0.307") LONGFRAME PLUG : Overall Diameter 10.6mm (0.417")
- Interchangeable color rings for easy patch cord identification.
- Choice of five attractive colors for Bantam Patch Cord Only : Black・Red・Yellow・Green・Blue
  Available standard color for longframe patch cord is Black only.
- Adaptor cable of bantam plug or longframe plug to other connector available to special order.
- Neglex OFC bulk cable also available in 50m (164Ft), 100m (328Ft) and 200m (656Ft) rolls :
  Analog cable : Part No.2893
  Digital cable : Part No.3228

OTHER VARIATION OF AUDIO AND VIDEO PATCH CABLES

Supplemented to TT Patch Cables, many other variation of audio and video patch cables are available in standard lengths. Available combination is RCA Plug, 2P and 3P 1/4" Phone Plug with original mold cover and one touc push-pull BNC connector. Used unbalanced audio cable Part No. 2964 is designed to be 75Ω coaxial cable comprised of OFC conductor so that it can be used for video signal as well as audio signal application with its low capacitance value of 65pF/m (19.8pF/Ft). Stereo cable Part No. 2965 is basically dual version of 2964 so that it can be also used for video signal.

Bantam Patch Cord

Analog

Part No.	PJM-12	PJM-18	PJM-24	PJM-36	PJM-48	PJM-60	PJM-72
Length	12" 30cm	18" 45cm	24" 60cm	36" 90cm	48" 120cm	60" 150cm	72" 180cm

Cable : Part No. 2893 standard Color : Black • Red • Yellow • Green • Blue

Digital

Part No.	PJD-12	PJD-18	PJD-24	PJD-36	PJD-48	PJD-60	PJD-72
Length	12" 30cm	18" 45cm	24" 60cm	36" 90cm	48" 120cm	60" 150cm	72" 180cm

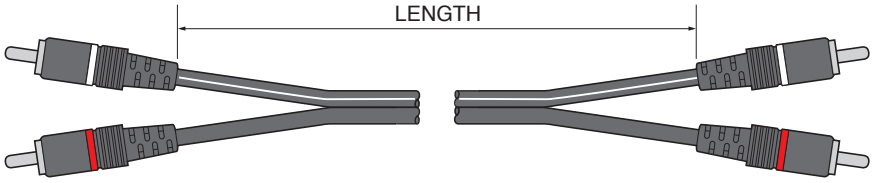
Cable : Part No. 3228 standard Color : Black only

Longframe Patch Cord

Part No.	LF-18	LF-24	LF-36	LF-48	LF-72
Length	18" 45cm	24" 60cm	36" 90cm	48" 120cm	72" 180cm

Cable : Part No. 2893 Standard Color : Black

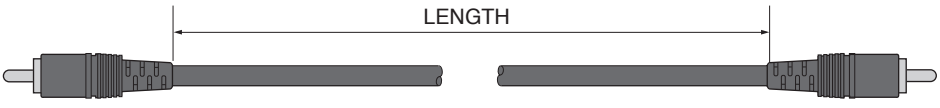
Stereo RCA Phono Cables



Part No.	WR-01	WR-03	WR-06	WR-10	WR-15	WR-20
Length	1 Ft 30cm	3 Ft 90cm	6 Ft 1.8m	10 Ft 3m	15 Ft 4.5m	20 Ft 6.1m

Cable : Part No. 2965 Color : Black only

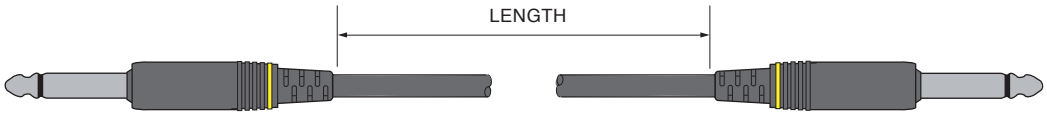
RCA Plug to RCA Plug



Part No.	RR-01	RR-03	RR-06	RR-10	RR-15	RR-20
Length	1 Ft 30cm	3 Ft 90cm	6 Ft 1.8m	10 Ft 3m	15 Ft 4.5m	20 Ft 6.1m

Cable : Part No. 2964 Standard color : Black

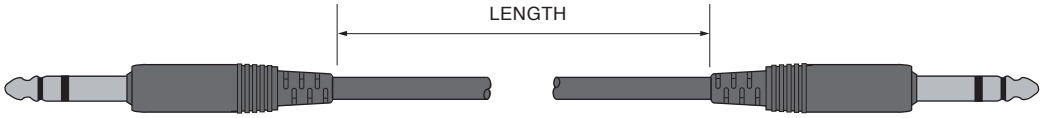
1/4" Plug to 1/4" Plug (2P/Mono)



Part No.	PP-01	PP-03	PP-06	PP-10	PP-15	PP-20
Length	1 Ft 30cm	3 Ft 90cm	6 Ft 1.8m	10 Ft 3m	15 Ft 4.5m	20 Ft 6.1m

Cable : Part No .2964 Standard color : Black

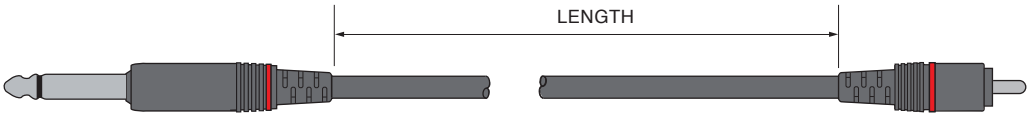
1/4" Plug to 1/4" Plug (3P/Stereo/TRS)



Part No.	SS-01	SS-03	SS-06	SS-10	SS-15	SS-20
Length	1 Ft 30cm	3 Ft 90cm	6 Ft 1.8m	10 Ft 3m	15 Ft 4.5m	20 Ft 6.1m

Cable : Part No .2893 Standard color : Black

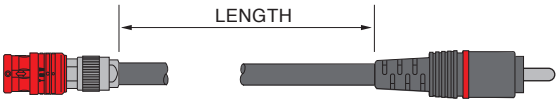
1/4" Plug to RCA Plug



Part No.	PR-01	PR-03	PR-06	PR-10	PR-15	PR-20
Length	1 Ft 30cm	3 Ft 90cm	6 Ft 1.8m	10 Ft 3m	15 Ft 4.5m	20 Ft 6.1m

Cable : Part No .2964 Standard color : Black

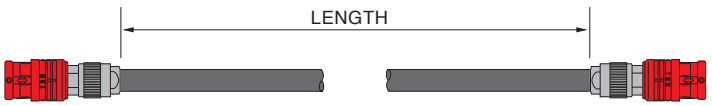
BNC to RCA



Part No.	BR-03	BR-06	BR-10	BR-16
Length	3Ft 0.9m	6Ft 1.8m	10Ft 3.0m	16Ft 4.8m

Cable : Part No. 2964 Standard Color : Black

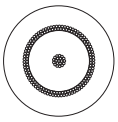
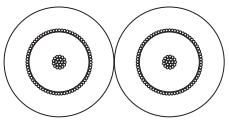
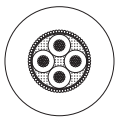
BNC to BNC



Part No.	BB-01	BB-02	BB-03	BB-06	BB-10	BB-16	BB-25	BB-33	BB-50	BB-66	BB-100
Length	1Ft 0.3m	2Ft 0.6m	3Ft 0.9m	6Ft 1.8m	10Ft 3.0m	16Ft 4.8m	25Ft 7.6m	33Ft 10.0m	50Ft 15.2m	66Ft 20.1m	100Ft 30.5m

Cable : Part No. 2964 Standard Color : Black • Red • Yellow • Green • Blue

CABLE SPECIFICATIONS

Configuration				
Part No.		2964	2965	2893
No. of Conductor		1(Mono)	2×1(Dual)	4(Quad)
Conductor	Details	20/0.12 OFC		30/0.08 OFC
	Size(mm^2)	0.226mm^2 (#24 AWG)		0.15mm^2 (#26 AWG)
Insulation	Ov. Dia.(mm)	2.65ϕ(0.104")		1.0ϕ(0.039")
	Material	XLCPE (Cross-Linked Cellular PE)		XLPE
	Colors	Clear		Black/Red/Blue/Clear
Served Shield		Double Served Shield Approx.66/0.12 OFC, Approx.72/0.12 OFC	Approx.66/0.12 OFC	Approx.72/ 0.12A
Jacket	Ov. Dia.(mm)	4.8ϕ(0.189")		
	Material	Flexible PVC		
	Colors	Black/Red/Yellow/Green/Blue	Black	Black/Red/Yellow/Green/Blue
Roll Sizes		50m/100m/200m (164 Ft /328Ft/656Ft)	77m /153m (250 Ft /500 Ft)	50m/100m/200m (164Ft/328Ft/656 Ft)
Weight		3.4kg/100m(328Ft)	8.9kg/153m(500Ft)	7.5kg/200m(656Ft)

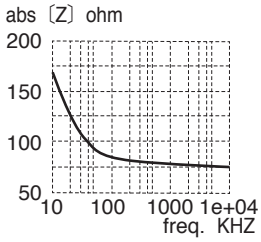
ELECTRICAL & MECHANICAL CHARACTERISTICS

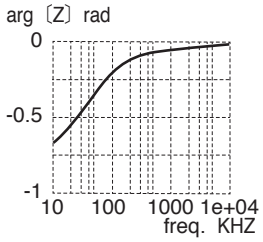
Part No.		2964	2965	2893
DC Resistance at 20°C	Inner Cond.	0.083Ω/m(0.025Ω/Ft)		0.13Ω/m(0.040Ω/Ft)
	Shield	0.012Ω/m(0.0037Ω/Ft)	0.025Ω/m(0.0076Ω/Ft)	0.023Ω/m(0.0070Ω/Ft)
Capacitance at 1kHz,20°C		57pF/m(17.4pF/Ft)		Ref. Page 8.
Inductance between conductors at 1kHz. 20°C		0.4μH/m(0.12μH/Ft)		0.5μH/m(0.15μH/Ft)
Characteristic Impedance(10MHz)		75Ω		-
Attenuation(10MHz) *(1)		0.047dB/m(0.014db/Ft)		-
Phase Constant(10MHz)		0.3 rad/m		-
Electrostatic Noise *(2)		50m V Max.		50m V Max.
Microphonics at 50KΩ Load *(2)		40m V Max.		30m V Max.
Voltage Breakdown		Must withstand at DC 500V/15sec.		
Insulation Resistance		10^5 MΩ · m Min. at DC 125V,20°C		
Flex Life *(2)		16,000cycles	16,500cycles	26,000cycles
Tensile Strength		274N	539N	500N
Emigration		non–emigrant to ABS resin		
Applicable Temperature		-20°C~ +70°C(-4°F~ +158°F)		

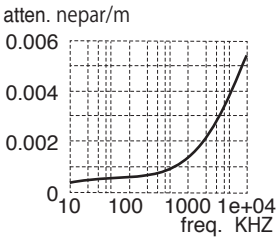
* (1)Attenuation 1 dB=0.1151 neper (1 neper=8.686 dB)

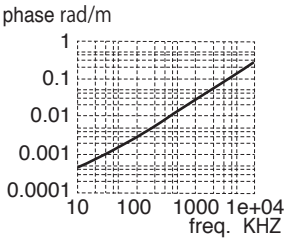
* (2)Using standard testing methods of Mogami Wire & Cable Corp.

Note : For digital audio cable Part No.3228 cable, see page48







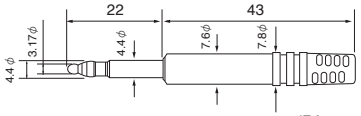


High frequency characteristics of Part No.2964 and #2965.

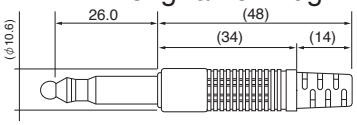
600Ω AUDIO TERMINATION /600Ω

600Ω Bantam Plug Termination and
600Ω Longframe Plug Termination.

Bantam Plug



Longframe Plug



(Dimensions in mm)

Part No.	Bantam	Longframe
	PJM-TNT	LF-TNT

Plug Mold	Material	PVC
	Color	Ivory
Metal Film Resistor	Power Rating	1/4W
	Resistance	602Ω±1%

PART NUMBERING SYSTEM FOR CUSTOM ASSEMBLIES

Ordering Information

Example

One end : XLR Male
Another end : XLR Female
Length : 5m
Colour : Blue
Desirable Cable : 2534

MF - 50 - 06 - 2534

Connectors at both ends
M=XLR Male
F =XLR Female
J =Bantam Plug
L =Long Frame Plug
P =1/4" 2p Phone Plug
S =1/4" 3p Phone Plug
R =RCA Phono Plug
3.5S=3.5mm 3P Mini Plug
B =75Ω BNC (male)

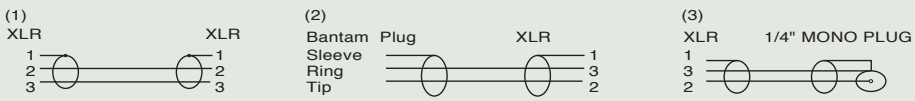
Cable Length
(specify units)
Example
1.0m=10
2.5m=25
5.0m=50
7.5m=75
10.0m=100

Cable Colour
00=Black
01=Brown
02=Red
03=Orange
04=Yellow
05=Green
06=Blue
07=Purple
08=Gray
09=White

Cable Part No.
Example
2534
2893
2791
2552
2964
2965
etc.

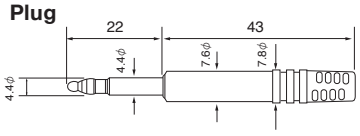
In case of XLR audio connector, please specify the hot pin number #2 or #3.
Also, for any special wiring, wiring diagram is necessary.
Followings are representative wiring diagrams for your reference.

Standard Connection

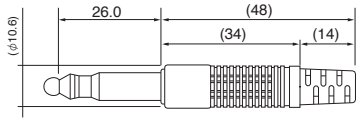


Connector Specifications (Dimensions in mm)

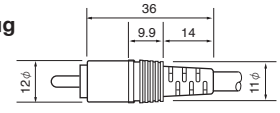
Bantam Plug



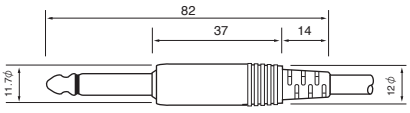
Longframe Plug



RCA Plug



1/4"(6.35φ) Plug



Construction	RCA Phono Plug	1/4" Phone Plug	Bantam Plug	Longframe Plug
Contacts	Brass, Gold plate	Brass, Nickel plate	Brass, Nickel plate	Brass, Nickel plate
Shield	Phosphor Bronze, Gold plate	Brass, Nickel plate	Brass, Nickel plate	Brass, Nickel plate
Insulation	ABS Resin	Polystyrene	Polyacetal	Polyacetal
Molding	Flexible PVC	Flexible PVC(Double Mold)	Flexible PVC	Flexible PVC(Double Mold)

NOTE: For BNC connector, please refer to Page 40~42.

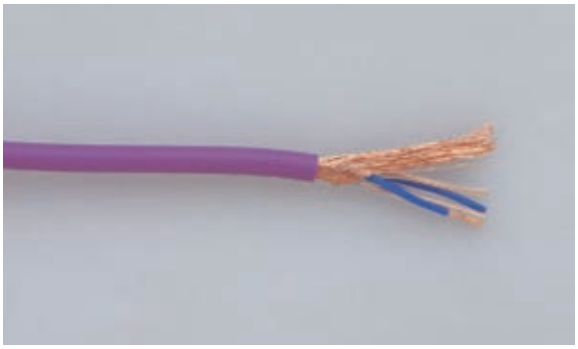
MICROPHONE CABLES

MOGAMI

NEGLEX QUAD MIC. CABLES

NEGLEX type Quad Cables have been developed for the highest quality recording applications where maximum definition of recorded sound is of critical importance. Special proprietary materials & construction methods make those state-of-the-art mic. cables a must for direct to DISC and digital recording. Basic matters of flexibility, microphonics and shielding effect have been designed to meet international professional requirements. A Balanced quad structure is effective for high definition sound transmission as well as in canceling electromagnetic induction caused by nearby equipment such as floodlight projection, and therefore is well adapted to motion picture and TV studios.

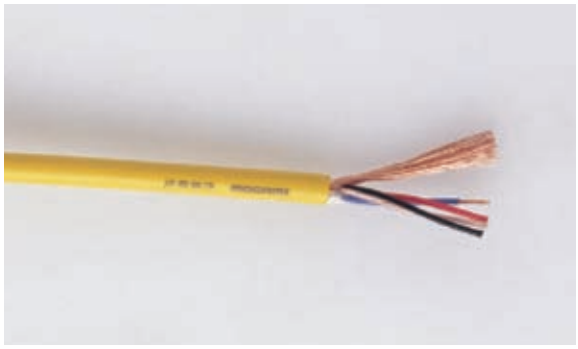
- Conductor insulation is XLPE (Cross-Linked Polyethylene) which has excellent electrical characteristics and prevents shrink-back during soldering.
- Served (spiral) Bare Copper Shield is better for sound quality and simplifies termination.



Part No.2534

Reference Standard NEGLEX Quad High Definition Mic. Cable

NEGLEX No.2534 has become popular around the world as the standard for high quality digital and analog recording. The cable has also become popular for use with unbalanced equipment, such as high quality pre-amp, amp inputs and tape decks.



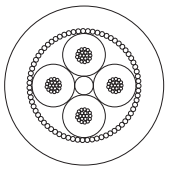
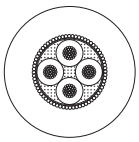
Part No.2893

Miniature Quad Superflexible Mic. Cable

Originally designed for BANTAM patch-cords, this cable has become popular where a small diameter Quad mic cable is required.

NEGLEX QUAD MIC. CABLES

SPECIFICATIONS

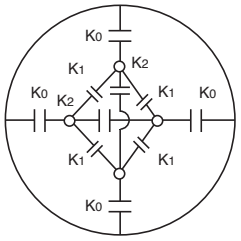
Configuration			
Part No.		2534	2893
No. of Conductor		4	
Conductor	Details	20/0.12 OFC	30/0.08 OFC
	Size(mm²)	0.226mm²(#24AWG)	0.15mm²(#26AWG)
Insulation	Ov. Dia.(mm)	1.6φ(0.063")	1.0φ(0.039")
	Material	XLPE(Cross-Linked Polyethylene)	
	Colors	Blue/Clear(Quad)	Black/Red/Blue/Clear
Served Shield		Approx. 62/0.18A	Approx. 72/0.12A
Jacket	Ov. Dia.(mm)	6.0φ(0.236")	4.8φ(0.189")
	Material	Flexible PVC	Flexible PVC
	Colors	10 colours available	5 colours available
Roll Sizes		50 m (164Ft) 100m (328Ft) 200m (656Ft)	50 m (164Ft) 100m (328Ft) 200m (656Ft)
Weight per 200m Roll		11 kg	7.5kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.			2534	2893
DC Resistance at 20°C	Inner Cond.		0.083Ω/m(0.025Ω/Ft)	0.13Ω/m(0.040Ω/Ft)
	Shield		0.012Ω/m(0.0037Ω/Ft)	0.023Ω/m(0.0070Ω/Ft)
Capacitance at 1kHz, 20°C (Partial C. Value) See below figure *(1)		K_0	65pF/m(20 pF/Ft)	74pF/m(23 pF/Ft)
		K_1	13pF/m(4 pF/Ft)	11pF/m(3.4 pF/Ft)
		K_2	4pF/m(1.2 pF/Ft)	3pF/m(0.9 pF/Ft)
	Balanced Quad Connection	Cond.-Cond.	97pF/m(29.6 pF/Ft)	131pF/m(40 pF/Ft)
		Cond.-Shield.	110pF/m(33.6 pF/Ft)	178pF/m(54 pF/Ft)
Inductance betweenn conductors at 1kHz, 20°C			0.4μH/m (0.12μH/Ft)	0.5μH/m(0.15μH/Ft)
Electrostatic Noise *(2)			50 mV Max.	50 mV Max.
Electromagnetic Noise *(2)			0.15 mV Max.	0.15 mV Max.
Microphonics at 50kΩ Load *(2)			30 mV Max.	30 mV Max.
Voltage Breakdown			Must withstand at DC 500V/15 sec.	
Insulation Resistance			10^5 MΩ · m Min. at DC 125 V, 20°C	
Flex Life *(2)			11,000 cycles	26,000 cycles
Tensile Strength			686 N	500 N
Emigration			Non-Emigrant to ABS	
Applicable Temperature			-20°C~ + 70°C (-4°F~ + 158°F)	

*(2) Using standard testing methods of Mogami Wire & Cable Corp.

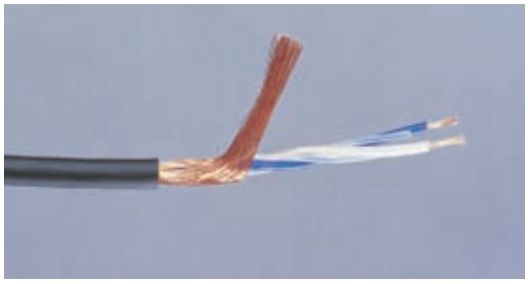
*(1) Partial Capacitance



HIGH QUALITY BALANCED MIC. CABLES

NEGLEX TYPE #22AWG BALANCED MIC. CABLE

2549 has been designed using our famous Neglex OFC to provide the highest quality of audio reproduction in any recording application. It features #22AWG conductors and lower capacitance than our quad cables. The served shield and twisted pair construction is excellent at preventing noise caused by electromagnetic interference. This cable is recommended when high frequencies are important and where long cable runs are needed, and, it is cheaper and easier to terminate than quad cables.



Part No.2549

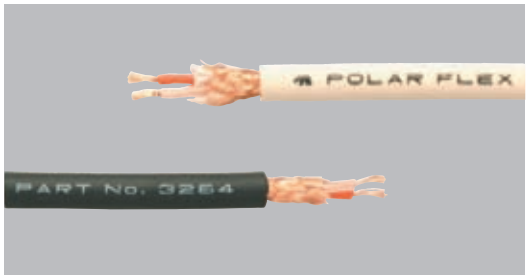
105 STRAND BROADCAST MIC. CABLE

Excellent for rugged remote and on stage use in Sound Reinforcement, TV, Radio broadcasting etc. Its compact size together with a heavy duty binder and filler system and a braided shield make it ideal for all continuous handling applications. Exhibits very low microphonic pick-up and can operate at very cold temperatures down to -20°C (-4°F) without losing its flexibility. 105 strands of 0.05 mm O.D. annealed bare copper (#44AWG) features ultra flexibility with long flex life, maintaining excellent strength characteristics.

Part No.2791

POLAR FLEX - EXTREME TEMPERATURE BALANCED MICROPHONE CABLE

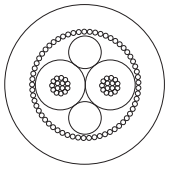
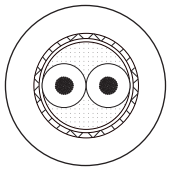
Polar Flex™ microphone cable is designed to maintain flexibility down to -40°C (-40°F). This is achieved by utilizing a TPE jacket instead of the more common PVC. This extremely rugged, durable cable uses the same unique, high strand-count internal construction as the 2791 Stage/Broadcast cable. Available in black and white.



Part No.3284

HIGH QUALITY BALANCED MIC. CABLES

SPECIFICATIONS

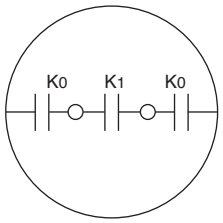
Configuration				
Part No.		2549	2791	3284
No. of Conductor		2		
Conductor	Details	30/0.12 OFC	105/0.05 A	
	Size(mm²)	0.339mm² (#22AWG)	0.206mm² (# 24AWG)	
Insulation	Ov. Dia. (mm)	1.9 ϕ (0.075")	1.5 ϕ (0.059")	
	Material	XLPE(Cross-Linked Polyethylene)		
	Colors	Blue/Clear	Red/Clear	
Shield		Served Approx. 62/0.18A	Braid 24/6/0.10A	Braid 24/6/0.10TA
Jacket	Ov. Dia. (mm)	6.0 ϕ (0.236")	5.5 ϕ (0.217")	
	Material	Flexible PVC		Flexible TPE
	Colors	Black/Red/Yellow/Green/Blue	Black	Black/White
Roll Sizes		50 m (164Ft) 100m (328Ft) 200m(656Ft)		100m (328Ft)
Weight per 100m Roll		4.8 kg	4.2kg	3.4kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.			2549	2791	3284
DC Resistance at 20°C	Inner Cond.		0.058Ω/m(0.018Ω/Ft)	0.09Ω/m(0.027Ω/Ft)	
	Shield		0.012Ω/m(0.004Ω/Ft)	0.02Ω/m(0.006Ω/Ft)	
Capacitance at 1kHz, 20°C (Partial C. Value) See below figure ＊(1)		K_0	76pF/m(23 pF/Ft)	86pF/m(26 pF/Ft)	
		K_1	11pF/m(3.4 pF/Ft)	10pF/m(3.1 pF/Ft)	
Inductance between conductors at 1kHz, 20°C			0.8 μH/m (0.24 μH/Ft)	0.8 μH/m (0.24 μH/Ft)	
Electrostatic Noise ＊(2)			50 mV Max.	250 mV Max.	
Electromagnetic Noise ＊(2)			0.15 mV Max.	0.15 mV Max.	
Microphonics at 50kΩ Load ＊(2)			30 mV Max.	30 mV Max.	
Voltage Breakdown			Must withstand at DC 500V/15 sec.		
Insulation Resistance			10^5 MΩ · m Min. at DC 125 V, 20°C		
Flex Life ＊(2)			14,500 cycles	131,000 cycles	53,000 cycles
Tensile Strength			657 N	578 N	
Emigration			Non-Emigrant to ABS		
Applicable Temperature			-20°C ~ + 70°C (-4 °F ~ + 158 °F)		-40°C~+60°C (-40°F~+140°F)

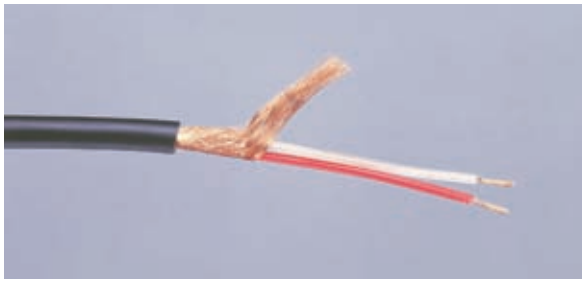
＊(2) Using standard testing methods of Mogami Wire & Cable Corp.

＊(1) Partial Capacitance



LOW COST HIGH PERFORMANCE SUPERFLEXIBLE BALANCED MIC. CABLES

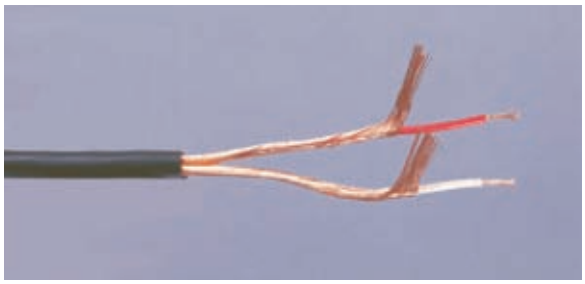
A specially developed high performance yet economical series of low impedance balanced microphone cables. These cables are small in size and special rubber-like PVC jacket is extremely flexible and exhibits good resistance to rough handling and abrasion.
High grade insulation material is designed to minimize heat shrinkage during soldering which allows easy termination to XLR type connectors. Available in both overall and individually sheilded types.



Part No.2552

Part No.2552 & 2582
Superflexible Light Weight Mic.Cables With Overall Shield
Here is an extremely limp and flexible cable for all types of audio/visual and industrial audio applications. XLPE insulation and a strong rubber-like outer jacket makes this cable ideal where a durable yet economical cable is needed.

Part No.	2552	2582
O.D. (mm)	5.0φ(0.197")	6.0φ(0.236")
Flex Life	11,000 cycles	13.800 cycles
Tensile Strength	421N	441N
Colors	Black	Black/Red/Yellow/ Green/Blue/Gray



Part No.2447

Part No.2447 & 2435
Superflexible Light Weight Mic.Cables With Individual Shield
A durable and mechanically strong cable similar to 2552 but with two separately served shields. This produces capacitance level a little higher than that of 2552.

Part No.	2447	2435
O.D. (mm)	5.0φ(0.197")	6.0φ(0.236")
Flex Life	14,000 cycles	24,000cycles
Tensile Strength	451 N	451 N
Color	Black	Black

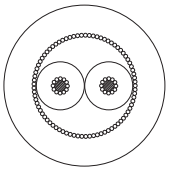
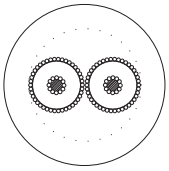
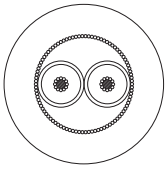
Part No.2792

Part No.2792
LOW MICROPHONICS MIC.CABLE WITH CONDUCTIVE PVC
Conductive material is coated on top of the XLPE insulation which reduces microphonic handling noise to negligible level even in high impedance applications. Before soldering the black coating shall be stripped back.

Part No.	2792
O.D. (mm)	6.0φ(0.236")
Flex Life	22,000cycles
Tensile Strength	490 N
Colors	Black/Red/Yellow/Green/Blue/Gray

LOW COST HIGH PERFORMANCE SUPERFLEXIBLE BALANCED MIC. CABLES

SPECIFICATIONS

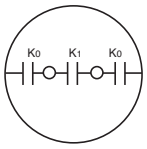
Configuration						
Part No.		2552	2582	2447	2435	2792
No. of Conductor		2				
Conductor	Details	12/0.12 A〈T250D＊3〉				
	Size(mm²)	0.135mm² (#26AWG)				
Insulation	Ov. Dia. (mm)	1.5φ(0.059")				
	Material	XLPE(Cross-Linked Polyethylene)				
	Colors	Red/Clear				
Conductive PVC(mm)		———	———	———	———	1.75φ(0.069")
Served Shield		Approx. 70/0.12A		Approx. 40/0.12A		Approx. 95/0.12A
Jacket	Ov. Dia. (mm)	5.0φ(0.197")	6.0φ(0.236")	5.0φ(0.197")	6.0φ(0.236")	6.0φ(0.236")
	Material	Flexible PVC				
	Colors	Black	Black/Red/Yellow/ Green/Blue/Gray	Black	Black	Black/Red/Yellow/ Green/Blue/Gray
Roll Sizes		50 m (164Ft) 100m (328Ft) 200m(656Ft)	50 m (164Ft) 100m (328Ft) 200m(656Ft)	100m (328Ft) 200m(656Ft)	100m (328Ft) 200m(656Ft)	50 m (164Ft) 100m (328Ft) 200m(656Ft)
Weight per 200m Roll		7.5 kg	9 kg	7.7kg	9kg	8.8kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

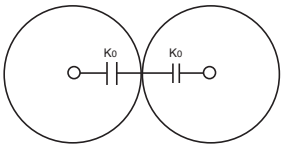
Part No.		2552	2582	2447	2435	2792
DC Resistance at 20°C	Inner Cond.	0.14Ω/m(0.043Ω/Ft)				
	Shield	0.024Ω/m(0.007Ω/Ft)		0.021Ω/m(0.006Ω/Ft)		0.018Ω/m(0.005Ω/Ft)
Capacitance at 1kHz, 20°C (Partial C. Value) See below figure ＊(1)	K_0	90pF/m(27 pF/Ft)		123pF/m(37.5 pF/Ft)		127pF/m(38.7 pF/Ft)
	K_1	10pF/m(3pF/Ft)		———		
Inductance betweenn conductors at 1kHz, 20°C		0.8μH/m (0.24μH/Ft)				
Electrostatic Noise ＊(2)		50 mV Max.		50 mV Max.		0.5 mV Max.
Electromagnetic Noise＊(2)		0.15 mV Max.				
Microphonics at 50kΩ Load ＊(2)		30 mV Max.	30 mV Max.	30 mV Max.	30 mV Max.	1 mV Max.
Voltage Breakdown		Must withstand at DC 500V/15 sec.				
Insulation Resistance		10^5 MΩ · m Min. at DC 125 V, 20°C				
Flex Life＊(2)		11,000 cycles	13,800 cycles	14,000 cycles	24,000 cycles	22,000 cycles
Tensile Strength		421 N	441 N	451 N	451 N	490 N
Emigration		Non-Emigrant to ABS				
Applicable Temperature		-20°C~ + 70°C (-4°F~ + 158°F)				

＊(2) Using standard testing methods of Mogami Wire & Cable Corp.

＊(1) Partial Capacitance

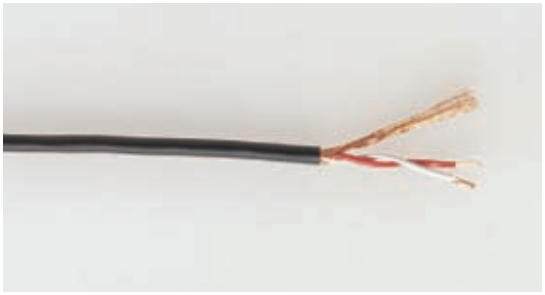


2552/2582

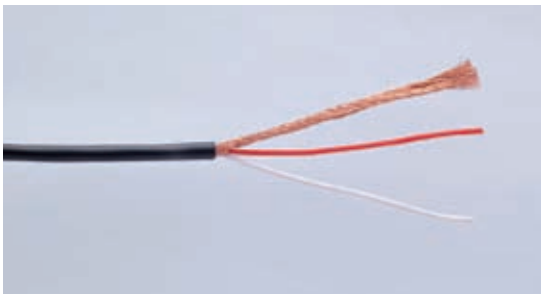


2447/2435/2792

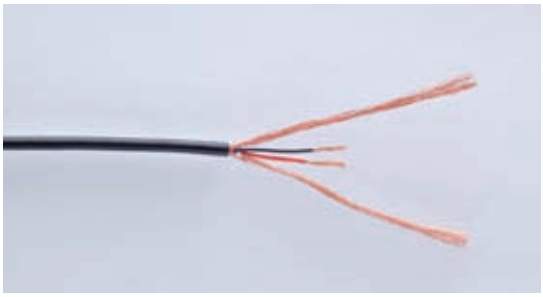
MINIATURE BALANCED MIC.CABLES/LAVALIER MIC.CABLES



Part No.2697



Part No.3031



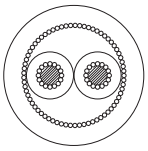
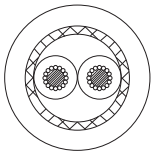
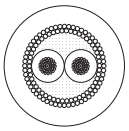
Part No.2901

These miniature microphone cables feature necessary mechanical strength (tensile strength and long flex life) and flexibility for lavalier microphones and other applications. All balanced configuration. Part No.3031 cable is exactly same construction as Part No.2697 cable except for shield structure. Part No.2697 cable is constructed with served (spiral) shield, while Part No.3031 cable is constructed with braided shield. Part No.2901 is specially designed with better tensile strength and longer flex life, sacrificing some sound quality, and creating a slightly more difficult soldering job because of used copper-tin alloy conductor, this cable is mechanically very strong and durable. Of couse, its cost is higher.

Note : Any specific countermeasure against microphonics(noise) for high impedance microphones is not taken for these three lavalier microphone cables.

MINIATURE BALANCED MIC.CABLES/LAVALIER MIC.CABLES

SPECIFICATIONS

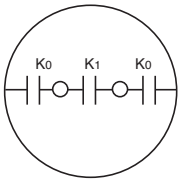
Configuration				
Part No.		2697	3031	2901
No. of Conductor		2		
Conductor	Details	16/0.08 A 〈T1000D＊1〉		43/0.04 Cu-Sn
	Size(mm^2)	0.08mm^2(#29AWG)		0.054mm^2(#30AWG)
Insulation	Ov. Dia. (mm)	0.85ϕ(0.033")		0.6ϕ(0.0236")
	Material	PVC		Polyester
	Colors	Red/White		Black/Red
Filler Thread		———		Fiver
Shield		Served Shield Approx.60/0.08A	Braided Shield 16/6/0.08A	Double Served Shield Approx.36/0.08A, Approx.40/0.08A
Jacket	Ov. Dia. (mm)	2.5ϕ(0.098")	2.8ϕ(0.110")	2.16ϕ(0.085")
	Material	Flexible PVC		
	Colors	Black	Black/White	Black
Roll Sizes		50 m (164Ft) 100m (328Ft) 200m (656Ft)	200m (656Ft)(on spool)	305 m (1000Ft)
Weight		1.8kg/200m	2.5kg/200m	2.6kg/305m

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.		2697	3031	2901
DC Resistance at 20°C	Inner Cond.	0.23Ω/m(0.070Ω/Ft)		0.41Ω/m(0.125Ω/Ft)
	Shield	0.063Ω/m(0.019Ω/Ft)	0.038Ω/m(0.0116Ω/Ft)	0.07Ω/m(0.0214Ω/Ft)
Capacitance at 1kHz, 20°C (Partial C. Value) See below figure ＊(1)	K_0	300pF/m(92pF/Ft)	290pF/m(88 pF/Ft)	176pF/m(54 pF/Ft)
	K_1	57pF/m(17pF/Ft)	70pF/m(21 pF/Ft)	32pF/m(9.8 pF/Ft)
Inductance between conductors at 1kHz, 20°C		0.8μH/m (0.24μH/Ft)		
Electrostatic Noise ＊(2)		50 mV Max.	200mV Max.	1mV Max.
Electromagnetic Noise ＊(2)		0.15 mV Max.		
Microphonics at 50kΩ Load ＊(2)		300mV Max.	150mV Max.	40mV Max.
Voltage Breakdown		Must withstand at DC 500V/15 sec.		
Insulation Resistance		10^5MΩ · m Min. at DC 125 V, 20°C		
Flex Life ＊(2)		34,100 cycles	26,000 cycles	177,000 cycles
Tensile Strength		294 N	313 N	176 N
Emigration		Non-Emigrant to ABS resin		
Applicable Temperature		-20°C~ + 70°C (-4°F~ + 158°F)		

＊(2) Using standard testing methods of Mogami Wire & Cable Corp.

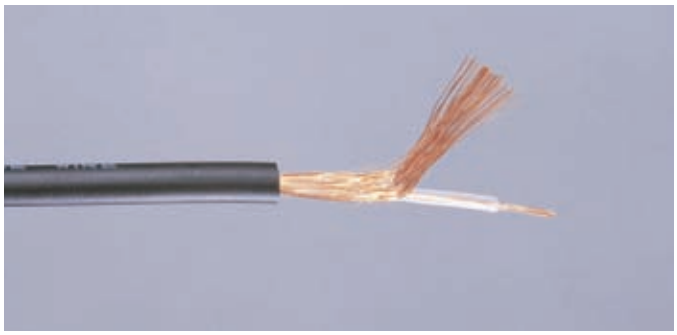
＊(1) Partial Capacitance



UNBALANCED MIC. CABLES

ECONOMICAL SUPERFLEXIBLE UNBALANCED MIC.CABLES

These cables show Mogami's manufacturing and cable design expertise in creating an economical unbalanced cables which maintain necessary mechanical strength (tensile strength and long flex life) and flexibility for a microphone cable. Two overall diameter sizes are available with exactly the same construction.



Part No.2333

Part No.	2330	2333
O.D. (mm)	3.0φ(0.118")	4.0φ(0.157")
Flex Life	15,500cycles	16,500 cycles
Tensile Strength	274 N	284 N
Color	Black	Black

Note : For the very highest quality recording applications, Mogami original high-end Neglex audio cable Part No. 2803 or Part No.2497 constructed with patented Double-Cylindrical structure should be used.

MINIATURE UNBALANCED MIC. CABLE

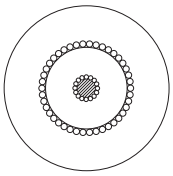
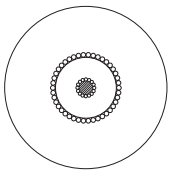
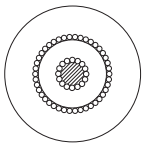
Part No.2368

Part No. 2368 cable has the same structure as Part No. 2697 cable except for an unbalanced configuration. Therefore, although it naturally becomes weaker than Part No. 2697 cable because of its smaller overall diameter, its mechanical strength is much higher than any comparable overall diameter cable without any special contrivance, besides, it is low cost.

Note : Any specific countermeasure against microphonics (noise) for high impedance microphones is not taken for this cable.

UNBALANCED MIC. CABLES / LAVALIER MIC. CABLE

SPECIFICATIONS

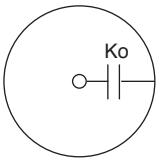
Configuration				
Part No.		2330	2333	2368
No. of Conductor		1		
Conductor	Details	16/0.08 A 〈T1000D＊1〉		
	Size(mm^2)	0.08mm^2(#29AWG)		
Insulation	Ov. Dia.(mm)	1.5ϕ(0.059")		1.0ϕ(0.039")
	Material	XLPE(Cross-Linked polyethylene)		PVC
	Color	Clear		White
Served Shield		Approx. 40/0.12A		Approx. 40/0.08A
Jacket	Ov. Dia.(mm)	3.0ϕ(0.118")	4.0ϕ(0.157")	2.0ϕ(0.079")
	Material	Flexible PVC		
	Color	Black		
Roll Sizes		100m (328Ft) 200m(656Ft)	200 m (656Ft) (standard)	100 m (328Ft) 200 m (656Ft)
Weight per 200m Roll		2.5 kg	4.2kg	1.5kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.		2330	2333	2368
DC Resistance at 20°C	Inner Cond.	0.23Ω/m(0.07Ω/Ft)		
	Shield	0.042Ω/m(0.013Ω/Ft)		0.094Ω/m(0.029Ω/Ft)
Capacitance at 1kHz, 20°C See below figure＊(1)	Ko	115pF/m(35 pF/Ft)		350pF/m(107 pF/Ft)
Inductance between conductors at 1kHz, 20°C		0.3μH/m (0.092μH/Ft)		
Electrostatic Noise＊(2)		50 mV Max.		
Electromagnetic Noise＊(2)		0.05 mV Max.		0.05 mV Max.
Microphonics at 50kΩ Load＊(2)		30 mV Max.		1V Max.
Voltage Breakdown		Must withstand at DC 500V/15 sec.		
Insulation Resistance		10^5MΩ · m Min. at DC 125 V, 20°C		
Flex Life＊(2)		15,500 cycles	16,500 cycles	43,000 cycles
Tensile Strength		274 N	284 N	206 N
Emigration		Non-Emigrant to ABS resin		
Applicable Temperature		-20°C~ + 70°C (-4°F~ + 158°F)		

＊(2) Using standard testing methods of Mogami Wire & Cable Corp.

＊(1) Partial Capacitance

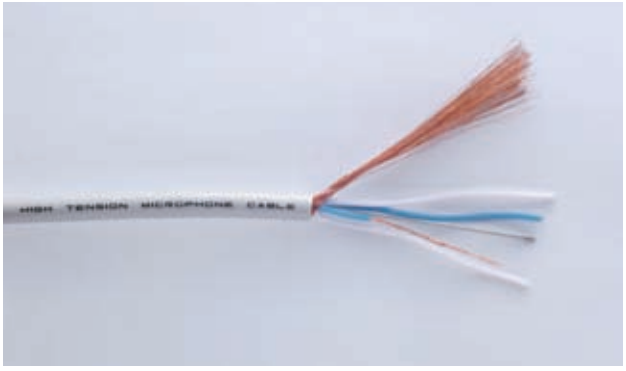


#24AWG STEREO MIC. CABLE

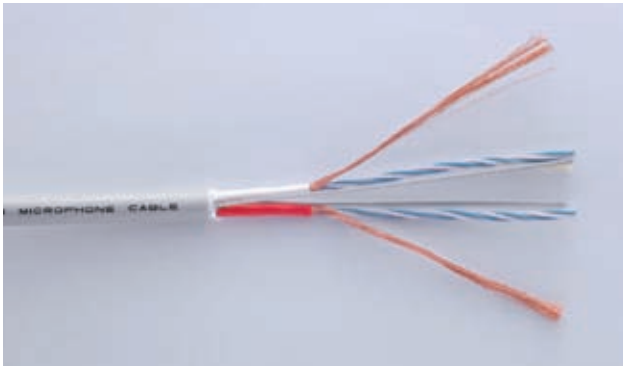
Part No.3106

Stereo microphone cable comprised of larger and mechanically stronger cores for those who need stereo wiring at stage recording etc. to get rid of tangling problems. OD of each channel is 4.8mm(0.189") to relieve any anxiety about mechanical strength of separated cores connected to each XLR 3P audio connectors when compared with regular 2-core snake cable. This design of OFC conductor and low capacitance as regular size microphone cable assures the same reliable sound quality as MOGAMI #2549 mic cable level.

HIGH TENSION AERIAL MIC. CABLES



Part No.3177 (MONAURAL)

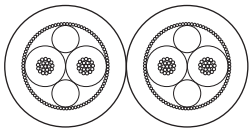
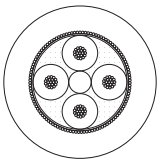
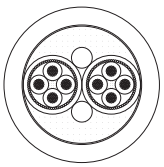


Part No.3178 (STEREO)

These cables are designed for suspension microphones reinforced by one stainless steel wire rope of 830N(187 pounds) breakable weight for monaural type(Part No. 3177) and two same size ropes for stereo type(Part No. 3178). Although the sound quality is compromised a little(especially at high frequency range), they are all designed with quad(shielded four conductor)configuration for wider applications(to provide stronger electromagnetic noise cancellation).

STEREO MIC. CABLE / AERIAL MIC. CABLES

SPECIFICATIONS

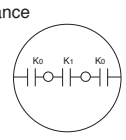
Configuration				
Part No.		3106	3177	3178
No. of Cores		2	1	2
No. of Conductor		2	4	4
Conductor	Details	20/0.12OFC	20/0.12OFC	30/0.08OFC
	Size(mm²)	0.226mm² (#24AWG)	0.226mm² (#24AWG)	0.15mm² (#26AWG)
Insulation	Ov. Dia. (mm)	1.6φ (0.063")	1.6φ (0.063")	0.9φ (0.0354")
	Material	XLPE (Cross-Linked Polyethylene)		
	Colors	Blue/Clear	Blue/White (Quad)	
Reinforcement	Material	——	Stainless Steel Wire Rope	
	Details		7/7/0.11	
	Numbers of Rope		1	2
	Breakable Weight		830 N (187pound)	1,660 N (374pound)
Monofilament	Ov. Dia. (mm)	1.07φ (0.042")	——	——
	Material	PE (Polyethylene)		
Filler Thread		—	Fiver	
Binder	Thickness	——	0.025mm (0.00098")	——
	Material		Paper Tape	
Served Shield		Approx. 80/0.12A	Approx.134/0.12A	Approx.68/0.10A
Core Jacket	Ov. Dia. (mm)	——	——	2.8mm (0.110")
	Material			PVC
	Colors			Red/White
Filler Thread		——	——	Polypropylene
Binder	Thickness			0.025mm (0.00098")
	Material			Paper Tape
Ov. Jacket	Ov. Dia. (mm)	2×4.8φ (2×0.189")	6.8φ (0.268")	7.4φ (0.291")
	Material	PVC	PVC+Polyurethane Compound	
	Colors	Black	Light Gray	
Roll Sizes		50 m (164Ft) 100m (328Ft) 200m(656Ft)	200m (656Ft)	200m (656Ft)
Weight		5.7Kg/100m	12.2Kg/200m	13.3Kg/200m

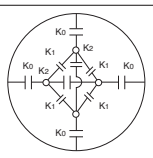
ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.			3106	3177	3178
DC Resistance at 20°C	Inner Conductor.		0.083Ω/m(0.025Ω/Ft)	0.083Ω/m(0.025Ω/Ft)	0.13Ω/m(0.0397Ω/Ft)
	Shield		0.021Ω/m(0.0064Ω/Ft)	0.013Ω/m(0.0040Ω/Ft)	0.036Ω/m(0.011Ω/Ft)
Capacitance at 1kHz,20°C (ParitialCapacitance Value) See below figure *(1)	K0 (Shield-Conductor)		77pF/m(23.5 pF/Ft)	108pF/m(32.9 pF/Ft)	83pF/m(25.3pF/Ft)
	K1 (between neighbour conductors)		10pF/m(3.1 pF/Ft)	8pF/m(2.44 pF/Ft)	18pF/m(5.49 pF/Ft)
	K2		—	3pF/m(0.92 pF/Ft)	3pF/m(0.92 pF/Ft)
	Balanced Quad Connection	Cond-Cond	—	107pF/m(32.6 pF/Ft)	160pF/m(48.8 pF/Ft)
		Cond-Shield	—	190pF/m(58.0pF/Ft)	222pF/m(67.7pF/Ft)
Inductance			0.9μH/m (0.27μH/Ft)	0.5μH/m (0.15μH/Ft)	0.2μH/m (0.061μH/Ft)
Electrostatic Noise *(2)			5 mV Max.	20mV Max.	5mV Max.
Electromagnetic Noise at 10kHz *(2)			0.5 mV Max.	0.013 mV Max.	0.06 mV Max.
Microphonics *(2)			10 mV Max.	5 mV Max.	10 mV Max.
Voltage Breakdown			AC 500V/60sec.	Must withstand at DC 500V/15sec.	
Insulation Resistance			10^5 MΩ · m Min. at DC 500V, 20°C		
Flex Life *(2)			100,000 cycles	36,100 cycles	59,000 cycles
Tensile Strength			382 N (per pair)	Over 980 N	
Emigration			Non-Emigrant to ABS resin		
Applicable Temperature			-20°C~+70°C (-4°F~+158°F)		
Standard			UL 2552 AWM 30V 60°C VW-1	—	—

*(2) Using standard testing methods of Mogami Wire & Cable Corp.

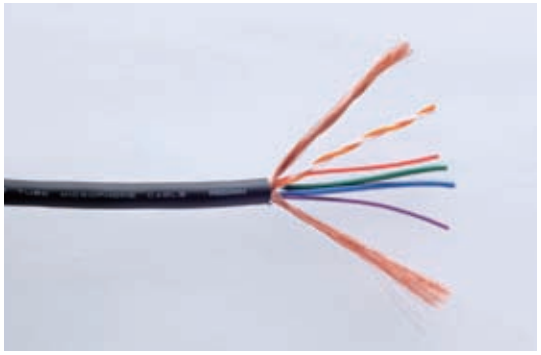
*(1) Partial Capacitance





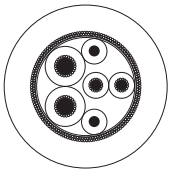
HIGHEST DEFINITION TUBE MICROPHONE CABLE

Specifically designed highest sound quality tube microphone cable basd on representative electrical circuits of today's tube microphone including its power supply. Applicable to most representative tube microphones.



Part No.3172

SPECIFICATIONS

Configuration			
Part No.		3172	
No. of Conductor		6	Signal Assignment
Conductor	Details	2x(30/0.08OFC)	MIC. OUTPUT
	Size(mm²)	0.15mm²(#26AWG)	
Insulation	Ov. Dia. (mm)	1.0φ(0.039")	
	Material	XLPE	
	Colors	Orange/White	
Conductor	Details	2x(75/0.04Cu-Sn)	BIAS
	Size(mm²)	0.094mm²(#28AWG)	
Insulation	Ov. Dia. (mm)	1.0φ(0.039")	
	Material	XLPE	
	Colors	Red/Purple	
Conductor	Details	2x(80/0.08A)	HEATER CIRCUIT
	Size(mm²)	0.40mm²(#22AWG)	
Insulation	Ov. Dia. (mm)	1.6φ(0.063")	
	Material	PVC	
	Colors	Green/Blue	
Shield		Double Served Shield Approx. 120/0.10A and Approx. 120/0.10A	
Binder	Thickness	0.025mm(0.00098")	
	Material	Paper Tape	
Ov. Jacket	Ov. Dia. (mm)	6.5φ(0.256")	
	Material	Flexible PVC	
	Color	Black	
Roll Size		100 m (328Ft)	
Weight per 100m Roll		6.3kg	

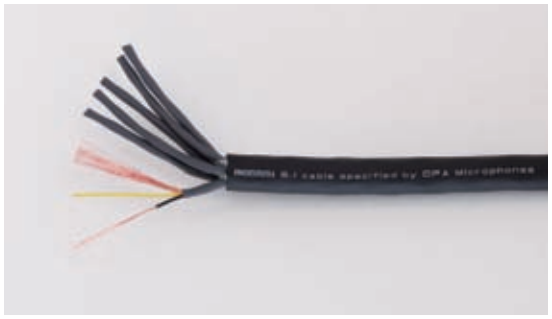
ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.		3172	
DC Resistance at 20°C	Inner Conductor.	MIC SIGNAL	0.13Ω/m (0.040Ω/Ft)
		BIAS CIRCUIT	0.23Ω/m (0.070Ω/Ft)
		HEATER CIRCUIT	0.046Ω/m (0.014Ω/Ft)
	Shield	0.012Ω/m(0.0034Ω/Ft)	
Capacitance at 1kHz, 20°C	Shield-Conductor	230pF/m(70pF/Ft) 100pF/m(30pF/Ft) 93pF/m(28pF/Ft)	
	between neighbour conductors	"TWISTED PAIR" 56pF/m(17pF/Ft)	46pF/m(14pF/Ft) 137pF/m(42pF/Ft)
Inductance		"TWISTED PAIR" 0.4μH/m (0.12μH/Ft)	
Electrostatic Noise*		"TWISTED PAIR" 1 mV Max.	
Electromagnetic Noise at 10kHz*		"TWISTED PAIR" 0.1mV Max.	
Microphonics *		"TWISTED PAIR" 10 mV Max.	
Voltage Breakdown		Must withstand at DC 500V/15sec.	
Insulation Resistance		10^5 MΩ · m Min. at DC 500V, 20°C	
Flex Life*		13,000 cycles	
Tensile Strength		588 N	
Emigration		Non-Emigrant to ABS resin	
Applicable Temperature		-20°C~+70°C (-4°F~+158°F)	

*Using standard testing methods of Mogami Wire & Cable Corp.

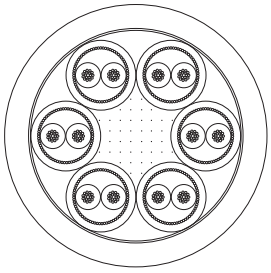
5.1ch SURROUND MICROPHONE CABLE

Six balanced, individually shielded and jacketed cores inside a small O.D.cable (9mm/.354"). Extreme flexibility for easy handling and field work. Specifically designed for 5.1 channel surround recording microphones in collaboration with DPA microphones. Great for limited channels in a smaller format than our standard multichannel snake cables.



Part No.3349

Configuration



SPECIFICATIONS

Part No.		3349
No. of Cores		6
No. of Conductors		2
Conductor	Details	17/0.08 A
	Size(㎟mm)	0.085mm²(#28AWG)
Insulation	Ov. Dia.(mm)	0.87mm(0.034")
	Material	XLPE
Served Shield		Approx. 70/0.08A
Core Jacket	Ov. Dia.(mm)	2.4mm(0.094")
	Material	PVC
	Color	Dark Gray
Filler Thread		Fiber
Binder	Thickness	0.025mm(0.00098")
	Material	Paper Tape
0v. Jacket	Ov. Dia.(mm)	9.0mm(0.354")
	Material	PVC
	Color	Black
Roll Sizes		100m (328Ft)
Weight		8.9 kg/100m

ELECTRICAL & MECHANICAL CHARACTERISTICS

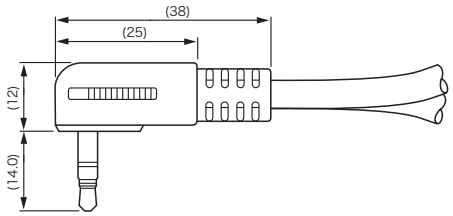
Part No.		3349
DC Resistance at 20°C	Inner Cond.	0.21Ω/m(0.064Ω/Ft)
	Shield	0.05Ω/m(0.015Ω/Ft)
Capacitance at 1kHz, 20°C (Partial C.Value) See below figure *(1)	Ko	90pF/m(27.5pF/Ft)
	K1	15pF/m(4.6pF/Ft)
Inductance between conductors at 1kHz, 20°C		0.7μH/m (0.21μH/Ft)
Electrostatic Noise *(2)		2.5mV Max.
Electromagnetic Noise *(2)		0.15mV Max.
Microphonics at 50kΩ Load*(2)		30mV Max.
Voltage Breakdown		Must withstand at DC 500V/15 sec.
Insulation Resistance		10^5MΩ · m Min. at DC 125 V, 20°C
Flex Life *(2)		27,000 cycles
Tensile Strength of one pair		130 N
Emigration		Non-Emigrant to ABS
Applicable Temperature		-20°C~ + 70°C (-4°F~ + 158°F)

*(2) Using standard testing methods of Mogami Wire & Cable Corp. * (1) Partial Capacitance

3.5mm right angle Stereo mini plug to dual cable for Professional use.

Designed for ruggedness and very high sound quality. These assemblies are available in right angle stereo 3.5mm plug to two unbalanced coaxial cables (using model 2965) for RCA and 1/4 TS plugs, or to two twisted-pair cables (using model 3106) for connection to normally balanced connectors like 1/4 TRS, XLR, or TT. Applications include MP3 player to sound console or amp, computer to powered speakers, wireless receiver to monitor, etc. Any length is available on request, with bare breakout ends or factory terminated.

Signal Type	Unbalanced	Balanced
Used Cable	2965	3106



Construction	3.5mm Mini Plug
Cotacts	Brass, Gold plate
Shield	Brass, Gold plate
Insulation	Polyacetal
Molding	Flexible PVC（Double Mold）

INTERCOM HEADSET EXTENSION CABLE

Part No.3242-00

Specifically designed for INTERCOM HEADSET EXTENSION CABLE. Not sticking to quality of sound, this cable is designed to be compact, flexible, light weight and durable handy structure for practical applications.

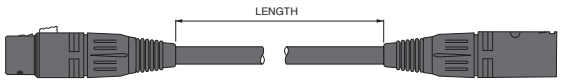
- Independent two coaxial core construction for better isolation between microphone signal and earphone signal.
- Many strands of copper-tin alloy conductor material makes it durable cable without losing flexibility.
- Compact round shape with smooth slippery surface makes it really handy for practical applications.
- Both bulk roll cable and standard length cable assemblies are available from stock.

Cable : Part No. 3242-00

Configuration

Part No.	IHE-03	IHE-05	IHE-10
Length	3m 9.8 Ft	5m 16.4 Ft	10m 32.8 Ft

Assembly



SPECIFICATIONS

Part No.		3242-00
Conductor	Details	75/0.04 Cu-Sn
	Size(mm²)	(0.094mm²)(#28AWG)
Insulation	Ov. Dia. (mm)	1.05φ(0.041")
	Material	XLPE
	Colors	Clear
Served Shield		Approx. 36/0.08A
Jacket	Ov. Dia. (mm)	1.6φ(0.063")
	Material	PVC
	Colors	Yellow/Blue
Nos. of Core		2
Monofilament	Ov. Dia. (mm)	1.07φ(0.042")
	Material	PVC
	Color	White
	Nos.	2
Filler Thread		Fiver
Binder	Thickness	0.025mm(0.00098")
	Material	Paper Tape
Sheath	Ov. Dia. (mm)	5.0φ(0.197")
	Material	PVC
	Color	Black
Roll Size		50m(164Ft)/100m(328Ft)/200m(656Ft)
Weight per 100m Roll		3.9 Kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

DC Resistance at 20°C	Inner Conductor.	0.22Ω/m(0.067Ω/Ft)
	Shield	0.12Ω/m(0.040Ω/Ft)
Capacitance at 1kHz, 20°C		135pF/m(41.2pF/Ft)
Inductance		0.3μH/m(0.09μH/Ft)
Characteristic Impedance at 10MHz		46Ω ±5%
Attenuation at 10MHz		0.25dB/m(0.076dB/Ft)
Phase Constant at 10MHz		0.43rad/m
Electrostatic Noise*		50mV Max.
Electromagnetic Noise at 10kHz*		LOD (Limit of Detection)
Microphonics*		40mV Max.
Voltage Breakdown		Must withstand at DC 500V/15Sec.
Insulation Resistance		10^4 MΩ · m Min. at DC 250V, 20°C
Flex Life*		50,000 cycles
Tensile Strength		294 N
Emigration		Non-Emigrant to ABS resin ABS
Applicable Temperature		-10°C~+60°C (10°F~+140°F)

*Using standard testing methods of Mogami Wire & Cable Corp.

SNAKE CABLES (MULTICORE MIC.CABLES)

MOGAMI

Part No.2939

Mogami multicore cables are designed for the highest level of audio performance and feature superb electrical and mechanical characteristics while remaining compact, superflexible and easy to use.

- CL2 rated version available. Conductor size of CL2 rated version is thicker #25AWG so that it is also recommended for rugged application and firm and easier crimp terminal connector wiring as well as NEC fire regulation requirement.

- Individually twisted shielded pairs, available in 2 to 48 channels.
- Rugged and flexible construction that is easy to handle, even at temperatures down to -20˚C(-4˚F).
- Easy cable identification system:
  ※Channel numbers are printed and underlined on each core jacket to ensure correct identification, regardless of which end is stripped.
  ※Outer jackets of each pair are color coded by standard resistor color code, allowing quick identification of conductor pairs.
  ※Inner conductors are also color coded based on the international standard resistor color code. Each pair is color coded by jacket and conductor color combination.
- Each channel has a drain wire and served (spiral) bare copper shield. The drain wire simplify termination and can be crimped by the same size contact as the inner conductor pair.
- XLPE (Cross Linked Polyethylene) insulation provides superb electrical characteristics and will not melt or shrink back during soldering.

STANDARD VERSION

Part No.	No. Of Channels	Ov. Dia. (Approx. mm)	Jacket Thickness (Approx. mm)	Weight (kg/100m)(kg/328Ft)	Maximum Length available
2930	2- ch	7.5(0.295")	1.0(0.039")	7	506m (1.659Ft)
2931	4- ch	8.6(0.339")	1.0(0.039")	9	
2932	8- ch	11.5(0.453")	1.2(0.047")	18	
2933	12- ch	14.3(0.563")	1.5(0.059")	28	
2934	16- ch	15.8(0.622")	1.5(0.059")	32	305m (1.000Ft)
2935	19- ch	17.0(0.669")	1.7(0.067")	40	
2936	24- ch	20.0(0.787")	2.0(0.079")	46	
2937	27- ch	20.5(0.807")	2.0(0.079")	58	
2938	32- ch	21.7(0.854")	2.0(0.079")	63	
2939	48- ch	26.0(1.02")	2.0(0.079")	97	200m (656Ft)

(Figures in parenthesis are in inches)

CABLE CORE SPECS

Conductor	30/0.08A (0.15mm²) #26AWG	(30×#40AWG)
Insulation	1.0ϕ XLPE (Cross Linked Polyethylene)	(0.039"ϕ)
Drain Wire	7/0.18TA (0.18mm²) #25AWG	(7×#33AWG)
Shield	Approx. 60/0.10A Served (spiral) Shield	
Jacket(Covering)	2.8ϕ Flexible PVC	(0.110"ϕ)
Identification	See core number identification table	

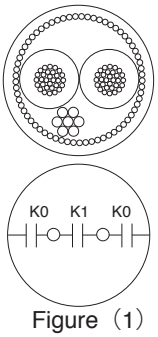


Figure (1)

ELECTRICAL & MECHANICAL CHARACTERISTICS

DC Resistance at 20°C	Inner Pair Conductor	0.13Ω/m (0.040Ω/Ft)
	Shield	0.030Ω/m (0.0092Ω/Ft)
Capacitance at 1 kHz, 20°C(Partial Capacitance Value) See Figure (1)	Ko	130pF/m (40pF/Ft)
	K1	12pF/m (3.7pF/Ft)
Inductance		0.6μH/m (0.18μH/Ft)
Electrostatic Noise (Hum Pick-up)*		2.5mV Max.
Electromagnetic Noise at 10kHz* (Inductance of the toroidal core: 595μH)		0.1mV Max.
Microphonics * Method: Stepping on cable		50mV at 50kΩ Load
Voltage Breakdown		Must withstand at DC 500V/15sec.
Insulation Resistance at DC 125V, 20°C		10^5 MΩ · m Minimum
Tensile Strength of one pair (26°C,65% RH)		274 N
Emigration		Non-Emigrant to ABS resin
Applicable Temperature		-20˚C~+70˚C (-4˚F~+158˚F)
Standard		UL13 CL2X 60˚C

* Using standard testing methods of Mogami Wire & Cable Corp.

REMARKS : Standard EZID models with 19 channels or more are designed for studio applications only. For PA and/or non-statistical applications, use the CL2 rated version.

CL 2 RATED VERSION CL2

Part No.	No. Of Channels	Ov. Dia. (Approx. mm)	Jacket Thickness (Approx. mm)	Weight (kg/100m) (kg/328Ft)	Maximum Lengths available
3040	2- ch	7.8(0.307")	1.0(0.039")	7.2	305m (1.000Ft)
3041	4- ch	9.0(0.354")	1.0(0.039")	10	
3042	8- ch	12.0(0.472")	1.2(0.047")	19	
3043	12- ch	14.6(0.575")	1.3(0.051")	29	
3044	16- ch	16.3(0.642")	1.4(0.055")	36	
3045	19- ch	17.5(0.689")	1.7(0.067")	44	
3046	24- ch	20.5(0.807")	2.0(0.079")	57	
3047	27- ch	21.0(0.827")	2.0(0.079")	63	
3048	32- ch	22.4(0.882")	2.0(0.079")	73	
3049	48- ch	27.5(1.063")	2.0(0.079")	104	200m (656Ft)

(Figures in parenthesis are in inches)

CABLE CORE SPECS

Conductor	7/0.18A (0.178mm²) #25AWG	(7×#33AWG)
Insulation	1.05ϕ XLPE (Cross Linked Polyethylene)	(0.0413"ϕ)
Drain Wire	7/0.18A (Exactly same as conductor)	
Shield	Approx. 65/0. 10A Served (spiral) Shield	
Jacket(Covering)	2.9ϕ Flexible PVC	(0.114"ϕ)
Identification	See core number identification table	

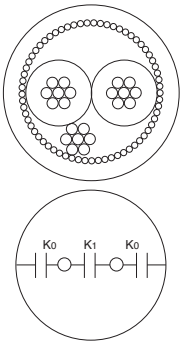


Figure (1)

ELECTRICAL & MECHANICAL CHARACTERISTICS

DC Resistance at 20°C	Inner Pair Conductor	0.11Ω/m (0.0336Ω/Ft)
	Shield	0.028Ω/m (0.0085Ω/Ft)
Capacitance at 1 kHz, 20°C(Partial Capacitance Value) See Figure (1)	Ko	140pF/m (42.7pF/Ft)
	K1	12pF/m (3.7pF/Ft)
Inductance		0.6μH/m (0.18μH/Ft)
Electrostatic Noise (Hum Pick-up) *		2.5mV Max.
Electromagnectic Noise at 10kHz* (Inductance of the toroidal core: 595μH)		0.1mV Max.
Microphonics * Method: Stepping on cable		50mV at 50kΩ Load
Voltage Breakdown		Must withstand at DC 500V/15sec.
Insulation Resistance at DC 125V, 20°C		10^5MΩ · m Minimum
Tensile Strength of one pair (26°C,65%RH)		274 N
Emigration		Non-Emigrant to ABS resin
Applicable Temperature		-20˚C~+70˚C (-4˚F~+158˚F)
Standard		UL13 CL2 60˚C

*Using standard testing methods of Mogami Wire & Cable Corp.

CORE NUMBER IDENTIFICATION TABLE

CORE NO.	COLOR OF ONE OF THE PAIR	CORE JACKET COLOR	CORE NO.	COLOR OF ONE OF THE PAIR	CORE JACKET COLOR	CORE NO.	COLOR OF ONE OF THE PAIR	CORE JACKET COLOR
1	BROWN	BLACK (WHITE)	17	PURPLE	BROWN (WHITE)	33	ORANGE	ORANGE (BLACK)
2	RED		18	GRAY		34	YELLOW	
3	ORANGE		19	WHITE		35	GREEN	
4	YELLOW		20	BLACK	RED (WHITE)	36	BLUE	
5	GREEN		21	BROWN		37	PURPLE	
6	BLUE		22	RED		38	GRAY	
7	PURPLE		23	ORANGE		39	WHITE	
8	GRAY		24	YELLOW		40	BLACK	YELLOW (BLACK)
9	WHITE		25	GREEN		41	BROWN	
10	BLACK	BROWN (WHITE)	26	BLUE		42	RED	
11	BROWN		27	PURPLE		43	ORANGE	
12	RED		28	GRAY		44	YELLOW	
13	ORANGE		29	WHITE		45	GREEN	
14	YELLOW		30	BLACK	ORANGE (BLACK)	46	BLUE	
15	GREEN		31	BROWN		47	PURPLE	
16	BLUE		32	RED		48	GRAY	

- Color identification is based on the resistor color code.
- Colors indicated in parenthesis indicate the number print color on the core jacket.
- Insulation color of other wire in all pairs is clear.
- Color of outer cable jacket is black.

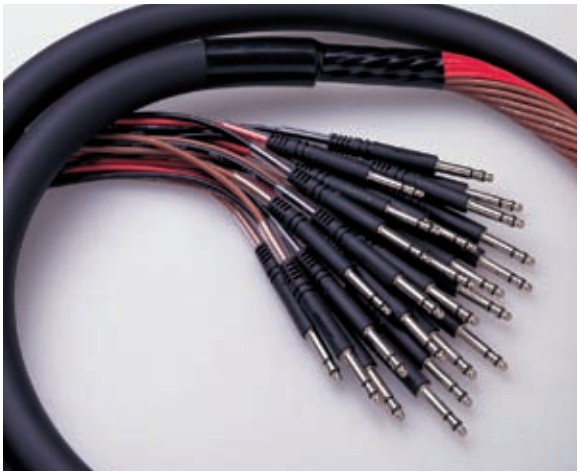
- How to read core jacket channel numbers.

- Each number printed on the core jacket is underlined (as shown below) in order to prevent mis-reading of cable numbers.

EXAMPLE 1) $\underline{9}$ means SIX 2) $\underline{6}$ means NINE 3) $\underline{8}$ 1 means EIGHTEEN, not EIGHTY-ONE

ASSEMBLY OF SNAKE CABLE

- Customised connections and cable assemblies are available to special order.
- Connection diagram and detailed specification sheet are necessary for all order.
- Delivery : 4 weeks excluding shipping time.
- For details, consult your Mogami dealer.



CONSOLE INTERNAL / EXTERNAL WIRING CABLES

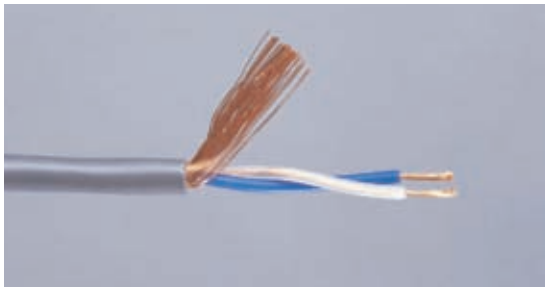
The copper conductors of all these console cables are made of famous NEGLEX OFC, hence we can recommend any of these with confidence for the highest quality wiring of mixing consoles, rack panels, and studio equipment.

- All cables feature XLPE (Cross-Linked Polyethylene) which has excellent electrical characteristics and prevents shrink-back during soldering.
- Served (spiral) shield provides easier cable termination and better sound quality than braided shield.

Part No.2944

STANDARD CONSOLE CABLE

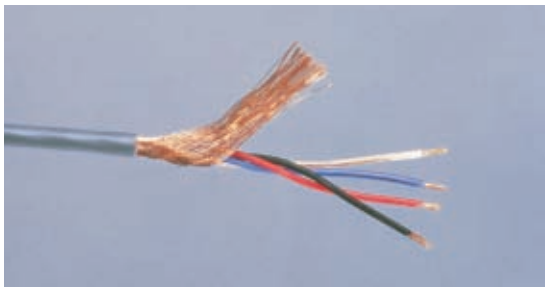
- Small size for space saving.
- Very flexible and easy to use.
- Ten colors available for easy identification.
- Same configuration as the core of our standard multi mic. snake cable series (EZID models).
- Additional drain wire makes wiring efficient, as it can be crimped by the same size crimp terminal.



Part No.2806

LARGE CONDUCTOR SIZE CONSOLE CABLE

- #22AWG conductor version technically similar to #2549 NEGLEX balanced Mic. Cable except for smaller outer jacket.
- This item is designed for permanent installation and where larger conductor size is required such as long runs.
- Jacket Color: Only Gray is available.



Part No.2799

MINI-QUAD CONSOLE CABLE

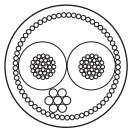
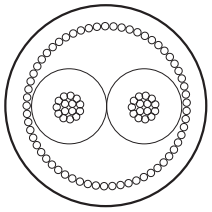
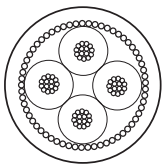
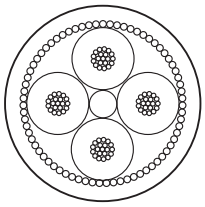
- Quad configuration reduces electromagnetic noise.
- Four different colors of insulation makes it possible to use as a four conductor overall shield cable.
- Conductor size: same as#2944
- Jacket Color: Only Gray is available.

Part No.2820

LARGE SIZE QUAD CABLE

- #24AWG conductor version technically similar to #2534 NEGLEX quad Mic. Cable except for smaller and slippery outer jacket.
- This item is designed for permanent installation and where larger conductor size is required such as long runs.

SPECIFICATIONS AND CHARACTERISTICS

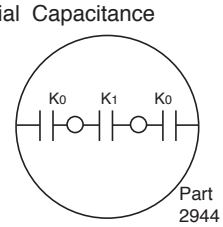
Configuration					
Part No.		2944	2806	2799	2820
No. of Conductor		2	2	4	4
Conductor	Details	30/0.08 OFC	30/0.12 OFC	30/0.08 OFC	20/0.12 OFC
	Size	0.15mm² (#26AWG)	0.34mm² (#22AWG)	0.15mm² (#26AWG)	0.226mm² (#24AWG)
Insulation	Ov. Dia. (mm)	1.0φ(0.039")	1.9φ(0.075")	1.0φ(0.039")	1.6φ(0.063")
	Material	XLPE(Cross-Linked Polyethylene)			
	Core Colors	Red/Clear	Blue/Clear	Black/Red/Blue/Clear	Blue/Clear(Quad)
Drain Wire	Details	7/0.18A	———	———	———
	Size	0.18mm² (#25AWG)	———	———	———
Served Shield		Approx. 60/0.10A	Approx. 58/0.18A	Approx. 60/0.12A	Approx. 60/0.18A
Jacket	Ov. Dia. (mm)	2.5φ(0.098")	5.2φ(0.205")	3.2φ(0.126")	5.0φ(0.197")
	Material	PVC			
	Core Colors	Black/Brown/Red/ Orange/Yellow/Green/ Blue/Purple/Gray/White	Gray	Gray	Gray
Roll Sizes		50 m (164Ft) 100m (328Ft) 200m(656Ft)	200 m (656Ft) (standard)	50 m (164Ft) 100m (328Ft) 200m(656Ft)	200 m (656Ft) (standard)
Weight per 200m Roll		2.5 kg	8 kg	3.8 kg	8 kg

DC Resistance at 20°C	Inner Cond.	0.13Ω/m(0.040Ω/Ft)	0.058Ω/m(0.018Ω/Ft)	0.13Ω/m(0.040Ω/Ft)	0.083Ω/m(0.025Ω/Ft)
	Shield	0.029Ω/m(0.009Ω/Ft)	0.013Ω/m(0.004Ω/Ft)	0.028Ω/m(0.009Ω/Ft)	0.012Ω/m(0.0037Ω/Ft)
Capacitance at 1kHz, 20°C (Partial C. Value) See below figure *(1)	K_0	130pF/m(40 pF/Ft)	87pF/m(27 pF/Ft)	69pF/m(21 pF/Ft)	65pF/m(20 pF/Ft)
	K_1	12pF/m(3.7 pF/Ft)	11pF/m(3.4 pF/Ft)	15pF/m(4.6 pF/Ft)	13pF/m(4 pF/Ft)
	K_2	———	———	2pF/m(0.6 pF/Ft)	4pF/m(1.2 pF/Ft)
	Quad-Connection	Cond-Cond.		131pF/m(40 pF/Ft)	97pF/m(29.6 pF/Ft)
		Cond-Shield.		192pF/m(59 pF/Ft)	110pF/m(33.6 pF/Ft)
Inductance between conductors at 1kHz, 20°C		0.6μH/m (0.18μH/Ft)	0.8μH/m (0.24μH/Ft)	0.5μH/m (0.15μH/Ft)	0.4μH/m (0.12μH/Ft)
Electrostatic Noise *(2)		20 mV Max.	5 mV Max.	1.5 mV Max.	50 mV Max.
Electromagnetic Noise *(2)		0.1 mV Max.	0.2 mV Max.	0.02 mV Max.	0.15 mV Max.

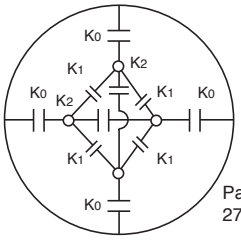
COMMON SPECS.

Voltage Breakdown	Must withstand at DC 500V/15 sec.
Insulation Resistance	10^5 MΩ · m Minimum at DC 125 V, 20°C

*(1) Partial Capacitance



Part No.
2944 & 2806



Part No.
2799 & 2820

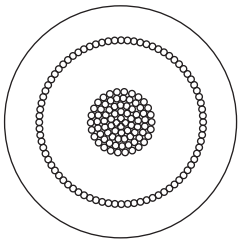
*(2) Using standard testing methods of Mogami Wire & Cable Corp.

SPEAKER CABLES

MOGAMI

SUPERFLEXIBLE STUDIO SPEAKER CABLES

2.0mm² (APPROX.#14AWG) SPEAKER CABLE TO MEET XLR CONNECTOR CABLE CLAMP



Part No.3082

This standard speaker cable is designed to meet XLR audio connector cable clamp. Coaxial Design is used to provide as large a conductor size as possible, which results in the following features.

- Large conductor size of 2.0mm (close to #14AWG) despite small OD of 6.5mm (0.256"). (Same conductor size for both internal and external (shield) conductors.)
- Extremely low induction from outside and affection to outside.
- Suitable impedance as speaker cable.
- Better sound quality than quad nor regular parallel configuration.

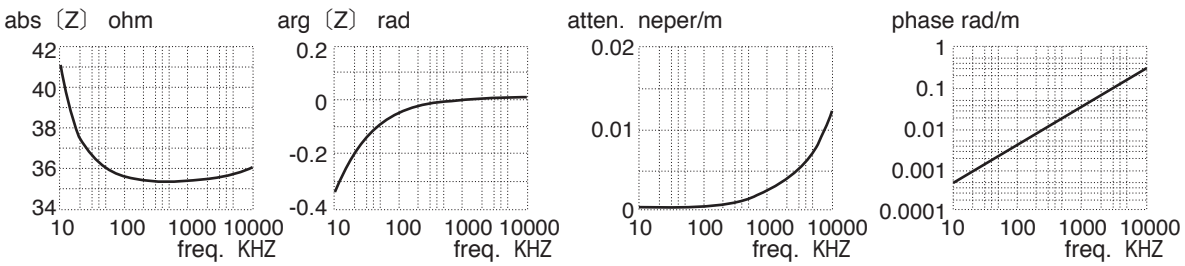
  Now, specify MOGAMI #3082 as world standard of economy and popular professional speaker cable.

SPECIFICATIONS

Part No.		3082
Conductor	Details	80/0.18 OFC (80×#33AWG)
	Size	2.03mm² (#15 AWG)
Insulation	Ov. Dia.(mm)	4.75φ(0.187")
	Material	PVC
	Color	White
Served Shield	Details	80/0.18 OFC (80×#33AWG)
	Size	2.03mm² (Approx.#14 AWG)
Jacket	Ov. Dia.(mm)	$6.5^{\pm 0.5}\phi$ (0.256± 0.0197"ϕ)
	Material	Flexible PVC
	Color	Black
Roll Sizes		100m(328Ft)/200m(656Ft)/ 153m(500Ft)
Weight per 100m (328Ft) roll		7.5kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

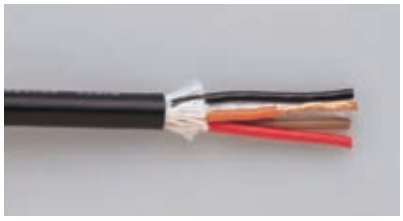
Part No.		3082
DC Resistance at 20°C	Inner Conductor Shield Conductor	0.009Ω/m (0.0027Ω/Ft) Same value for both internal and outernal/ shield conductor)
Capacitance at 1kHz, 20°C		253pF/m (77pF /Ft)
Inductance		0.2μH/m (0.061μH/Ft)
Electrostatic Noise		0.2mV Max.
Electromagnetic Noise at 10kHz		LOD (Limit of Detection)
Voltage Breakdown		Must withstand at DC 500V/15sec.
Insulation Resistance		10^5 MΩ·m Min. at DC 500V, 20°C
Flex Life		15,000 cycles
Tensile Strength		More than 980 N 以上
Emigration		Non-Emigrant to ABS resin
Applicable Temperature		-20°C~+70°C (-4°F~+158°F)
Standard		UL13 CL2X 75°C



SUPERFLEXIBLE STUDIO SPEAKER CABLES

HIGH DEFINITION MULTI SERIES PROFESSIONAL SPEAKER CABLES

- These unique professional speaker cables are originally designed to deliver maximum performance from state-of-the-art Tri-Amp Systems.
- They offer true audiophile performance for accurate sound transmission with clear transparent response yet possess a rugged superflexibility for the most demanding professional applications.
- Each conductor features many strands in rope-lay of famous MOGAMI ' NEGLEX ' Oxygen-Free-Copper within color-coded PVC insulation. A tough, low profile matte black superflexible PVC jacket protects the cables.
- Available in series of 2mm^2 (close to #14AWG), 2.5mm^2 (close to #13AWG) and 4mm^2 (close to #11AWG) conductor sizes.

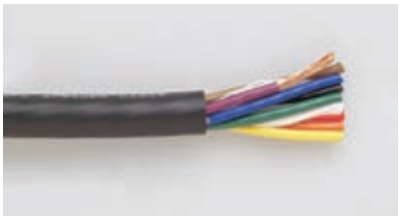

Part No.2972


Part No.3103


Part No.2919


Part No.2921


Part No.3104

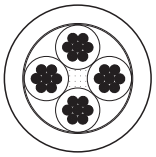
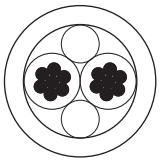
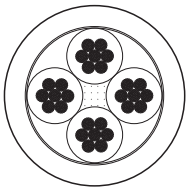

Part No.2941

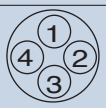
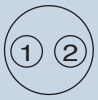
Part No.	3103	2972	2921	3104	2919	2941
No. of Conductor	2	4			6	8
Conductor Size	4mm^2 (#12AWG)	2mm^2 (#15AWG)	2.5mm^2 (#14AWG)	4mm^2 (#12AWG)	2.5mm^2 (#14AWG)	
Overall Diameter(mm) (inch)	12ϕ (0.472")	10.5ϕ (0.413")	11.3ϕ (0.445")	14.5ϕ (0.571")	12.5ϕ (0.492")	15.7ϕ (0.618")
Core Colors	Black/Red	Brown/Red/Orange/Yellow			Black/Brown/Red Orange/Yellow/Green	Black/Brown/Red Orange/Yellow/Green Blue/Purple

- 4-conductor type is also applicable for standard 2-conductor speaker cable by quad-connection.
- 2972 is designed to be 2mm^2 which is ideal conductor size where it is necessary to combine two conductors (quad-connection) to fit a 3.5mm^2 crimp terminal.

SUPERFLEXIBLE STUDIO SPEAKER CABLES

SPECIFICATIONS AND CHARACTERISTICS

Configuration				
Part No.		2972	3103	3104
No. of Conductor		4	2	4
Conductor	Details	7/26/0.12 OFC (bare)	7/50/0.12 OFC (bare)	
	Size	2.05mm² (#15AWG)	3.96mm² (#12AWG)	
Insulation Ov. Dia. (mm)		3.2φ(0.126"φ) PVC	4.5φ(0.177"φ) PVC	
Jacket	Ov.Dia. (mm)	10.5φ(0.413"φ)	12.0φ(0.472"φ)	14.5φ(0.571"φ)
	Material	Flexible PVC, Matte Black		
Weight per 100m (328Ft) roll		17kg	20kg	31kg

DC Resistance (20°C)		0.0088Ω/m (0.0027Ω/Ft)	0.005Ω/m (0.0015Ω/Ft)			
Inductance (20°C, 1kHz) (Refer to the figures shown in the capacitance data.)	1-2	0.7μH/m (0.21μH/Ft)	0.6μH/m (0.18μH/Ft)			0.6μH/m (0.18μH/Ft)
	1-3	0.7μH/m (0.21μH/Ft)	———			0.6μH/m (0.18μH/Ft)
Capacitance (20°C)	Frequency	100Hz	1kHz	10kHz	50kHz	100kHz
2972 	1-2	130pF/m (39.7pF/Ft)	100pF/m (30.5pF/Ft)	81pF/m (24.7pF/Ft)	74pF/m (22.6pF/Ft)	71pF/m (21.7pF/Ft)
	1-3	110pF/m (33.6pF/Ft)	79pF/m (24.1pF/Ft)	63pF/m (19.2pF/Ft)	57pF/m (17.4pF/Ft)	56pF/m (17.1pF/Ft)
3103 	1-2	106pF/m (32.3pF/Ft)	93pF/m (28.4pF/Ft)	83pF/m (25.3pF/Ft)	76pF/m (23.2pF/Ft)	74pF/m (22.6pF/Ft)
3104 	1-2	110pF/m (33.6pF/Ft)	99pF/m (30.2pF/Ft)	86pF/m (26.2pF/Ft)	78pF/m (23.8pF/Ft)	76pF/m (23.2pF/Ft)
	1-3	90pF/m (27.5pF/Ft)	78pF/m (23.8pF/Ft)	67pF/m (20.4pF/Ft)	61pF/m (18.6pF/Ft)	59pF/m (18.0pF/Ft)

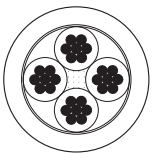
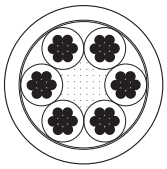
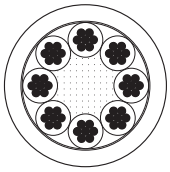
COMMON SPECS.

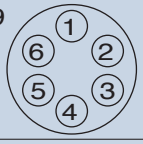
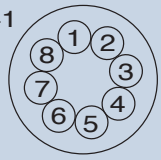
Voltage Breakdown	Must withstand at DC 500V/ 15sec.
Insulation Resistance	10^4 MΩ · m Minimum at DC 125 V, 20°C
Emigration of Jacket Material	Non-Emigrant to ABS resin
Applicable Temperature	-20°C~+70°C(-4°F~ +158°F)
Roll Sizes	2972: 100m (328Ft) /300m (984Ft)
	3103/3104: 100m (328Ft) /250m (820 Ft)
Standard	UL13 CL2X 75°C

Remarks: Connecting the conductors as diagonal pairs greatly reduces mutual inductance, even though cross-talk interferance is negligible.

SUPERFLEXIBLE STUDIO SPEAKER CABLES

SPECIFICATIONS AND CHARACTERISTICS

Configuration				
Part No.		2921	2919	2941
No. of Conductor		4	6	8
Conductor	Details	7/32/0.12 OFC (bare)		
	Size	2.53mm² (#14AWG)		
Insulation Ov. Dia. (mm)		3.4φ(0.134"φ) PVC		
Jacket	Ov.Dia. (mm)	11.3φ(0.445"φ)	12.5φ(0.492"φ)	15.7φ(0.618"φ)
	Material	Flexible PVC, Matte Black		
Weight per 100m (328Ft) roll		18kg	26kg	38kg

DC Resistance (20°C)		0.008Ω/m Typ. (0.0024Ω/Ft)				
Inductance (20°C, 1kHz) (Refer to the figures shown in the capacitance data.)	1-2	0.5μH/m (0.15μH/Ft)	0.5μH/m (0.15μH/Ft)	0.5μH/m (0.15μH/Ft)		
	1-3	0.6μH/m (0.18μH/Ft)	0.6μH/m (0.18μH/Ft)	0.6μH/m (0.18μH/Ft)		
	1-4	———	0.7μH/m (0.21μH/Ft)	0.7μH/m (0.21μH/Ft)		
	1-5	———	———	0.8μH/m (0.24μH/Ft)		
Capacitance(effective value) (20°C)	Frequency	100Hz	1kHz	10kHz	50kHz	100kHz
2921 	1-2	127pF/m (38.7pF/Ft)	110pF/m (33.6pF/Ft)	101pF/m (30.8pF/Ft)	92pF/m (28.1pF/Ft)	90pF/m (27.5pF/Ft)
	1-3	102pF/m (31.1pF/Ft)	89pF/m (27.1pF/Ft)	89pF/m (27.1pF/Ft)	74pF/m (22.6pF/Ft)	71pF/m (21.7pF/Ft)
2919 	1-2	126pF/m (38.4pF/Ft)	102pF/m (31.1pF/Ft)	87pF/m (26.5pF/Ft)	80pF/m (24.4pF/Ft)	78pF/m (23.8pF/Ft)
	1-3	94pF/m (28.7pF/Ft)	72pF/m (22.0pF/Ft)	61pF/m (18.6pF/Ft)	56pF/m (17.1pF/Ft)	55pF/m (16.8pF/Ft)
	1-4	82pF/m (25.0pF/Ft)	62pF/m (18.9pF/Ft)	52pF/m (15.9pF/Ft)	48pF/m (14.6pF/Ft)	46pF/m (14.0pF/Ft)
2941 	1-2	113pF/m (34.5pF/Ft)	100pF/m (30.5pF/Ft)	90pF/m (27.5pF/Ft)	84pF/m (25.6pF/Ft)	80pF/m (24.4pF/Ft)
	1-3	77pF/m (23.5pF/Ft)	67pF/m (20.4pF/Ft)	61pF/m (18.6pF/Ft)	56pF/m (17.1pF/Ft)	55pF/m (16.8pF/Ft)
	1-4	68pF/m (20.7pF/Ft)	60pF/m (18.3pF/Ft)	54pF/m (16.5pF/Ft)	50pF/m (15.3pF/Ft)	49pF/m (14.9pF/Ft)
	1-5	93pF/m (28.4pF/Ft)	81pF/m (24.7pF/Ft)	74pF/m (22.6pF/Ft)	69pF/m (21.0pF/Ft)	67pF/m (20.4pF/Ft)

COMMON SPECS.

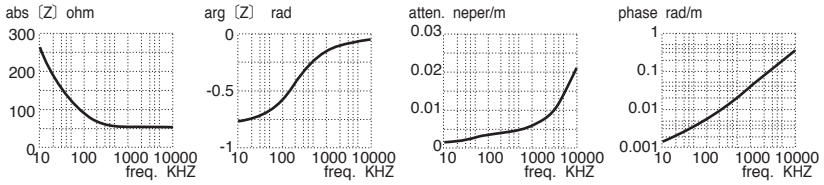
Voltage Breakdown	Must withstand at DC 500V/ 15sec.
Insulation Resistance	10^4 MΩ · m Minimum at DC 125 V, 20°C
Emigration of Jacket Material	Non-Emigrant to ABS resin ABS
Applicable Temperature	-20°C~+70°C (-4°F~ + 158°F)
Roll Sizes	100m (328Ft) /153m (500 Ft)/300m (984Ft)
Standard	UL13 CL2X 75°C

Remarks: Connecting the conductors as diagonal pairs greatly reduces mutual inductance, even though cross-talk interferance is negligible. For 8-cond. version P/N 2941, connect it as close as to diagonal combination.

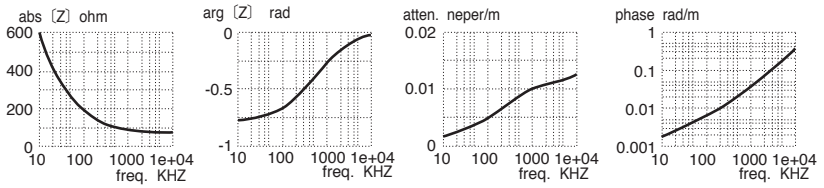
VIDEO CABLES & HIGH FREQUENCY COAXIAL CABLES

SUBMINIATURE & MINIATURE COAXIAL CABLES

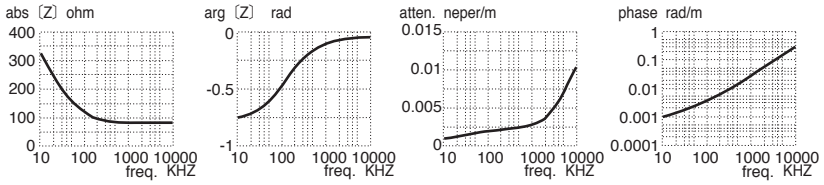
Part No.2381



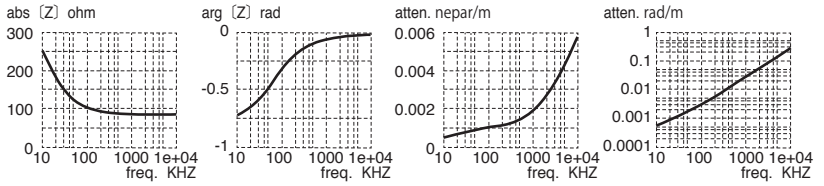
Part No.3351



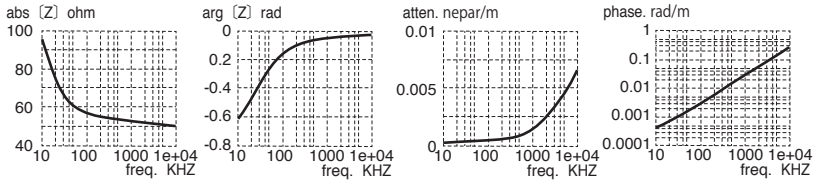
Part No.2895



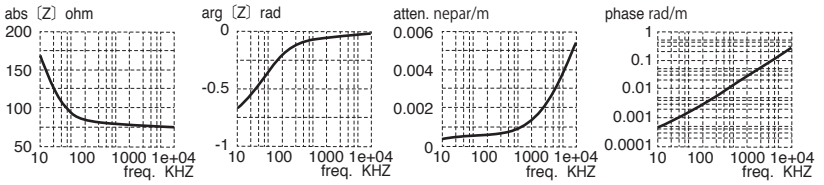
Part No.2546



Part No.3200

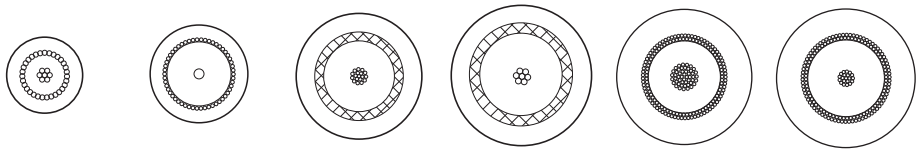


Part No.2964



Superflexible subminiature coaxial cables which cannot be found out in MIL, JIS and other worldwide popular standards. Standardized coaxial cables are available from any cable manufacturer so that your choice is determined by competitive price, which means there is no chance for a Japanese cable manufacturer in the world market. However, there are lots of cases where those standard cables will not do the job. MOGAMI superflexible subminiature coaxial cables may have a chance in such case. All these coaxial cables were also originally made for custom applications and remained long thereafter finding unfixed multiple users all over the world.

SUBMINIATURE & MINIATURE COAXIAL CABLES



CABLE SPECIFICATIONS

Part No.		2381	3351	2895	2546	3200	2964
Characteristic Impedance		50Ω	75Ω	75Ω	75Ω	50Ω	75Ω
Conductor	Details	1/0.10 Copper Plated Piano Wire 6/0.10A Served Cond.	0.20mm Copper-Covered Steel Wire	17/0.08A	7/0.14A	50/0.12 OFC	20/0.12 OFC
	Size	0.047mm^2 (#32AWG)	0.0314mm^2(#33AWG)	0.085mm^2 (#28AWG)	0.107mm^2 (#27AWG)	0.565mm^2 (#20AWG)	0.226mm^2 (#24AWG)
Insulation	Ov. Dia . (mm)	0.9ϕ(0.035")	1.3ϕ(0.051")	1.7ϕ(0.067")	1.95ϕ(0.077")	2.6ϕ(0.102")	2.65ϕ(0.104")
	Material	XLPE		XLCPE	CPE	XLCPE	
Shield	Type	SERVED		BRAIDED		Double Served Shield	
	Details	Approx. 30/0.10A	Approx. 50/0.08A	16/5/0.10A	16/4/0.12A	Approx. 66/0.12 OFC, Approx. 72/0.12 OFC	
Jacket	Ov. Dia . (mm)	1.6ϕ(0.063")	2.0ϕ(0.0787")	3.0ϕ(0.118")	3.3ϕ(0.130")	4.8ϕ(0.189")	
	Material	PVC					
	Colors	Black			Gray	Black	Black/Red/Yellow/ Green/Blue
Roll Sizes		305m (1,000Ft)	153m (500Ft)/ 305m (1,000Ft)	305m (1,000Ft)		50m (164Ft)/100m(328Ft)/200m(656Ft)	
Weight Per 305m (1,000Ft) Roll		1.5kg	2.1kg	4.2kg	5.0kg	3.6kg /100m(328Ft)	3.4kg /100m(328Ft)

ELECTRICAL & MECHANICAL CHARACTERISTICS

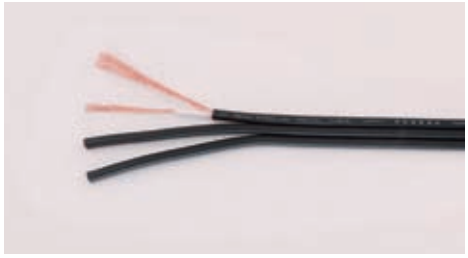
Part No.		2381	3351	2895	2546	3200	2964
DC Resistance at 20°C	Inner Cond.	0.4Ω/m (0.12Ω/Ft)	1.6Ω/m (0.49Ω/Ft)	0.22Ω/m (0.067Ω/Ft)	0.18Ω/m (0.055Ω/Ft)	0.035Ω/m(0.011Ω/Ft)	0.083Ω/m(0.025Ω/Ft)
	Shield	0.079Ω/m (0.024Ω/Ft)	0.08Ω/m (0.024Ω/Ft)	0.035Ω/m (0.011Ω/Ft)	0.03Ω/m (0.009Ω/Ft)	0.012Ω/m(0.0037Ω/Ft)	0.012Ω/m(0.0037Ω/Ft)
Capacitance at 1kHz, 20°C		102pF/m (31.1pF/ Ft)	68pF/m (20.7pF/ Ft)	58pF/m (17.7pF/ Ft)	62pF/m (18.9pF/ Ft)	95pF/m(29.0pF/ Ft)	57pF/m(17.4pF/ Ft)
Characteristic Imperdance at 10MHz		50Ω±10%	75Ω±10%	75Ω±10%	75Ω±10%	50Ω±10%	75Ω±10%
Attenuation (10MHz)		0.15 dB /m (0.046 dB /Ft)	0.11 dB /m (0.033 dB /Ft)	0.069 dB /m (0.021 dB /Ft)	0.051 dB /m (0.016 dB /Ft)	0.058dB /m (0.018 dB /Ft)	0.047 dB /m (0.014 dB /Ft)
Phase Constant (10MHz)		0.38rad / m	0.33rad / m	0.28rad / m	0.30rad / m	0.31rad / m	0.3rad / m
Electromagnetic Noise*		LOD (Limit of Detection)					
Voltage Breakdown		Must withstand at DC 500V/15sec.		AC 500V/60sec.		Must withstand at DC 500V/15sec.	
Insulation Resistance		10^4 MΩ · m Min . at DC 250V , 20°C					
Flex Life*		21,000 cycles	14,000 cycles	8,400 cycles	8,600 cycles	12,000 cycles	16,000 cycles
Tensile Strength		68 N	95 N	196 N	205 N	343 N	274 N
Emigration		Non-Emigrant to ABS resin					
Applicable Temperature		-20°C~ +60°C (-4°F~+140°F)					
Standard		–	–	UL 1354 AWM VW-1 30V 60°C		–	–

Attenuation : 1 dB = 0.1151 neper (1 neper = 8.686 dB)

*Using standard testing method of Mogami Wire & Cable Corp .

75Ω COAX. PARALLEL MULTICORE CABLES

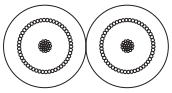
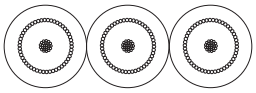
Part No.2947



Part No.3243

The dual 75 ohm parallel "zip style" 2947 was originally developed to maintain maximum video performance while fitting the very compact 4 pin mini-Din (S-video) connector. Success in this challenging project required Mogami's highly experienced design and extremely precise manufacturing technique.
Because this small cable is excellent for audio and video, two (2947) three (3243) and four (3294) conductor versions of this cable are now available to meet market demands in home and industrial audio-video, law enforcement, medical imaging, and security environments.

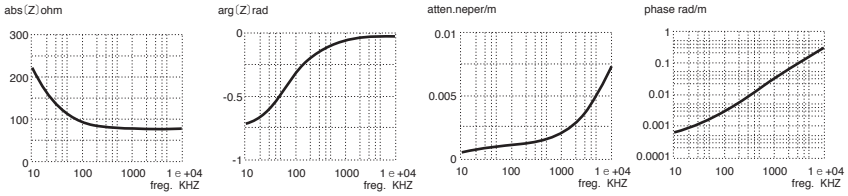
CABLE SPECIFICATIONS

Configuration			
Part No.		2947	3243
Core Configuration		2×75Ω Coax.	3×75Ω Coax.
Conductor Size		0.126mm² (#27AWG)	
Shield Structure		Served Shield	
Jacket	Material	Flexible PVC	
	Ov. Dia . (mm)	2×3.0φ(0.118")	3×3.0φ(0.118")
	Color	Black	
Roll Sizes		153m/305m (500Ft /1,000Ft)	153m (500Ft)
Weight Per 153m (500Ft) Roll		4kg	6.1kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.		2947	3243
DC Resistance at 20°C	Inner Cond.	0.15Ω/ m (0.046Ω/ Ft)	
	Shield	0.035Ω/ m (0.011Ω/ Ft)	
Capacitance at 1kHz, 20°C		59pF/ m (18.0 pF/ Ft)	
Characteristic Impedance at 10MHz		75Ω±5%	
Attenuation (10MHz)		0.061dB / m (0.019 dB / Ft)	
Phase Constant (10MHz)		0.28 rad / m	
Electromagnetic Noise*		LOD (Limit of Detection)	
Voltage Breakdown		Must withstand at DC 500V/15sec .	
Insulation Resistance		10^4MΩ · m Min . at DC 500V , 20°C	
Flex Life*		24 ,000 cycles	28 ,000 cycles
Tensile Strength		392 N	530 N
Emigration		Non-Emigrant to ABS resin	
Applicable Temperature		-20°C～+70°C (-4°F～+158°F)	

Attenuation : 1 dB =0.1151 neper (1 neper =8.686 dB)
* Using standard testing method of Mogami Wire & Cable Corp .



MOLDED Y/C CABLE ASSEMBLY WITH 4-PIN MINI DIN CONNECTORS

Part No.5139

ASSEMBLY

Part No.	5139-03	5139-06	5139-12	5139-20	5139-30	5139-50	5139-75	5139-100
Length (m)	0.9m (3 Ft)	1.8m (6 Ft)	3.6m (12 Ft)	6.1m (20 Ft)	9.1m (30 Ft)	15.2m (50 Ft)	22.8m (75 Ft)	30.5m (100 Ft)

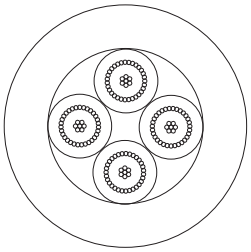
MONITOR CABLE

Specifically designed as a miniature video monitor cable, it can be easily connected to a rectangular 8-pin connector.

Part No.2326

CABLE SPECIFICATIONS

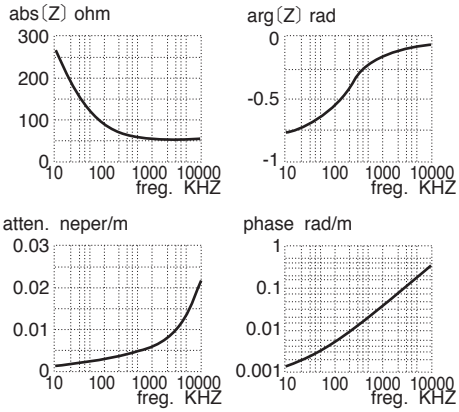
Part No.		2326
Core Configuration		4×50Ω Coax.
Conductor Size		0.047mm² (#32AWG)
Ov. Jacket	Material	Flexible PVC
	Ov. Dia . (mm)	6.0φ(0.236")
	Color	Dark Gray
Roll Size		200m (656Ft)
Weight per 200m (656Ft) Roll		8.3kg



ELECTRICAL & MECHANICAL CHARACTERISTICS

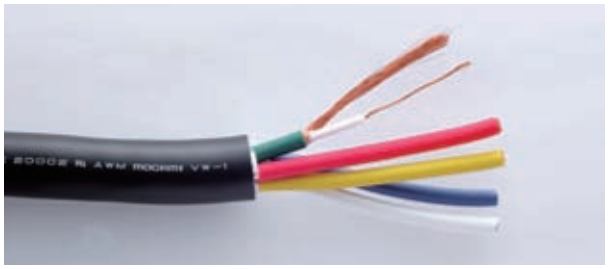
DC Resistance at 20°C	Inner Cond.	0.4Ω/m (0.122Ω/Ft)
	Shield	0.079Ω/m (0.024Ω/Ft)
Capacitance at 1kHz, 20°C		102pF/m (31.1pF/ Ft)
Characteristic Impedance at 10MHz		50Ω±5%
Attenuation at 10MHz		0.2dB/m (0.061 dB /Ft)
Velocity Ratio		0.63
Electromagnetic Noise*		LOD (Limit of Detection)
Voltage Breakdown		Must withstand at DC 500V/15sec .
Insulation Resistance		10^4 MΩ · m Min . at DC 500V , 20°C
Flex Life*		6,500 cycles
Tensile Strength		294 N
Emigration		Non-Emigrant to ABS resin
Applicable Temperature		-20°C~+70°C (-4°F~+158°F)

* Using standard testing method of Mogami Wire & Cable Corp .



MULTICORE 75Ω COAXIAL CABLES

Part No.3145



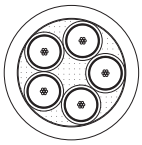
Part No.3158

Multicore 75Ω coaxial cables used for HD TV RGB signal, VGA and CRT drive etc. are available in two versions. One small overall diameter version to meet shrink Dsub 15P connector and another large overall diameter version with less attenuation for longer runs offer the following outstanding features.

- Because of used XLCPE (Cross-Linked Cellular polyethylene) insulation, despite its compact overall diameter, lower attenuation value is realized. To reach the same attenuation level by regular solid PE insulated coax. cable, its overall diameter has to become more than 50% larger. Also, cross-linking makes this insulation more durable against soldering heat.
- All versions have featured MOGAMI flexibility so that they are convenient for handling, and its unique served (spiral) shielding construction and stranded center conductor helps easier wiring and installation.
- Medium overall diameter version is comprised of MOGAMI standard #2964 (75Ω audio video cable), and one touch Push-Pull BNC male connector specifically designed for #2964 cable is available so that your own original cable assembly and instant procurement from standard cable assemblies are both available.

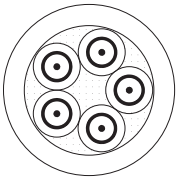
Note : Two items in Miniature type (Part No.3146～3147) are available only on order made production because of small demand.

MINIATURE MULTI 75Ω COAX. CABLE



Part No.	Nos. of Cores	Ov.Dia. (Approx. mm)	Weight (Kg/153m) (Kg/500Ft)	Roll Sizes
3147	3	8.0 (0.315")	?	77m/153m (250Ft/500Ft)
3146	4	8.9 (0.350")	?	
3145	5	9.8 (0.386")	14.8	

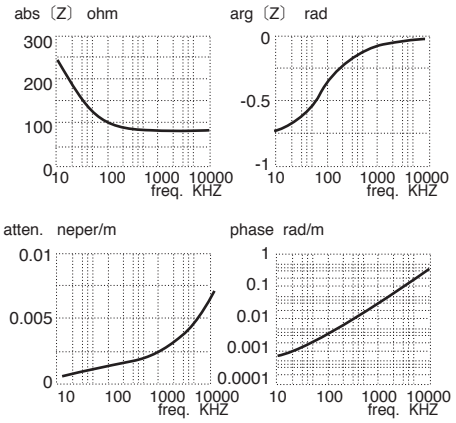
MEDIUM SIZE MULTI 75Ω COAX. CABLE



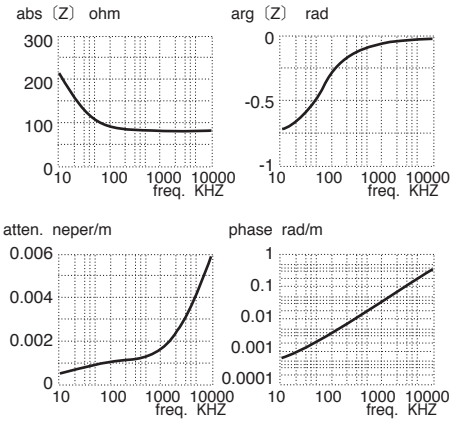
Part No.	Nos. of Cores	Ov.Dia. (Approx. mm)	Weight (Kg/100m) (Kg/328Ft)	Roll Sizes
3156	3	14.0 (0.551")	18	10m/20m/30m/ 40m/50m/ 100m/300m
3157	4	15.5 (0.610")	25	
3158	5	17.5 (0.689")	33	

MULTICORE 75Ω COAXIAL CABLES

3145



3158



CABLE CORE SPECS (COMMON SPECS)

Type		MINIATURE MULTI 75Ω COAX. CABLE	MEDIUM SIZE MULTI 75Ω COAX. CABLE
Conductor	Details	7/0.18A(7×#33AWG)	20/0.12 OFC
	Size	0.178mm^2 (#25AWG)	0.226mm^2 (#24AWG)
Insulation	Ov. Dia. (mm)	2.3ϕ(0.091")	2.6ϕ(0.102")
	Material	XLCPE (Cross-Linked Cellular Polyethylene)	
Overall Shield	Type	SERVED	Double Served Shield
	Details	Approx.70/0.10A	Approx.66/0.12OFC / Approx.72/0.12OFC
Jacket	Ov. Dia. (mm)	2.9ϕ(0.114")	4.8ϕ(0.189 ")
	Material	PVC	

ELECTRICAL & MECHANICAL CHARACTERISTICS

Type		MINIATURE MULTI 75Ω COAX. CABLE	MEDIUM SIZE MULTI 75Ω COAX. CABLE
DC Resistance at 20°C	Inner Cond.	0.104Ω/m(0.032Ω/Ft)	0.083Ω/m(0.025Ω/Ft)
	Shield	0.035Ω/m(0.011Ω/Ft)	0.012Ω/m(0.0037Ω/Ft)
Capacitance at 1kHz, 20°C		60pF/m(18.3 pF/Ft)	60pF/m(18.3 pF/Ft)
Characteristic Impedance at 10MHz		75Ω±10%	
Attenuation (10MHz)		0.058dB/m (0.018dB/Ft)	0.050dB/m (0.015dB/Ft)
Phase Constant (10MHz)		0.30rad/m	0.29rad/m
Electromagnetic Noize *		LOD (Limit of Detection)	
Voltage Breakdown		Must withstand at AC 500V/60sec.	
Insulation Resistance		10^4 MΩ · m Min. at DC 250V , 20°C	
Flex Life of Inside Core*		4,100 cycles	16,000 cycles
Tensile Strength per Core		186 N	274 N
Emigration		Non-Emigrant to ABS resin	
Applicable Temperature		-20°C～+70°C (-4°F～+158°F)	
Standard		60°C	
		UL 20002 AWM 30V VW-1	

Attenuation : 1dB＝0.1151 neper (1 neper=8.686 dB)

＊Using standard testing method of Mogami Wire & Cable Corp.

LIGHT WEIGHT CABLE! FLEXIBLE! ONE TOUCH!

PUSH-PULL BNC CABLE ASSEMBLIES

Only available combination of Mogami & Tajimi. Both have supplied high quality products, and for the first time ever, have now introduced cable assemblies that are perfect for field engineers. This cable is a dream come true for those with professional analog and digital video applications. Available in both 50Ω & 75Ω.

One Touch "Push-Pull" locking mechanism is markedly effective in high density patch panels, considerably reduces installation time, and perfect for applications requiring frequent connection and disconnection.

50Ω/75Ω BNC CONNECTOR SPECIFICALLY DESIGNED FOR P/N 3200/2964 COAXIAL CABLE

It is our pleasure to be able to provide our customers with REAL "ONE TOUCH PUSH-PULL BNC Connector" by TAJIMI specifically designed for MOGAMI P/N 3200& 2964 cables. This very innovative and handy BNC can be combined with varied cables from single 50Ω&75Ω coaxial cables in five colors up to complexed five core RGB cables. Not only available in raw cables and connectors independently as well as standard length cable assemblies, but also custom length with various connector combinations are made to order.

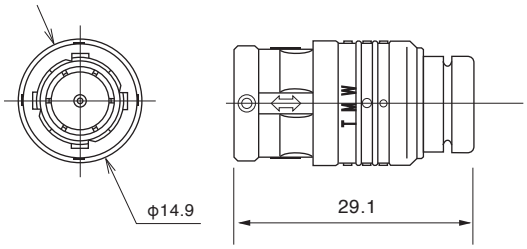
- Quick and reliable ONE TOUCH LOCK " PUSH-PULL" connection suitable for dense panel, fast installation and frequent connection and removal.
- Equivalent connection strength to conventional BNC, realized by innovative rotary mechanism.
- Durable 75Ω BNC against gouge strength, reinforced by newly developed open part of the shield contact structure and the fixed structure of the center pin terminal.
- Reliable high frequency characteristics with MOGAMI standard superflexible light weight cable assured for 1.2 V.S.W.R. up to 1GHz and acceptable to be bent up to 10mm (0.4") as the minimum radius of curvature.
- Both solder type and crimp type are available. However, we basically recommend solder type for field use because strength of cable clamp becomes too weak in case of crimp type resulted by the very feature of flexiblity of MOGAMI cable. We can assure the cable retention strength only up to 98 N in case of crimp type, while up to 147 N can be assured in case of solder type. Therefore, all of our standard cable assemblies are made of solder type.
- Available in colors :
  50Ω BNC CONNECTOR : BLACK ONLY
  75Ω BNC CONNECTOR : 6 colors (BLACK·RED·YELLOW·GREEN·BLUE·WHITE)

Characteristic Impedance	50Ω		75Ω	
Type	SOLDER TYPE	CRIMP TYPE	SOLDER TYPE	CRIMP TYPE
Part No.	BNC-3200	BNC-3200C	BNC-2964-□	BNC-2964C-□

Add register color code in □
Example : P/N BNC-2964-6 means BLUE

Color 色	BLACK	RED	YELLOW	GREEN	BLUE	WHITE
Code No. 品番	0	2	4	5	6	9

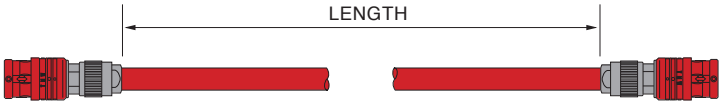
TERMINATIONS



Part No.	Impedance	Color	Frequency Range V.S.W.R. under 1.2	Option	Rating
BNC-TNT-50	50Ω	White	DC ～ 2GHz	W/Out String	1／4W
BNC-TNT-50S				With String	
BNC-TNT-75	75Ω	Yellow		W/Out String	
BNC-TNT-75S				With String	

STANDARD CABLE ASSEMBLIES AVAILABLE FROM STOCK

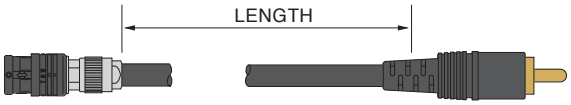
■ BNC to BNC



Part No. 品番	BB-01	BB-02	BB-03	BB-06	BB-10	BB-16	BB-25	BB-33	BB-50	BB-66	BB-100
Length 長さ	1Ft 0.3m	2Ft 0.6m	3Ft 0.9m	6Ft 1.8m	10Ft 3.0m	16Ft 4.8m	25Ft 7.6m	33Ft 10.0m	50Ft 15.2m	66Ft 20.1m	100Ft 30.5m

Cable : Part No. 2964 Standard Color : Black · Red · Yellow · Green · Blue

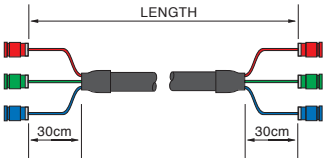
■ BNC to RCA



Part No.	BR-03	BR-06	BR-10	BR-16
Length	3Ft 0.9m	6Ft 1.8m	10Ft 3.0m	16Ft 4.8m

Cable : Part No. 2964 Standard Color : Black

■ 3×BNC to 3×BNC

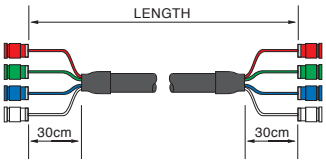


(Remarks : 3 and 4 core types are available on only order made, not standard stock item.)

Part No.	3B3B-02	3B3B-03	3B3B-05	3B3B-08	3B3B-10	3B3B-15	3B3B-20	3B3B-30
Length	6.55Ft 2m	9.83Ft 3m	16.3Ft 5m	26.2Ft 8m	32.7Ft 10m	49.1Ft 15m	65.5Ft 20m	98.3Ft 30m

Cable : Part No. 3156

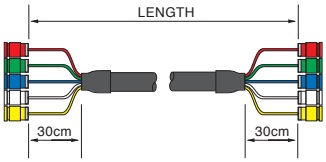
■ 4×BNC to 4×BNC



Part No.	4B4B-02	4B4B-03	4B4B-05	4B4B-08	4B4B-10	4B4B-15	4B4B-20	4B4B-30
Length	6.55Ft 2m	9.83Ft 3m	16.3Ft 5m	26.2Ft 8m	32.7Ft 10m	49.1Ft 15m	65.5Ft 20m	98.3Ft 30m

Cable : Part No. 3157

■ 5×BNC to 5×BNC



Part No.	5B5B-02	5B5B-03	5B5B-05	5B5B-08	5B5B-10	5B5B-15	5B5B-20	5B5B-30
Length	6.55Ft 2m	9.83Ft 3m	16.3Ft 5m	26.2Ft 8m	32.7Ft 10m	49.1Ft 15m	65.5Ft 20m	98.3Ft 30m

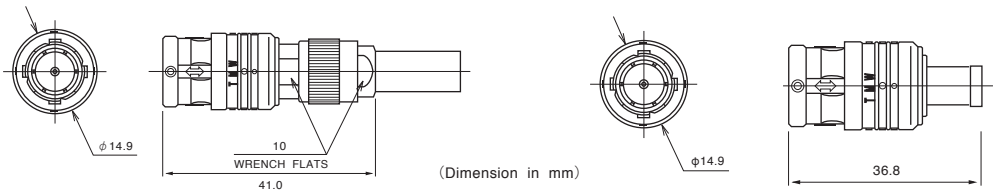
Cable : Part No. 3158

NOTE : Customised cable Assembly is available to special order. Please refer to Page 6 and Page 26 in our general catalogue and or consult your MOGAMI distributor.

CONNECTOR SPECIFICATION

SOLDER TYPE

CRIMP TYPE



CONSTRUCTION

Part No.	BNC-3200	BNC-3200C	BNC-2964-□	BNC-2964C-□
Type	SOLDER TYPE	CRIMP TYPE	SOLDER TYPE	CRIMP TYPE
Coupling Ring	Nylon W/Glass Fiber		Nylon W/Glass Fiber	
Rotary Shell	Nickel Plated Phosphor Bronze		Nickel Plated Phosphor Bronze	
Shell	Nickel Plated Brass		Nickel Plated Brass	
Clamp Shell	Silver Plated Brass	————	Silver Plated Brass	————
Center Terminal	Gold Plated Brass		Gold Plated Brass	
Insulation	PTFE		PTFE	
Ferule	————	Tin Plated Copper	————	Tin Plated Copper
Spacer	————		Silver Plated Brass	————
Nut	Nickel Plated Brass	————	Nickel Plated Brass	————
Sleeve	————		Chloroprene	————

CHARACTERISTICS

Part No.	BNC-3200	BNC-3200C	BNC-2964-□	BNC-2964C-□
Type	SOLDER TYPE	CRIMP TYPE	SOLDER TYPE	CRIMP TYPE
Voltage Rating	AC 500Vrms		AC 500Vrms	
Dielectric Withstanding Voltage	AC 1,500Vrms at sea level		AC 1,500Vrms at sea level	
Insulation Resistance	1,000 MΩ Min. at DC 500V		1,000 MΩ Min. at DC 500V	
Contact Resistance	5mΩ Max. at DC 1A		5mΩ Max. at DC 1A	
Characteristic Impedance	50Ω		75Ω	
V.S.W.R.	1.2 Max. DC ~1GHz		1.2 Max. DC ~1GHz	
Minimum Acceptable Radius of Curvature of Used Cable	10mm (0.4")		10mm (0.4")	
Cable Retention	196 N (44 lbf) Min.	117 N (26 lbf) Min.	147 N (33 lbf) Min.	98 N (22 lbf) Min.
Withstanding Vibration	98m/S^2 (10G),10～500Hz (JIS C5402 6.1)		98m/S^2 (10G) , 10～500Hz (JIS C5402 6.1)	
Connector Durability	1,000 times Min.		1,000 times Min.	
Applicable Temperature	-40°C～+85°C (85%RH Max.)		-40°C～+85°C (85%RH Max.)	
Standard	IEC 169-8/MIL-C-39012		IEC 169-8/MIL-C-39012	

TOOLS

Crimp Tool

CWB-T0276/T0277

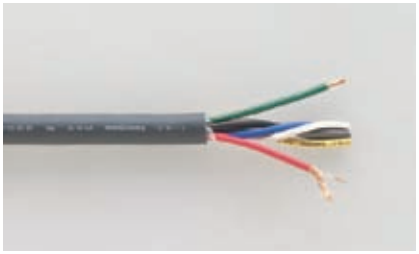
Attach and Detach Connecting Tool

T90-28

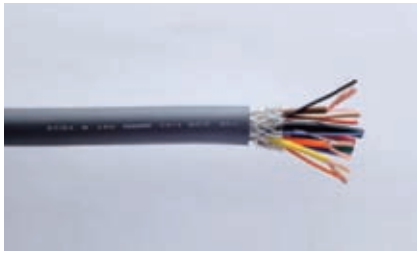
COMPLEXED COAX. (VIDEO CAMERA) CABLES

Part No.2673

Part No.2537



Part No.2543

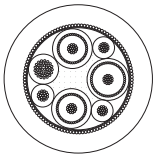
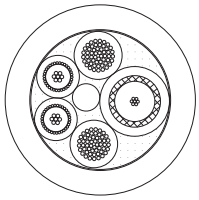
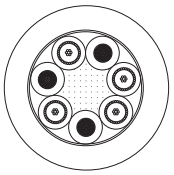


Part No.3027

Part No.2859

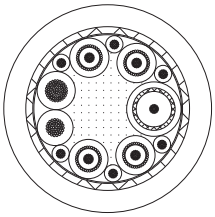
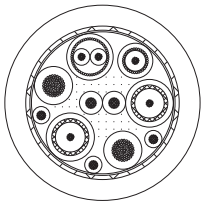
Many variations of video camera cables which were originally developed for respective customers' requirements (as each camera needed a different specification) when the camera and the recorder were separated, these cables remained as a kind of standard stock item with some demand for maintenance and new and different applications in the international world wide market. Some video camera cables are of course applicable to professional cameras, and feature the same flexibility and compact size as other MOGAMI cables. Most of these cables are often comprised of 50Ω coaxial cable cores to make them as miniature as possible (of course it naturally becomes flexible), because the wave length of video signal is rather long (20m / 66Ft) the reflection (impedance mismatch) problem does not become critical as long as it is used within this length (within one whole wave length) so that compactness and flexibility can be a benefit without any anxiety. However, for interconnection longer than 20m (66Ft) or when attenuation is of importance, strictly adjusted 75Ω coaxial cable with larger conductor size must be used. Finally, video camera cables are destined to be discontinued as their demand decreases, therefore, please ask our distributor for its availability before you make a decision on its application.

COMPLEXED COAX. (VIDEO CAMERA) CABLES

CABLE SPECIFICATIONS

Part No.		2673	2537	2543
Core Configuration		1×50Ω COAX. (# 28AWG) 2×40Ω COAX. (# 28AWG) 1×Power (# 22AWG) 1×Signal (# 26AWG) 2×Signal (# 28AWG)	1×75Ω COAX. (# 28AWG) 2×Unbalanced (# 24AWG) 2×Power (# 16AWG)	4×50Ω COAX. (# 32AWG) 3×Power(# 22AWG)
Overall Shield		Served (# 16AWG)	Unshielded	
Ov. Jacket	Material	Flexible PVC		
	Ov. Dia.(mm)	5.9φ(0.232")	9.0φ(0.354")	7.6φ(0.299")
	Color	Black	Dark Gray 灰	
Standard		—	UL 20002 AWM VW-1 30V 60°C	
Emigration		Non-Emigrant to ABS resin		
Applicable Temperature		-20°C~+70°C(-4°F~+158°F)		
Roll Size		153m (500Ft)		
Weight Per 153m(500Ft) roll		8.7kg	16kg	9.7kg

CABLE SPECIFICATIONS

Part No.		3027	2859
Core Configuration		1×75Ω COAX. (# 26AWG) 4×40Ω COAX. (# 26AWG) 1×Power (# 18AWG) 1×Power (# 20AWG) 6×Signal (# 26AWG)	2×75Ω COAX. (# 28AWG) 1×50Ω COAX. (# 28AWG) 1×Balanced (# 28AWG) 2×Power (# 18AWG) 2×Signal (# 24AWG) 3×Signal (# 26AWG)
Overall Shield		Braided	
Ov. Jacket	Material	Flexible PVC	
	Ov. Dia.(mm)	11.6φ(0.457")	11.0φ(0.433")
	Color	Dark Gray	Black
Standard		UL 20124 AWM VW-1 30V 60°C	
Emigration		Non-Emigrant to ABS resin	
Applicable Temperature		-20°C~+70°C(-4°F~+158°F)	
Roll Size		153m (500Ft)	
Weight Per 153m(500Ft) roll		33kg	27kg

More detailed specification or characteristics of the used inside cores are not included in this catalogue as it is not economical compared with the size of the market for these items. In case of necessity, please ask our distributor for extended detailed core specifications.

DIGITAL INTERFACE CABLES

MOGAMI

MIDI SYNCHRO CABLE ASSEMBLIES

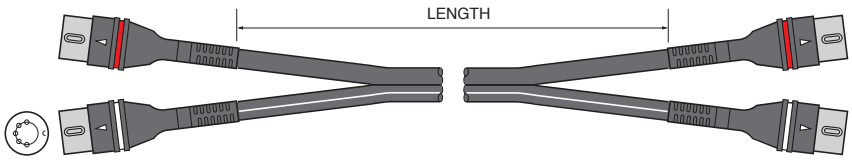
Single

Dual

MOGAMI MIDI SYNCHRO CABLE ASSEMBLIES are specially designed for use with the Musical Instrument Digital Interface (MIDI) communication system.
Applications include the latest MIDI patchbays, and interconnection between MIDI equipment and MIDI served musical instruments. These outstanding professional cables offer the following features:

- SINGLE and DUAL MIDI CABLES are both available from standard stock. NEW DUAL MIDI CABLES are designed for compact wiring and prevent connection errors when using both Midi-Out and Midi-In ports simultaneously.
- One piece molded 5pin Din connectors.
- Elegant desigh two stage molding for easy handling, reliability and long life.
- 0.76μ gold plated pin version available to order.
- Specially designed, superflexible cable with four #25AWG copper conductors and served (spiral) shield.
- Attractive, durable, satin black rubber like PVC jacket.
- Fast, accurate transmission of MIDI signal via a twisted pair for better electromagnetic noise rejection.
- Additional two pins wired for tape synchro signal.
- Interchangeable color rings for easy patch cord identification.
- Bulk cable also available in 50m (164Ft) ,100m (328Ft) rolls and 200m (656Ft) spools .

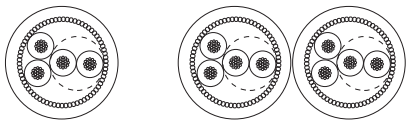
Single Cable	Part No. 2948
Dual Cable	Part No. 3033

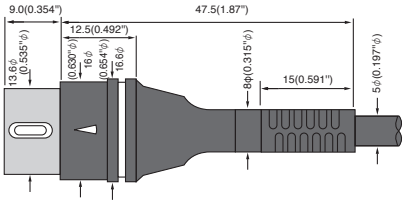


Part No.								
	Single	MIDI-015	MIDI-03	MIDI-05	MIDI-10	MIDI-15	MIDI-20	MIDI-30
	Dual	MIDI-015D	MIDI-03D	MIDI-05D	MIDI-10D	MIDI-15D	MIDI-20D	MIDI-30D
Length		18"(1.5') 45cm	3Ft 90cm	5Ft 1.5m	10Ft 3m	15Ft 4.5m	20Ft 6.1m	30Ft 9.1m

MIDI SYNCHRO CABLE ASSEMBLIES

SPECIFICATIONS





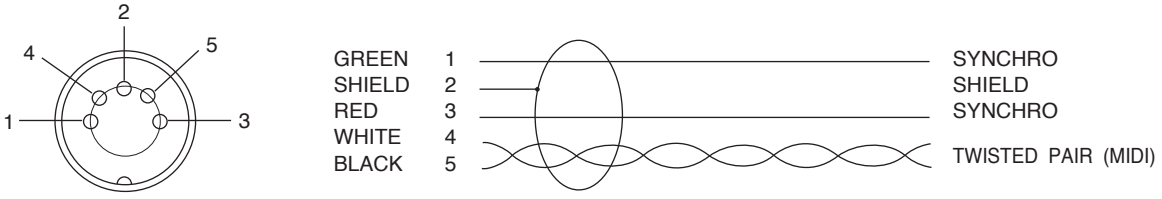
Cable Part No.	2948	3033	PLUG	
Conductor	30/0.08A (30×#40) 0.15mm² (#26AWG)		Pins	Silver Plated Brass
Insulation	1.2ϕ(0.047"ϕ)PVC(BLACK/WHITE/RED/GREEN)		Shield	Nickel Plated Brass
Shield	Approx.100/0.12A(100× #37)Served Shield		Insulation	Polyacetal Resin
Jacket	5.0ϕ(0.197"ϕ) Flexible PVC (BLACK)		Molding	Flexible PVC (Two Stage Molding) (BLACK)
Weight	8.6kg/200m	15kg/200m		

ELECTRICAL & MECHANICAL CHARACTERISTICS

DC Resistance (20°C)	Inner Conductor : 0.12Ω/m (0.037Ω/ Ft) Shield : 0.017Ω/m (0.005Ω/ Ft)
Capacitance (1kHz, 20°C)	Between Twisted Pair : 99 pF/m (30 pF/Ft) Between Shield and one of Twisted Pair : 182 pF/m (56 pF/Ft) Between Shield and Synchro Conductor : 180 pF/m (55 pF/Ft) Between One of Twisted Pair and Synchro Conductor : 91pF/m (28 pF/Ft)
Pitch of Twisted Pair	Approx. 30mm (1.18")
Electromagnetic Noise*(10kHz)	0.02~0.06mV
Voltage Breakdown	Must withstand at DC 500V/15sec.
Insulation Resistance (DC 125V, 20°C)	10^4 MΩ · m Min.
Tensile Strength (At Cable-Connector Joint)	480 N Min.
Flex Life*: At the connector strain relief : Cable itself (200gr, Bend radius of the cable stopper : 12.7mm)	45,000 Cycles 6,700 Cycles
Emigration	Non-Emigrant to ABS resin

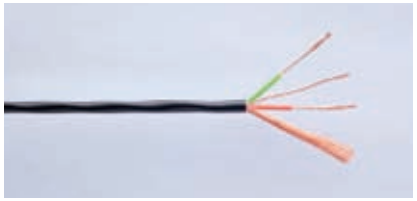
* Using standard testing methods of Mogami Wire & Cable Corp.

WIRING DIAGRAM : The MIDI signal is transmitted via a twisted pair (black and white) and wired to pins 4 & 5.

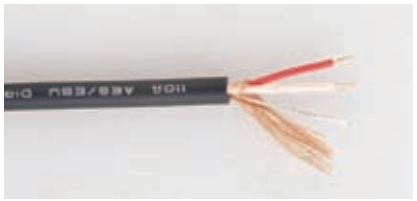


NOTE : Transmission lag in MIDI systems is mainly caused by the speed of the photocoupler and the rise time of the driver rather than the transmission characteristics of the cable.

AES/EBU & DMX CABLES



Part No.3159



Part No.3080

3080-FC
FERRITE CORE

Part No.3173

3080-TB
FITTING TUBING FOR ITT
CANNON XLR CONNECTOR

All of MOGAMI 110Ω AES/EBU digital audio cables are designed with flexibility and handy configuration. Many variations are available from regular application type up to long distance application types, from single core up to 12-core types, internal wiring type, and interconnect application types. Strict tolerance control of impedance within ±5% up to ±10% at the maximum. All these are applicable for DMX interconnect.

Part No.	3159	3228	3080	3135	3173	3160～3163
Suggested Maximum applicable length	150m 492Ft				300m 1,000Ft	150m 492Ft

Part No.3159 is for internal wiring material, Part No.3160～3163 are multicore cables and other cables are for regular interconnect application. Part No.3228 is compact size, flexible and durable configuration to meet tiny telephone plug cable clamp, therefore it is recommended for use with rough applications. And, Part No.3173 is specially designed for long distance application assured over 300m.

However, above suggested maximum applicable length is based on use with any device that meets AES standard requirement without equalizer. In the case of use with an equalizer, the maximum applicable length can be expanded up to 1.5 times longer than assured length above. We have also prepared CAD program to see the changes of eye-diagram and transmitted wave form at the receiving end for various working conditions, so you can check it yourself at http://www.mogami-wire.co.jp/ before purchasing cables. Since AES/EBU digital audio cable is low capacitance characteristics, it can result in high quality analog audio transmission in general especially for high frequency range.

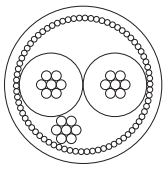
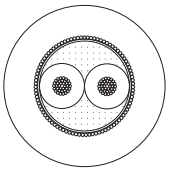
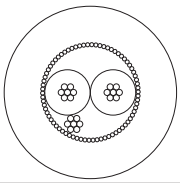
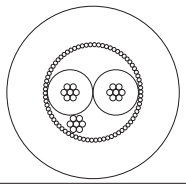
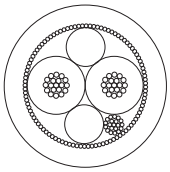
Bantam Patch Cord

Part No.	PJD-12	PJD-18	PJD-24	PJD-36	PJD-48	PJD-60	PJD-72
Length	12" 30cm	18" 45cm	24" 60cm	36" 90cm	48" 120cm	60" 150cm	72" 180cm

Cable : Part No .3228 standard Color : Black only

AES/EBU & DMX CABLES

SPECIFICATIONS

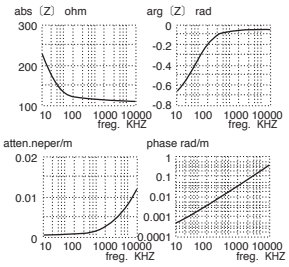
Configuration						
Part No.		3159	3228	3080	3135	3173
No. of Conductor		2	2	2	2	2
Conductor	Details	7/0.20A（7 x#32AWG）	36/0.08OFC（36x#40AWG）	7/0.18A（7 x#33AWG）	7/0.18A（7 x#33AWG）	19/0.25A（19 x#31AWG）
	Size（mm²）	0.22mm²（#24AWG）	0.18mm²（#25AWG）	0.178mm²（#25AWG）	0.178mm²（#25AWG）	0.932mm²（#18AWG）
Insulation	Ov. Dia.（mm）	1.4φ（0.055"）	1.35φ（0.053"）	1.5φ（0.059"）	1.5φ（0.059"）	2.8φ（0.110"）
	Material	CPP	XLPE	XLPE	XLPE	CPP
	Colors	Red/Light green	Red/Clear	Red/Clear	Red/Clear	Red/White
Monofilament Filler	Ov. Dia.（mm）	———	———	———	———	1.87φ（0.0736"）
	Material		Fiber			LDPE（Clear）
Drain Wire	Details	7/0.20A（7 x#32AWG）	———	7/0.18TA（7 x#33AWG）	7/0.18TA（7 x#33AWG）	20/0.18TA（20x#33AWG）
	Size（mm²）	0.22mm²（#24AWG）	———	0.178mm²（#25AWG）	0.178mm²（#25AWG）	0.509mm²（#21AWG）
Served Shield		Approx. 90/0.10A（Approx.90/#39AWG）	Approx. 97/0.10A（Approx.97/#39AWG）	Approx. 70/0.12A（Approx.70/#37AWG）	Approx. 70/0.12A（Approx.70/#37AWG）	Approx. 95/0.18A（Approx.95/#33AWG）
Ov. Jacket	Ov. Dia.（mm）	3.3φ（0.130"φ）	4.8φ（0.189"φ）	5.0±0.3φ（0.197±0.0118"φ）	5.0±0.3φ（0.197±0.0118"φ）	7.8±0.5φ（0.307±0.0197"φ）
	Material	PVC	Flexible PVC	Flexible PVC	Flexible PVC	Flexible PVC
	Color	Black/Gray	Black	Black/Blue	Black	Black
Roll Sizes		50 m（164Ft） 100m（328Ft） 200m（656Ft）			77m（250Ft） 305m（1,000Ft）	300m（983Ft）
Weight		2Kg/100m Roll	3.0Kg/100m Roll	3.3Kg/100m Roll	2.6Kg/250 Ft Roll	27Kg/300m

ELECTRICAL & MECHANICAL CHARACTERISTICS

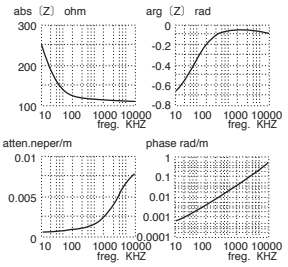
Part No.		3159	3228	3080	3135	3173
DC Resistance at 20°C	Inner Conductor	0.081Ω/m（0.0247Ω/Ft）	0.1Ω/m（0.031Ω/Ft）	0.11Ω/m（0.034Ω/Ft）	0.11Ω/m（0.034Ω/Ft）	0.02Ω/m（0.006Ω/Ft）
	Shield Conductor	0.021Ω/m（0.0064Ω/Ft）	0.025Ω/m（0.0076Ω/Ft）	0.02Ω/m（0.0061Ω/Ft）	0.02Ω/m（0.0061Ω/Ft）	0.007Ω/m（0.0021Ω/Ft）
Capacitance at 1kHz, 20°C (effective capacitance value between inner twin)		46pF/m（14 pF/Ft）	53pF/m（16 pF/Ft）	46pF/m（14 pF/Ft）	46pF/m（14 pF/Ft）	50pF/m（15.3pF/Ft）
Inductance		0.8μH/m（0.24μH/Ft）	0.8μH/m（0.24μH/Ft）	1.0μH/m（0.31μH/Ft）	1.0μH/m（0.31μH/Ft）	0.7μH/m（0.21μH/Ft）
Characteristic Impedance		110Ω±10%	110Ω±5%	110Ω±5%	110Ω±5%	110Ω±10%
Attenuation（6MHz）		0.065dB/m（0.020dB/Ft）	0.069dB/m（0.021dB/Ft）	0.069dB/m（0.021dB/Ft）	0.069dB/m（0.021dB/Ft）	0.0347dB/m（0.0106dB/Ft）
Phase Constant（6MHz）		0.17rad/m	0.20rad/m	0.20rad/m	0.20rad/m	0.17rad/m
Electrostatic Noise *		50mV Max.				
Electromagnetic Noise At 10kHz *		2.0mV Max.				
Microphonics*		60mV	40mV Max.		40mV Max.	
Voltage Breakdown		DC 500V/15sec.	AC 600V/60sec.		DC 500V/15sec.	
Insulation Resistance		10^4MΩ · m Min. at DC 250V, 20°C				
Flex Life *		2,900 cycles	33,000 cycles	10,000 cycles	10,000 cycles	16,000 cycles
Tensile Strength		303 N	441 N	343 N	362 N	Over 980 N
Emigration		Non-Emigrant to ABS resin				
Applicable Temperature		-20°C～+60°C（-4°F~+140°F）				
Standard		AES3-100X（ANSI S. 4. 40-199-X） EBU Rech, 3250-E CEI / IEC 958 / CCIR Rec. 647	AES3-100X（ANSI S. 4. 40-199-X） EBU Rech, 3250-E CEI / IEC 958 / CCIR Rec. 647 UL AWM 20124, 30V, 60°C, VW-1		AES3-100X（ANSI S. 4. 40-199-X） EBU Rech, 3250-E CEI / IEC 958 / CCIR Rec. 647 UL444, CM, 300V, 60°C, #25AWG	AES3-100X（ANSI S. 4. 40-199-X） EBU Rech, 3250-E CEI / IEC 958 / CCIR Rec. 647 UL13 CL2X, 30V, 60°C

* Using standard testing methods of Mogami Wire & Cable Corp.

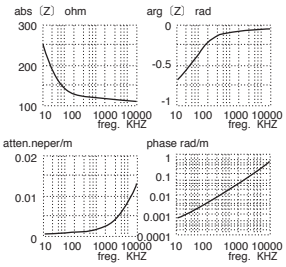
3159



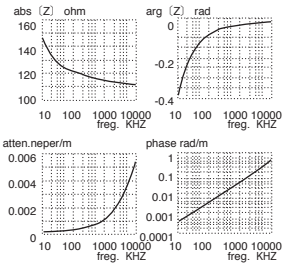
3080



3135

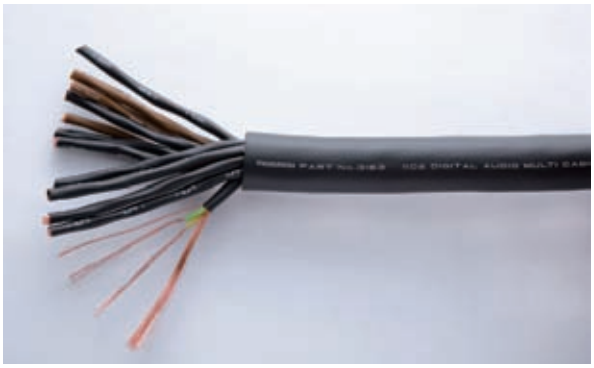


3173



Option : FERRITE CORE is available for Part No.3080 and No.3135 to eliminate EMI noise. FITTING TUBING for ITT CANNON XLR connector is available for Part No.3080 and No.3135 cable.

MULTICORE AES/EBU & DMX SNAKE CABLES



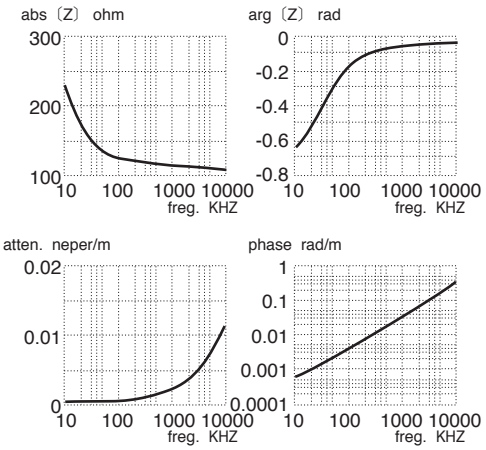
Part No.3163

Like the world standard MOGAMI multicore microphone "Snake" cable, very flexible and compact design makes these multicore AES/EBU & DMX cables easy for wiring, installation and handling.

- Because of employed cellular PP (polypropylene) insulation material, regardless of its compact overall diameter, larger conductor size is used, which naturally results in lower attenuation.
- Besides, there are the following outstanding features similar to the standard analog multipair cables:
  - Easy cable core identification system, such as numbered cable core (please refer to Page 26)
  - Easy wiring assisted by the same conductor size drain wire
  - Flexible and good low temperature characteristic

3160.

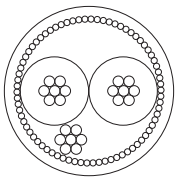
freq kHz	abs(z)ohm	arg(z)rad	atten npr/m	phase rad/m
10	253.053778	-0.666284	0.000485	0.000617
20	186.122587	-0.559186	0.000611	0.000978
50	140.097832	-0.348423	0.00074	0.002038
100	127.900865	-0.206205	0.000811	0.003876
200	123.592395	-0.124331	0.000951	0.007596
500	120.029543	-0.080112	0.001498	0.018508
1000	117.020927	-0.0671	0.002361	0.036164
2000	114.290764	-0.0558	0.003866	0.070617
5000	111.573232	-0.04365	0.007263	0.173456
10000	110.521001	-0.0358	0.012238	0.351575



Part No.	Nos. of Cores.	O.D. (Approx. mm)	Jacket Thickness (Approx. mm)	Weight (Kg/100m)(Kg/328Ft)	Maximum Length available
3160	2-CR	9.0(0.354")	1.0 (0.039")	8	305m (1,000Ft)
3161	4-CR	10.5(0.413")	1.2 (0.047")	14	
3162	8-CR	13.8(0.543")	1.4 (0.055")	23	
3163	12-CR	17.0(0.669")	1.6 (0.063")	30	

CABLE CORE SPECS

Conductor	7/0.20A (0.22mm²)#24AWG (7×#32AWG)
Insuration	1.4φCPP (Cellular polypropylene) (0.055")
Drain Wire	7/0.20A (Exactly same as conductor)
Shield	Approx. 90/0.10A Served (Spiral) Shield
Jacket(covering)	3.3φ Flexible PVC (0.130")
Identification	Similar to analog snake cable (Ref. Page #26) except for insulation color of other wire in all pair is chartreuse green



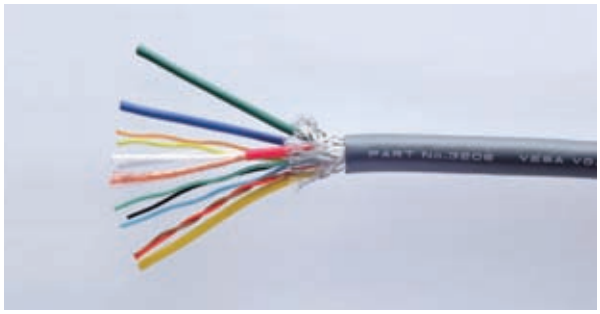
ELECTRICAL & MECHANICAL CHARACTERISTICS

DC Resistance	Inner Pair Conductor	0.081Ω/m(0.0247Ω/Ft)
	Shield	0.021Ω/m (0.0064Ω/Ft)
Capacitance at 1kHz 20°C (effective capacitance value between inner twin)		46pF/m (14pF/Ft)
Inductance		0.8μH/m (0.24μH/Ft)
Characteristic Impedance		110Ω±10%
Attenuation (6MHz)		0.065dB/m (0.020dB/Ft)
Phase Constant (6MHz)		0.17rad/m
Electrostatic Noise *		50mV MAX.
Electromagnetic Noise at 10kHz *		2.0mV MAX.
Microphonics *		60mV MAX.
Voltage Breakdown		Must Withstand at DC 500V/15sec.
Insulation Resistance at DC 125V. 20°C		10^4MΩ · m MIN.
Tensile Strength of one Core		303 N
Emigration		Non-Emigrant to ABS resin
Applicable Temperature		-20°C～+70°C (-4°F～+158°F)
Standard		AES3-100X(ANSI S.4.40-199X) EBU Rech. 3250-E CEI/IEC 958/CCIR Rec. 647 UL13 CL2X 60°C

* Using standard testing methods of Mogami Wire & Cable Corp.

VESA VGA CABLE

〈 FOR PLUG & PLAY 〉



Part No.3206

MOGAMI Part No. 3206-08 is a specially designed cable to meet VESA standard for plug and play. Applicable up to 30 m (100 Ft) long, and possible to solder to a very small and troublesome Shrink Dsub 15P connector.

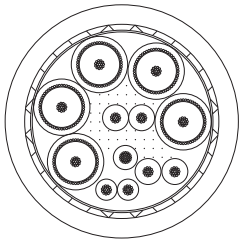
Shrink Dsub 15P Pin Assignment

Pin No.	Standard VGA	DDC1 Host	DDC2B Host	DDC2B+or DDC2AB Host	DDC1/2 Display
1	Red video				
2	Green video				
3	Blue video				
4	Monitor ID bit 2				Optional
5	Test(ground)	Return			
6	Red video return				
7	Green video return				
8	Blue video return				
9	No connection (mechanical key)	+5volt supply (mandatory supply)			+5volt load (optional use)
10	Sync. return				
11	Monitor ID bit 0				Optional
12	Monitor ID bit 1	Data from display	Bi-directional data (SDA)		
13	Horizontal sync.				
14	Vertical sync.				
15	Monitor ID bit 3	Open	Data clock(SCL)		

Wiring Instruction When all 15 Pins're Wired

Pin No.	Assigned Core
1	Centre Conductor of Red Coax.
2	Centre Conductor of Green Coax.
3	Centre Conductor of Blue Coax.
4	Brown Lead Wire, #28 AWG, PVC
5	Orange + Green Lead Wire, #28 AWG, XLCPE
6	Shield Conductor of Red Coax.
7	Shield Conductor of Green Coax.
8	Shield Conductor of Blue Coax.
9	Black Lead Wire, #26AWG , PVC
10	Shield Conductor of White + Yellow Coax.
11	Red Lead Wire, #28 AWG , PVC
12	Yellow Lead Wire, #28 AWG , XLCPE
13	Centre Conductor of White Coax.
14	Centre Conductor of Yellow Coax.
15	Blue Lead Wire, #28 AWG , XLCPE

VESA VGA CABLE



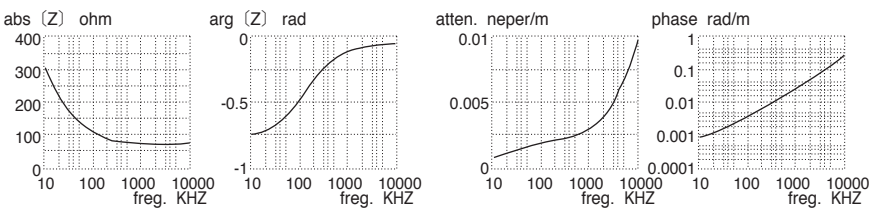
SPECIFICATIONS

Part No.			3206
Core Configuration			5×75Ω Coax. (#28AWG) 3×Twisted-Pair (#28AWG) 1×Power (#26AWG)
Coax.	Conductor	Details	17/0.08A
		Size(mm²)	0.0854mm² (#28AWG)
	Insulation	Ov. Dia. (mm)	1.7φ (0.0669")
		Material	XLCPE
		Color	Natural
	Served Shield		Approx. 54/0.10A
	Jacket	Ov. Dia. (mm)	2.4φ (0.0945")
		Material	PVC
		Colors	Red/Green/Blue/White/Yellow
Lead Wire	Conductor	Details	4 × (17/0.08A)
		Size (mm²)	0.0854mm² (#28AWG)
	Insulation	Ov. Dia. (mm)	1.1φ (0.0433")
		Material	XLCPE
		Colors	Orange/Yellow/Green/Blue
Lead Wire	Conductor	Details	2 × (17/0.08A)
		Size (mm²)	0.0854mm² (#28AWG)
	Insulation	Ov. Dia. (mm)	0.9φ (0.0354")
		Material	PVC
		Colors	Brown/Red
Power Lead Wire	Conductor	Details	1 × (30/0.08A)
		Size (mm²)	0.15mm² (#26AWG)
	Insulation	Ov. Dia. (mm)	1.0φ (0.0394")
		Material	PVC
		Color	Black
Filler			Fiber
Binder	Thickness		0.025mm (0.001")
	Material		Paper Tape
Ov. Shield			Braid Shield
			24/10/0.12TA
Ov. Jacket	Ov. Dia. (mm)		9.8φ (0.386")
	Material		PVC
	Color		Dark Gray
Roll Sizes			77/153m (250Ft/500Ft)
Weight per 77m (250Ft) Roll			9.0kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

DC Resistance at 20°C	Inner Conductor	Coax.	0.22Ω/m (0.0671Ω/Ft)
		lead Wire	0.22Ω/m (0.0671Ω/Ft)
		Power lead	0.12Ω/m (0.0366Ω/Ft)
	Shield Conductor	Coax.	0.044Ω/m (0.0134Ω/Ft)
		Ov.Shield	0.0076Ω/m (0.0023Ω/Ft)
Capacitance (1kHz,20°C)			58pF/m (17.7pF/Ft)
Characteristic Impedance(10MHz)			75Ω±10%
Attenuation (10MHz)			0.085dB/m (0.0259dB/Ft)
Phase Constant (10MHz)			0.30rad/m
Electromagnetic Noise at 10kHz			LOD (Limit of Detection)
Voltage Breakdown			Must Withstand at AC 500V/60sec.
Insulation Resistance			10^4MΩ·m Min. at DC 250V,20°C
Tensile Strength (22°C,60%RH)			Over 980 N
Emigration			Non-Emigrant to ABS resin
Applicable Temperature			-20°C～+60°C (-4°F～+140°F)
Stanndard			VESA, UL20124 AWM 60°C 30V VW-1

freq khz	abs (z) ohm	arg (z) rad	atten npr/m	phase rad/m
10	303.478132	-0.750064	0.000824	0.000885
20	215.268557	-0.714327	0.001123	0.001293
50	139.510971	-0.615286	0.001603	0.002265
100	106.083113	-0.479051	0.001945	0.00374
200	89.114101	-0.314782	0.002197	0.006734
500	81.545187	-0.154867	0.002515	0.016007
1000	79.55112	-0.09565	0.003033	0.031444
2000	78.029826	-0.0649	0.004074	0.061829
5000	76.504807	-0.04325	0.006485	0.152336
10000	76.266668	-0.0294	0.009814	0.307579

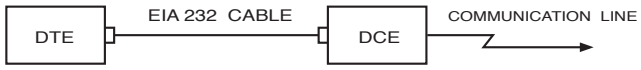


ANSI/EIA 232 CABLE

EIA 232 was originally developed as an interface between DTE (data terminal equipment) such as computers and DCE (data circuit-terminating equipment) such as MODEM to transmit 20 kbit/sec. serial data within 15m(50Ft). Today it is widely used as a standard interface for a computer system as well as GP-IB interface. However, different from GP-IB, it has directional rule for data path, and further the definition of the control signals and the pin assignment differs between each device, therefore, special care for necessary numbers of conductors and wiring diagram is needed in choosing a cable.

EIA 232 CABLE

EIA 232 CABLE is an interface cable to connect DTE (data terminal equipment) and DCE (data circuit-terminating equipment) to transmit 20kbit / sec. serial data within 15m (50 Ft) distance based on EIA 232 standard.



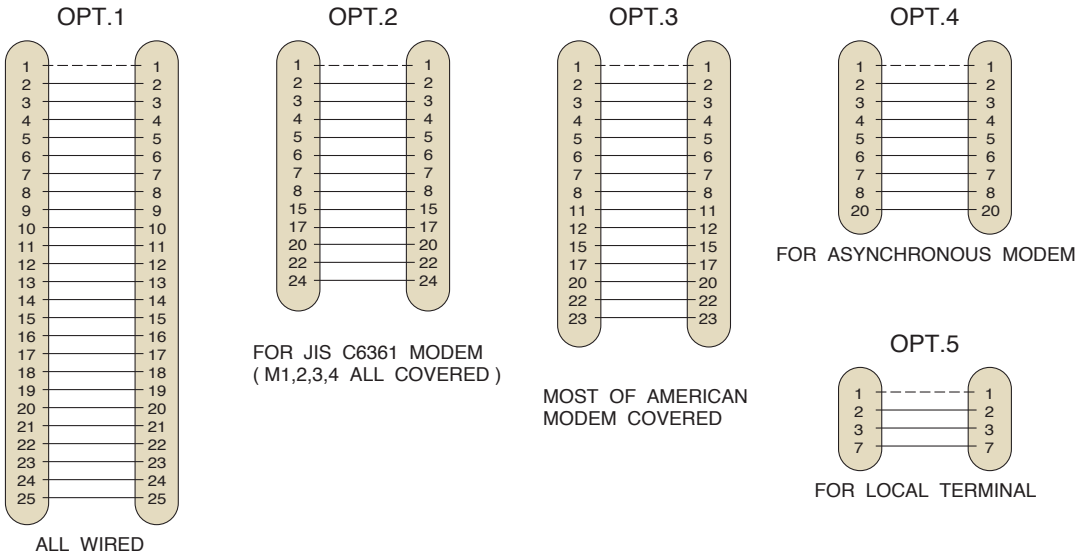
For ordering, specify the following informations:

PART NO : EIA 232 CABLE

CABLE LENGTH :

COMBINATION OF CONNECTORS AT BOTH ENDS : Generally male to male

WIRING DIAGRAM : Select correct wiring from the following five options.

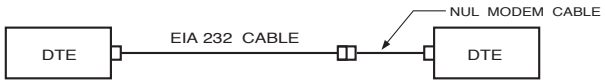


Remarks : ANSI/EIA 232 standard is almost same contents as CCITT V.24 and JIS C6361.

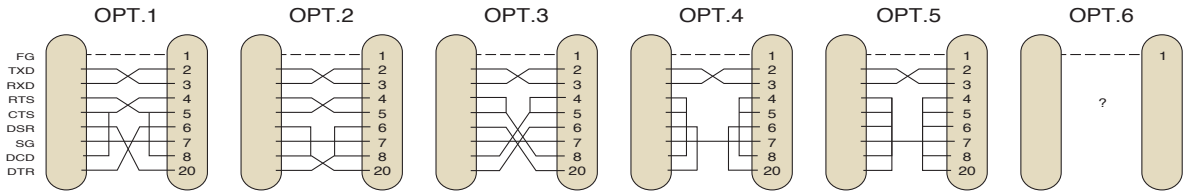
SERVICE INFORMATION

NUL MODEM CABLE

NUL MODEM CABLE is a tool to solve a contradiction or collision generated when the same type of equipment, DTE and DTE or DCE and DCE, are connected. Because it looks like modem from DTE side without substance, it is called so " NUL MODEM "



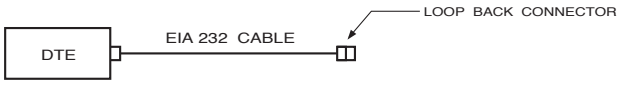
For ordering, specify the following informations:
PART NO : NUL MODEM CABLE
WIRING DIAGRAM : Select correct wiring from the following six options.
Also, in case of special requirement, specify necessary cable length (generally 1m/3.28Ft)
and combination of connectors at both ends (generally male to female) .



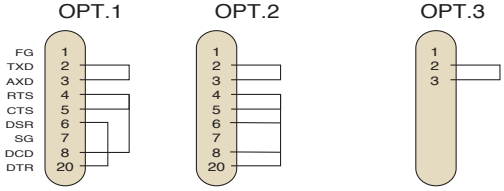
OPT.6 All the wiring except for Pin No. 1 can be designated at your free choice.

LOOP BACK CONNECTOR

In case the system wired by EIA 232 interface does not work or there is any anxiety in operation of DTE (data terminal equipment) , the easiest and important test is the loop back test. It works as a mirror against DTE when it is connected in place of DTE or DCE. In other words, it looks like corresponding from a reproduction of the DTE itself by returning the output data or control signals from itself, so it can test its own transmitter-receiver and control function.



For ordering, specify the following informations:
PART NO : LOOP BACK CONNECTOR
WIRING DIAGRAM : Select correct wiring from the following three options.
Also, in case of special requirement, specify sex distinction of the connector (generally female) .

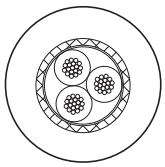
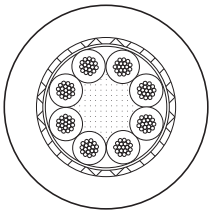
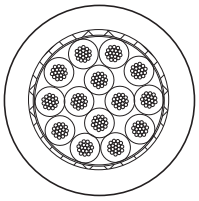
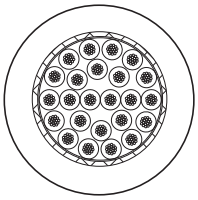


All the wiring except for Pin No. 2 & 3 can be designated at your free choice.

ANSI/EIA232 CABLE

There are some variations in EIA 232 interface as explained in the beginning, therefore, the following four types of raw cables are prepared to match respective cost and those raw cables are also available from stock. All those cables are approved as UL SUBJECT 758 AWM 2626 VW-1.

CABLE SPECIFICATIONS

Configuration					
Part No.		2691	2690	2689	2579
No. of Conductor		3	8	14	24
Conductor	Details	17/0.16TA (17 ×#34AWG)			7/0.16TA (7 ×#34AWG)
	Size	0.34mm² (#22AWG)			0.14mm² (#26AWG)
Insulation	Ov. Dia. (mm)	1.4φ(0.055")			1.0φ(0.0394")
	Material	PVC			
Drain Wire	Details	17/0.16TA (17×#34AWG)			20/0.18TA (20×#33AWG)
	Size	0.34mm² (#22AWG)			0.51mm² (#21AWG)
Braided Shield		16/ 6/ 0.12TA	24/ 7/ 0.12TA	24/ 8/ 0.12TA	24/ 8/ 0.12TA
Jacket	Ov. Dia. (mm)	6.0φ (0.236"φ)	8.1φ (0.319"φ)	9.2φ (0.362"φ)	9.3φ (0.366"φ)
	Material	Flexible PVC			
	Color	Gray			
Roll Size		153 m (500Ft)			
Weight per 153m (500Ft) Roll		8.0Kg	13.5Kg	20Kg	21Kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

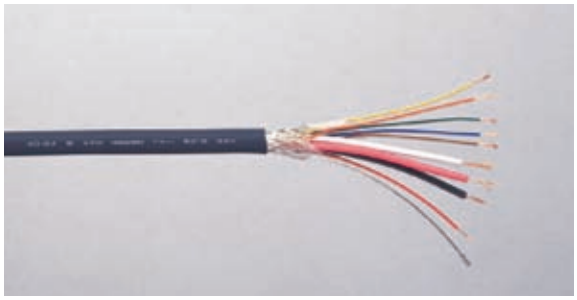
Part No.	2691	2690	2689	2579
DC Resistance at 20°C	0.06Ω/m(0.018Ω/Ft)			0.14Ω/m(0.043Ω/Ft)
Voltage Breakdown	Must withstand at AC 500V/60sec.			
Insulation Resistance	10^4 MΩ · m Min. at DC 500V , 20°C			
Emigration	Non-Emigrant to ABS resin			
Applicable Temperature	-20°C~+70°C (-4°F~+158°F)			
Standard	UL Subject 758 AWM 2626 VW-1 30V 80°C			

Option : FERRITE CORE is available as a countermeasure against EMI noise.

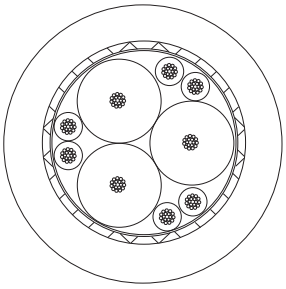
HIGH SPEED SERIAL TRANSMISSION CABLE

High speed serial transmission cable is a specifically designed cable for higher speed and or longer cable transmission is required such as for 115.2 kbps ISDN-TA. This cable enables for use at five times higher rate transmission or five times longer cabling, comparing with regular cable. Feature of this cable can be described as shown below. For detailed information such as transmitted wave form etc., please ask for technical data.

- Higher speed transmission and or longer cabling becomes possible.
- Compact overall diameter to meet Dsub 9P connector used for IBM-PC.
- This very flexible cable is available in both raw cable and cable assembly.



Part No.3227



OVERALL SPCIFICATION

Part No.	3227
Ov. Dia.(mm)	7.3ϕ (0.287"ϕ)
Conductor Size	17/0.08A (#28AWG)
Shield	Overall Braided Shield
Capacitance	37pF/m (Signal Line-All other conductors) 87pF/m (Control Line-All other conductors)
Mutual Capacitance	3pF/m (Between Signal Lines) 6pF/m (Signal Line-Control Line) 32pF/m (Between Control Lines)
Weight per 153m (500Ft) Roll	9.3kg
Standard	UL758 STYLE 20124 60°C 30V VW-1 28AWG

Remarks : Capacitance value determines distortion of transmitted wave.
Mutual capacitance value is the largest factor to determine cross-talk level.

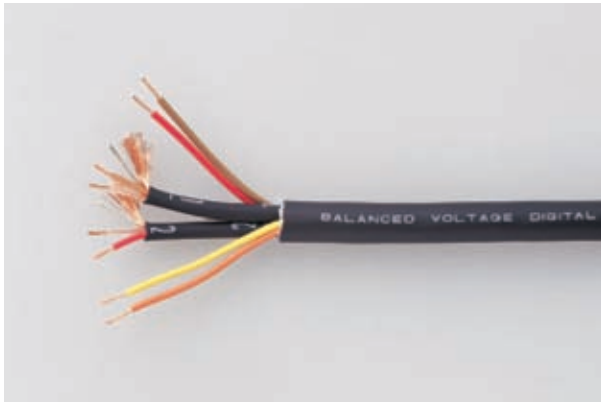
Typical Pin Assignment

Dsub 25P	Dsub 9P	Circuit	Function Name
1	—	FG	Protective Ground
2	3	TXD	Transmitted Data
3	2	RXD	Receive Data
4	7	RTS	Request to Send
5	8	CTS	Clear to Send
6	6	DSR	Data Set Ready
7	5	SG	Signal Ground
8	1	DCD	Received Line Signal Detector
20	4	DTR	Data Terminal Ready
22	9	RI	Ring Indicator

- Please assign inside core conductor Red, White and Black to TxD, RxD and SG respectively for your own original cable assembly, otherwise expected characteristics cannot be realized. Other inside core conductors can be wired to any signal line.
- Cable assembly is available to order in 10cm(0.394")interval. Specify required length at XX part of the cable assembly part number of 5016-XX.
  Example: In case of 6m, it is 5016-60, while in case of 8.5m, it is 5016-85. In addition, we need to know used connector and wiring diagram variations as well as type of screw of the connector case you actually need.

RS-422 BALANCED VOLTAGE DIGITAL INTERFACE CABLE

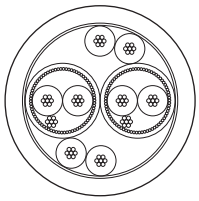
MOGAMI #2997 is designed to meet EIA Standard RS-422 general applications, with 2 balanced cores and 4 signal conductors. Overall diameter of 7mm (0.276") enables it to fit into most of the D-sub 9-pin connectors available. All the conductors are designed same the size (#25AWG) including the drain wire which can be crimped by the same size contact. Numbering print system on the balanced cores is the same as Mogami snake cables and serves as an efficient identification system together with color coded remaining four signal conductors.



Part No.2997

2997-FC FERRITE CORE

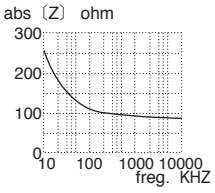
SPECIFICATIONS

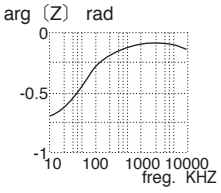
Configuration			
Part No.		2997	
No. of Conductor		2 × BALANCED CORE 4 × SIGNAL CONDUCTOR	
Conductor	Details	7/0.18A(7 × #33AWG)	
	Size(mm²)	0.178mm² (#25AWG) (The same size in all conductor)	
Insulation	Ov. Dia. (mm)	1.05φ(0.0413")	1.2φ(0.0472")
	Material	XLPE	PVC
	Colors	Brown/Clear Red/Clear	Brown/Red Orange/Yellow
Drain Wire	Details	7/0.18TA(7×#33AWG)	———
	Size(mm²)	0.178mm² (#25AWG)	
Served Shield		Approx.65/0.10A (Approx.65×#38AWG)	———
Core Jacket	Ov. Dia. (mm)	2.7φ(0.106")	———
	Material	PVC	
	Color	Black (with number print)	
Binder	Thickness	0.025mm (0.001")	
	Material	Paper Tape	
Ov. Jacket	Ov. Dia. (mm)	7.0φ Max. (0.276" Max.)	
	Material	Flexible PVC	
	Color	Black	
Roll Sizes		153 m (500Ft) / 305m (1.000Ft)	
Weight		9.6Kg/153m (500Ft) Roll	

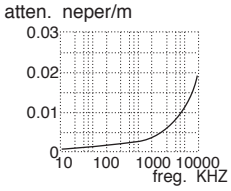
ELECTRICAL & MECHANICAL CHARACTERISTICS

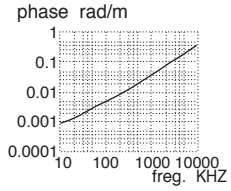
Part No.		2997
DC Resistance at 20°C	Inner Conductor	0.105Ω/m(0.032Ω/Ft)
	Shield Conductor	0.028Ω/m(0.0085Ω/Ft)
Capacitance at 1kHz, 20°C (effective capacitance value between inner twin)		65pF/m(19.8 pF/Ft)
Characteristic Impedance		95Ω±10%
Attenuation(1MHz)		0.031dB/m (0.0095dB/Ft)
Phase Constant(1MHz)		0.043rad/m
Electromagnetic Noise At 10kHz		0.5mV Max.
Voltage Breakdown		Must withstand at DC 500V/15sec.
Insulation Resistance		10^4 MΩ・m Min. at DC 500V , 20°C
Tensile Strength (26°C,65%RH)		705 N
Emigration		Non-Emigrant to ABS resin
Applicable Temperature		-20°C~+70°C (-4°F~+158°F)
Standard		EIA RS-422

Option : FERRITE CORE is available to eliminate EMI noise.









IEEE1394 FIRE WIRE
HIGH PERFORMANCE SERIAL BUS CABLE

Part No.
3208

Part No.
5086-XX

IEEE 1394 is a Serial BUS standard designed for use in real-time applications such as sound, video, and animation. This technology was designed by INMOS for their TRANSPUTER and then further developed by APPLE, at which point it was given the name "FIRE WIRE". The IEEE 1394 signal has an intermediate characteristic between serial and parallel transmission. It transmits serial data and clock signal in parallel, and countermeasures cable skew (propagation velocity difference between two pairs) by not changing the clock signal when the data signal changes. This interface requires a new type of cable and connector. It uses high speed real-time transmission with a cable that can be connected and disconnected without turning off any device. It makes it possible to connect freely between multiple terminals without having to consider termination. MOGAMI Part No. 3208-08 is specifically designed for the IEEE 1394 standard, and offers the following features.

1) Low attenuation
2) High propagation velocity
3) Low cable skew

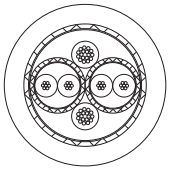
Therefore, it carries data transmission with enough margin to be used for longer runs than the recommended maximum length of 4.5m (14.75 Ft) per cable in the IEEE 1394 standard. Incidentally, the maximum applicable length of all the connected cables in one Fire Wire system, excluding a bus bridge on any one bus, is limited to 4.5 m × 15 pcs for a total of 67.5m (14.75 Ft ×15 pcs = 221.25 Ft) .

- 6p connector cable assembly is available to order in 10cm (0.394") interval. Specify required length at XX part of the cable assembly part number of 5086-XX.
  Example : In case of 1.2m, it is 5086-12, while in case of 4.5m, it is 5086-45.
- Bulk cable is available in 77m (250 Ft) and 153m (500 Ft) roll.

6P CONNECTOR PIN ASSIGNMENT

Pin No.	Signal	Comment
1	Y P	Cable Power
2	V G	Cable Ground
3	TPB	Strobe on receive, Data on transmit (differential pair)
4	TPB	
5	TPA	Data on receive , Strobe on transmit (differential pair)
6	TPA	

SPECIFICATIONS

Configuration			
Part No.			3208
Core Configuration			2×Balanced Signal Pair 2×Power Conductor
Balanced Signal Pair	Conductor Size (mm^2)		0.0886mm^2 (#28AWG)
	Insulation	Ov. Dia. (mm)	1.0ϕ(0.0394")
		Material	CPP
		Colors	Red/Green, Blue/Orange
	Shield	1st Shield	Aluminum Tape Shield
		2nd Shield	Copper Braid Shield
Power Conductor	Conductor Size (mm^2)		0.341mm^2 (#22AWG)
	Insulation	Ov. Dia. (mm)	1.2ϕ(0.0472")
		Material	PVC
		Colors	Black/White
Insulation Taping between two individual core braided shields and overall aluminum tape shielding			1/2 Wrap Polyester Tape
Ov. Shield	1st Shield		Aluminum Tape Shield
	2nd Shield		Copper Braid Shield
Ov. Jacket	Ov. Dia. (mm)		6.1ϕ(0.240")
	Material		Flexible PVC
	Color		Dark Gray
Roll Sizes			77/153m (250Ft/500Ft)
Weight per 77m (250Ft) Roll			4.5kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Signal Pair	Impedance	Differential	110Ω±6Ω
		Common Mode	33Ω±6Ω
	Attenuation (at 4.5m)		100MHz : 1.3dB
			200MHz : 1.9dB
			400MHz : 3.1dB
	Propagation Velocity		4.35nS/m
	Relative Propagation Skew (at 4.5m)		76ps
Power Pair	Characteristic Impedance (Differential)		53Ω
	DC Resistance at 20°C (at 4.5m)		0.235Ω
Crosstalk (at 1MHz~500MHz)			−52dB
Tensile Strength			882 N
Emigration			Non-Emigrant to ABS resin
Applicable Temperature			-10˚C~+60˚C(-14˚F~+140˚F)
Standard			IEEE 1394, UL 13 CL2X 60°C

ETHERNET CABLE

Part No. 3306

Mogami Ethernet Cable is specifically designed for demanding mobile applications. It is flexible enough to lay flat on a floor, yet rugged enough for reliable performance—even with the frequent set ups needed in live sound and commercial venues. Fully meets TIA/EIA-568B Category 5e performance characteristics.

ELECTRICAL & MECHANICAL CHARACTERISTICS

(Measured Value on an average for a length of 100 m at 100 MHz)

Nominal Characteristic Impedance	100Ω
Attenuation	24dB
Return Loss	22dB
Propagation Delay	480ns
Delay Skew	5ns
NEXT	44dB
PS NEXT	44dB
ELFEXT	33dB
PS ELFEXT	32dB

Tensile Strength connector to cable	Minimum 300 N
Tensile Strength of cable itself	Minimum 700 N

Overall Diameter	9.2mm (0.362")
Overall Jacket Material	PVC
Color	Black
Weight per 100 m Roll	8.3 Kg
Standard	UL758 Style 20124 60˚C 30V VW-1

COMBINATION OF TWISTED PAIR COLORS AND RECOMMENDED WIRING DIAGRAM

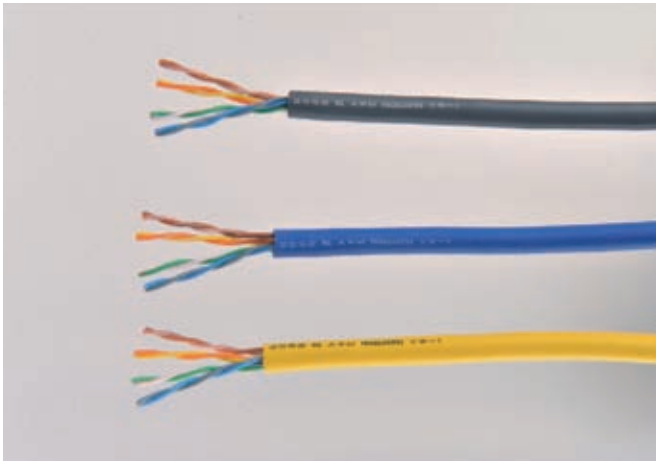
COLOR COMBINATION OF A PAIR	PIN NUMBER OF RJ45
White/Green	1, 2
Blue/Grey	3, 6
Yellow/Orange	4, 5
Natural/Brown	7, 8

3306-TB Tube set for both ends

This cable is available in complete assemblies, wired for straight or cross connection format. Please specify which format when ordering. Bulk cable is also available in lengths up to 300m (1,000 Ft). Factory assemblies carry a one year warranty against failure. Service outside of warranty is available from the factory at nominal cost.

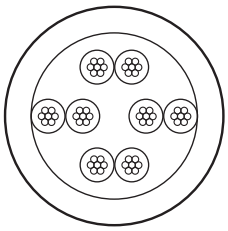
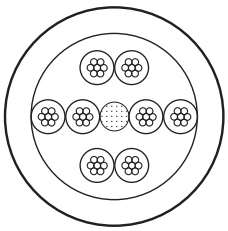
LAN CABLE FOR INSTALLATION & EVENT SET UP APPLICATION

3367 LAN cable is designed to be limp in order to be easy to handle and lay out flat. This solves a significant problem with standard data cables, which lay about as flat as barbed wire!
Performance meets the TIA/EIA-568B Cat-5e standard up to approximately 295 feet (90 meters).
Please note that precise usable length depends greatly on the electrical characteristics of the connected devices, so if there is any doubt it is best to verify performance with the specific devices before installation.
Complies with UL VW-1 flame propagation standard. Three standard colors, Blue, Grey, and Yellow are available.
3381 features a reinforcement fiber cord in the center of the cable for enhanced tensile strength. This makes it approximately 30% stronger than 3367. The additional strength combined with the limp, no-memory handling characteristic mean 3381 is perfect for live event set up. Available in Black jacket.



Part No.3367

SPECIFICATION S & ELECTRICAL CHARACTERISTICS

Configuration			
Part No.		3367	3381
Characteristic Impedance		100Ω	
Conductor	Details	7/0.203A	
	Size	0.22mm^2 (#24AWG)	
Insulation	Ov. Dia.	0.98mm (0.039")	
	Material	PE	
Filler Thread		–	Fiber
Ov. Jacket	Ov. Dia.	6.2mm (0.24")	
	Material	PVC	
	Colors	Blue/Grey/Yellow	Black
Flex Life＊		4,300 cycles	
Breaking Strength		470N	610N
Roll Sizes		153m (500Ft) / 305m (1,000Ft)	305m (1,000Ft)
Weight		12.7Kg/305m (1,000Ft)	13Kg/305m (1,000Ft)
Standard		UL 2552 AWM VW-1 30V 60°C	UL 20124 AWM VW-1 30V 60°C

＊Using standard testing methods of Mogami Wire & Cable Corp.

MULTICORE CABLES

MOGAMI

MECHATRO OVERALL SHIELD CABLES

Part No. 2863

Part No. 2842

Multi purpose #28AWG superflexble overall shielded cable available in twisted pair configuration for electromagnetic noise rejection as well as in economy and easy wiring general round configuration in compact gray jacket. All these cables are approved as UL SUBJECT 758 AWM 20002 VW-1.

CABLE SPECIFICATIONS

Conductor	Details	7/0.127TA (7x#37AWG)
	Size	0.088mm² (#28AWG)
Insulation	Ov. Dia. (mm)	0.95 ϕ (0.0374")
	Material	PVC
Overall Shield	Type	Braided shield
	Coverage	Minimum 85%
Ov. Jacket	Material	Flexible PVC
	Color	Dark Gray

ELECTRICAL & MECHANICAL CHARACTERISTICS

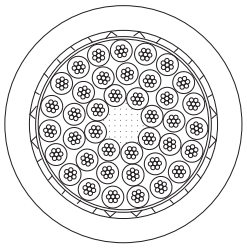
DC Resistance at 20°C	0.21Ω/m(0.064Ω/Ft)
Voltage Breakdown	Must withstand at AC 500V/60sec.
Insulation Resistance	10^4MΩ·m M in. at DC 500V , 20°C
Chracteristic Impedance *	90~115Ω (at 10MHz)
Cable Skew*	0.517nS/m
Delay Time*	5.5~6.1nS/m
Velocity Ratio*	0.55~0.60
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C~ +70°C (-4°F~+158°F)
Standard	UL 758 AWM 20002 VW-1 30V 80°C

*Data for Twisted Pair Type Only.

ROUND TYPE

Part No .	No. of Conductor	Ov. Dia. (mm)	Roll size and weight per roll
2861	7	5.2ϕ(0.205")	6kg/153m (500Ft)
2862	12	6.4ϕ(0.252")	9kg/153m (500Ft)
2863	24	8.4ϕ(0.331")	15kg/153m (500Ft)
2835	30	9.0ϕ(0.354")	17kg/153m (500Ft)
2864	40	10.3ϕ(0.406")	20kg/153m (500Ft)
2865	50	11.0ϕ(0.433")	25kg/153m (500Ft)
2866	64	12.3ϕ(0.484")	30kg/153m (500Ft)

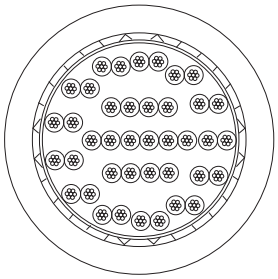
Basical structure



TWISTED PAIR TYPE

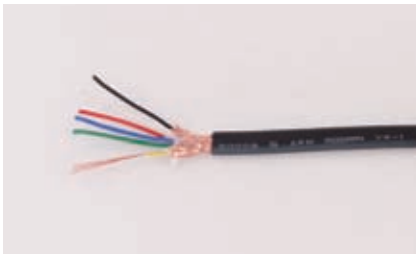
Part No .	No. of Pair	Ov. Dia. (mm)	Roll size and weight per roll
2840	5-PR	7.4ϕ(0.291")	11kg/153m (500Ft)
2841	7-PR	7.8ϕ(0.307")	12kg/153m (500Ft)
2842	8-PR	8.4ϕ(0.331")	13kg/153m (500Ft)
2843	10-PR	9.5ϕ(0.374")	17kg/153m (500Ft)
2845	13-PR	10.0ϕ(0.394")	19kg/153m (500Ft)
2847	18-PR	11.5ϕ(0.453")	24kg/153m (500Ft)
2848	20-PR	11.8ϕ(0.465")	26kg/153m (500Ft)
2849	25-PR	13.0ϕ(0.512")	15kg/77m (250Ft)
2851	32-PR	14.5ϕ(0.571")	19kg/77m (250Ft)

Basical structure

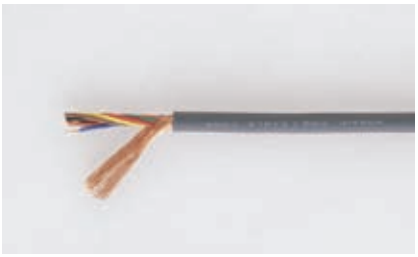


Option : FERRITE CORE is available as a countermeasure against EMI noise.

0.15mm²(#26AWG) CONDUCTOR OVERALL SHIELD CABLE SERIES



Part No.2814



Part No.2642

Part No.2789

0.15mm² (#26AWG) conductor overall shield cable series is comprised of about two times larger conductor size as mechatro overall shield cable series. There is no community in design policy, as they were originally custom-made cables and remained as standard items one by one, however, they are suitable where larger conductor size, flexibility and compactness are all required. Available from five up to nine conductor, not in twisted pair configuration.

SPECIFICATIONS

Conductor	Details	30/0.08A (30 ×#40AWG)
	Size	0.150 mm² (#26AWG)
Insulation	Ov. Dia. (mm)	1.0 ϕ (0.0394")
	Material	PVC
Overall Shield	Type	See Each Spec.
	Coverage	85% (Braid)~ 100%(Served)
Ov. Jacket	Material	Flexible PVC
	Color	Dark Gray or Black

ELECTRICAL & MECHANICAL CHARACTERISTICS

DC Resistance at 20°C	0.13Ω/m(0.040Ω/Ft)
Electromagnetic Noise	0.1mV Max.
Voltage Breakdown	Must withstand at AC 500V/60sec.
Insulation Resistance	10^4 MW · m Min. at DC 500V, 20°C
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C~+70°C (-4°F~+158°F)
Standard	UL 758 AWM 20002 VW-1 30V 80°C Except for Part No. 2642-08 / No. 2789-00

Part No .	No. of Conductor	Ov. Dia. (mm)	Type of Shield	Color	Roll size and weight per roll
2757-00	5	5.0ϕ(0.197")	Braid	Black	5.5kg/153m (500Ft)
2814-00	6	5.4ϕ(0.213")	Braid	Black	6.2kg/153m (500Ft)
2642-08	7	5.1ϕ(0.201")	Served	Gray	8.8kg/200m (656Ft)
2789-00	8	5.6ϕ(0.220")	Served	Black	9.0kg/200m (656Ft)
2871-00	9	6.0ϕ(0.236")	Served	Black	8.0kg/153m (500Ft)

Option : FERRITE CORE is available as a countermeasure against EMI noise.

GUITAR CABLES

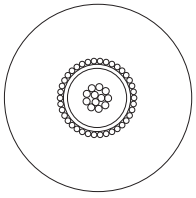
MOGAMI

GUITAR CABLES/HIGH IMPEDANCE TRANSMISSION CABLES

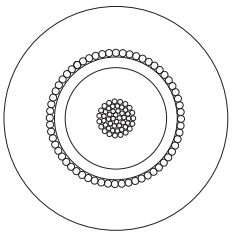
Part No.2319

Part No.2524

Most musical instrument sound pick-ups such as those in electric guitars are comprised of high impedance circuits driven by voltage, in other words by very small electrical current flow. Therefore, so-called MICROPHONICS (noise) becomes a critical problem. (Microphonics means noise that is generated when the cable is moved and or tapped when the cabling circuit is a high impedance link.) Guitar cables must be counter-measured against this, so, a conductive PVC layer is placed under the shield conductor in most cases even though it may have a bad affect on audio sound quality. Therefore, the conductive PVC (black carbon PVC) layer must be removed together with the shielding conductor when wiring, otherwise we receive a strange claim that the cable is shorting.



2319



2524

SPECIFICATIONS

Part No.		2319	2524
Conductor	Details	12/0.18A	50/0.12OFC
	Size(mm^2)	0.305mm^2 (#23AWG)	0.565mm^2 (#20AWG)
Insulation	Ov. Dia. (mm)	1.6ϕ(0.063")	2.7ϕ(0.106")
	Material	PE	
	Color	Clear	
Sub-Shield	Ov. Dia. (mm)	1.8ϕ(0.071")	3.4ϕ(0.134")
	Material	Conductive PVC (Carbon PVC)	
	Color	Black	
Main-Shield	Served-Shield	Approx.48/0.12A	Approx.57/0.18OFC
Jacket	Ov. Dia. (mm)	5.0ϕ(0.197")	6.0ϕ(0.236 ")
	Material	PVC	
	Color	Black	
Roll Sizes		100 m (328Ft) / 200m (656Ft)	
Weight per 100 (328 Ft) m roll		3.5Kg	5.1Kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.		2319	2524
DC Resistance at 20°C	Inner Conductor	0.06Ω/m(0.018Ω/Ft)	0.033Ω/m(0.010Ω/Ft)
	Shield Conductor	0.032Ω/m(0.010Ω/Ft)	0.013Ω/m(0.0040Ω/Ft)
Capacitance at 1kHz, 20°C		155pF/m(47.3 pF/Ft)	130pF/m(39.7 pF/Ft)
Inductance		0.16μH/m(0.049μH/Ft)	0.2μH/m(0.061μH/Ft)
Electrostatic Noize*		LOD (Limit of Detection)	
Electromagnetic Noise At 10kHz*		LOD (Limit of Detection)	
Microphonics*		0.3mV Max	0.3mV Max
Voltage Breakdown		Must withstand at DC 500V/15sec.	
Insulation Resistance		10^5 MΩ · m Min. at DC 500V , 20°C	
Flex Life*		11,000 cycles	15,000 cycles
Tensile Strength (26°C,65%RH)		303 N	578 N
Emigration		Non-Emigrant to ABS resin	
Applicable Temperature		-20°C~ +60°C (-4°F~+140°F)	

*Using standard testing methods of Mogami Wire & Cable Corp.

Low Capacitance Guitar Cable

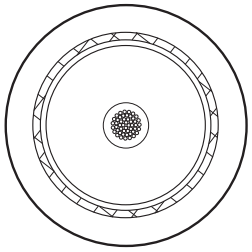
Part No.3368

3368 is a new cable designed for truly high performance sound while simultaneously being rugged enough for live stage and performance use. This large diameter cable is designed with lower capacitance for the purest possible sound, while not being so low to cause performance problems by being outside the design range of available instrument pickups.

Coaxial configuration gives the most accurate tone. A challenge for large diameter coaxial cables is that the center conductor must move inside the structure when the cable is flexed, so such cables can be delicate when handled roughly.

The proprietary composite braid shield structure of 3368 makes the cable quite rugged, and this new design maintains flexibility and performance even when used in a stage and touring environment.

A new method has been used to keep handling noise extremely low, so this cable can be used for any application where high impedance circuits (guitar pickups, sensor cables) with very low loss are needed.



3368

CABLE SPECIFICATIONS

Part No.		3368
Conductor	Details	50/0.12OFC
	Size	0.565mm² (#20AWG)
Semi-Conductive Layer	Ov. Dia. (mm)	1.5φ (0.059")
	Material	Conductive PE
	Color	Black
Insulation	Ov. Dia. (mm)	5.3φ (0.209")
	Material	CPE
	Color	Natural
Sub-Shield	Ov. Dia. (mm)	5.7φ (0.224")
	Material	Conductive PVC (Carbon PVC)
	Color	Black
Shield	Type	Composite Braid Shield
	Details	0.12OFC/7/12 + 167Dtec/2/12
Jacket	Ov. Dia. (mm)	8.0φ (0.315")
	Material	PVC
	Color	Black
Roll Sizes		100m(328Ft)/153m(500Ft)
Weight per 100 (328 Ft) m roll		6.2 Kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.		3368
DC Resistance at 20°C	Inner Conductor	0.033Ω/m(0.010/Ft)
	Shield Conductor	0.024Ω/m(0.0073/Ft)
Capacitance at 1kHz, 20°C		70pF/m(21.4pF/Ft)
Inductance		0.4μH/m (0.12 μH/Ft)
Electrostatic Noize*		LOD (Limit of Detection)
Electromagnetic Noise At 10kHz*		LOD (Limit of Detection)
Microphonics*		LOD (Limit of Detection)
Voltage Breakdown		Must withstand at DC 500V/15sec.
Insulation Resistance		10^5 MΩ・m Min. at DC 500V, 20°C
Flex Life*		15,000 cycles
Tensile Strength (26°C,65%RH)		540N
Emigration		Non-Emigrant to ABS resin
Applicable Temperature		-20°C～+60°C (-4°F～+140°F)

*Using standard testing methods of Mogami Wire & Cable Corp.

HI-FI AUDIO CABLES

MOGAMI

Hi-Fi Interconnection Cables

Part No.2803 / 2497

2803

2497

2803 has been evaluated as the world's highest resolution and rich detailed cable in the world market. Because of pursuit of reducing the effect of the cable to improve resolution to the utmost limit, it may not suit all systems depending on the situation. This cable works well when a vivid original sound image, without any colouration to the signal, is wanted. Since the only degradation of a 2803 cable will be caused by the RCA phono plug used this must be carefully selected.
The key point of the plug lies in its size to keep metal parts, other than cable itself, as short and small as possible.

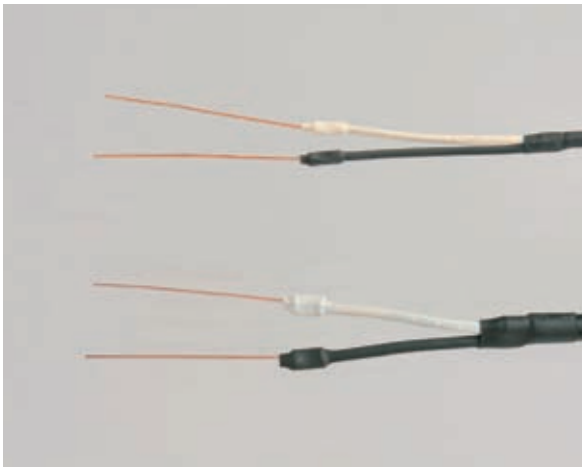
2497 has been available for a long time before 2803 was developed. Its larger cable structure makes it easier to use than 2804 and so is preferred in some applications.

ELECTRICAL CHARACTERISTIC data are just for reference.

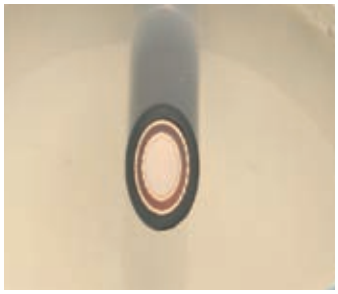
Part No.	DC Resistance	Capacitance	Characteristic Impedance	O.D.
2803	160 mOhm/m	108 pF/m	50 Ohm	3.6mm (0.142")
2497	55 mOhm/m	67 pF/m	75 Ohm	8.0mm (0.315")

Preassembled cables are also available from us in Japan. In case of 2803, an exclusive moulded RCA plug is used, and in case of 2497, Mogami Part No. 7553 RCA plug is used. Ordering information for 1 meter is 2803PP-10, 2 meter becomes 2803PP-20 and so on.

Hi-Fi Speaker Cables



2804



2477

Part No.2804 / 2477

Despite a very small overall diameter 2804 delivers marvellous resolution and rich detail. It's main application is for making short speaker cables when a power amplifier is placed close to a speaker, in separate pre/power amplifier configurations.

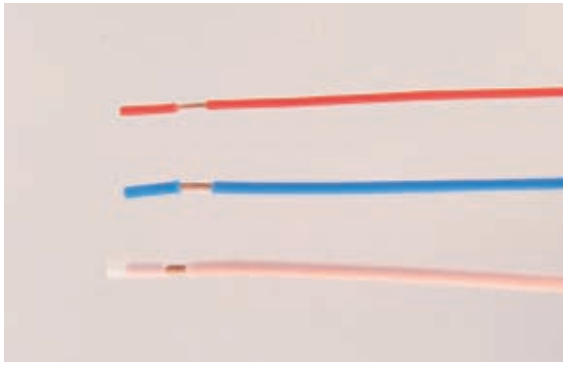
2477 has been available for a long time before 2804 was developed. Its larger cable structure makes it easier to use than 2804 and so is preferred in some applications.

ELECTRICAL CHARACTERISTIC data are just for reference.

Part No.	DC Resistance	Capacitance	Characteristic Impedance	O.D.
2804	94 mOhm/m	590 pF/m	15 Ohm	3.6mm (0.142")
2477	15 mOhm/m	550 pF/m	16 Ohm	8.0mm (0.315")

Preassembled cables are also available from us in Japan. Connector pin (5cm/1.97" long 1mm/0.039" O.D. wire) for speaker terminal is connected at the both ends of cable. Ordering information for 1 meter is 2804SS-10, 2 meter becomes 2804SS-20 and so on.

Hi-Fi Hook-Up Wire



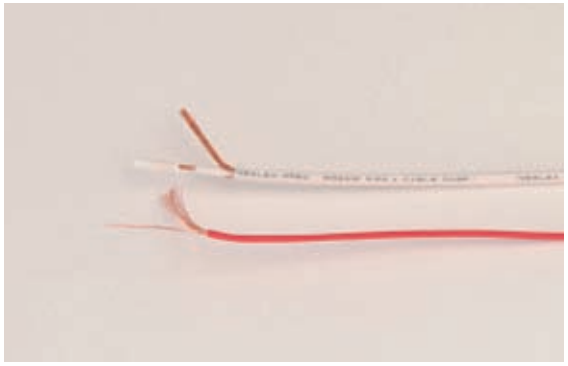
Part No.2514/2515/2516

Internal wiring lead wires for Hi-Fi devices. Those hook-up wires are made of fine conductor and insulation materials for those applications. Black, Red, Orange, Yellow, Green, Blue and Clear are available.

ELECTRICAL CHARACTERISTIC data are just for reference.

Part No.	Conductor	Ov. Dia.	DC Resistance	Roll Size
2514	19/0.18 0.483mm^2 (#21AWG)	1.7mm (0.067")	36 mΩ/m (11mΩ/Ft)	100m
2515	30/0.18 0.763mm^2 (#19AWG)	2.0mm (0.079")	23 mΩ/m (7mΩ/Ft)	100m
2516	52/0.18 1.323mm^2 (#16AWG)	3.3mm (0.130")	13 mΩ/m (4mΩ/Ft)	100m

Hi-Fi Sub-Miniature Coaxial Cables



Part No.2526/2520

Very fine coaxial cable that can be used in place of lead wire for a record player cartridge. Red and White are available for stereo.

ELECTRICAL CHARACTERISTIC data are just for reference.

Part No.	Ov. Dia.	DC Resistance	Capacitance	Roll Size
2526	1.2mm (0.047")	630 mΩ/m (192 mΩ/Ft)	150 pF/m (46 pF/Ft)	100m
2520	2.3mm (0.091")	290 mΩ/m (88 mΩ/Ft)	100 pF/m (31 pF/Ft)	50m

Hi-Fi Cable NEGLEX 2803 & 2804 - Historical Review

Part No. 2803 and 2804 are difficult to manufacture and have a very low yield rate. So we can make relatively small amounts of them. These present the paradox that if they became very popular it would take too many factory resources which could be used more profitably in making other products. Frankly most companies would discontinue them as too much trouble for the revenue they generate.

How they came about and why we have continued production for so many years is an interesting story. The reader must remember that for many years it was assumed that audio cable did not affect the sound of audio systems. This is taken for granted by most people today.

Then, back in April 1974 Mr. Akihiko Kaneda of Akita University presented in the technical magazine for amateur "MUSEN TO JIKKEN" (Wireless & Experimentation) that the sound quality of an amplifier could be changed even by wire or cable. Further, sonic effect was assumed to be caused by skin effect, and also made worse by the common tin plate over copper structure.

At the same time, audio critic Mr. Sabro Egawa presented his experimental results in a music magazine "Record Geijyutsu" (Record Art) in its December, 1975 issue that the sound quality is different between speaker cables, and he pointed out the possibility of its relation to skin effect as well.

These two statements that I called "Kaneda-Egawa prospect" were in error in the following points:

> It is against common sense of electro-acoustical engineering (we knew electrical characteristic of a cable cannot change sound and skin effect at audio frequencies is extremely low, un-measurable in level.) Since it referred to the electrical property which caused difference in sound definitely as skin effect, it could become a verification and argument subject with non-ambiguous electrical engineering.

I started engineering calculation and experimentation, assuming at the beginning I could easily prove that skin effect could never affect sound quality. However, before long I was forced to realize that it was not so easy. In fact, I had to recognize the fact that sound is changed by cable, as a result of the very experiments by the discoverers in front of me, so that I was compelled to research it seriously.

Skin effect is a part of eddy current nature, and although it is not possible to measure it at audio frequency range, it can be calculated electromagnetically and the calculated result can be verified by several methods. Therefore I did listening tests myself and asked many people for double blind tests, making many cable models that had different eddy current loss. These listening tests made me sure that skin effect has a rather large role in the sound differences.

Given this result, the next question became if we human-beings could detect such minute differences that they could not be measured by electrical measurement. On the other hand, we can identify the same sound source even though it is quite different in electrical characteristics. Therefore, it became understood that our brain percepts sound by a different mechanism from electrical measurement.

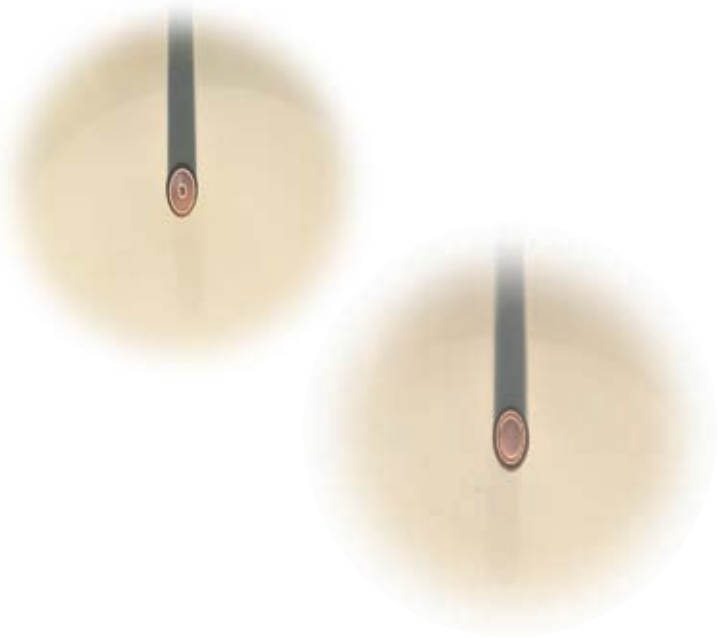
What became apparent after many experiments was that "Frequency Derivative of the transfer function" (system function - magnitude and phase response) of an audio system was deeply related to this issue. If so, humans are very sensitive to the difference between close frequencies and not good at comparison between greatly separated frequencies. These are quite different characteristics from electrical measurement.

The reason for this difference seems to relate to the fact that the transmission system from ear to brain is two-dimensional, and operation is done at orthotomic surface; further, total brain operation is processed three-dimensionally. However, an electrical measuring system is a one-dimensional operation, so that it becomes hard to make frequency derivative operation of the transfer characteristic. (In an optical computing system using lens and mirror with laser light, this kind of operation can be easily realized).

Two products which resulted from huge amount of theoretical study, computation, measurement and experimental research by double blind test are the 2803 interconnect and 2804 speaker cable. These have been judged by countless listeners to have extremely high sound quality.

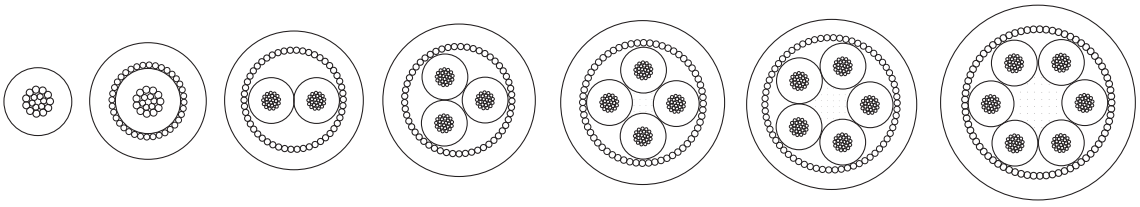
Because of difficult to manufacture cable design and resulting very low yield rate, these are not "practical" products, so that we are always urged by our accountants to discontinue them. However, we think we are going to continue with the challenge of making them. We hope critical listeners continue to enjoy them.

Incidentally, to this day most audio makers and electrical cable designers deny skin effect. Sadly there are many gimmicky goods on the market, with marketing suggesting countless "voodoo" factors that simply cannot be understandable by science and engineering, for example purity of conductor material. Of course, there are some upright and serious makers like Panasonic that are indifferent to those gimmicks. We salute the latter, while recalling the often cited advice to "let the buyer beware."



ULTRAFLEXIBLE MINIATURE CABLES

ULTRAFLEXIBLE MINIATURE CABLES



2912 2943 2784 2754 2739 2780 2880

Most of these miniature cables were originally developed one by one as custom cable for a magnetic head lead which must be swiftly moved to speficified position precisely by small energy such as a floppy disk drive. And then, some of them remained as continued items close to standard stock products, finding out unfixed varied demand in long period of time. For such application, these cables are indispensable, even thanked.

☐LEAD WIRE

Part No.	Conductor Size	Ov. Dia.	Available Color
2680-0X	#33AWG (0.0314mm²)	0.6mm (0.0236")	Standard 10 Colors
2912-0X	#28AWG (0.0854mm²)	0.85mm (0.0335")	

☐SHIELDED CABLES

Nos. of Conductor	#33 AWG SERIES		#32 AWG SERIES		#28 AWG SERIES	
	Part No.	Ov. Dia.	Part No.	Ov. Dia.	Part No.	Ov. Dia.
1	——	——	2444-0X	1.0mm (0.0394")	2943-00	1.5mm (0.0591")
2	2784-0X	1.8mm (0.0709")	2490-08	1.7mm (0.0669")	2794-00	2.3mm (0.0906")
3	2754-08	1.95mm (0.0768")	2879-08	1.8mm (0.0709")	2790-00	2.45mm (0.0965")
4	2739-0X	2.1mm (0.0827")	2769-0X	2.0mm (0.0787")	2929-00	2.7mm (0.106")
5	2780-00	2.2mm (0.0866")	——	——	——	——
6	2880-00	2.5mm (0.0984")	——	——	——	——
Flexibility / Flex Life	1		3		2	
Easiness of cable end treatment	3		2		1	
Low cost	2		1		3	

ESTIMATION : 1 : TOP 2 : MEDIUM 3 : LOW

CAUTION : Extremely weak against Tensile Strength.

Because of drastic changes in UL standards effective from May, 2008, two versions of each cable are now available; either the new UL rated version or non-approved original specification version.
This is because the UL standard now requires a physical strength test on both the insulation and jacket materials, in addition to a fire protection property test. This physical strength test was not previously required for low voltage application cables. To pass the test the insulation and or jacket materials must be revised to more physically durable types in most cases. Since the diameter of the stronger materials is larger, they are slightly less flexible than the originals. Please carefully review the following comparison table between the original and new UL approved designs for the best match in your application.

Mogami Part No. Assignment for new UL version Ultraflexible Miniature Cable Series

Part No.	Part No. W/UL Approval	Approved UL Style No.	Structure	Revised Part	Past	New
2680	3308	1571	#33AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.6mm	0.7mm
2912	3309	1571	#28AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	No change	
2444	3324	1682	1×#32AWG	Insulation Material.	No change	
				Insulation O.D.	0.55mm	0.7mm
				Jacket O.D.	1,0mm	1.5mm
2490	3314	2725	2×#32AWG	Insulation Material.	No change	
				Insulation O.D.	0.53mm	0.75mm
				Jacket O.D.	1.7mm	2.3mm
2879	3315	2725	3×#32AWG	Insulation Material.	No change	
				Insulation O.D.	0.53mm	0.75mm
				Jacket O.D.	1.8mm	2.45mm
2769	3316	2725	4×#32AWG	Insulation Material.	No change	
				Insulation O.D.	0.53mm	0.75mm
				Jacket O.D.	2.0mm	2.6mm
2943	3325	1571	1×#28AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.85mm	0.85mm
				Jacket O.D.	1.5mm	1.63mm
2794	3311	2725	2×#28AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.83mm	0.90mm
				Jacket O.D.	2.3mm	2.6mm
2790	3312	2725	3×#28AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.83mm	0.90mm
				Jacket O.D.	2.45mm	2.7mm
2929	3313	2725	4×#28AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.83mm	0.85mm
				Jacket O.D.	2.7mm	2.8mm
2784	3317	2725	2×#33AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.6mm	0.75mm
				Jacket O.D.	1.8mm	2.3mm
2754	3318	2725	3×#33AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.6mm	0.75mm
				Jacket O.D.	1.95mm	2.4mm
2739	3319	2725	4×#33AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.6mm	0.7mm
				Jacket O.D.	2.1mm	2.5mm
2780	3320	2725	5×#33AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.6mm	0.7mm
				Jacket O.D.	2.2mm	2.7mm
2880	3321	2725	6×#33AWG	Insulation Material.	FB201	M163A
				Insulation O.D.	0.6mm	0.7mm
				Jacket O.D.	2.5mm	2.9mm

SPECIFICATIONS

☐ LEAD WIRE

SPECIFICATIONS

Part No.	Conductor		Insulation		Weight
	Details	Size (mm^2)	Ov. Dia.(mm)	Material	
2680	25／0.04A	0.0314mm^2 (#33AWG)	0.60ϕ(0.0236")	Flexible PVC	0.52kg
2912	17／0.08A	0.0854mm^2 (#28AWG)	0.85ϕ(0.0335")	Flexible PVC	1.03kg

Common Specification	Roll Size	Color	Details of Colors
	2,000 Ft spool	10 colours	Black/Brown/Red/Orange/Yellow/ Green/Blue/Violet/Gray/White

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C	Tensile Strength	Flex Life (cycles)
2680	0.6Ω／m (0.183Ω／Ft)	8 N	36,000
2912	0.22Ω／m (0.0672Ω／Ft)	16 N	11,800

COMMON CHARACTERISTICS

Voltage Breakdown	Spark Test at 500V
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176°F)

☐ SHIELDED WIRE #32AWG SERIES

SPECIFICATIONS

Common Construction	Conductor		Insulation	
	Details	Size (mm^2)	Ov. Dia.(mm)	Material
	7/0.08TA	0.0351mm^2 (#32AWG)	0.53ϕ(0.0209")	Flexible PVC

Part No	Nos. of Conductor	Shield Served Shield	Jacket		Colors	Roll Size	Weight
			Ov. Dia.(mm)	Material			
2444	1	Approx. 23/0.08A	1.0ϕ(0.0394")	Flexible PVC	Black/Gray	305m (1,000Ft)	0.75 kg
2490	2	Approx. 30/0.10A	1.7ϕ(0.0669")		Gray		1.55 kg
2879	3	Approx. 35/0.10A	1.8ϕ(0.0709")		Gray		1.83 kg
2769	4	Approx. 40/0.10A	2.0ϕ(0.0787")		Black/Gray		2.28 kg

Exception Ov. Dia. of conductor insulation of Part No.2444 is 0.55ϕ(0.0217").Also, stranded conductor of 0.08mm dia. bare copper, not tin plated.

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C		Flex Life (cycles)
	Inner Conductor	Shield Conductor	
2444	0.53Ω/m(0.162Ω/Ft)	0.16Ω/m (0.0488Ω/Ft)	13,000
2490	0.55Ω/m (0.168Ω/Ft)	0.08Ω/m (0.0244Ω/Ft)	9,100
2879		0.07Ω/m (0.0214Ω/Ft)	22,000
2769		0.06Ω/m (0.0183Ω/Ft)	20,000

COMMON CHARACTERISTICS

Voltage Breakdown	Must Withstand at DC 250V/15sec.
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Tensile Strength (26°C, 65%RH)	9.8 N (Per One Core Conductor)
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176°F)

□ #28AWG SERIES

SPECIFICATIONS

Common Construction	Conductor		Insulation	
	Details	Size (mm^2)	Ov. Dia.(mm)	Material
	17/0.08A	0.0854mm^2 (#28AWG)	0.83ϕ(0.0327")	Flexible PVC

Part No	Nos. of Conductor	Filler	Shield Served Shield	Jacket Ov. Dia.(mm)	Jacket Material	Color	Roll Size	Weight
2943	1	-	Approx. 34/0.08A	1.5ϕ(0.0591")	Flexible PVC	Black	305m (1,000Ft)	1.37kg
2794	2	-	Approx. 57/0.08A	2.3ϕ(0.0906")		Black		2.55kg
2790	3	-	Approx. 70/0.08A	2.45ϕ(0.0965")		Black		3.25kg
2929	4	Polypropylene	Approx. 80/0.08A	2.7ϕ(0.1063")		Black		4.0kg

Exception: Ov. Dia. of conductor insulation of Part No.2943 is 0.85ϕ (0.0355") .

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C		Flex Life (cycles)
	Inner Conductor	Shield Conductor	
2943	0.22 Ω／m (0.0671Ω／Ft)	0.11Ω／m (0.0336Ω／Ft)	36,000
2794		0.07 Ω／m (0.0214Ω／Ft)	16,000
2790		0.054Ω／m (0.0165Ω／Ft)	28,000
2929		0.047Ω／m (0.0143Ω／Ft)	21,000

COMMON CHARACTERISTICS

Voltage Breakdown	Must Withstand at DC 250V/15sec.
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Tensile Strength (26°C, 65%RH)	21 N (per one core conductor)
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176°F)

□ #33AWG SERIES

SPECIFICATIONS

Common Construction	Conductor		Insulation	
	Details	Size (mm^2)	Ov. Dia.(mm)	Material
	25/0.04A	0.0314mm^2 (#33AWG)	0.60ϕ(0.0236")	Flexible PVC

Part No	Nos. of Conductor	Filler	Shield Served Shield	Jacket Ov. Dia.(mm)	Jacket Material	Color	Roll Size	Weight
2784	2	-	Approx. 38/0.08A	1.8ϕ(0.0709")	Flexible PVC	Black/Gray	305m (1,000Ft)	1.56kg
2754	3	-	Approx. 54/0.08A	1.95ϕ(0.0768")		Gray		2.05kg
2739	4	Polypropylene	Approx. 59/0.08A	2.1ϕ(0.0827")		Black/Gray		2.44kg
2780	5	Polypropylene	Approx. 70/0.08A	2.2ϕ(0.0866")		Black		2.85kg
2880	6	Polypropylene	Approx. 79/0.08A	2.5ϕ(0.0984")		Black		3.24kg

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C		Flex Life (cycles)
	Inner Conductor	Shield Conductor	
2784	0.6 Ω／m (0.183Ω／Ft)	0.1Ω／m (0.0305Ω／Ft)	20,000
2754		0.07 Ω／m (0.021Ω／Ft)	36,000
2739		0.06Ω／m (0.0184Ω／Ft)	57,000
2780		0.054 Ω／m (0.0165Ω／Ft)	35,000
2880		0.048 Ω／m (0.0146Ω／Ft)	50,000

COMMON CHARACTERISTICS

Voltage Breakdown	Must Withstand at DC 250V/15sec.
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Tensile Strength(26°C, 65%RH)	8.3 N (per one core conductor)
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176 °F)

□ STANDARD COLOUR COMBINATION OF SHIELDED CORES

Nos. of Cores	1	2	3	4	5	6
Core Color	White	White/Red	White/Red/ Black	White/Red/ Black/Yellow	White/Red/Black/ Yellow/Blue	White/Red/Black/ Yellow/Blue/Green

Exception	Part No. 2769	White/Yellow/Blue/Green

SPECIFICATIONS

☐ LEAD WIRE

SPECIFICATIONS

Part No.	Conductor		Insulation		Weight
	Details	Size (mm^2)	Ov. Dia.(mm)	Material	
3308	25/0.04A	0.0314 (#33AWG)	0.7φ(0.0276")	Flexible PVC	0.6kg
3309	17/0.08A	0.0854 (#28AWG)	0.85φ(0.0335")	Flexible PVC	1.05kg

Common Specification	Roll Size	Color	Available Colours
	2,000 Ft spool	10 colors	Black/Brown/Red/Orange/Yellow/ Green/Blue/Violet/Gray/White

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C	Tensile Strength	Flex Life (cycles)
3308	0.6Ω／m (0.183Ω／Ft)	8.4 N	21,000
3309	0.22Ω／m (0.0672Ω／Ft)	22 N	32,000

COMMON CHARACTERISTICS

Voltage Breakdown	Spark Test at 1,500V
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176°F)
Standard	UL758 STYLE 1571 80°C 30V VW-1

☐ SHIELDED WIRE #32AWG SERIES

SPECIFICATIONS

Common Construction	Conductor		Insulation	
	Details	Size (mm^2)	Ov. Dia.(mm)	Material
	7/0.08TA	0.0351 (#32AWG)	0.75φ(0.0295")	Flexible PVC

Part No	Nos. of Conductor	Shield Served Shield	Jacket		Color	Roll Size	Weight
			Ov. Dia.(mm)	Material			
3324	1	Approx. 28/0.08A	1.5φ(0.0591")	Flexible PVC	Black/Gray	305m (1,000Ft)	1.17 kg
3314	2	Approx. 42/0.10A	2.3φ(0.0906")		Gray		2.33 kg
3315	3	Approx. 50/0.10A	2.45φ(0.0965")		Gray		2.93 kg
3316	4	Approx. 52/0.10A	2.6φ(0.102")		Black/Gray		3.30 kg

Exception: Ov. Dia. of conductor insulation of Part No.3324 is 0.7φ(0.0276")

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C		Flex Life (cycles)
	Inner Conductor	Shield Conductor	
3324	0.53Ω/m(0.162Ω/Ft)	0.13Ω/m (0.0397Ω/Ft)	18,700
3314	0.55Ω/m (0.168Ω/Ft)	0.058Ω/m (0.0177Ω/Ft)	3,560
3315		0.050Ω/m (0.0153Ω/Ft)	18,600
3316		0.048Ω/m (0.0146Ω/Ft)	13,900

COMMON CHARACTERISTICS

Voltage Breakdown	Must Withstand at AC 500V/60sec.
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Tensile Strength (26°C, 65%RH)	10 N (Per One Core Conductor)
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176°F)
Standard	UL758 STYLE 2725 80°C 30V VW-1

Exception: UL approval of Part No.3324 is STYLE 1682 60°C 30V VW-1 32AWG.

☐ #28AWG SERIES

SPECIFICATIONS

Common Construction	Conductor		Insulation	
	Details	Size (mm²)	Ov. Dia.(mm)	Material
	17/0.08A	0.0854 (#28AWG)	0.9φ(0.0354")	Flexible PVC

Part No	Nos. of Conductor	Shield Served Shield	Jacket			Roll Size	Weight
			Ov. Dia.(mm)	Material			
3325	1	Approx. 35/0.08A	1.63φ(0.0642")	Flexible PVC	Black	305m (1,000Ft)	1.48kg
3311	2	Approx. 60/0.08A	2.6φ(0.102")				3.03kg
3312	3	Approx. 72/0.08A	2.70φ(0.106")				3.47kg
3313	4	Approx. 85/0.08A	2.8φ(0.110")				4.15kg

Exception: Ov. Dia. of conductor insulation of Part No.3325 and 3313 is 0.85φ(0.0335")

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C		Flex Life (cycles)
	Inner Conductor	Shield Conductor	
3325	0.22 Ω/m (0.0671Ω/Ft)	0.099Ω/m (0.0302Ω/Ft)	29,700
3311		0.059Ω/m (0.0180Ω/Ft)	15,200
3312		0.053Ω/m (0.0162Ω/Ft)	34,700
3313		0.045 Ω/m (0.0137Ω/Ft)	32,400

COMMON CHARACTERISTICS

Voltage Breakdown	Must Withstand at AC 500V/60sec.
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Tensile Strength (26°C, 65%RH)	21 N (per one core conductor)
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176°F)
Standard	UL758 STYLE 2725 80°C 30V VW-1

Exception: UL approval of Part No.3325 is STYLE 1571 80°C 30V VW-1 28AWG.

☐ #33AWG SERIES

SPECIFICATIONS

Common Construction	Conductor		Insulation	
	Details	Size (mm²)	Ov. Dia.(mm)	Material
	25/0.04A	0.0314 (#33AWG)	0.7φ(0.0276")	Flexible PVC

Part No	Nos. of Conductor	Shield Served Shield	Jacket		Color	Roll Size	Weight
			Ov. Dia.(mm)	Material			
3317	2	Approx. 42/0.08A	2.3φ(0.0906")	Flexible PVC	Black/Gray	305m (1,000Ft)	2.23kg
3318	3	Approx. 56/0.08A	2.4φ(0.0945")		Gray		2.31kg
3319	4	Approx. 62/0.08A	2.5φ(0.0984")		Black/Gray		2.91kg
3320	5	Approx. 80/0.08A	2.7φ(0.106")		Black		3.48kg
3321	6	Approx. 82/0.08A	2.9φ(0.114")		Black		3.70kg

Exception: Ov. Dia. of conductor insulation of Part No.3317 and 3318 is 0.75φ(0.0295")

ELECTRICAL & MECHANICAL CHARACTERISTICS

Part No.	DC Resistance at 20°C		Flex Life (cycles)
	Inner Conductor	Shield Conductor	
3317	0.6 Ω/m (0.183Ω/Ft)	0.085Ω/m (0.0259Ω/Ft)	16,900
3318		0.065Ω/m (0.0198Ω/Ft)	27,600
3319		0.063Ω/m (0.0192Ω/Ft)	32,200
3320		0.047Ω/m (0.0143Ω/Ft)	49,100
3321		0.046Ω/m (0.0140Ω/Ft)	54,000

COMMON CHARACTERISTICS

Voltage Breakdown	Must Withstand at AC 500V/60sec.
Insulation Resistance	10^3MΩ · m Min. at DC 250V, 20°C
Tensile Strength(26°C, 65%RH)	9.5 N (per one core conductor)
Emigration	Non-Emigrant to ABS resin
Applicable Temperature	-20°C～+80°C (-4°F～+176 °F)
Standard	UL758 STYLE 2725 80°C 30V VW-1 33AWG

☐ STANDARD COLOUR COMBINATION OF SHIELDED CORES

Nos. of Cores	1	2	3	4	5	6
Core Color	White	White/Red	White/Red/ Black	White/Red/ Black/Yellow	White/Red/Black/ Yellow/Blue	White/Red/Black/ Yellow/Blue/Green

Exception	Part No. 3316	White/Yellow/Blue/Green

APPENDIX

How to read catalog data

1.ELECTRICAL CHARACTERISTICS

With regard to electrical characteristic of a cable, necessary parameter changes at low frequency and high frequency.

Low Frequency (Length of cable is short compared to signal wavelength)

- Direct Current Resistance (heat loss of its conductor is determined)
- Capacitance (storable quantity of electrostatic energy is determined)
- Dielectric Power Factor (heat loss of dielectric is determined)
- Insulation Resistance (direct current resistance of insulation)
- Inductance (storable quantity of magnetic energy is determined)

High Frequency (Length of cable is long compared to signal wavelength)

- Characteristic Impendance (reflectance of electromagnetic wave is determined)
- Velocity Ratio (propagation velocity of electromagnetic wave is determined)
- Attenuation Constant (heat loss of electromagnetic wave inside cable is determined)

Difference (borderline) between low frequency and high frequency for a cable is determined **if reflection of transmitted electromagnetic wave matters or not**. If it does not matter it is low frequency, and if it does it is high frequency. This borderline lies in the cable length that is about 1/10 of transmitted electromagnetic wavelength. The reason why reflection of electromagnetic wave does not matter at low frequency lies in that affection by reflection is fainted (fade out) while signal does not change almost at all.

When it is looked at from cable side,

Cable Length / Transmitted Electromagnetic Wavelength << 1: Low Freuquency
Cable Length / Transmitted Electromagnetic Wavelength >> 1: High Freuquency

Never forget this, as it is not determined by extent of frequency. In case signal waveform is other than sine wave, it is compared with the highest frequency component (spectrum) wavelength.

Wavelength of electromagnetic wave is given by following equation.

$\lambda = Vp / f$
hereby, λ = wavelength of electromagnetic wave (m)
Vp = phase velocity of electromagnetic wave (m/s)
f = frequency of electromagnetic wave (Hz)

Phase velocity of high frequency is calculated by following equation.

$Vp = c * Vr$
hereby, c = light velocity in vacuum (299,792,458 m/s)
Vr = velocity ratio of cable ($0 < Vr <= 1$) = $1 / \sqrt{\varepsilon s}$
εs = (equivalent) relative permittivity of cable dielectric ($1 <= \varepsilon s$)

Relative permittivity of polyethylene is about 2.3, therefore velocity ratio of polyethylene insulated coaxial cable at high frequency is about 0.66. Velocity ratio at low frequency range becomes smaller than that at high frequency range.

Electrical characteristic at low frequency is called **primary parameters** in transmission line theory and that at high frequency is called **secondary parameters**.

As far as energy transmission is concerned, above characteristic factors are enough, however, there are cases that the following characteristic must be considered depending on applications.

- Microphonics -
  phenomenon that cable itself becomes a generator by mechanical vibration
- Shielding effectiveness -
  Countermeasure against electromagnetic coupling with other circuit

Microphonics is a noise caused by static electricity generated by mechanical vibration, etc., it becomes problem when a cable is used at high impedance circuit.

Shielding effectiveness involves all of different physical mechanism countermeasure against Conductive Coupling (Common Impedance Coupling), Electromagnetic Coupling (Mutual Inductance Couplig), Capacitive Coupling (Mutual Capacitance Coupling) and Electromagnetic Wave Coupling (Radiation Field Coupling), therefore special care is required. Namely, this word itself is obscure.

2.DIRECT CURRENT RESISTANCE

DC resistance of electrical cable is determined by **conductor structure** and used **temperature**, therefore it is indicated at **20 degree C** normally. (Note 1)

Electrical resistance of metal at around **normal temperature** can be roughly calculated by following equation.

$Rt = R0 * (1 + \alpha * (t - t0))$

hereby, Rt = resistance at temperature t (Ohm)
R0 = resistance at reference temperature t0 (Ohm)
t0 = reference temperature (˚C)
t = around normal temperature (˚C)
α = constant

Typical value of α are the followings.

α value for common metals

Copper	Tin	Gold	silver	Aluminum	Iron
$4.3e^{-3}$	$4.5e^{-3}$	$4.0e^{-3}$	$4.1e^{-3}$	$4.2e^{-3}$	$6.6e^{-3}$

In case of **alloy**, a very small amount of additional element afffects it largely. For example, in case of 0.3% of tin included **copper-tin alloy** is about $3.65e^{-3}$ / ˚C.

When temperature becomes low, electron scattering generated by atomic thermal motion is reduced which is called **phonon scattering**, resistance decreases proportionally to the fifth power of the absolute temperature, and at further lower temperature, electrical resistance generated by **collision between electrons** decreases proportionally to the square of the absolute temperature, following relation is know at wider temperature range which is called **Matthiessen's Law**.

$$Rt = Rmin + a * t^2 + b * t^5 + c * t$$

hereby, Rt = electrical resistance at temperature t(K) (Ohm)
Rmin = lowest electrical resistance determined by impurities (Ohm)
t = temperature (K)
a, b, c = constant fixed by characteristic of respective metal

However, at further lower temperature, there are some substances that becomes **super-conductive**, which is out of this application range.

By the way, since we call it **DC resistance**, resistance value changes with flown frequency.

AC resistance is determined by frequency and conductor structure involving its periphery (surroundings), it is always larger than DC resistance. Majority of its cause is conductor **skin effect**, and affection of **eddy current** generated in other conductors is added to it.

Since AC resistance is **proportional to the square root of frequency** when frequency becomes high, there is a distinctive feature that cannot be found in other parts that **attenuation** at high frequency also increases proportionally to the square root of frequency. This becomes the cause that makes it hard to compensate it by general circuit component. However, because of recent development of **LSI** that can be stuffed with plenty of parts, it became possible to compensate pretty well so that it has become possible to manage up to very high frequency and or long distance that had been regarded impossible to transmit signal by cable in the past.

Then, **up to how much of frequency DC resistance value can be used**, there is an expedient indicator called **skin depth**, if thickness of conductor (in case of column it becomes radius of it) is sufficiently small compared to 1.5 times as large as skin depth, DC resistance and AC resistance do not differ almost at all.

$$\delta = \sqrt{2 / (\omega * \mu * \sigma)}$$

hereby, δ = skin depth (m)
ω = angular frequency (rad/s)
$= 2 * \pi * f$
f = frequency (Hz)
π = 3.141592..
μ = magnetic permeability (H/m) .. in case of non-magnetic material $4e7 * \pi$
σ = conductivity (G/m) .. in case of annealed copper 5.80e7.. in case of hard copper 5.65e7

Note 1 - Temperature Correction

For example, in case of **JIS C 3005**, the following value is used, considering electron collisions.

$$R20 / Rt = 1 - (0.003945 - 1.55e^{-5} * (t - 20)) * (t - 20)$$

hereby, R20 = electric resistance at 20˚C (Ohm)
Rt = electric resistance at t ˚C (Ohm)
t = temperature (˚C)

However, it does not mean that **JIS C 3005** used this formula, but it was worked out (calculated) by myself out of the table listed there.

3.CAPACITANCE

1. Capacitance of multi-conductor system

As coaxial cable, if the case of a **two conductor system** separated electromagnetically from the external space, capacitance is simple matter. But capacitance of multi-conductor system is not so easy.
This reason is not only the structure of the cable, but circuit strcucture using cable affects **effective capacitance**.
Therefore, the specifcation of the cable must describe the cable-specific characteristics not related to how to use.

2. partial capacitance

The most suitable parameters for this purpose is the **partial capacitance** which is defined as follows in electrical engineering.
(Note 1)

$$Q1 = K10 * V1 + K12 * (V1-V2) + ... + K1n * (V1-Vn)$$
$$Q2 = K20 * V2 + K21*(V2-V1) + ... + K2n * (V2-Vn)$$
$$\cdots\cdots$$
$$Qn = Kn0 * Vn + Kn1 * (Vn-V1) + ... + Kn.n-1 * (Vn-Vn-1)$$

where, Qr = charge of the r-th conductor (C) (0 <= r <= n)
Vrs = potential difference between r-th conductor and s-th conductor (V)
(0-th condictor is the oveall shield)
Krs = partial capacitance between r-th conductor and s-th conductor (F) (0 <= r, s <= n)

If there is no oveall shield, the earth (ground) is the first conductor.

Krs is called **mutual capacitance** or **partial capacitance** between r-th conductor and s-th conductor. **Kr0** is called **self capacitance** or **earth capacitance**. These parameters are totally defind by the dielectric properties of the insulator and the geometrical positional relationship.
For example, in case of a shielded 2-donductor shown in Figure 1,

K10 = K20 is held by Green's reciprocity theorem.

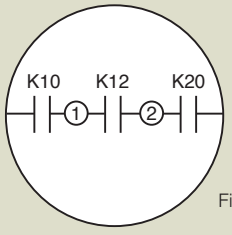


Fig. 1 : partial capacitance of shieded 2-conductor cable

3. partial capacitance measurement and calculation

The **partial capacitance** is obtained solving linear eqation made by combinations of partial capacitance measurement.
For example, We can make following procedure for Fig.1.

1. Measure the capacitance C1 between first conductor and overall shield connected with second conductor to overall shield.
2. Measure the capacitance C2 between second conductor and overall shield connected with first conductor to overall shield.
3. Measure the capacitance C12 between connected first and second conductor and overall shield.

Calculates K10, K12, K20 by next relations.

K10 = (C1 - C2 + C12) / 2
K12 = (C1 + C2 - C12) / 2
K20 = (C2 - C1 + C12) / 2

For general multi-conductor case, see Note 1.

4. effctive capacitance in actual use

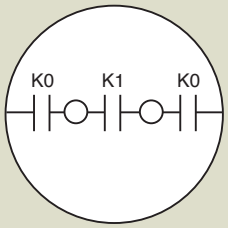


Fig. 2 : partial capacitance of shielded 2-conductor cable

Once the **partial capacitances** are known, **effective capacitance** can be calculated easily by simple parallel/series capacirance circuit. And this is the work of cable users. For example, in case of shielded 2-donductor cable such as a microphone cable, it becomes follows due to the symmetry.

K0 = K10 = K20
K1 = K12
We can get

differential mode capacitance = K1 + K0 / 2
common mode capacitance = K0 ∗ 2 (capacitance between connected 2-condictor and shield)
capacitance between one conductor connected with anothe conductor and shield = K0 + K1

5. Frequency and temperature dependency of capacitance

The capacitance value defined in specification is the value of **20 C 1kHz**. For cable using material having good high-frequency characteristics in **non-polar molecule**, such as polyethylene, these values do not vary with freauency and temperature. But for the cable using PVC compound and other **polar molecule** material, capacitance is largely varied with freauency and temperature.

6. Note

6.1. Note 1 - coefficient of potential and partial capacitance

On electro-magnetic thory, relation between the potential and the charge of multi-conductor system is defined by **coefficient of potential** or **coefficient of capacity**. Using **coefficient of capacity**,

```
Q1 = C11*V1 + C21*V2 + .... + Cn1*Vn
Q2 = C12*V1 + C22*V2 + .... + Cn2*Vn
.....
Qn = C1n*V1 + C2n*V2 + .... + Cnn*Vn
```

Compared with the **partial capacitance** definition, we get following relation.

```
Ki0 = Ci1 + Ci2 + Ci3 + .... + Cin
Kij = -Cij  (i != k, k != 0)
```

To interpret **coefficient of capacity** as a **circuit element** is difficult, but the measurement is easy. For example, we can use the following procedure.

1. measure Cii between i-th conductor and overall shield connected with all other conductors.
2. measure Cjj between j-th conductor and overall shield connected with all other conductors.
3. measure Ci+j between connected i-th and j-th conductor between overall shield connected with all othe onductors.
4. culculate Cij with followinf relation.

```
Cij = (Ci + Cj - Ci+j) / 2
```

That is, Cii, Cjj is **directily measureable**, Cij also obtained by simple calcultion, Kij is obtained by changing the sign of the Cij.
As nCr is the number of combinations to choose r from n, the number of measurements is

```
nC1 + nC2 = n + n!/2/(n-2)!
```

It takes lot of work if number of conductors is incresed. But in many cases, number of measurement reduces by symmetry.
Measurement of capacitance coefficient from can be performed with a minimum step in an organized manner, at first measure the capacitance coefficient, then calculate partial capacitance is the good measurement practice.

4.INDUCTANCE

The inductance of electric cable is not usually specified in the data sheets or catalog. The reason lies in that inductance is not a problem in ordinary electric circuits. (Note 1) But there are still rare cases that need its value. We have prepared the following explanation on how to estimate this value from catalog data.

1. Meaning of inductance

Inductance of the circuit determines the magnetic energy stored in the circuit.

$$Wl = L * I^2 / 2 \qquad (1)$$

where Wl = the magnetic energy stored in the circuit (J)
L = the inductance of the circuit (H)
I = the current flowing through the inductance (A)

Please note that the magnetic energy does not exist if there is no current. This reason becomes clear when we study the special theory of relativity.
In the case of electric cable, we can understand it clearly by separating total inductance to two partial inductances in the following way. One is due to the electromagnetic energy existing in inside conductor, the other is due to the external space of the conductor.

$$L = Li + Le$$

where L = the total inductance of wire (H)
Li = the internal inductance of wire (H)
Le = the external inductance of wire (H)

In case of DC (direct current), uniform current flows through the entire cross section of the conductor. But when the frequency of the current becomes higher, current is concentrated in the conductor surface by the Skin Effect. As a result, internal inductance decreases, and the total inductance of a cable converges to the external inductance of the cable.
In other words, separation of external and internal inductance is due to the Skin Effect phenomenon.
In addition, it must be noted that the inductance is defined for closed circuit loop.
(Note 2)

2. Estimate of the inductance value of a cable

Thus, we know inductance has frequency dependency, and the maximum value is the DC (Direct Current) inductance. And total inductance decreases with increased frequency approaching to Le. Normally, inductance of the electric cable becomes almost Le at about 10 MHz or higher frequency. There is no significant difference of Le (external inductance) in the value of the DC inductance and HF(high Frequency) inductance. Therefore, we can make a rough estimate of the inductance value from the value at DC current (largest value) and high frequency (smallest value).

2.1. Inductance at high frequency

For normal electric cable, the following relationship is established at frequency of 10 MHz or more.

$$Z0 \sim \sqrt{L / C} \quad (2)$$

$$v \sim 1 / \sqrt{L * C} \quad (3)$$

$$Vr = v / c \sim 1 / \sqrt{\varepsilon s} \quad (4)$$

where Z0 = characteristic impedance of the cable (Ohm)

v = phase velocity of electromagnetic wave traveling through the cable (m/s)

Vr = velocity ratio of the cable (0 < Vr <= 1)

c = phase velocity of the electromagnetic wave in vacuum (2.99792458e8 m/s-defined value, not measured value)

εs = relative dielectric constant of the cable insulation (1 <= εs)

ZO and Vr are important properties as high frequency characteristics for a cable, as an electric cable can not be used at high-frequency if ZO or Vr is not a constant value, therefore these two properties are always specified in catalogs or data sheets. Any cable that can be used at high frequency must have a constant ZO and Vr regardless frequency range. (Note 3)

Following relations are obtained by (2), (3) and (4) at high frequency.

$$L = Z0 / (c * Vr) \quad (5)$$

$$C = 1 / (c * Vr * Z0) \quad (6)$$

2.2. Inductance at direct current

The internal inductance of electric cable is varies by frequency. Maximum internal inductance is obtained at direct current. For a non-magnetic cylindrical conductor, this maximum value is as follows.

$$Li = 0.05e\text{-}6 \ (H/m) \quad (7)$$

For a two parallel wire cable, we can estimate the DC inductance value by adding (5) and two times (7).

An analytical solution can be obtained easily in case of cylindrical conductor. But in other shapes, this is quite a cumbersome procedure. If interested, you can look at the following text.

Frederick W. Grover,- Inductance Calculations (Dover Publications, Inc) ISDN 0-486-49577-9

It is a classic, but it is still available today.

In our time, it is practical to use a numerical method such as finite element method. The following book is recommended.

P.Silvester,- Modern Electromagnetic Fields (Prentice-Hall, Inc.)

The author is famous for application of finite element method to electric engineering. It is a marvellous book in a way of clear and concise.

3. Note

3.1. Note 1 - The reason why inductance does not matter so much

Energy stored in the capacitance of the circuit is as follows.

$$Wc = C * V^2 / 2$$

where Wc = the electrostatic energy stored in the circuit (J) (8)

C = the capacitance of the circuit (F)

V = voltage across the capacitor (V)

Combining (8) and (1), we get,

$$Wl / Wc = (I / (Z0 * V))^2 \quad (9)$$

For most electric circuits, the large current is avoided to reduce heat loss (Joule heat). Therefore, the following relationship is established,

$I << (Z0 * V)$, ie, $Wl << Wc$

this tends to reduce the effect of inductance compared to capacitance. In the case of large current flows such as an electric heater, the electrical resistance is greater than the inductance, therefore the effect of the inductance is small as well.

In addition, following relation obtained from same (1) and (8) contains a problem worthy of consideration.

$$Wc * Wl = (V * I / (2 * Vr * c)) ^ 2 \quad (10)$$

3.2. Note 2 - Definition of inductance

It is important to note that the inductance is defined only for a closed circuit loop. In other words, the inductance of lead wire (open loop) is meaningless. There are many misunderstandings on this point, we can see even in IEEE standard.

The inductance of electric cable is specified by inductance per unit length (H/m). This is the value with both ends shorted and a long enough cable to neglect the end effect of both ends

And inductance or capacitance of electric cable is defined only for normal mode. Capacitance and inductance of the common mode can not be predicted at the time of shipment of the cable. These parameters depend on the wiring method in the field, which often generates noise problems.

3.3. Note 3 - The reason why characteristic impedance and velocity ratio are important

If the characteristic impedance of the transmission line is not uniform, energy loss by electromagnetic wave reflection and distortion of the transmission waveform are generated, therefore it is necessary to know the characteristic impedance value and also velocity ratio to know the propagation time of a signal.

Also, if the propergation speed of electromagnetic waves is changed with frequency, it causes distortion of the transmission waveform, so it must be constant as well.

On the other hand, Li << Le is formed at high frequency, it can be almost regarded as L = Le on the whole. However, inductance itself only plays a role, together with capacitance, to delay electromagnetic wave propagation and it does not change the wave form. Therefore, non-ferquency-characteristic Le (at non-magnetic material) has no relation to the distortion of the transmission waveform, and an imperceptible change of Li by frequency change, in other words, caused eddy current such as skin effect, cause a large distortion of the transmission waveform.

SCREEN (SHIELD) MECHANISM FOR WIRE AND CABLE

In case of signal transmission among various cable applications, it is important to prevent from getting mixed with noise and to reduce affection to external environment in addition to fast transmission to the atmost without distortion nor large attenuation, so that various kinds of noise countermeasure technics have been developed from old time.
Basical **screen**(**shield**)**technique** is tried to be explained hereafter. Please note that there is **reversibility** between screen(shield) that protects from noise come from out side and EMI (Electromagnetic Interference) that interferes outside from noise source cable. Therefore, shield technique and interfering control technique become exactly same. In other words, it is same to think about either way. (Note: 1)

1. Mechanism of being mixed with noise

The most important point when think about screen (shield) and or countermeasure against noise is to grasp the noise mixing mechanism exactly (accurately) which is comprised of **different mechanism**. This different mechanism are following based on electric circuit technique.

Coupling Type	Circuit Element	Noise Source	Coping Method
Conductive Coupling	Common Impedance Coupling	Eurrent or Voltage Source	Circuit Isolation
Capacitive Coupling	Mutual Capacitance Coupling	Voltage Source	Electrostatic Shield
Inductive Coupling	Mutual Inductactance Coupling	Current Source	Cancelling
Electromagnetic Wave	Radiation Field Coupling	Electricmagnetic Wave	Electromagnetic Shield

All of these property are **undescribed part in electric circuit** and they must be paid carful attention that they are all different physical mechanism so that countermeasure method has to become quite different.

2. Conductive Coupling - Common Impedance Coupling

When multiple circuits such as earth wire, earth plate and or printed circuit board etc., share a same circuit element, noise is generated by flown electric current from other circuits. In case of direct current or low frequency, it is easy to lower the value of common impedance coupling by increasing earth conductor size. However, in case of high frequency, it becomes not negligible because common impedance caused by inductance element increases proportionally to frequency.
Therefore, basical countermeasure becomes **isolation of circuits** so that earth wire is separated with each circuit and made into **single point ground** so that GND potentialis fixed. This method becomes principle.
Interesting point that happens with cable peculiarly among conductive coupling is the case that external conductor of a coaxial cable becomes common impedance.

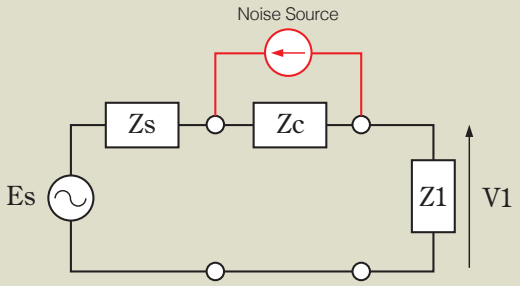


Fig. 1: Common Impedance Coupling

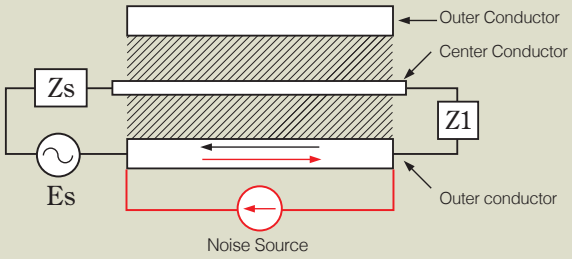


Fig. 2: Transfer Impedance of a Coaxial Cable (Cross Section of a Coaxial Cable)

It is common case that electric current flows into external conductor of coaxial cable from other circuit as shown in figure 2. External conductor of coaxial cable is usually grounded so that it is difficult to get rid of loop combined with other earth line, and even though this external conductor is not included in a loop, if there is electromagnetic wave in its surrounding, external conductor works (performs) as an antenna so that electric current flows by electromotive force caused by received electromagnetic wave. Please remember that long cable becomes a good antenna.

However, as the frequency of transmitted signal and noise increases, majority of transmitted signal flows inside of external conductor and noise current flows outside of external conductor by **skin effect** so that this common impedance circuit is **automatically separated**.

The following formula is useful to know how deep high frequency current flows in the surface of conductor, which is called as **skin depth**.

δ = sqrt(2 / (ω * μ * σ))

hereby,

δ = skin depth (m) ..

In case of electrolytic cathode copper, it is $8.46e^{-2}$/sqrt(f)

ω = angular frequency (rad/s) = 2 * π * f

f = frequency (Hz)

π = 3.14519265..

μ = magnetic permeability of conductor (H/m) ..

In case of nonferrous metal, it is $4e^{-7}*\pi$

σ = conductivity (G/m) ..

In case of electrolytic cathode copper, it is 5.8e7

Surprisingly, resistance value of 1.6* δ thickness cylindrical conductor and same overall diameter of columnar conductor does not differ more than several percentage. For example, δ of electrolytic cathode copper at 100 MHz is 8.5 μm, so how this circuit isolation mechanism is efficient.

Of course, as flown frequency becomes low, branched current from noise into transmission line increases, it is necessary to know its frequency characteristic of this mechanism and this indicator so called **Transfer Impedance** is used for this purpose which is defined as follows:

Zt = Vt / I

hereby, Zt = transfer impedance (Ohm)

Vt = generated voltage on the surface of external conductor per unit length (V/m)

I = current that flows internal conductor (A)

This is considering that how much signal current affects to other circuits so that thinking it upside down. However, it does not matter because there is reversibility between them, and it makes us not necessary to care for other circuits by this way of definition.
In case external conductor structure is cylindrical, current distribution can be shown(expressed) by Bessel function so that Zt can be obtained analytically. And, in case thickness of external conductor is small enough compared to its internal (inside) diameter,
it becomes as follows:

$Zt / Rdc \sim p * t / \sinh(p * t)$
hereby,
t = thickness of external conductor (m)
Rdc = DC resistance of external conductor (Ohm)
$p = (1 + j) / \delta$
$j = \sqrt{-1}$
δ = skin depth (m) ..
In case of electrolytic cathode copper, it is $8.46e^{-2}/\sqrt{f}$

If frequency is zero, Zt is equal to DC resistance naturally, and as it becomes high, this value decreases swiftly so that crosstalk with external circuit decreases.
In case of braided shield structure, since inside electromagnetic field leaks through openings between conductors, mutual capacitance and mutual inductance between internal conductor and the surface of external conductor are generated so that transfer impedance is added proportionally to frequency. Zt is increased proportionally to frequency from around several MHz normally.
As countermeasure against it, polyester-film-reinforced aluminum foil is inserted underneath the braided shield in geneal. It gives satisfactory result up to GHz bandwidth, although cable loses flexibility.
Another interesting method as a countermeasure against conductive coupling for a coaxial cable is to wind cable itself over a ferrite core so that self-inductance of the noise circuit including external conductor increases, which is called **Coaxial Choke**. In this case, inductance consists of external conductor and other conductor circuit can be increased without affecting electrical characteristic between internal conductor and external conductor circuit of the coaxial cable, therefore this method can reduce noise current only without affecting signal circuit. This is same idea as Common Mode Choke that is often used for countermeasure against common mode noise.

3. Capacitive Coupling - Mutual Capacitance Coupling

Capacitive coupling is caused by electrostatic induction by electric field generated by voltage generator that arises noise. As an electric circuit, current flows into signal circuit from other circuit through (via) **mutual capacitance** Cm. Cm is normally considerably small so that this impedance is large, therefore noise source becomes constant current source for load Zl side. Therefore, when the **impedance of the signal circuit is high** (large), it becomes problem.
There is an extremely effective method called **Electrostatic Shield** against capacitive coupling in addition to (other than) separating (setting apart) from high voltage generator and reducing impedance Zs of the signal circuit.

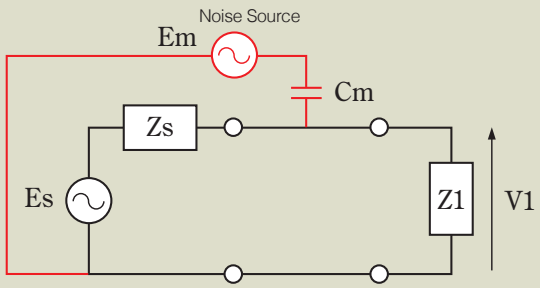


Fig. 3: Capcitive Counpling by mutual capacitance

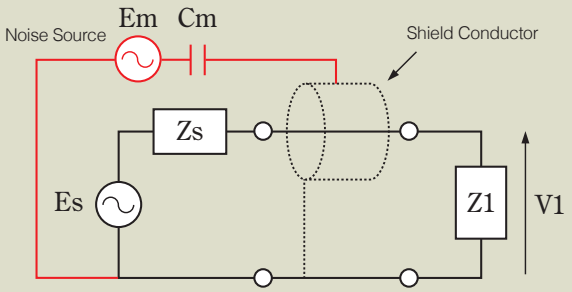


Fig. 4: Electrostatic Shield

This method is to bypass noise current by enclosing signal line with conductor so-called **electrostatic shield** and connecting to GND. Since impedance of this electrostatic shield conductor is extremely low compared to capacitance between signal conductor and electrostatic shield conductor, this baypass mechanism functions extremely effective in deed. Of course, if there is openings in this shield conductor, mutual capacitance between signal conductor and noise generator is arised so that noise current is increased at high frequency.

Braiding, serving (spiraling) and conductive tape are usual shield structure used for wire and cable. Conductive tape without any opening is the most cost effective structure, but it's weak point is inflexibility. Serving (spiraling) is to wind many annealed copper wires in a row (lay flat), so it becomes flexible and generated openings between neighbour conductor is much less than braiding structure, but it's weak point is uneasy production process and possibility of increased cross-talk at high frequency in case of one layer structure. Brading structure has good balance of flexibility and shielding effect so that this method has been used for varied cable structures from coaxial cable's external conductor up to overall shield for multicore cables from the old time. For counter-measure against openings between conductors of braiding structure at high frequency, double brading structure or combination of brading structure and polyester-film-reinforced aluminum foil are often used.

4. Inductive Coupling (Electromagnetic Coupling) - Mutual Inductactance Coupling

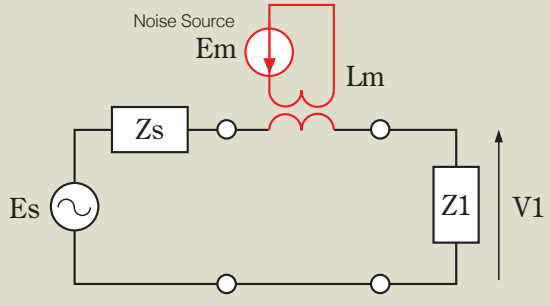


Fig. 5: Coupling by Mutual Inductance

Electromagnetic coupling is generated when magnetic flux generated by noise source electrical current interlinks with signal circuit where electromotive force is generated by magnetic flux so that this coupling is **mutual inductance** coupling in terms of a circuit. In this case, noise becomes constant voltage supply so that affection by noise becomes larger at **low impedance circuit** and even though **feed end side (transfer end side-sending end side) of a signal line is shorted, noise can be appeared** at load side. In other words,

- In case load side noise disappears when feed end side (transfer end side - sending end side) of a signal line is shorted, it is mutual capacitance coupling
- In case load side noise won't disappear when feed end side (transfer end side - sending end side) of a signal line is shorted, it is mutual inductance coupling

thus, we can isolate the cause by these judgement.

If magnetic flux generated by noise source electrical current does not interlink with signal circuit, it is not affected by it, so that we want to think about magnetic shielding, however, there is not any appropriate magnetic material. Therefore, the following two methods are used for counter-measure against inductive coupling by this reason.

1. Induction field cancellation by generated eddy current inside flat shield conductor
2. Mutual inductance cancellation (negation) by twisted structure or quad structure

The former method is the same structure as electrostatic shield in the point that the signal conductor is surrounded by conductor, but, what is done is quite different even though it looks similar because this mechanism is that generated eddy current flow inside shield conductor cancels (negates) magnetic field penetrating the shield. It is an excellent method in a point that it can be used for both as electrostatic shield and electromagnetic shield. However, it cannot be used at low frequency range where generated eddy current becomes low.

Strategy of the latter method is to utilize existence of plus and minus sign in mutual inductance unlike mutual capacitance, combining same magnitude with opposite sign mutual inductance to **deprive (eliminate) mutual inductance in a whole circuit**. It functions well at relatively low frequency range. However, when frequency rises up high, it does not function well because of increased affection by stray capacitance.

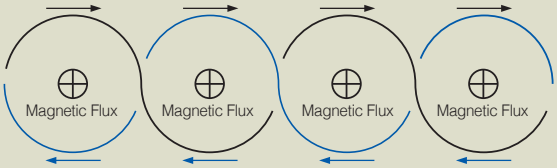


Fig. 6: Cancellation of Electromagnetic Coupling by twisted pair structure
(Arrow shows directon of electromotive force by noise)

The most often used method is twisted pair structure which is to twist two conductors of a round trip of transmission line at fixed pitch so that direction of electromotive force caused by interlinkage magnetic field is inverted at every pitch, so it can be canceled sequentially. As in terms of a circuit, mutual inductance becomes zero by inverting plus and minus of mutual inductance with noise source at every pitch when it is contour integrated. Otherwise interlinked magnetic field is same largeness between neighbour pitch, it does not function. However, interlinkage magnetic field between neighbour pitch can become very close to zero by making twisted pitch short and distance of two conductors very close. It costs rather high to twist at short pitch, on the other hand there are many advantages such as not sacrificing flexibility, so this technique is extensively used. Besides, though it is touched later on once again, in case a **twisted pair is used for balanced transmission line, capacitance coupling with outside induction**

voltage source becomes almost same strength so that capacitance coupling is also canceled at the same time as well as electromagnetic coupling, so effectiveness of two birds with one stone could be gained. The very reason why lan cable can be used without overall shield lies in this point.

There are some othe mthods to cancel electromagnetic coupling, star-quad configuration is often used for a microphone cable that is used at a close distance from a large current dimmer.

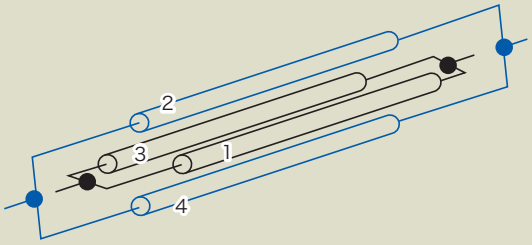


Fig. 7: Cancellation of electromagnetic coupling by star-quad connection

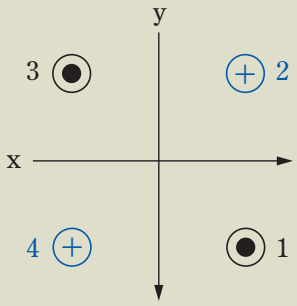


Fig. 8: Cross section of star-quad connection and direction of induced electromotive force

Idea of this method is to short opposite (diagonal) conductors of a four conductor cable to use it as one go and return conductor, considering X-direction of magnetic flux in Fig. 8 cross section, direction of induced electromotive force generated in conductor 1 and 2 loop and that in conductor 3 and 4 are reversed so that both induced electromotive forces are canceld respectively.

This canceling mechanism becomes the same with Y-direction, therefore, canceling is done in a small geometric scale as about twice as the insulation thickness so that it becomes considerablly advantageous against non-homogeneity (ununiformity) of induction field.

Twisted-pair-pitch is about 20 times of overall diameter of insulation even though it is twisted densely, fineness of cancelling mesh of a quad configuration exceeds roughly twenty times of star-quad structre so that it can be expected over 26 dB improvement.

This conductor structure and combination of conductors is same as **phantom circuit** of a cabled telephone line, however, in case of cabled telephone line (phantom circuit), diagonal pairs are used independently and they are also used for parallel connection as the third line. This technique secures three circuits by two twisted pair cables preventing from large cross-talk so that it contributes cost down. In case of quad structure of a microphone cable, it is quite different idea because its strategy is to reduce mutual inductance by peripheral circuits being aware of cost-up.

Furthermore superior structure with regard to canceling function is a **coaxial cable**. As long as linkage magnetic flux is symmetry about its centre conductor, reversed direction electromotive force is generated at both side of the outernal conductor of the coaxial cable so that essentially perfect induced electromotive force cancellation is taken place.

In case of a coaxial cable made of perfect conductor whose electrical resistivity is zero, electromagnetic field inside its cable does not leak outside of a cable, it can create an independent space from any other circuit in terms of electromagnetic field, therefore, it could be understood that there is no mutual inductance with any outside circuits, considering reversibility.

5. Electromagnetic Wave Coupling

Both of electric field caused by **capacitive coupling** and magnetic field caused by **electromagnetic (inductive) coupling** becomes weak **inversely proportional to square of distance** from the source, therefore affection becomes low sharply as it parts from the noise source. In other words, strategy to set a signal circuit apart from a noise source is very effective, so shielding and or canceling technique is utilized when it (separation) cannot be used.

On the other hand, **electromagnetic wave** does not attenuate inversely proportional to square of distance from the source different from sole electric field or megnetic field, but it **attenuates inversely proportional to distance** from the source so that it affects to the distance up to extremely far away. This nature is utilized for radio communication such as broadcasting.

This situation can be understood quite well by observing a generated electromagnetic field inside **small loop** or **infinitesimal dipole** whose circuit size is small enough compared to wavelength. For example, centre of **infinitesimal loop** is set to be origin of x-y-z coordinates, and loop plane is set on x-y plane, electromagnetic field is expressed as shown below:

$$Hr = I * A/\lambda * (j/r^2 + \lambda/2/\pi/r^3) * \cos(\sigma)$$
$$H\sigma = \pi * I * A/\lambda^2/r * \mathrm{sqrt}(1 - (\lambda/2/\pi/r)^2 + (\lambda/2/\pi/r)^4) * \sin(\sigma)$$
$$E\varphi = Z0 * \pi * I * A/\lambda^2/r * \mathrm{sqrt}(1 + (\lambda/2/\pi/r)^2) * \sin(\sigma)$$

hereby,

- r = distance from the centre of infinitesimal loop (m)
- σ = angle between straight line connecting origin and observation point and Z-axis (rad)
- φ = angle between straight line connecting origin and observation point and X-axis (rad)
- Hr = magnetic field at straight line connecting origin and observation point direction (A/m)
- Hσ = magnetic field at surface direction including straight line connecting origina and observation point and Z-axis (A/m)
- Eφ = electric field at X-Y-axis surface direction (at loop plane) (V/m)
- A = area (square measure) of loop (m^2)
- I = electrical current flow in loop (A)
- λ = wavelength (m)
  = 3e8/f
- f = frequency (Hz)
- r = daistance between centre of loop and observation point (m)
- Z0 = free space impedance (Ohm)
  = 120 * π = 377
- j = sqrt(-1)

Considering X-Y-axis surface (loop plane) whose electromagnetic field is large, it is separated into the following two cases:

1. Adjacent area ($r << \lambda/2/\pi$ in other words, in case of $r << 4.8e6/f$)

$$H = I * A/4/\pi/r^3 \ (A/m)$$
$$E = Z0 * I * A/2/\lambda/r^2 \ (V/m)$$

2. Far field (λ/2/π << r in other words, in case of r >> 4.8e6/f)

H = π＊I＊A/λ^2/r (A/m)
E = Z0＊π＊I＊A/λ^2/r (V/m)

Electrostatic induction and electromagnetic induction are the leading factor at adjacent area, whose strength is weakened inversely proportional to square of distance from the source, because opposite direction electrical current exists quite close inside infinitesimal loop, magnetic field from infinitestimal loop at a little far area is canceled and it attenuates rapidly inversely proportional to cubes of distance from the source. And, electromagnetic field at far field attenuates slowly inversely proportional to distance from the source, so it's affection spread out extensively.
In case of tying infinitestimal loops into a row, electrical current component crossing at right angle against the line cancels each other so that it becomes zero and it becomes same as parallel two conductor transmission line, therefore, it becomes same transmission line characteristics as parallel two conductor cable as it is, so electric field at far area by round trip current of small conductor distance parallel two conductor cable accords with the value replacing area (square measure) of round trip conductors with that of infinitestimal loop as shown below.

E = 120＊π^2＊I＊s＊h/λ^2/r (V/m)
hereby,
E = electric field at far area by round trip current of a parallel two conductor configuration (V/m)
I = current (A)
s = length of a parallel cable (m)
h = distance between two conductors of a parallel cable (m)
.. h << λ
λ = wavelength of round trip curremt of a parallel cable
.. 3e8＊coefficient of velocity/frequency
r = distance between central axis of a parallel cable and observation point (m)

Hereafter, when centre of **infinitestimal dipole** is set origin of Y-axis of x-y-z coordinates, electromagnetic field is expressed as shown below:

Er = 60＊I＊s＊(1/r^2 - j＊λ/2/π/r^3)＊cos(σ) (V/m)
Eσ = Z0＊I＊s/2/π/r＊(1 - (λ/2/π/r)^2 + (λ/2/π/r)^4)＊sin(σ) (V/m)
Hφ = I＊s/2/λ/r＊(sqrt(1 + (λ/2/π/r)^2)＊sin(σ) (A/m)
hereby,
I = current flows in dipole (wire) (A)
s = length of dipole (wire) (m)

Considering X-Y-axis surface whose electromagnetic field is large, it is separated into the following two cases:

1. Adjacent area (r << λ/2/π in other words, in case of r << 4.8e6/f)

H = I＊s/4/π/r^2 (A/m)
E = Z0＊L＊s＊λ/8/π^2/r^3 (V/m)

2. Far field (λ/2/π << r in other words, in case of r >> 4.8e6/f)

H = I∗s/2/λ/r (A/m)
E = Z0∗I∗s/2/λr (A/m)

Electric field at adjacent area is inversely proportional to cubes of distance from the source, not inversely proportional to square of distance from the source, lies in that positive charge and negative charge are set very close dipole structure so that electric field at a little far away is canceled by them.

Difference between infinitestimal loop and infinitestimal dipole is deeply understood when comparing ratio of electric field and magnetic field E/H (Ohm), in other words, comparing wave inpedance (surge impedance - characteristic impedance). In case of infinitestimal dipole, wave impedance is extremely high at short distance, and it becomes smaller as distance becomes larger and finally it accords with wave impedance of free space (120∗π) at far field. On the other hand, in case of infinitestimal loops, wave impedance at short distance is very low on the contrary, and it increases as distance becomes larger and finally it accords with wave impedance of free space (120∗π) at far field. Therefore, in either way, as long as it is apart from origin (source) of electromagnetic wave far away, both segment accord with each other because of under control of free space in either way. In other words, they show antithetical characteristic at short distance.

When considering coupling with external circuit, although largeness of electric field and magnetic field is reversal between infinitestimal loop and infinitestimal dipole at short distance, it is far from wave impedance at free space in either way, efficiency as antenna is not good because of mismatching with free space impedance.

The other way, as area (square measure) of loop and or length of dipole becomes close to 1/4 wavelength of high frequency current, wave impedance at adjacent area becomes close to the wave impedance at free space, so that it functions as antenna effectively. Since wire and cable are long, it is common that shield acts as an antenna. Therefore, commonly ferrite beads are inserted at a certain interval as its countermeasure to prevent from emission or making hard to flow receiving current.

Only method to screen (shield) from electromagnetic wave is to wrap a whole circuit with high conductivity case (chassis), joint utilizing electromagnetic wave reflection generated between outernal space and case and attenuation by eddy current loss generated inside case material.

Reflection loss among these two factors is determined by ratio of wave impedance between free space and inside conductor, which is as shown below:

R = 20∗log10(sqrt(σ/(ω∗μ∗ε))/4)
hereby,
R = reflection loss (dB)
σ = conductivity (S/m)
= σs ∗ 5.80e7 (S/m)
σs = conductivity (specific conductivity against cathode copper)
μ = magnetic permeability (H/m)
= μs ∗ $4e^{-7}$ ∗ π
μs = relative permeability
ε = dielectric constant (F/m)
= εs ∗ 1e7 / (4 ∗ π ∗ c^2)
εs = relative permittivity
c = 299,792,458 m/s (velocity of light in a vacuum)

ω = angular velocity (rad/s)
= 2 ∗ π ∗ f
f = frequency (Hz)

Attenuation loss is determined by skin depth and thickness of used material, which is as shown below:

A = 20 ∗ log10(exp(t / δ))
hereby,
A = attenuation loss (dB)
t = thickness of shielding material (m)
δ = skin depth (m)

Total shielding effect is sum of reflection loss and attenuation loss, and reflection loss is decreased inversely proportional to the square root of frequency, but attenuation loss radically increases at high frequency so that this mechanism functions effectively at high frequency. However, if there is a hole inside case, electromagnetic wave leaks through it, it becomes major problem how to take **measure against openings** Moreover, in case of electric field, reflection at exterior surface of shield material is large, so that attenuation loss effect becomes secondary. On the other hand, in case of magnetic field, reflection at interior surface of shield material is large so that attenuation loss inside becomes more important, because of limitation of available material it is hard to realize large attenuation. In any case, it can be understood that high conductivity material is required for this purpose.
Also, as a counter-measure against **EMI** (Electro-Magnetic Interference), because distance between shield and object circuit is reversal, it must be paid attention that far field must be considered in case of shield (screen), and adjacent area must be considered in case of **EMI**.

6. Counter-measure against Common Mode

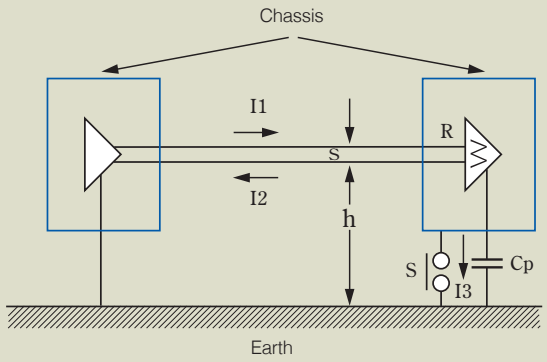


Fig. 9 : Common-mode current (i3) - Impedance of Cp is low because of high frequency

When considering electromagnetic field generated by infinitestimal loop and or infinitestimal dipole, it is understood that the most efficient method is to make the circuit size small enough comparing wavelength. However, in case of transmission by cable, because length of wiring is long, in case of **single end (unbalanced) transmission**, use coaxial cable or utilize twisted pair cable reducing loop area to reduce current flow into ground (earth) as its home. Commonly used fundamental countermeasure is to let it **differential circuit** (balanced circuit) and use twisted pair cable so that signal current won't flow through ground (earth) in principle Nevertheless, there remain unbalanced part of a circuit somewhere, part of signal current will flow through ground (earth), in other words, **Common Mode** component has to be generated.

Because area where common mode current flows is extremely large, even though it is a minute unbalanced part, it occupies majority of general electromagnetic interference, therefore turning point (critical point) is how to reduce common mode current flow for high frequency transmission line.

Only counter-measure against it is to increase degree parallelization of a circuit and to use common mode choke such as ferrite beads and or ferrite core which became to be used a lot in today's electronic equipment.

Please note that cable shield does not work at all against common mode current hereby. Because thick conductor becomes excellent antenna, it (shield) has the opposite effect. There are not a few cases that it expands damage on the contrary by shielding electromagnetic wave and or overall shielding of a cable as a counter measure against **EMI**.

Progress of **LSI** revolutionized electronic technology, **differential transmission** like Fig. 9 has been used in wide range of field in cable transmission by widespread **Differential Drivers And Receivers**.

Twisted Pair Cable is used in this case to reduce electromagnetic coupling (inductive coupling), in case of **differential transmission and twisted pair cable**, it becomes **possible to cancel capacitance coupling with external voltage generator as well as electromagnetic coupling at the same time**, so killing two birds with one stone effect is obtained. This is the reason why shield is not required for **LAN** cable. (Note: 3)

Further, since electromagnetic coupling becomes lager as frequency becomes larger, **counter-measure by electric circuit** to reduce high frequency component included in signal current is important so that those technique are often used such as delaying pulse risetime and or giving temporal fluctuation to clock to disperse spectrum constituent of signal waveform.

7. Note

7.1 Reversibility

Reversibility of common impedance, mutual capacitance and mutual inductance is self-evident (obvious), in case antenna is used for signal transmission and signal receiver, it can be also verified to be reversibility, so it can be understood it is same situation to think about shield and emission. For example, please refer the following book: Name of Japanese book: VHF antenna

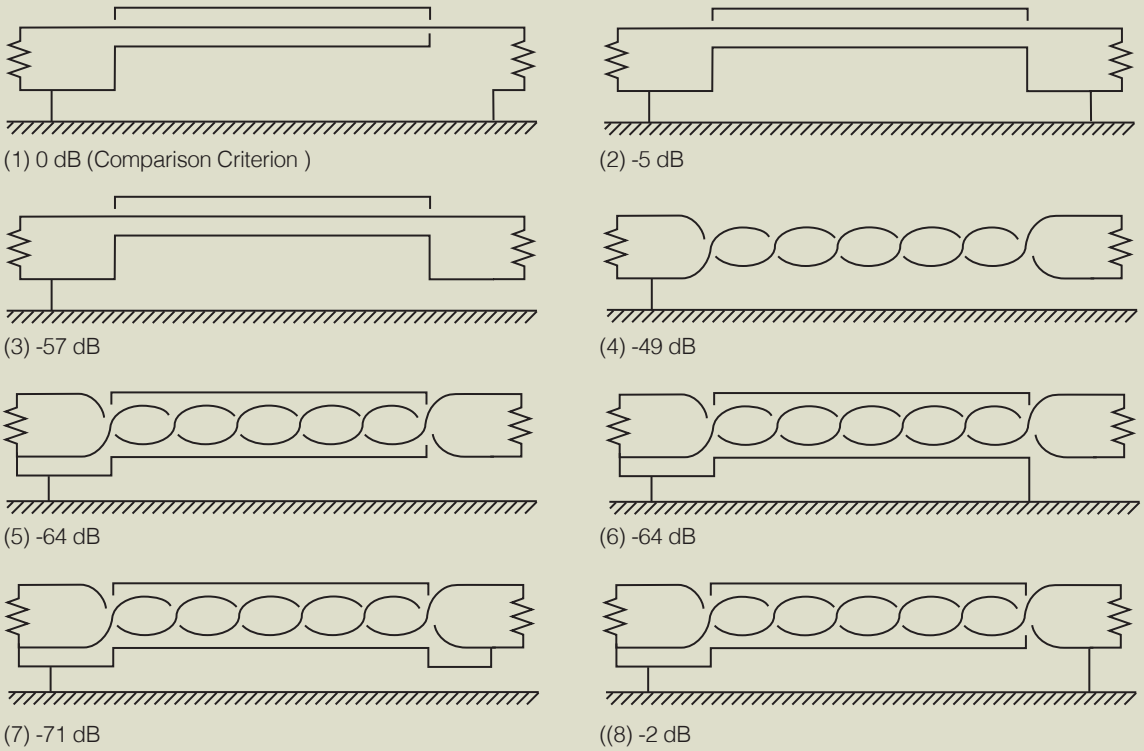
Author: Hidenari Uchida, Yasuto Mushiake

Publisher: CORONA pp33-38, 47-50

7.2 Electromagnetic coupling and wiring method (connection method)

There are interesting comparison data between several wiring method (connection method) with one end ground (single point ground) of shielded one conductor cable, twisted pair cable and overall shielded twisted pair cable shown in "Milton, R.T.,- Design Handbook Electromagnetic Compatibility, N.Y., General Electric Co., 1963.

These data show comparison of electromagnetic coupling (magnetic shield) at relatively low frequency. Comparison criterion (1) separates capacitance coupling by grounding shield conductor, however electromagnetic coupling with noise source is large because of a large loop through (with) earth.

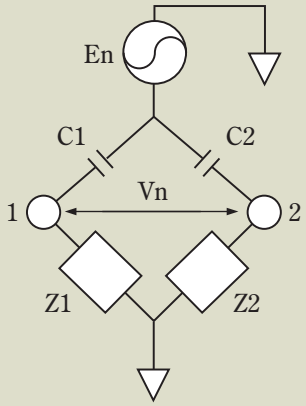


7.3 Cancellation of Mutual Capacitance

Capacitance coupling at unbalanced circuit is unrealizable, in case of differential transmission, conductors are grounded to be **capacitance between induced potential source and two conductors of differential transmission becomes the same**, same largeness induced current flows into both of reciprocating conductor (go and return conductor), it can become zero by subtracting them at receiving-end. In other words, affection by mutual capacitance can be made into only common mode.

Further, when this two conductors are comprised of a twisted pair, as long as distance from induced potential source is reasonablly long enough, mean distance from induced potential source becomes same for these two conductors so that mean mutual capacitance for these two conductors become same.

This situation is indicated as shown below circuit, current generated by voltage noise generation source En flow in conductor 1 and 2 through mutaul capacitance C1 and C2 and then back flow current flows through impedance to ground corresponding to each conductor Z1 and Z2, therefore, as long as C1=C2 and Z1=Z2, noise voltage generated between these two condcutors becomes zero, consequently it becomes into a balanced state of **Bridge Circuit**. In other words, it istaken place that capacitance coupling is canceled by bridge circuit.



In case of **overall shielded twisted pair structure**, because **shield conductor becomes induced potential source**, when degree of balance of capacitance between each conductor and its shield conductor is not good, this cancellation mechanism become not effective so much, therefore it is supervised (controlled) by indicator called **Capacitance Unbalance** as indicated below. There are some difinitions for this **Capacitance Unbalance**, so the value differs depending on standards. In any case, it is difined that it becomes zero when it is perfectly balanced.

Cu = 400 * (Ca - Cb) / (2 * (Ca + Cb) - Cc)
hereby,
Cu = Capacitance Unbalance (%)
Ca = Capacitance between Condcutor 1 and Shield while Conductor 2 and Shield are shorted (F/m)
Cb = Capacitance between Conductor 2 and Shield while Conductor 1 and Shield are shorted (F/m)
Cc = Capacitance between Conductor and Shield while Conductor 1 and 2 are shorted (F/m)

7.4 Physical property of shielding materials

Material	σs	μs	σs * μs	σs/μs
Copper	1	1	1	1
Silver	1.05	1	1.05	1.05
Gold	0.7	1	0.7	0.7
Aluminum	0.61	1	0.61	0.61
Brass	0.26	1	0.26	0.26
Bronze	0.18	1	0.08	0.08
Tin	0.15	1	0.15	0.15
Lead	0.08	1	0.08	0.08
Nickel	0.2	100	20	$2e^{-3}$
Stainless Steel (SUS-430)	0.02	500	10	$4e^{-5}$
Carbon Steel (SAE 1045)	0.1	1000	100	$1e^{-4}$
Super Permalloy (1 kHZ)	0.03	1e5	3000	$3e^{-7}$

Frequency characteristic of magnetic materials is large and dispersion by material is quite wide so that these yardsticks are not useful so much as a reference.

INDEX (PART NO.)

Cables are long term products, and cable failure often results in problems in which the original cause is extremely difficult to detect. Choosing a reliable, long life, and multiple application cable from the start, is the key to safety, efficiency, and getting the best value. Always select a quality product, and use it at great length to better coexist with our precious earth.

All given characteristic data provided in this brochure are typical values. Product specifications are subject to change without notice.

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