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		AUTHORIZED BY Nick Zhang	DATE 4-19-2016
CLASSIFICATION UNRESTRICTED			

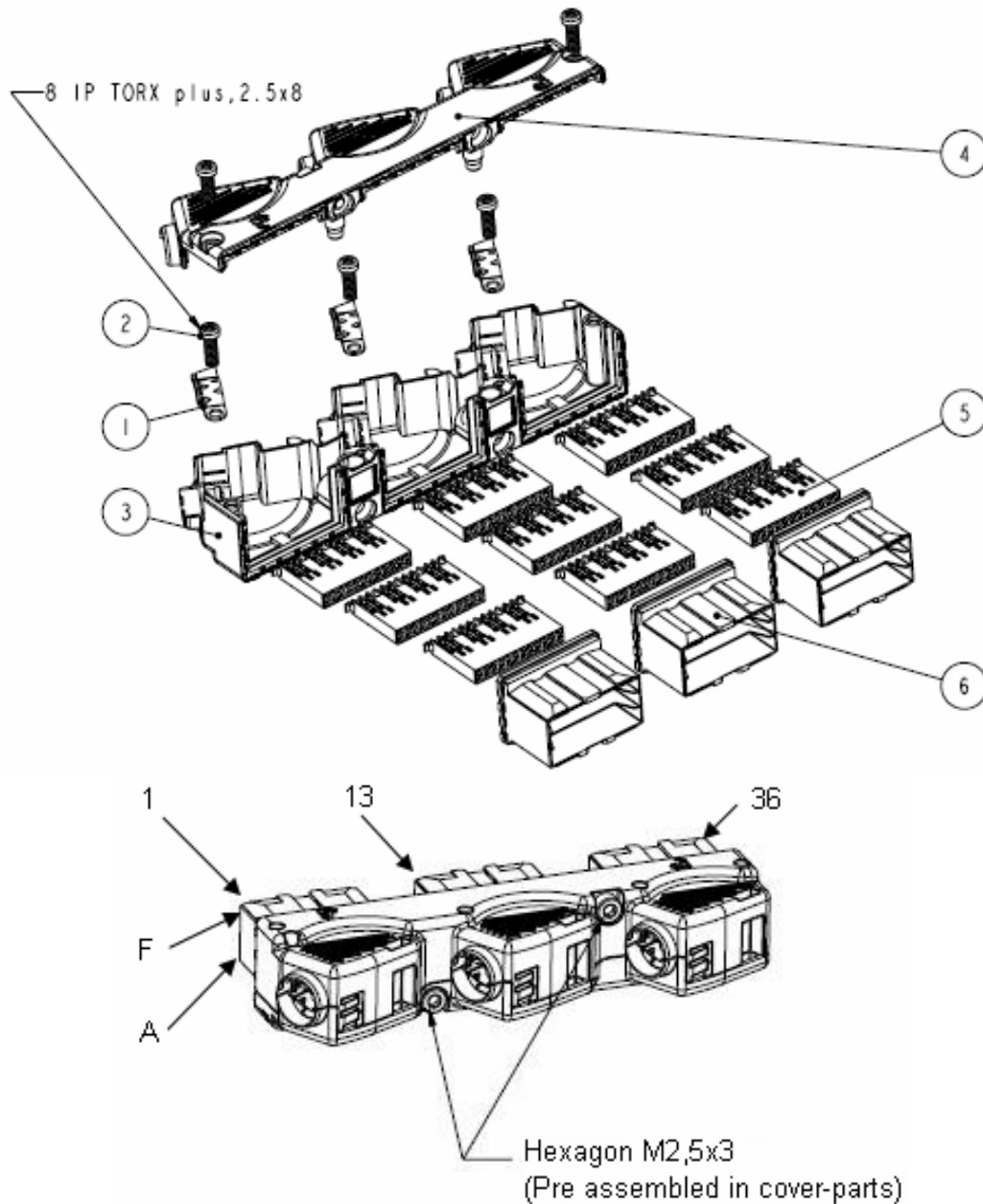
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1 CONNECTOR ASSEMBLY LAY-OUT

Kit part number 10076192-101LF 72 pair

Pict 1

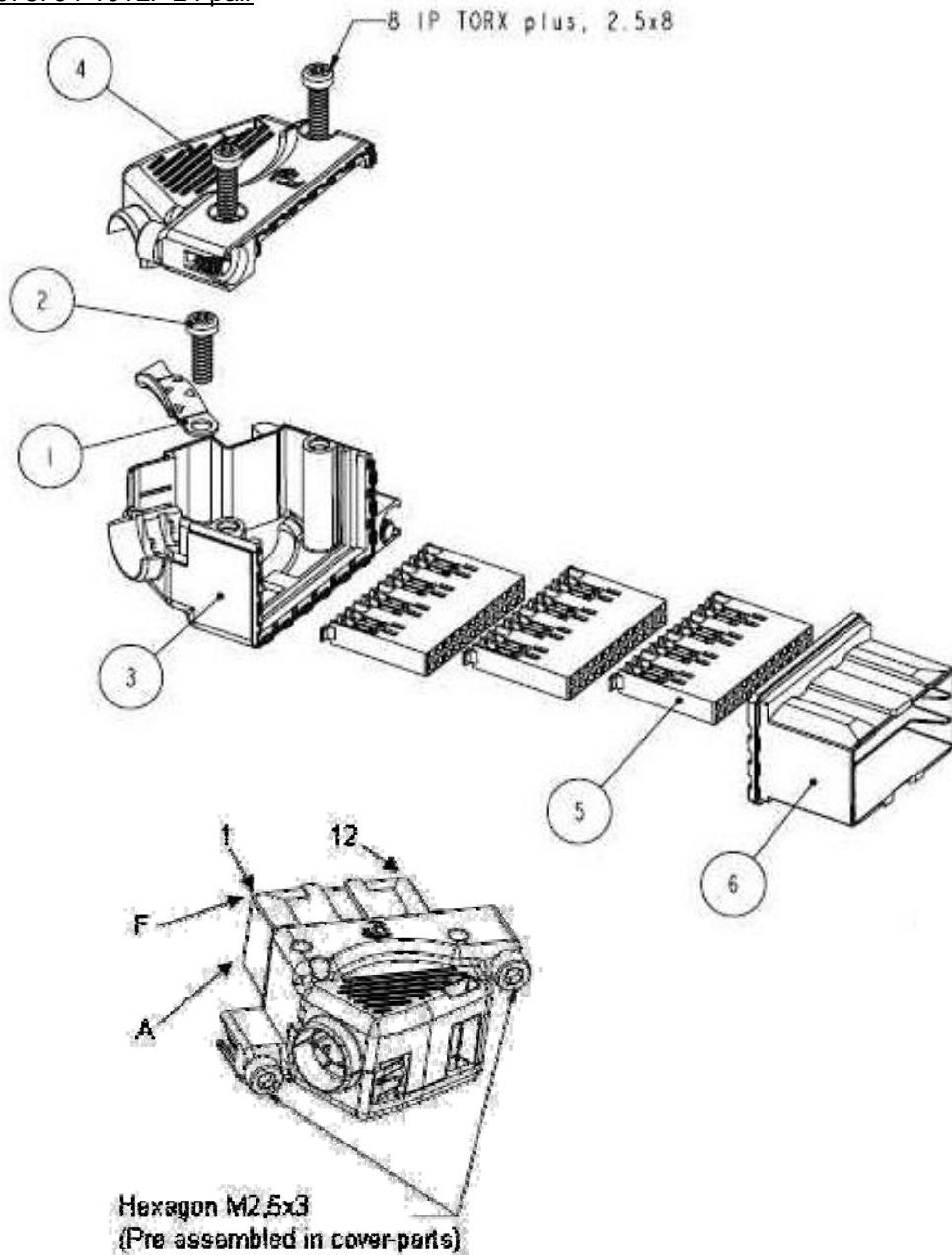


6	SHROUD	3
5	TERMINAL BLOCK ASSEMBLY	9
4	SUB-ASS'Y TOP-COVER	1
3	SUB-ASS'Y BOTTOM-COVER	1
2	CONNECTOR SELF TAPPING SCREW	5
1	CLAMP	3
INDEX NO.	TITLE I	QTY

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Kit part number 10078794-101LF 24 pair

pict 2

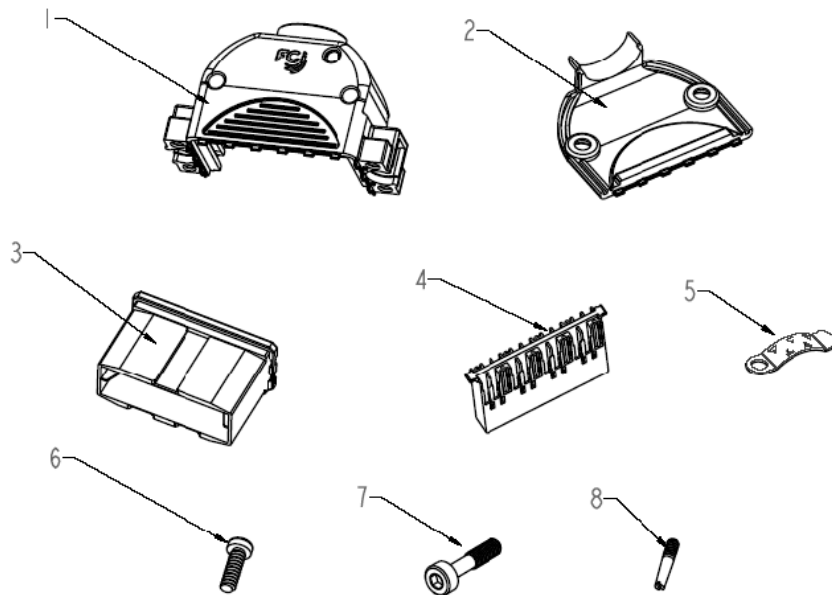
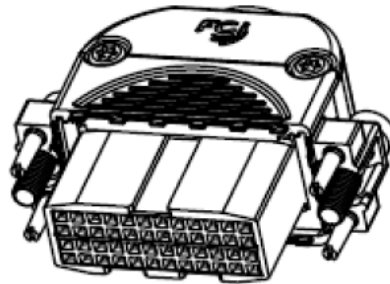


6	SHROUD	1
5	TERMINAL BLOCK ASSEMBLY	3
4	SUB-ASSEMBLY TOP-COVER	1
3	SUB-ASSEMBLY BOTTOM-COVER	1
2	CONNECTOR SELF TAPPING SCREW	3
1	CLAMP	1
INDEX NO.	TITLE	QTY

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Kit part number 10128988-102LF 16 Pair

pict 2-1

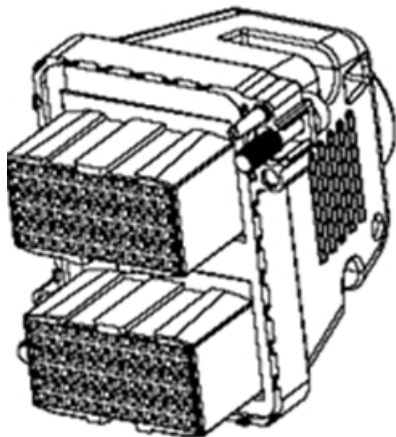
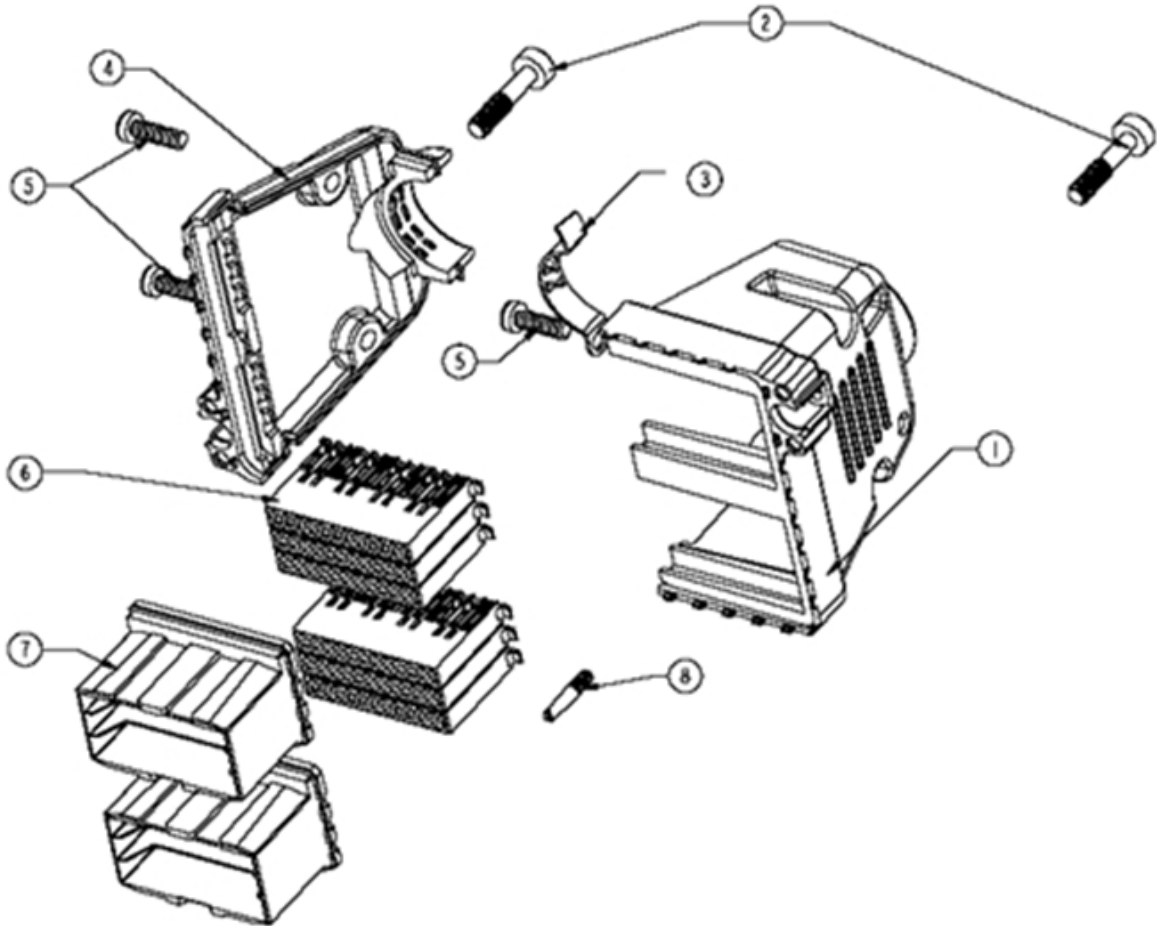


8	10131300-001	CODING KEY	1
7	10131301-001	SCREW	2
6	10083847-001	SELF TAPPING SCREW	3
5	10124618-001LF	CLAMP	1
4	10076649-002	TERMINAL BLOCK ASSEMBLY	2
3	10124617-001LF	SHROUD	1
2	10131298-001	SUB ASSEMBLY TOP-COVER	1
1	10131299-001	SUB ASSEMBLY BOTTOM-COVER	1
NO.	PART NUMBER	COMPONENT NAME	QTY

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Kit part number 10134895-001LF 48 pair

pict 2-2

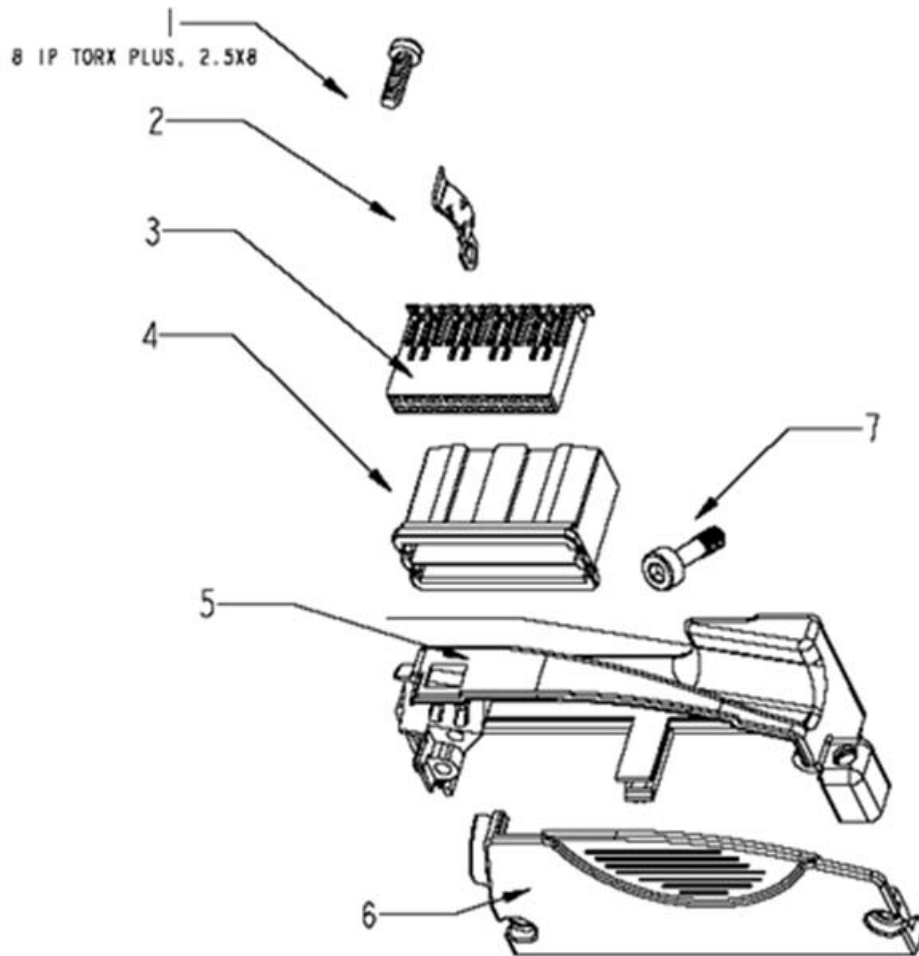


8	KEY PIN	1	STAINLESS STEEL
7	SHROUD	2	THERMOPLASTICS
6	TERMIANL BLOCK ASSEMBLY	6	THERMOPLASTICS+COPPER ALLOY
5	SELF TAPPING SCREW	3	CARBON STEEL
4	SUS ASSEMBLY TOP-COVE	1	ZINC ALLOY
3	CLAMP	1	STAINLESS STEEL
2	MOUNTING SCREW	2	STAINLESS STEEL
1	SUS ASSEMBLY BOTTOM-COVE	1	ZINC ALLOY
NO.	DESCRIPTION	Q'ty	MATERIAL

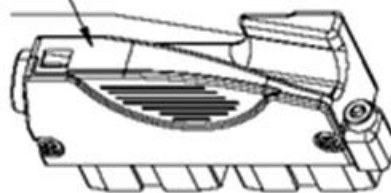
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Kit part number 10124614-101LF 32 pair

pict 2-3



Hexagon M3.0 x 4
(Pre-assembled in cover - parts)



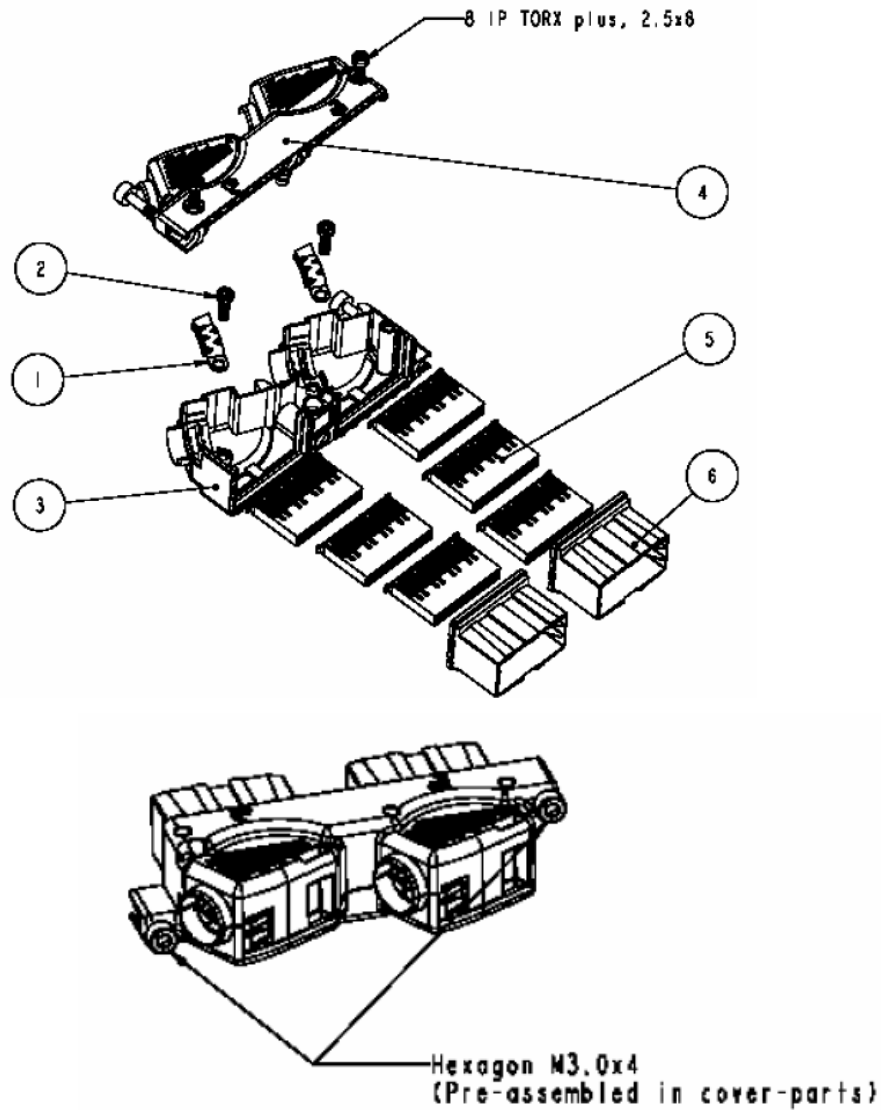
7	MOUNTING SCREW	2
6	TOP COVER	1
5	BOTTOM COVER	1
4	SHROUD	2
3	TERMINAL BLOCK	4
2	CLAMP	1
1	SELF TAPPING SCREW	3
No.	NAME	QTY.

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Kit part number 10090081-101LF 48pair

pict 2-4

48 Pair Cable Connector (2 Outlets)



6	SHROUD	2
5	TERMINAL BLOCK ASSEMBLY	6
4	SUB ASSEMBLY TOP-COVER	1
3	SUB ASSEMBLY BOTTOM-COVER	1
2	CONNECTOR SELF TAPPING SCREW	4
1	CLAMP	2
INDEX NO.	TITLE I	QTY

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2 OBJECTIVE

This specification provides information and requirements for customer application of the Metral™ HDXS 24 & 72 pair cable connector kits. It is intended to provide general guidance for application process development. It should be recognized that no single process will work under all customer applications and that customers should develop processes to meet individual needs. However, if the process varies greatly from the recommended one, FCI cannot guarantee acceptable results.

3 SCOPE

This specification provides information and requirements regarding application of Metral™ HDXS 72 & 24 pair cable connector kits (FCI kit product number: 10076192 and 10078794) into cable assemblies.

4 GENERAL

This document is a general application guide. If there is a conflict between the product drawings and this specification, the drawings take precedence.

5 DRAWINGS AND APPLICABLE DOCUMENTS

FCI product drawings and specifications are available by accessing the FCI website or contacting the FCI Technical Service. In the event of a conflict between this specification and the product drawing, the drawing takes precedence. Customers should refer to the latest revision level of FCI product drawings for appropriate product details.

GS-12-485 Product specification

10078794-101LF Cable Assembly Kit 24 pair connector.

10076192-101LF Cable Assembly Kit 72 pair connector.

10128988-102LF Cable Assembly Kit 16 pair connector.

10134895-001LF Cable Assembly Kit 48 pair connector.

10124614-101LF Cable Assembly Kit 32pair connector.

10090081-101LF Cable Assembly Kit 48pair connector.

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6 APPLICATION REQUIREMENTS

Materials, as cable and shrink sleeves must comply to the specifications mentioned in the product specification.

7 RECOMMENDED WIRE SIZES AND INSULATIONS

7.1 WIRE INSULATION MATERIALS

Semi-rigid PVC,PVC,PE,PP have been used.

7.2 MAXIMUM INSULATION DIAMETERS AND WIRE SIZES

Conductor Size	Maximum Insulation Dimensions			
	Insulation Thickness		Insulation Diameter	
	mm	inch	mm	inch
26 gage solid	0.17	0.0067	0.74	0.0291
0.4mm solid	0.17	0.0067	0.74	0.0291
24 gage solid	0.25	0.0098	1.0	0.0394
0.5mm solid	0.25	0.0098	1.0	0.0394

Certain stranded wires can be successfully inserted in the contact IDC but must be qualified individually. The specification of the cable using the stranded wire must have the wire insulation type, wire insulation Thickness, number of strands, size of strands and twist of strands controlled.

7.3 UNINSULATED WIRES

Uninsulated wire of size 24, 26 gage plus 0.4mm diameter have been successfully inserted in the contacts.

8 ACCEPTABLE WIRE TERMINATION

Caution: The wire strain relief of each contact must be closed by the wire insertion punch even if no wire is inserted into the contact! If the strain relieves are not closed, a short can occur between contacts on both shielded and unshielded connectors or between the contact and metal shields on shielded connectors.

The automatic wire terminators will set all the unused contacts unless the machine cycle is interrupted. When using hand tools, the operator must index the connector subassembly to all unused positions and activate the hand tool.

8.1 TERMINATION REQUIREMENTS, VISUAL

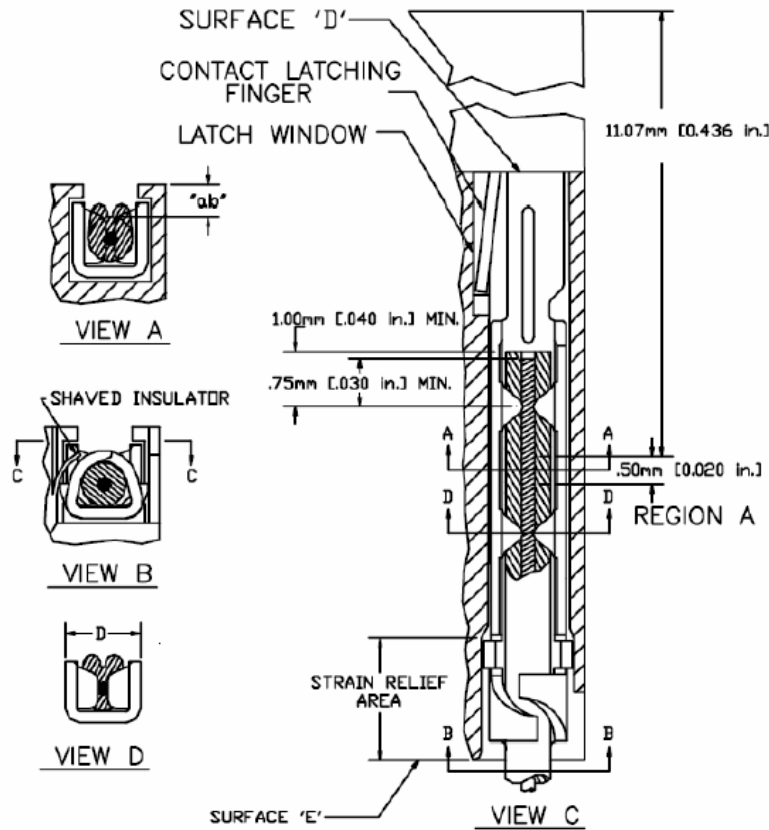
Requirements for an acceptable termination as well as non-destructive visual inspection methods to insure satisfactory terminations without removing wires.

8.1.1 WIRE LOCATION

The copper conductor shall extend at least 0.75mm beyond the IDC dimples. This requirement shall be considered met if the wire insulation extends at least 1.00mm beyond the IDC dimples. At a maximum the insulation may extend to surface "D". see pict 3 .

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Pict 3- WIRE INSERTION VISUAL REQUIREMENT



8.1.2 WIRE DEPTH

The wire shall be inserted into the IDC dimples so that the wire depth is greater than or equal to “ab” as measured from the connector insulator to the top of the wire insulation in region “A”(views A and C of pict3). A dial indicator (as depicted on pict 4) can be used to measure the depth required. The minimum “ab” is based on the diameter of the wire being used. For 26 gage wire, insulation diameters equal to 0.74mm (0.0291 inch), “ab” can be determined from relation “ab”=0.42+/-0.12mm; For 24 gage wire, insulation diameters equal to 1mm (0.0394 inch), “ab” can be determined from relation “ab”=0.36+/-0.12mm;

The measurement should be done when the insertion equipment is set up. If the measurement is less than specified, reduce the depth of insertion until it is meet. contact you FCI representative if the wire you selected cannot meet all requirements.

A standard depth gage is available for the measurement if “ab” as listed below. We have observed that with some wire insulation types, the insulation gradually lifts off the wire after insertion. For this reason, the measurement of wire depth “ab” should be made as soon after insertion as possible to avoid incorrect low readings.

Pict 4-WIRE DEPTH GAGE

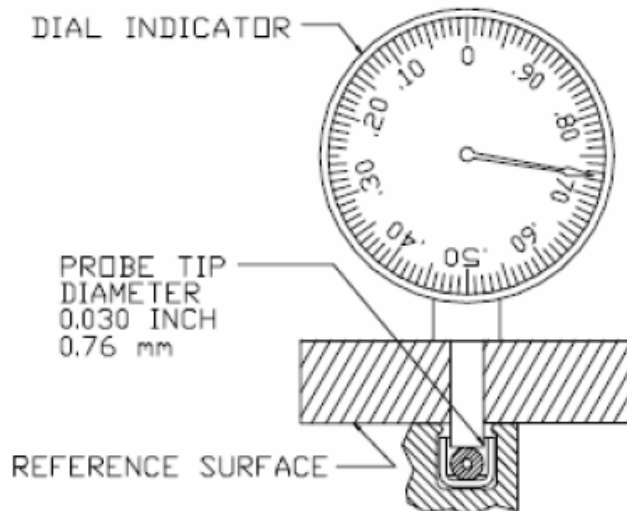
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Rev C

GS-01-001

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Dial Indicator Insertion Depth Gage			
FCI Part No.	Scale	Travel per Revolution	Graduations
413395-001	Millimeters	1.00	0.01



8.1.3 **STRAIN RELIEF**

For 26 gage wire, all strain relief tabs must be crimped firmly against the wire such that the wire will not be dislodged with a 9.8N(2.2LB.) minimum pull.

For 24 gage wire, all strain relief tabs must be crimped firmly against the wire such that the wire will not be dislodged with a 19.6N(4.4LB.) minimum pull.

The wire shall be pulled at 90 degrees to the axis of the terminated wire, in a direction opposite to the insertion direction. It should be considered a major defect if either of the contact strain relief tabs have not been crimped over the wire.

8.1.4 **IDC TERMINAL DAMAGE**

There should be no distortion of the metal terminal other than the intended forming of the strain relief except that the insertion punch may cut into the ace of the IDC dimple a maximum of 0.1 millimeter (0.004 inched) during wire insertion.

8.1.5 **WIRE DAMAGE**

There shall be no breaks in the wire insulation to expose the center conductor below surface "E" In pict 3, view C. marks and dents in the insulation caused by the insertion equipment that do not expose the conductor in this area are permitted.

8.2 **TOOL SET UP AND DESTRUCTIVE INSPECTION TECHNIQUES**

Techniques to verify proper tool set-up and for further inspection of suspected visual failures require wire removal. Wire removal shall be done in accordance with the following instructions.

8.2.1 **WIRE REMOVAL**

Force open the wire strain relieves of the contact and peel the wire away from the strain relief and out of the IDC dimples, being careful not to damage the contact.

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8.2.2 **IDC TERMINAL DAMAGE**

Examine the IDC dimples. There shall be no visible damage other than that caused by the intended forming of the strain relief and the normal widening of the IDC gap by the wire except that the insertion punch may cut into the face of the IDC dimple a maximum of 0.10 millimeters(0.004 inches) during wire insertion.

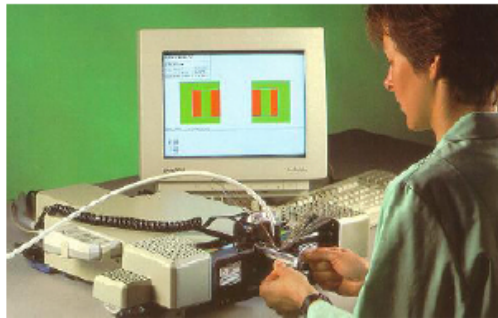
8.2.3 **ACCEPTABLE METALLIC CONTACT**

The removed wire shall show evidence of metallic contact with all four IDC dimples.

9 **APPLICATION TOOLING**

Product number	Tool description	Remark
BPY-6748-PC1	Semi automatic IDC cable terminator	Foehrenbach Belgium
BPY-13848	Manual IDC tool	Foehrenbach Belgium
BPY-75D25	IDC repair tool	Foehrenbach Belgium
Cable stripper	General available cable stripper	
Torx screw driver	Torx T8	

The BPY tooling is available at: Foehrenbach Belgium
BPY-6748-PC1 BPY-75D25



Pict5



pict 6



Stripper

pict 7

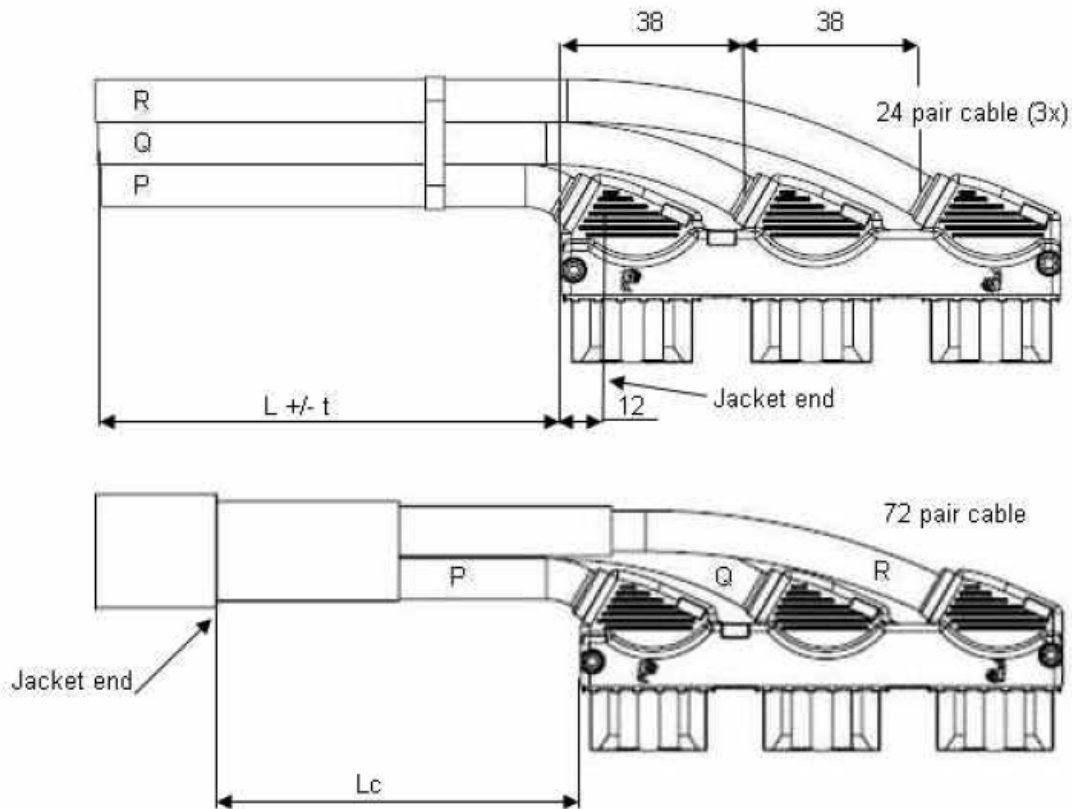
10 **APPLICATION PROCEDURE**

10.1 **CABLE PREPARATION**

10.1.1 CUT THE CABLE TO THE DESIRED LENGTH AND STRIP OUTER JACKET.

- The cable length L on the drawing is referenced to the front of the connector housing.
- The reference on the cable is the Bundle jacket or Shrink sleeve end.
- This bundle jacket end or shrink sleeve end will protrude approximately 12mm into the front of the connector housing.(at each cable entry)
- Advised is to strip 120mm of cable for internal wiring and IDC operation.

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pict 8

- General
The cable used on this connector can either be 3 separate 24 pair cables or one 72 pair cable. The 72 pair cable is to be split up in 3 bundles of 24 (twisted) pairs. Each bundle should be prepared to the correct length to fit the Connector. This procedure describes a single ended cable assembly. The dimension Lc is arbitrary and considered as the minimum length needed to be able to make a cable assembly at a BPY 6748 applicator. Dimensions given at customer drawings always take precedence.

10.1.1.1 CALCULATE THE CABLE CUT & CABLE STRIP LENGTH'S

- **L** = the given length at customer drawing.
- **t** = the tolerance on length L
- **Lk** = Cable cut length
- **Ls** = Jacket strip length
- **Lc** = Distance from connector body to 72pair jacket (215mm)
This distance is arbitrary, and defined minimum 215mm. Coming out of experience making cable assemblies with the BPY6748 IDC machine.

Cable cut length

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72 pair cable;

$$Lk=L+12+38+38+120= L+208mm$$

24 pair cable;

$$Lk=L+12+120= L+132mm \text{ (Bundle P)}$$

$$Lk=L+12+38=120= L+170mm \text{ (Bundle Q)}$$

$$Lk=L+12+38+38+120= L+208mm \text{ (Bundle R)}$$

Cable strip length

72 pair cable;

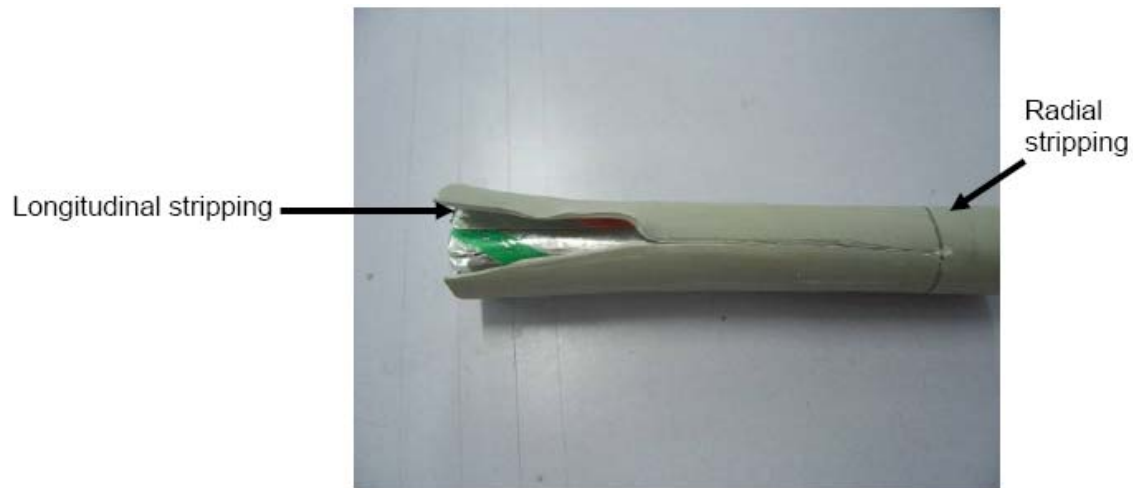
$$Ls = Lc+38+38+120= 411mm \text{ (outer jacket)}$$

24 pair cable;

$$Ls= 120mm \text{ (all 3 bundles)}$$

10.1.2 **STRIP THE CABLE JACKET**

The Stripper advised is a manual stripper which can cut cable jacket radially as well as longitudinal.



Pict 9

This longitudinal stripping is a must for the 72pair cable because of the big stripping length of > 411mm and the tight cable outer jacket.

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10.1.3 **OPTIONAL CABLE BUNDLE PREPARATION WITH SHRINKSLEEVE, ONLY 72PAIR CABLE**

- Once stripped the outer jacket, secure the aluminum wrap and or other foils, with some cellotape to make shrink sleeve application more easy.



Pict10

10.1.3.1 **APPLY THE SHRINKSLEEVES**

When the shrink sleeve is specified on the customer drawings, following remark must be made. Preferably use shrink sleeve which has a radial retraction and no length change during shrinking. Since the end of the jacket, (shrink sleeve), is the assembly reference in the covers, every deviation in length can cause assembly problems.

Assuming $L_c=215\text{mm}$, the respective shrink sleeves must be 215 (P), 253 (Q), 291(R) mm long.

- Assure the shrink sleeves are moved up to the cable jacket, every mis-positioning, misalignment or length difference of the shrink sleeve will give more difficulties when assembling the final assembly in the cover.
- Shrink the heat shrink sleeves starting at the end which is farthest away from the cable jacket. This is to be sure that the position is ok.

When the 3 bundles are prepared, a transition shrink sleeve can be mounted over the transition area where the cable jacket ends, and the P, Q, R bundles start. (Can be shrunk now or later)

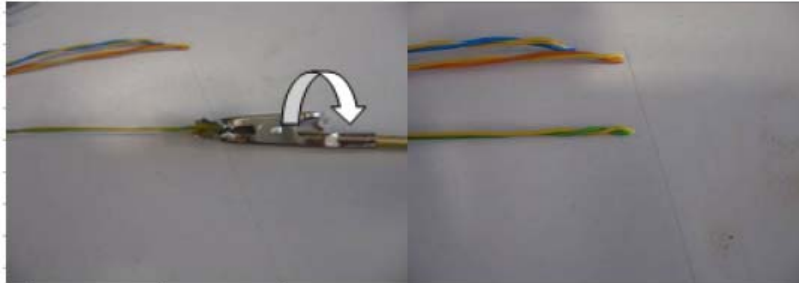
10.1.3.2 **CABLE PREPARATION AND COLORDRESSING**

The cables used can be quite different of detail construction. Some cables have twisted pairs with a long twist pitch, some with a very short twist pitch. There is a chance that pairs get untwisted and wires mix up with wires from another pair.

Therefore it is sometimes necessary to secure the pairs with an extra twist.

- **After heat-shrinking the bundle heat-shrink sleeves, be very careful handling the cable. Every movement can cause untwisting of the long pitch twisted pairs, and end in a mixup of colors**
- The preparation and color dressing is depending on the termination scheme of the cable assembly which has to be made. The Heat shrink sleeve can be seen as the jacket of the 24p cable.
 1. Cut Mylar or polyester foil. **Now it is very important not to untwist any pair.**
 2. Secure long pitch twisted pair by two extra twists at the end of the wires.

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Pict 11
Secure wire pairs by giving 2 twists

Pict 12
Secured twist

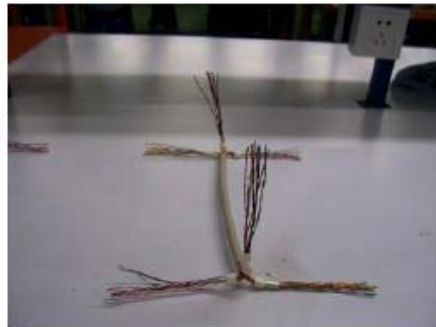
Making more than 2 twists will take more time making them as well as untwisting them when the IDC process has to be performed.

3. Make cable bundles according the cable assembly drawing.

One bundle for each terminal block row AB, CD and EF.

The bundle can be secured easily with some re-usable ferrules.

The orientation of the wire bundles on short cables, must be aligned according connector position defined. (Front and backside)



Example of a 24pair cable prepared for Idc termination.

Pict 13

4. When shielding requirements are set by customer specification, prepare the shielding foils , and or braid accordingly.

10.2 CABLE IDC

General BPY setup;

- For application tooling see Chapter 7.
- Read the BPY manual before setting up and adjusting the machine.
- For the 72 pair connector, the Terminal block type 72pair must be chosen, it will automatically use 3, 2x12 terminal blocks in the sequence AB, EF, CD.
- Make a program with color scheme's according the connection schemes.
- Choose the correct program in the "assembly library", selective loaded or fully loaded.

10.2.1 PLACE THE PREPARED CABLE IN THE WIRECLAMP

- The orientation of the wire bundles must be according the wiring scheme. The most used orientation is AB on the left hand side, EF on the right hand side, and CD in the middle. When short cables with strict connector orientation have to be made, the rotational positioning of the cable is very important.

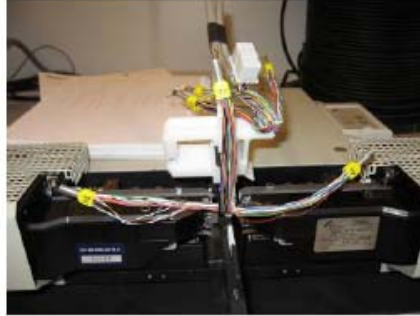
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- The end of the cable jacket or shrink sleeve, to be aligned with the cable clamp end.



pict 14

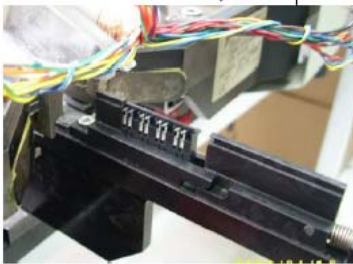
End of the cable jacket lined up with the end of the cable clamp.



pict 15

Bundles AB, CD, EF

- Open terminal block holder, load terminal block, close terminal block holder carefully, and assure the knob is in locked position



pict 16

Open terminal block holder with



pict 17

Terminal block holder closed



pict18

Knob in locked position, Terminal block loaded

- Press the "Cont." button on the remote control of the BPY
- The terminal block will move into the A1-B1 position. (AB terminal block)
IDC the correct wire(s) in the correct terminal position(s).
- When the 12th position is reached, the terminal block holder will go to the eject position.
- Open the terminal block holder, carefully lift the attached terminal block out of the holder, and fold it to the left hand side. Just above the horizontal position.
- Load a new terminal block, press "Cont.", wire the EF terminal block.

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- After termination take the terminal block out of the terminal block holder, and fold it to the right hand side.
- Repeat with CD terminal block.

After terminating 3 terminal blocks for the 24pair cable, or 9 terminal blocks for the 72pair cable, one cable side is finished IDC, and can be removed from the machine.

10.3 ASSEMBLING THE CONNECTOR

10.3.1 ASSEMBLING 3 TERMINALBLOCKS IN A SHROUD

- Align the 3 terminal blocks in such a way that the bottom side and the end walls line up.
- Position the 3 terminal blocks with one bottom corner in the shroud.

Pay attention to the correct orientation of the shroud (polarization)



Pict 19



Pict 20

Inserting 3 terminal blocks in shroud

- Be sure the 3 terminal blocks are seated well in the shroud. All six locking features at the top of the terminal blocks must be seated well in the shroud.



Pict 21

Inspect well seating of locking Features (2x3)

- Assemble 3x 3 terminal blocks in 3 shrouds, check on the well seating of the locking features.
- Check on orientation of the shrouds relative to the cable layout. Note that there is a asymmetric flange at the top of the shroud.

10.3.2 ASSEMBLING SHROUDS IN THE DIECAST COVERS

- Place the 3 shrouds with terminal blocks in the cover

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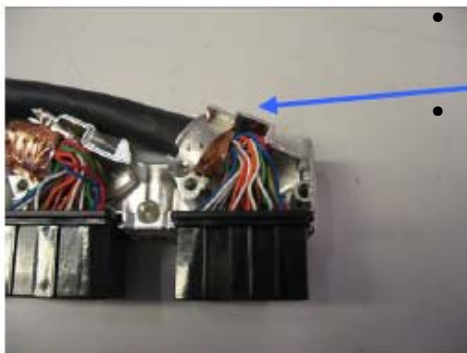
Pict22

The pre process for the self tapping screws:

1. Soak ----- Put the self tapping screws immersed into a container filled with lubricating oil for 30 minutes.
 2. Oil Sieve ----- Remove the self tapping screws from the lubricating oil and put them in the screen mesh for filtering.
 3. Use And Save ----- The screws filtered can be used up ASAP within 1 hour. If these screws can't be used up in the proposed time, please put them in the bag sealed
- Remarks: lubricating oil----- Volatile lubricating oil (such as cutting oil etc)

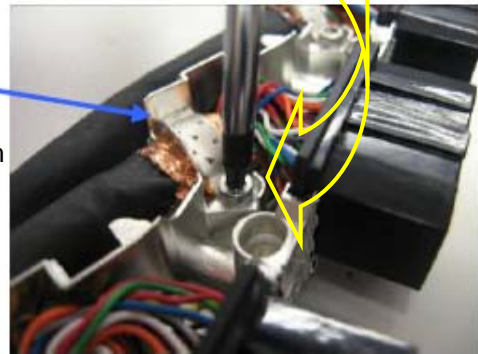


10.3.3 PLACE THE CABLE CLAMPS IN THE CORRECT POSITION



Pict 23

- Slide the cable clamps in the Corresponding slots.
- Screw down the Torx screw With a max torque of 0.72Nm



Pict24

10.3.4 CLOSE THE COVER



- Place the cover on the assembly. Before doing this, assure that there is no shielding foil, or wires trapped between the 2 cover halves, which can obstruct a proper closing.
- Screw down the 2 Torx screws with a max torque of 0.72Nm.
- Place cable ties according specification on cable assembly drawing.

10.4 LABELING AND PACKAGING

Label and pack the cable assembly according to the requirements of the customer.

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11 REWORK

11.1 REPAIR TOOLING

BPY-75D25

11.2 WIRE REPLACEMENT

No testing has been done on the reliability of the contacts that have been repaired (wire removed and replaces). Contacts with improperly inserted or incorrect wires should be removed and replaced.

11.3 DAMAGED CONTACTS IN A COMPLETED CONNECTOR

Damaged contact must be removed from the connector and replaced.

11.4 REMOVING CONTACTS FROM THE INSULATOR

Contacts are removed by inserting the contact removal tool, BPY-75D25 into the lock window in the insulator and deforming the lock tab in away from the window. This allows the contact to slide out through the back of the insulator. If the contact is to be reinserted, then the contact must be removed carefully so as to not bend or deformed the contact. The contact must also be protected from damage until it is reinserted.

11.5 INERTING CONTACT INTO THE INSULATOR

Carefully insert the contact into the desire insulator position. Check the orientation of other contacts in the insulator and orient the contact to be inserted the same before beginning insertion. Replacement contacts can be obtained by removing a contact from an identical connector sub-assembly or HM2CCD4MN9FLF. The contact must be fully seated so that the latch finger snaps into the locking window and holds the contact in place.

11.6 WIRE INSERTED IN WRONG POSITION OR DEFECTIVE INSERTION

11.6.1 PREFERRED METHOD OF REPAIR

The preferred method of repair is to cut off the defective connector sub-assemblies from the cable just above the connectors, strip the end of the cable and insert the wires into new connector subassemblies.

11.6.2 ALTERNATE METHOD OF REPAIR

11.6.2.1 WIRE INSERTED IN WRONG POSITION

Remove the inserted contact using BPY-75D25 being careful not to damage the contact or disturb the wire at the IDC's. In some cases the amount if free wire between the connector sub-assembly and the cable jacket is too short to back the contact out of the insulator. In this case the cable jacket will have to be slit higher to free more wire length to accomplish the task. After removal carefully reinsert the contacts in the correct positions. Another method would be to remove all contacts in the insulator at the same time which does not require slitting the cable jacket and reinserting all the contacts also at the same time. This latter method is not recommended since it is very hard to properly reinsert all the contacts at same time.

11.6.2.2 DEFECTIVE INSERTIONS

11.6.2.2.1 REINSERTION OF WIRE IN IDC OF CONTACT

Remove the inserted contact with BPY-75D25. Replace the contact with a new contact with new contact. The preferred method is to cut the wire outside the contact but if this does not leave a long enough wire for reinsertion then the strain relief of the

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contact can be opened and the wire removed. After removal of the wire cut off the end of the wire just before were the first IDC dimple had contacted the wire. Reinsert the end of the wire using wire insertion repair tool BPY-75D25. The reinserted wire must meet all the requirements listed for normal wire insertion.

11.6.2.2.2 **SOLDERING OF WIRE IN CONTACT**

Remove the inserted contact with BPY-75D25. Replace the contact with a new contact. The preferred method is to cut the wire outside the contact but if this does not leave a long enough wire for reinsertion then the strain relief of the contact can be opened and the wire removed. After removal of the wire cut off the end of the wire just before were the first IDC dimple had contacted the wire. Remove the insulation from the wire such that after reinsertion the wire is positioned in the contact. Reinsert the wire using the contact wire insertion repair tool BPY-75D25 setting the strain relief and carefully solder the wire to the contact IDC channel at the first set of IDC dimples or between sets of IDC dimples. The soldering operation must be done as quickly as possible to prevent damage to the insulator. Do not allow solder to protrude above the contact. Only certified soldering operators should be used to make these repairs.

12 REVISION RECORD

REV	PAGE	DESCRIPTION	ECR#	DATE
A	ALL	New	H07-0143	04-07-2007
B	ALL	Add item 7, item 8, item11	N10-0317	08-31-2010
C	ALL	1. New add P/N. and the pre process a methods for the self tapping screws. 1.10 128988-102LF 16 pair(new P/N) 2.10 124614-101LF 32 pair(new P/N) 3.10 134895-001LF 48 pair(new P/N) 2. Modify max torque from 1.0Nm to 0.72Nm	ELX-N-23890	04-19-2016