Jefferson Lab
Thomas Jefferson National Accelerator Facility

SPECIFICATION NO:
D00000-16-11-S100

Title: Hall D Cable Assemblies for the FDC and the CDC Detector Sub-Systems

Date: 19 April 2010

By: F. J. Barbosa
Chief Electrical Engineer – Hall D

APP: _____ _____ APP: _____ _____
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1. Scope

The Hall D CDC and FDC detector subsystems will require cable assemblies consisting of multi-conductor cables with connectors installed at both ends. A 3M connector with shell and cover is installed on one end of the cable; an ERNI connector is installed on the other end of the cable. The part numbers are as follows:

1. Amphenol Spectra-Strip, 50 Conductor (25 pairs), UL NEC CL2 – 169-3099-786
   (Refer to Section 4).

2. 3M Connector – 10150-6000EC & 10350-3210-000
   (Refer to Section 5).

3. ERNI Connector – 214347
   (Refer to Section 6).

4. Alpha Wire Expandable Sleeving – GRP120NF14
   (Refer to Section 7).

There are five (5) cable assembly variants, or cable assembly types. The length, cable and connectors are common specifications to all of the cable assembly types; the length of shielding braid removed is not, however. The following table summarizes these requirements:

Cable Assembly Type	Marking	Cable Length (m)	Length of Shielding Braid Removed (m)	Quantity
1	CDC	18	0	152
2	FDC1	18	2.0	132
3	FDC2	18	2.6	132
4	FDC3	18	3.2	132
5	FDC4	18	3.8	132

Dimensions are nominal and provided in meters in consideration for the cable construction specifications (Refer to Section 4).

Jefferson Lab requires these cable assemblies in the quantities provided in the table above and with the specifications outlined in this document. These cable assemblies are to be delivered fully tested and conforming to all applicable quality control procedures. These cable assemblies shall also be labeled at both ends of the cable assemblies with the marking provided on the table above and color coded as provided in Section 3. Packaging

and shipping shall be provided in a manner that prevents damage to any part of these cable assemblies.

1.1 Statement of Work - The selected vendor shall deliver and test all cable assemblies for the FDC and the CDC detector sub-syetems with the properties as specified in this document. A listing of the deliverables for this contract is given here, but described in more detail in the sections that follow:

1.1.1 First-article, consisting of 10 cable assemblies for each of the 5 cable assembly types, a total of 50 cable assemblies, for verification of all dimensions and conformance to all the specifications in this document, before production of the remaining cable assemblies.

1.1.2 The remaining cable assemblies, as required by this specification,

1.1.3 Data sheets accompanying each shipment with the results of all factory tests and relevant QA and QC, including the parts employed in these cable assemblies.

1.2 Handling, Packaging and Delivery – Cable assemblies shall be packaged in such a way that routine handling during shipping and receiving will not damage any part of the cable assemblies. The packaging shall be boxed or crated in a manner to prevent damage during shipment and to permit handling by forklift or hoist while in storage or during installation, where appropriate. The boxed or crated equipment shall be protected from the weather. Packages shall be suitably marked on the outside to facilitate identification of purchase order, the procurement specification, the package content, and any special handling instruction. Each Cable Assembly shall be marked with a unique serial number.

1.3 Schedule - All cable assemblies shall be delivered within 6 months from contract award. The vendor can propose variations on the following schedule, which optimizes their production:

1.3.1 First Article - The first-article shipment shall be due twelve (12) weeks from the subcontract award date. JLab personnel, or its representative, shall complete the first article acceptance review within 30 working days after receipt of the first article.

1.3.2 Production - Production shipments of the remaining cable assemblies shall begin after first article acceptance notification by JLAB and be completed within six (6) months from contract award.

2 Cable Assembly Procedures

The cable assembly specifications are provide in Section 3. The Amphenol cable specified for these cable assemblies has a foil shield (0.001" Alum/Poly Tape), immediately surrounding all of the 50 conductors, followed by a Tinned Copper Braid and enclosed by a black PVC Jacket. This Amphenol cable has laminated flats nominally spaced at every 1000 mm; the length of the laminated flat sections is 63.5 mm. Refer to Section 4 for additional information. The following procedures are provided for guidance.

2.A – 3M Connector Instalation

At one end of the cable assemblies, where the 3M connector is installed, the braid is to be attached to the connector shell for good electrical connection with the hardware provide with the connector shell kit. The color coded heat shrink cable assembly type marking is installed prior to connector installation. Individual wires are to be attached to the connector following the wire order specified in Section 3 and following the tooling guidelines suggested by the connector manufacturer. The same installation procedures for the 3M connector apply to all five (5) types of cable assemblies.

2.B – ERNI Connector Instalation

The following procedures apply to the end of the cable where the ERNI connector is installed:

Cable Assembly Type 1 – CDC:

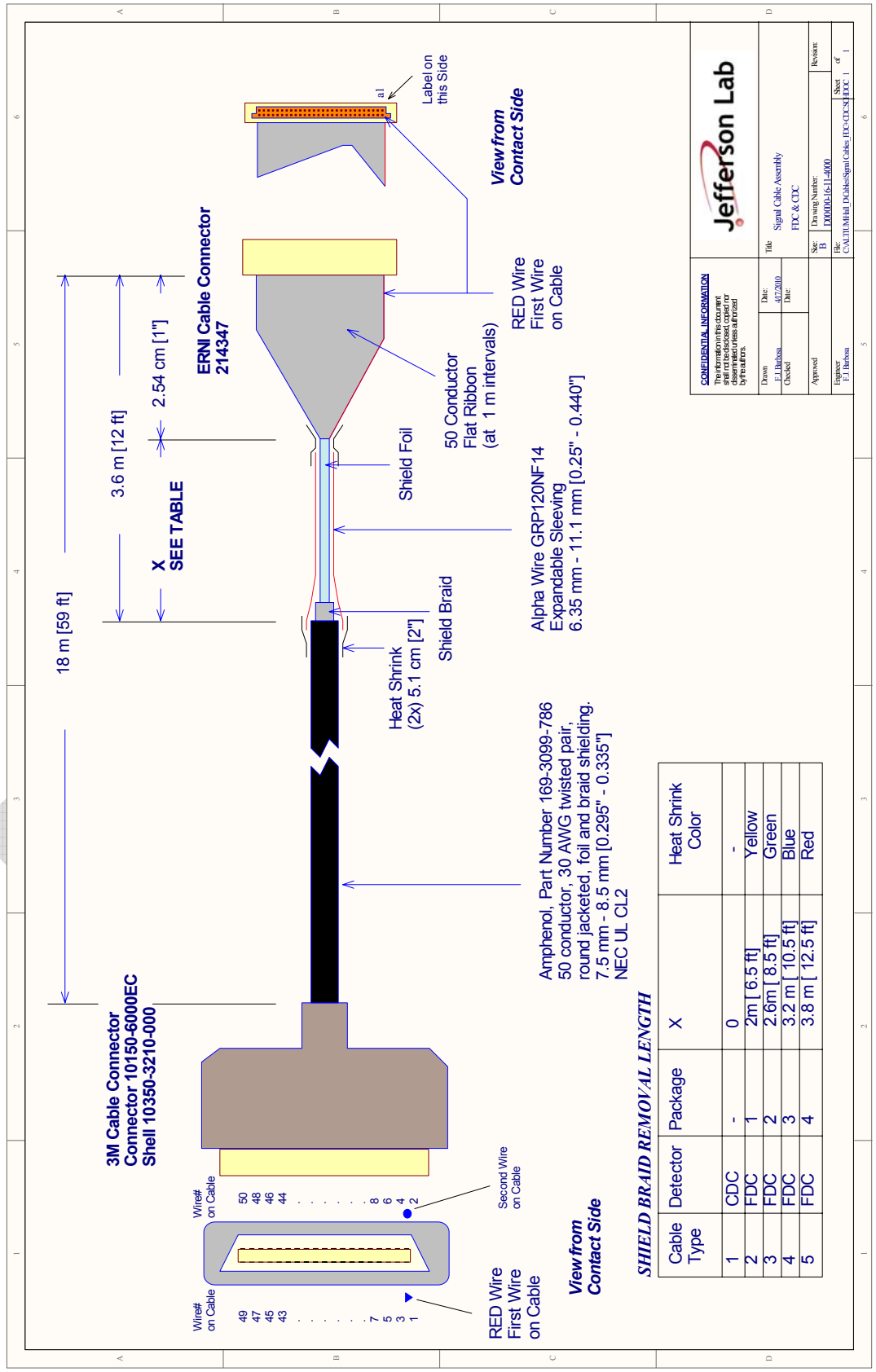
1. Remove approximately 1" of the cable jacket, of the copper braid and of the foil shield away from where the connector is to be installed, a laminated flat section of the cable.
2. Insert 1"-2" of color coded heat shrink cable assembly type marking on the cable.
3. Install the ERNI connector as outlined in Section 3 and following the tooling guidelines suggested by the connector manufacturer.

Cable Assembly Types 2, 3, 4 and 5 – FDC1, FDC2, FDC3 and FDC4

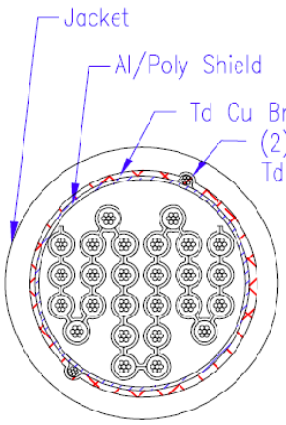
1. Prepare the expandable sleeving, making it approximately 2" longer than the length of the shielding braid to be removed from the cable and according to the dimensions in the table above. Also, refer to Section 3.
2. Insert the expandable sleeving over the cable jacket, past the length of braid to be removed from the cable.
3. Remove the length of the black PVC cable jacket and according to the dimensions in the table above. Also, refer to Section 3.

4. Remove the length of the tinned copper braid and according to the dimensions in the table above and on Section 3, being careful not to cause any damage to the foil shield. It is important to maintain the integrity of the foil shield shielding effectiveness throughout its full length.
5. Remove approximately 1” of the foil shield away from where the connector is to be installed, a laminated flat section of the cable.
6. Secure the foil shield by wrapping tape at various locations along the length of the exposed foil shield. This will prevent the foil from sliding and unwrapping while moving the expandable sleeving over it.
7. Move the expandable sleeving over the foil shield and towards the end where the ERNI connector is to be installed.
8. Insert two (2) 1”-2” of color coded cable assembly type marking over the cable and expandable sleeving. One heat shrink piece will secure the expandable sleeving to the cable jacket; the other, with marking, will secure the expandable sleeving to the 50-conductor bundle and foil shield.
9. Install the ERNI connector as outlined in Section 3 and following the tooling guidelines suggested by the connector manufacturer.

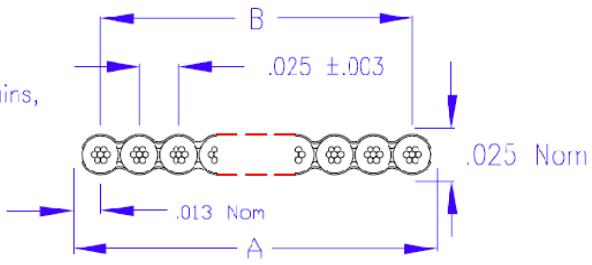
3 Cable Assembly Specifications



Cable Type	Detector	Package	X	Heat Shrink Color
1	CDC	-	0	-
2	FDC	1	2m [6.5 ft]	Yellow
3	FDC	2	2.6m [8.5 ft]	Green
4	FDC	3	3.2 m [10.5 ft]	Blue
5	FDC	4	3.8 m [12.5 ft]	Red



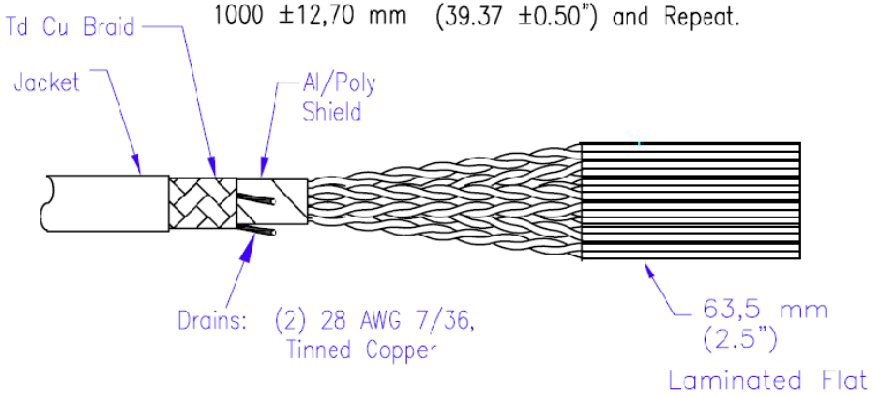
Cross Section at Flat



CROSS SECTION THRU FLAT

Center – Center of Flats:

1000 ±12,70 mm (39.37 ±0.50") and Repeat.



Part Number	Count	Pairs	A-Span	B-Span	Ref Dia (Nom EST.)
169-3099-786	50	25	1.251" Nom	1.225" Nom	@ loose Pairs 0.315" @ Flat: 0.415"

PRELIMINARY

PHYSICAL

Conductors:	30 AWG 7/38 Tinned Copper
Insulation:	.006" PVC
Laminate:	Polyester/Adhesive
Color Code:	1st Pair Red/Grey followed by Blue Grey and Repeat
Drain:	(2) 28 AWG 7/36 Tinned Copper
Shielding:	.001" Alum/Poly Tape w/ 85% min Coverage Tinned Copper Braid
Jacket:	.030" Black PVC
Temperature:	80°C

ELECTRICAL

Impedance:	112 ohms
Capacitance:	20.6 pF/ft
Current Rating:	0.75 A
Insulation Res:	10^{10} ohms – 10 ft minimum

Above Values measued Differentially

APPROVALS:

UL CL2
CSA AWM FT-1

DRAWN	PROD ENG	QA	MKT	P/ECN#	
FITTS 3/12/07	3/12/07				

DRAWING NO. 169-3099-786

TITLE: Loose Pair Round Twist 'N' Flat® Cable

AMPHENOL SPECTRA-STRIP
720 SHERMAN AVE HAMDEN CT 06514
TEL (203) 281-3200 FAX (203) 281-5872

Rev 1

SHEET 1 of 1

5 3M Connector Specifications

3M™ Mini D Ribbon (MDR) Connectors

.050" IDC Wiremount Plug - Shielded — 101 Series

- Wiper-on-wiper contact for reliable repetitive plugging
- MDR digital LCD interface as a 20 or 26 contact connector
- IEEE 1284C Interface as a 36 contact connector
- Accepts a wide variety of cable constructions including flat, round, twisted pair and twinax cables
- Accepts a wide variety of shielded junction shells
- Contacts: 14, 20, 26, 36, 40, 50, 68, 80 and 100
- See Regulatory Information Appendix (RIA) for chemical compliance information

Date Modified: February 7, 2007

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Physical

Insulation Material:	Glass Reinforced Polyester
Flammability:	UL 94V-0
Body Color:	Black
Cover Color:	Black, Gray
Contact	
Material:	Beryllium Copper
Underplating:	80 µ" [2.0 µm] Nickel
Wiping Area Plating:	30 µ" [0.76 µm] Min. Gold
IDC Contacts Plating:	Gold flash
Shroud	
Material:	Steel
Plating:	Nickel
Wire Accommodation	
Black Cover:	28 AWG Stranded, 30 AWG Solid (Insulation Diameter = 0.7 mm Max.)
Gray Cover:	26 AWG Solid (Insulation Diameter = 0.7 mm to 0.9 mm)
Marking:	3M Logo and Part Number

Electrical

Current Rating:	1 A
Insulation Resistance:	$> 1 \times 10^8 \Omega$ at 500 V_{DC}
Withstanding Voltage:	500 V_{RMS} for 1 Minute

Environmental

Temperature Rating:	-20°C to +85°C

UL File No.: E68080

3M
Interconnect Solutions
http://www.3M.com/interconnects/

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800-225-5373

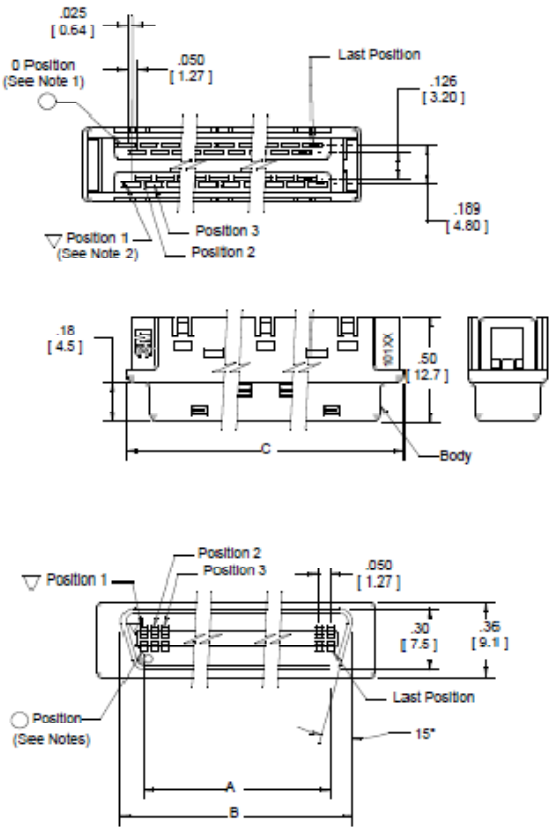
3M™ Mini D Ribbon (MDR) Connectors

.050" IDC Wiremount Plug - Shielded

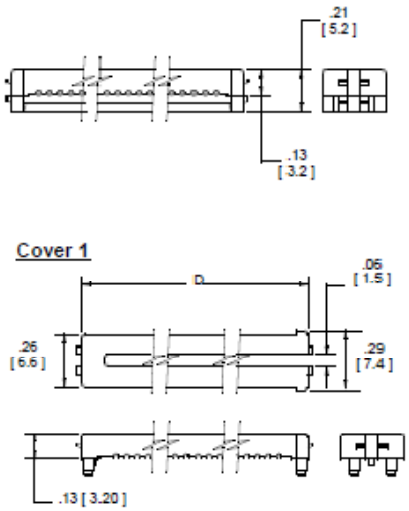
101 Series

Contact Quantity	Dimensions			
	A	B	C	D
14	.300 [7.62]	.54 [13.8]	.72 [18.2]	.58 [14.7]
26	.600 [15.24]	.84 [21.4]	1.02 [25.8]	.88 [22.4]
50	1.200 [30.48]	1.44 [36.6]	1.62 [41.1]	1.48 [37.6]

Body (14, 26 and 50 positions)



Cover Assembly



Inch
[mm]

Tolerance Unless Noted			
	.0	.00	.000
Inch	±.1	±.01	±.005

[ ] Dimensions for Reference Only

Notes:

1. Circle (0) position indicates #1 position in cable, when utilizing 0.025" pitch flat cable.
2. Triangle (∇) position indicates #2 position in cable, when utilizing 0.025" pitch flat cable.

Ordering Information

(See page 3 for other sizes and assembly tools.)

101XX-60X0EC

- XX — Contact Quantity (See Table) Note: 100 pos = A0
- 6 — Wire Accommodation: 0 = Black Cover: 28 AWG Stranded, 30 AWG Solid; 1 = Gray Cover: 26 AWG Solid (Available in 68 Contact Only, UL Pending)
- 0 — Wiping Interface Plating: C = 30µ in [0.76 mm] Min. Gold over Ni
- E — IDC Plating: E = Gold Flash over Ni (App E1 & C1 apply)

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Sheet 2 of 3

For technical, sales or ordering information call
800-225-5373

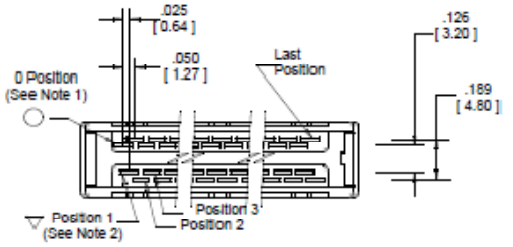
3M™ Mini D Ribbon (MDR) Connectors

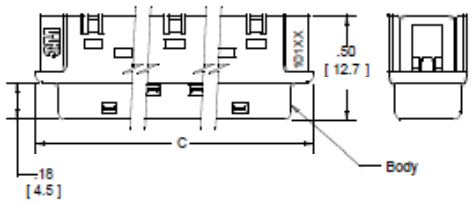
.050" IDC Wiremount Plug - Shielded

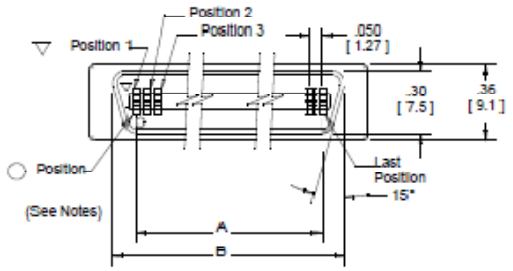
101 Series

Contact Quantity	Dimensions: A	B	C	D
20	.450 [11.43]	.69 [17.6]	.87 [22.0]	.73 [18.6]
36	.850 [21.59]	1.09 [27.8]	1.27 [32.2]	1.13 [28.7]
40	.950 [24.13]	1.19 [30.3]	1.37 [34.7]	1.23 [31.3]
68	1.650 [41.91]	1.89 [48.1]	2.07 [52.5]	1.93 [49.0]
80	1.950 [49.53]	2.16 [54.8]	2.37 [60.1]	2.23 [56.7]
100	2.450 [62.23]	2.66 [67.5]	2.87 [72.8]	2.73 [69.4]

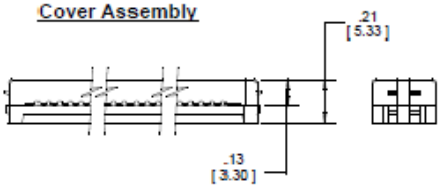
Body (20, 36, 40, 68, 80 and 100 positions)



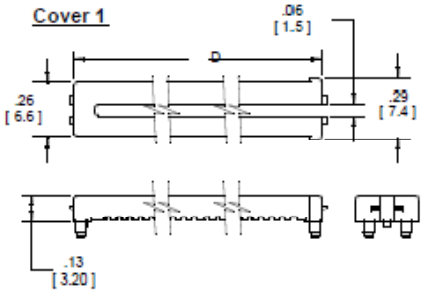




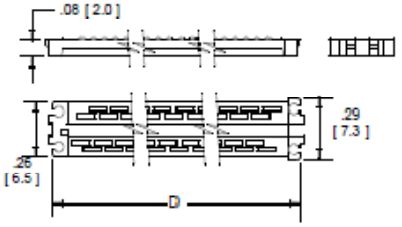
Cover Assembly



Cover 1



Cover 2



Inch [mm]

Tolerance Unless Noted			
	.0	.00	.000
Inch	±.1	±.01	±.005

[ ] Dimensions for Reference Only

Notes:

1. Circle (0) position indicates #1 position in cable, when utilizing 0.025" pitch flat cable.
2. Triangle (∇) position indicates #2 position in cable, when utilizing 0.025" pitch flat cable.

Ordering Information

101XX-60X0EC

- Contact Quantity (See Table) Note: 100 pos = A0
- Wire Accommodation: 0 = Black Cover: 28 AWG Stranded, 30 AWG Solid; 1 = Gray Cover: 26 AWG Solid (Available in 68 Contact Only, UL Pending)
- Wiping Interface Plating: C = 30µ m [0.76 mm] Min. Gold over Ni
- IDC Plating: E = Gold flash over Ni (App E1 & C1 apply)

3: Assembly tools: 3M™ Hand Press Kit 3829 (68 position & below). All Sizes: 3M™ Assembly Press 10962-2000; 3M™ Lacing Fixture 10962-2000, 3M™ Cutting Unit 10961 & 3M™ Wire Clamp 10964-1 (14-50 pos.) or 3M™ Wire Clamp 10964-2 (68-100 pos.).

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Regulatory Information Appendix
3M Electronic Solutions Division/Interconnect

EUROPE

Appendix E1: European Union RoHS
Directive 2002/95/EC, Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment, as amended by EU Commission Decision 2005/618/EC.
This product is RoHS Compliant 2005/95/EC.
"RoHS Compliant 2005/95/EC" means that the product or part ("Product") does not contain any of the substances in excess of the maximum concentration values in EU Directive 2002/95/EC, as amended by Commission Decision 2005/618/EC, unless the substance is in an application that is exempt under EU RoHS. Unless otherwise stated by 3M in writing, this information represents 3M's best knowledge and belief based upon information provided by third party suppliers to 3M.

In the event any product is proven not to conform with 3M's Regulatory Information Appendix, then 3M's entire liability and Buyer's exclusive remedy will be in accordance with the Warranty stated below.

Appendix E2: European Union RoHS
Directive 2002/95/EC, Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment, as amended by EU Commission Decision 2005/618/EC
This product contains lead in the compliant pin area in excess of the maximum concentration value allowed but is compliant by exemption under EU Commission Decision 2005/747/EC.
"RoHS Compliant 2005/95/EC" means that the product or part ("Product") does not contain any of the substances in excess of the maximum concentration values in EU Directive 2002/95/EC, as amended by Commission Decision 2005/618/EC, unless the substance is in an application that is exempt under EU RoHS. Unless otherwise stated by 3M in writing, this information represents 3M's best knowledge and belief based upon information provided by third party suppliers to 3M.

In the event any product is proven not to conform with 3M's Regulatory Information Appendix, then 3M's entire liability and Buyer's exclusive remedy will be in accordance with the Warranty stated below.

Appendix E3: European Union RoHS
Directive 2002/95/EC, Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment as amended by Commission Decision 2005/618/EC.
This product contains lead in the solder tail area in excess of the maximum concentration value allowed.
Unless otherwise stated by 3M in writing, this information represents 3M's best knowledge and belief based upon information provided by third party suppliers to 3M.

In the event any product is proven not to conform with 3M's Regulatory Information Appendix, then 3M's entire liability and Buyer's exclusive remedy will be in accordance with the Warranty stated below.

Appendix E4: European Union RoHS
Directive 2002/95/EC, Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment, as amended by EU Commission Decision 2005/618/EC.
This product contains decaBDE in the insulating material in excess of the maximum concentration value allowed but is compliant by exemption under EU Commission Decision 2005/17/EC.
"RoHS Compliant 2005/95/EC" means that the product or part ("Product") does not contain any of the substances in excess of the maximum concentration values in EU Directive 2002/95/EC, as amended by Commission Decision 2005/618/EC, unless the substance is in an application that is exempt under EU RoHS. Unless otherwise stated by 3M in writing, this information represents 3M's best knowledge and belief based upon information provided by third party suppliers to 3M.
In the event any product is proven not to conform with 3M's Regulatory Information Appendix, then 3M's entire liability and Buyer's exclusive remedy will be in accordance with the Warranty stated below.

RIA-2217-B

CHINA

Appendix C1: China RoHS

Electronic Industry Standard of the People's Republic of China, SJ/T11363-2006, Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products.
This symbol, per Marking for the Control of Pollution Caused by Electronic Information Products, SJ/T11364-2006, means that the product or part **does not** contain any of the following substances in excess of the following maximum concentration values in any homogeneous material: (a) 0.1% (by weight) for lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers; or (b) 0.01% (by weight) for cadmium. Unless otherwise stated by 3M in writing, this information represents 3M's best knowledge and belief based upon information provided by third party suppliers to 3M.

In the event any product is proven not to conform with 3M's Regulatory Information Appendix, then 3M's entire liability and Buyer's exclusive remedy will be in accordance with the Warranty stated below.

Appendix C2: China RoHS

Electronic Industry Standard of the People's Republic of China, SJ/T11363-2006, Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products.
This symbol, per Marking for the Control of Pollution Caused by Electronic Information Products, SJ/T11364-2006, means that the product or part **does** contain a substance, as detailed in the chart below, in excess of the following maximum concentration values in any homogeneous material: (a) 0.1% (by weight) for lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers; or (b) 0.01% (by weight) for cadmium. Unless otherwise stated by 3M in writing, this information represents 3M's best knowledge and belief based upon information provided by third party suppliers to 3M.

The numerical reference in the symbol above should not be construed as a representation regarding the product's life or an extension of a product warranty. The product warranty is stated below. In the event any product is proven not to conform with 3M's Regulatory Information Appendix, then 3M's entire liability and Buyer's exclusive remedy will be in accordance with the product Warranty stated below.

产品中有毒有害物质或元素的名称及含量 Name and Content of Hazardous Substances or Elements

部件名称 (Part or Component Name)	有毒有害物质或元素 (Hazardous Substances or Elements)					
	铅(Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
端子镀层(contact plating)	×	○	○	○	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。(Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.)
×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。(Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.)

Important Notice

All statements, technical information, and recommendations related to 3M's products are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use. Any statements related to the product which are not contained in 3M's current publications, or any contrary statements contained on your purchase order shall have no force or effect unless expressly agreed upon, in writing, by an authorized officer of 3M.

Warranty; Limited Remedy; Limited Liability.
This product will be free from defects in material and manufacture for a period of one (1) year from the time of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any indirect, special, incidental or consequential loss or damage arising from this 3M product, regardless of the legal theory asserted.**

3M

Electronic Solutions Division
6801 River Place Blvd.
Austin, TX 78726-9000
800/225-5373
www.3M.com/interconnects

3M™ Mini D Ribbon (MDR) Connectors

.050" Plastic Shielded Junction Shell for Round Cable — 103 Series

- Durable one piece plastic over two piece metal junction shell for straight round cable (compatible with 101XX-6000 EC plug)
- Quick release latching
- MDR digital LCD Interface as a 20 or 26 contact connector
- Contacts: 14, 20, 26, 36, 40, 50 and 68
- RoHS* compliant

Date Modified: January 31, 2006

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Sheet 1 of 2

Physical

Outer Shell	
Material:	ABS
Flammability:	UL 94V-0
Color:	Beige, Medium Gray, and Black
Inner Shellt	
Material:	Steel, .020" [0.5 mm] Thick
Plating:	Nickel
Marking:	3M Logo and Part Number

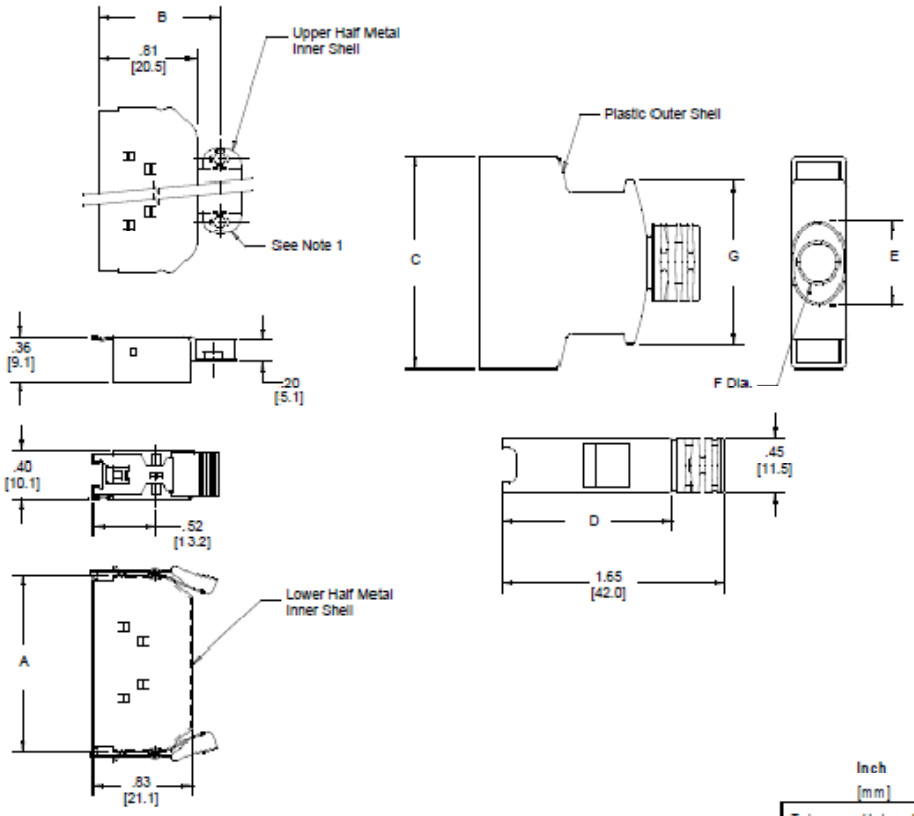
"RoHS compliant" means that the product or part does not contain any of the following substances in excess of the following maximum concentration values in any homogeneous material, unless the substance is in an application that is exempt under RoHS: (a) 0.1% (by weight) for lead, mercury, hexavalent chromium, polybrominated biphenyls or polybromianted diphenyl ethers; or (b) 0.01% (by weight) for cadmium. Unless otherwise stated by 3M in writing, this information represents 3M's knowledge and belief based upon information provided by third party suppliers to 3M.

3M™ Mini D Ribbon (MDR) Connectors

.050" Plastic Shielded Junction Shell for Round Cable

103 Series

Contact Quantity	Dimensions						
	A	B	C	D	E	F	G
14	.76 [19.4]	1.15 [29.3]	1.02 [25.9]	1.30 [33.0]	.57 [14.5]	.25 [6.3]	.67 [17.1]
20	.91 [23.2]	1.15 [29.3]	1.17 [29.7]	1.30 [33.0]	.57 [14.5]	.26 [6.7]	.82 [20.9]
26	1.06 [27.0]	1.15 [29.3]	1.32 [33.5]	1.30 [33.0]	.57 [14.5]	.28 [7.1]	.97 [24.8]
36	1.31 [33.3]	1.01 [25.6]	1.57 [39.8]	1.26 [32.0]	.63 [16.0]	.32 [8.1]	1.22 [31.1]
40	1.41 [35.8]	.98 [24.8]	1.67 [42.4]	1.26 [32.0]	.63 [16.0]	.32 [8.2]	1.32 [33.6]
50	1.66 [42.2]	.98 [24.8]	1.92 [48.7]	1.26 [32.0]	.63 [16.0]	.34 [8.7]	1.57 [40.0]
68	2.11 [53.6]	.98 [24.8]	2.37 [60.1]	1.26 [32.0]	.71 [18.0]	.36 [9.1]	2.02 [51.4]



Inch
[mm]

Tolerance Unless Noted			
	.0	.00	.000
inch	±.1	±.01	±.005

[ ] Dimensions for Reference Only

Notes:
1. Part number includes a cable clamp and 2X M2.6 screws. These parts are not shown.
2. Panel thickness including washers must be less than 2.0 mm.

Ordering Information

103XX-3210-00X

- XX — Contact Quantity (See Table)
- X — Color Code:
  - 0 = Beige (Standard)
  - 3 = Medium Gray (Special)
  - 6 = Black (Special)

TS-0571-07
Sheet 2 of 2

For technical, sales or ordering information call
800-225-5373

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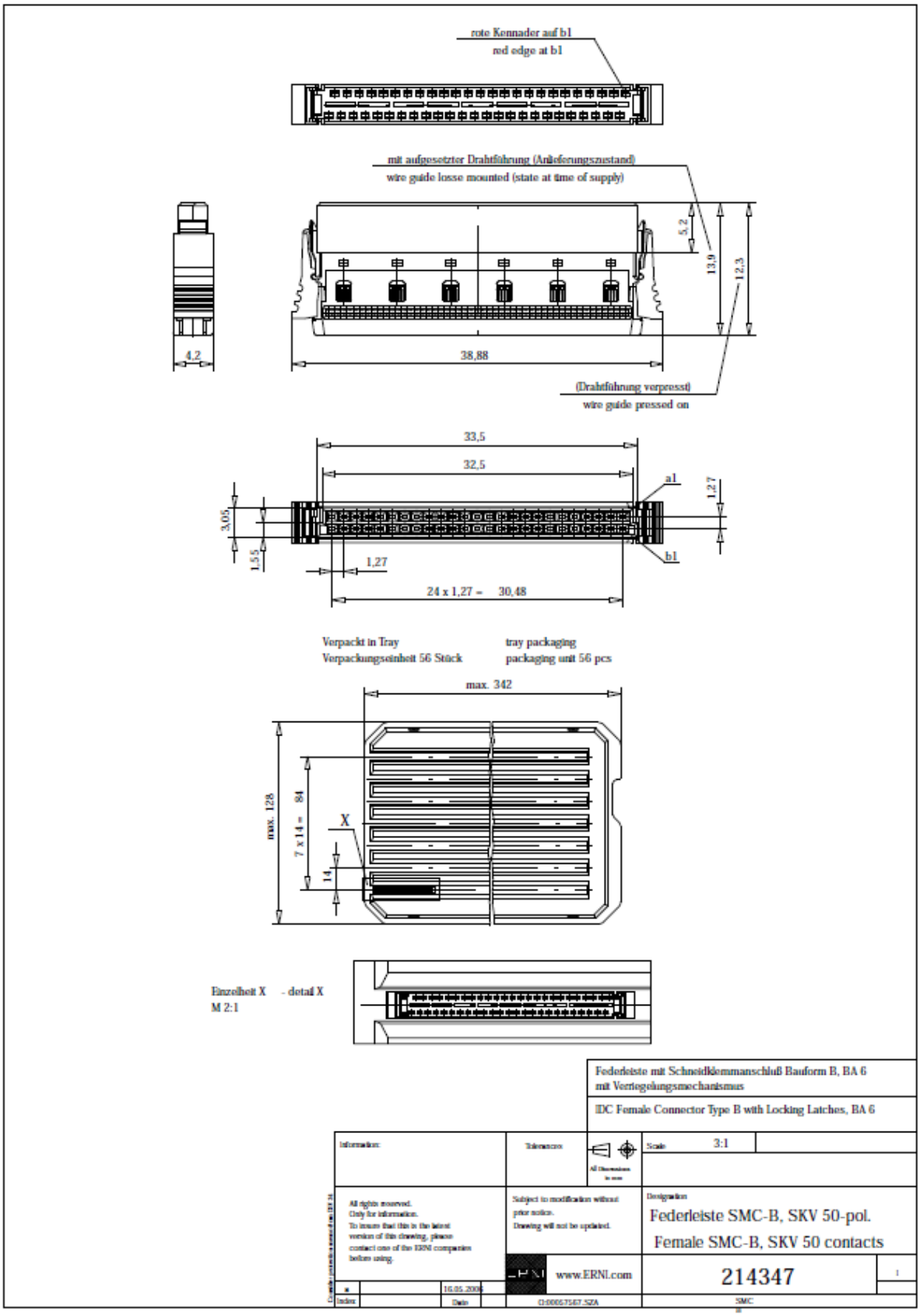
Minimum 10% Post-Consumer Fiber

6 ERNI Connector Specifications



7 Expandable Sleeving Specifications

WIRE MANAGEMENT PRODUCTS

UL VW-1
MIL-I-631D
RoHS COMPLIANT

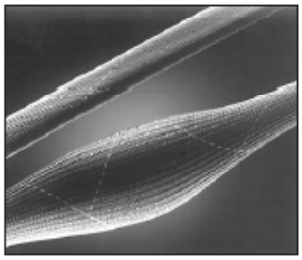
NON-FRAYING, EXPANDABLE BRAID SLEEVING

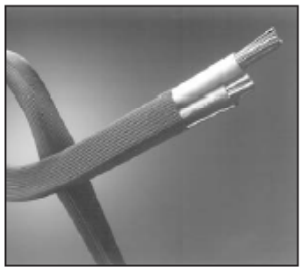
GRP-110NF, 120NF

153

CHOOSE GRP NF FOR:

- Frayless Cuts **WITHOUT A HOT KNIFE!**
- Frequent Expansion at Scissor Cut Ends Without Fraying!
- Lightweight, Flexible Routing
- Use with Automatic Cutting Machines
- Use with **XTRA•GUARD®** Flexible Cables





GRP NF APPLICATIONS:

- Field Installation Without Hot Knife
- Protection of Wire, Cable and Hoses
- Wire Bundling & Harnessing
- Wire Splices

CHARACTERISTICS

OPERATING TEMPERATURE:
- –70°C to 125°C

COLOR DESCRIPTION:
- GRP-110NF: Black
- GRP-120NF: Black with White Tracer

PHYSICAL PROPERTIES:
- Withstands Short Term Exposure to 230°C
- GRP-120NF Passes UL VW-1 Flame Test

CHEMICAL PROPERTIES:
- Not Affected by Most Chemical Environments and Common Solvents (Freon, Detergents, Soaps, Bleaches and Water)
- Fungus Resistance: No Growth

SPECIFICATIONS

- MIL-I-631D
- RoHS Compliant

Recognized Component Underwriters Laboratories Inc. | Passes UL VW-1 Flame Test Underwriters Laboratories Inc. | RoHS Compliant

Alpha's GRP NF is a braided sleeving designed not to fray when cut with ordinary scissors or when repeatedly expanded and retracted. This product **DOES NOT REQUIRE A HOT KNIFE WHEN CUTTING!** Ends remain clean after installation in the field as well as on the bench. Can be used on automated cutting machines.

General Purpose Alpha Part No.	Flame Retardant Alpha Part No.	Size	Minimum Supplied I.D. Inches	Minimum Supplied I.D. mm	Maximum Expanded I.D. Inches	Maximum Expanded I.D. mm	Nominal Wall Thickness Inches	Nominal Wall Thickness mm	Spools Total Ftg.
GRP-110NF18	GRP-120NF18	1/8	0.093	2,36	0.250	6,35	0.027	0,69	100, 500
GRP-110NF14	GRP-120NF14	1/4	0.125	3,18	0.440	11,09	0.027	0,69	100, 500
GRP-110NF12	GRP-120NF12	1/2	0.250	6,35	0.750	19,05	0.027	0,69	100, 500
GRP-110NF34	GRP-120NF34	3/4	0.500	12,70	1.250	31,75	0.027	0,69	100, 500
GRP-110NF114	GRP-120NF114	1-1/4	0.750	19,05	1.750	44,45	0.027	0,69	50, 250
GRP-110NF112	GRP-120NF112	1-1/2	1.250	31,75	2.750	69,85	0.027	0,69	50, 250

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