

**NOTE**



All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.

## 1. INTRODUCTION

This specification covers the requirements for the application of Z-PACK 2 mm HM Interconnection System for Board-to-Board Connections and provides information on the standard modules (Types A, B, C, A/B, D, E, F, and D/E) and modules with cavities for special contacts (Types L, M and N). Other parts of the Z-PACK 2 mm program are mentioned for reference only, as these applications are described in other separate application specifications. Refer to Paragraph 2.4.

The Z-PACK 2 mm HM Interconnection System is a two part connector system intended to connect free boards (daughterboards, printed circuit (pc) boards) to a fixed board (motherboard, backplane or backpanel); and to feed this connection through the fixed board. Also the connection of the free boards and the connection of cables to pc boards allows for multiple configurations.

The Z-PACK 2 mm HM Interconnection System consist of the combinations shown in Figure 1.

### 1.1. Board-to-Board Connections

#### A. Free Board to Fixed Board Connections

##### 1. Standard Connections

- (a) Standard (= Right-Angle) Female Connector on the Free Board
- (b) Standard (= Vertical) Male Connector on the Fixed Board

##### 2. Midplane Connections

In a midplane connection, a free board can be connected to the rear side of the fixed board. This connection is composed of the feed-through pins of the standard male connector and a shroud at the rear side, with a spacer to fix the shroud to the feed-through pins.

#### B. Free Board to Free Board Connections

##### 1. Card Extender Applications

- (a) Right-Angle Male Connector
- (b) Standard (= Right-Angle) Female Connector

##### 2. Mezzanine and Baby Board Applications

- (a) Standard (=Vertical) Male Connector
- (b) Vertical Female Connector

### 1.2. Cable-to-Board Connections

#### A. Cable to Fixed Board Connection

This backpanel connection is composed of:

##### 1. Feed Through Pins

Feed through pins of the standard male connector and a shroud at the rear side, with an integral retention plate to fix the shroud to the feed through pins.

##### 2. Cable Connector Female

#### B. Cable to Free Board Connection

This front connection is composed of:

##### 1. Right-Angle Male Connector

##### 2. Cable Connector Female

### 1.3. Components

All pc board connectors are connected to pc boards by miniaturized ACTION PIN\* contacts. In order to meet the signal requirements, connectors can be stacked along the edge of the pc board as specified in Paragraph 3.4.

All complete pc board connectors are equipped with guide and polarization posts. Connectors are also available with a Multi-Purpose Center (MPC) which can be used with a coding device as specified in Paragraph 3.6. These alignment features can also be used to guide connectors (Types B and E) which do not have any alignment features.

Thirteen different Types (styles) of connector modules are defined:

- Type A: 110 signal contacts, 50 mm length, with MPC, guiding and polarization
- Type B: 125 signal contacts, 50 mm length/110 44 mm/95 38 mm
- Type C: 55 signal contacts, 25 mm length, with guiding and polarization
- Type A/B: 125 signal contacts, 50 mm length with guide and polarization/110 44 mm /95 38 mm
- Type L: 6 cavities for special contacts, 50 mm length, with MPC, guiding and polarization
- Type M: 3 cavities for special contacts, 55 signal contacts, 50 mm length, with MPC, guiding and polarization
- Type N: 3 cavities for special contacts, 25 mm length, with guiding and polarization
- Type M-MSD: 4 cavities for fiber-optic plugs, 55 signal contacts, 50 mm length with MPC, guiding and polarization
- Type L-MSD : 8 cavities for fiber-optic plugs, 50 mm length with MPC, guiding and polarization
- Type D: 176 signal contacts, 50 mm length, with MPC, guiding and polarization/128 38 mm
- Type E: 200 signal contacts, 50 mm length
- Type F: 88 signal contacts, 25 mm length, with guiding and polarization
- Type D/E: 200 signal contacts, 50 mm length with guide and polarization

Male connectors of Type A, B, C, A/B, and M have 5 rows of signal contacts, and D, E, F, and D/E have 8 rows of signal contacts. Optionally they can have 2 additional rows for ground return. Female connectors of these types always have 5 or 8 rows, a two-part ground return shield is also offered. Refer to Paragraph 3.7 or Application Specification 114-19036 for ground return shield details.

Reduced-crosstalk shielding is based on signal transmission in wire-pairs. The shields are located between the columns (chicklets) in the female connectors. The shielding between rows is accomplished by grounding the entire row c. Reduced crosstalk shielding combined with ground return shields is applied mostly for differential pairs. The special contact cavities used in Types L, N and M can be equipped with coax, power or fiber-optic contacts, which must be separately ordered.

Figure 1 provides board-to-board and cable-to-board connector features and terms used throughout this specification. Use these terms when corresponding with Tyco Electronics Representatives to facilitate assistance.

PRODUCT CONNECTIONS			BOARD-TO-BOARD				CABLE-TO-BOARD	
			FREE-FIXED		FREE-FREE		FIXED BOARD	FREE BOARD
			STANDARD	MID-PLANE	CARD EXTENDER	MEZZANINE/BABY		
Board	Male	Vertical	✓	✓		✓		
		Right-Angle			✓		✓	
	Female	Vertical				✓		
		Right-Angle	✓		✓			
	Board-to-Board Shroud + Spacer			✓				
	Cable-to-Board Shroud					✓		
Cable	Female	Field Installation				✓	✓	
		Lead Assembly 5-Row				✓	✓	
		Lead Assembly 7-Row				✓		

Figure 1 (cont'd)

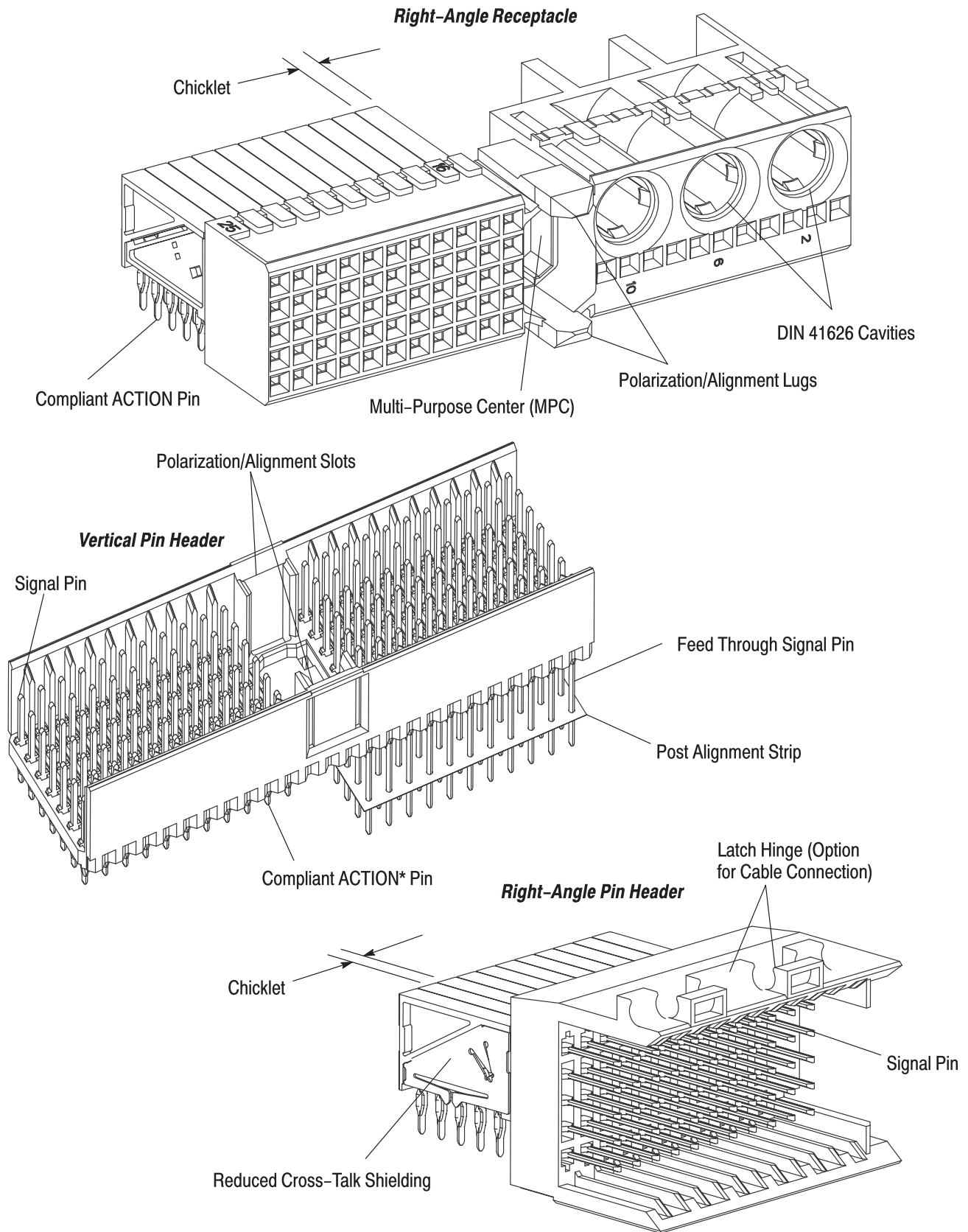


Figure 1 (end)

Figures 2 and 3 shows the different types of connector modules for the standard free-to-fixed board connection.

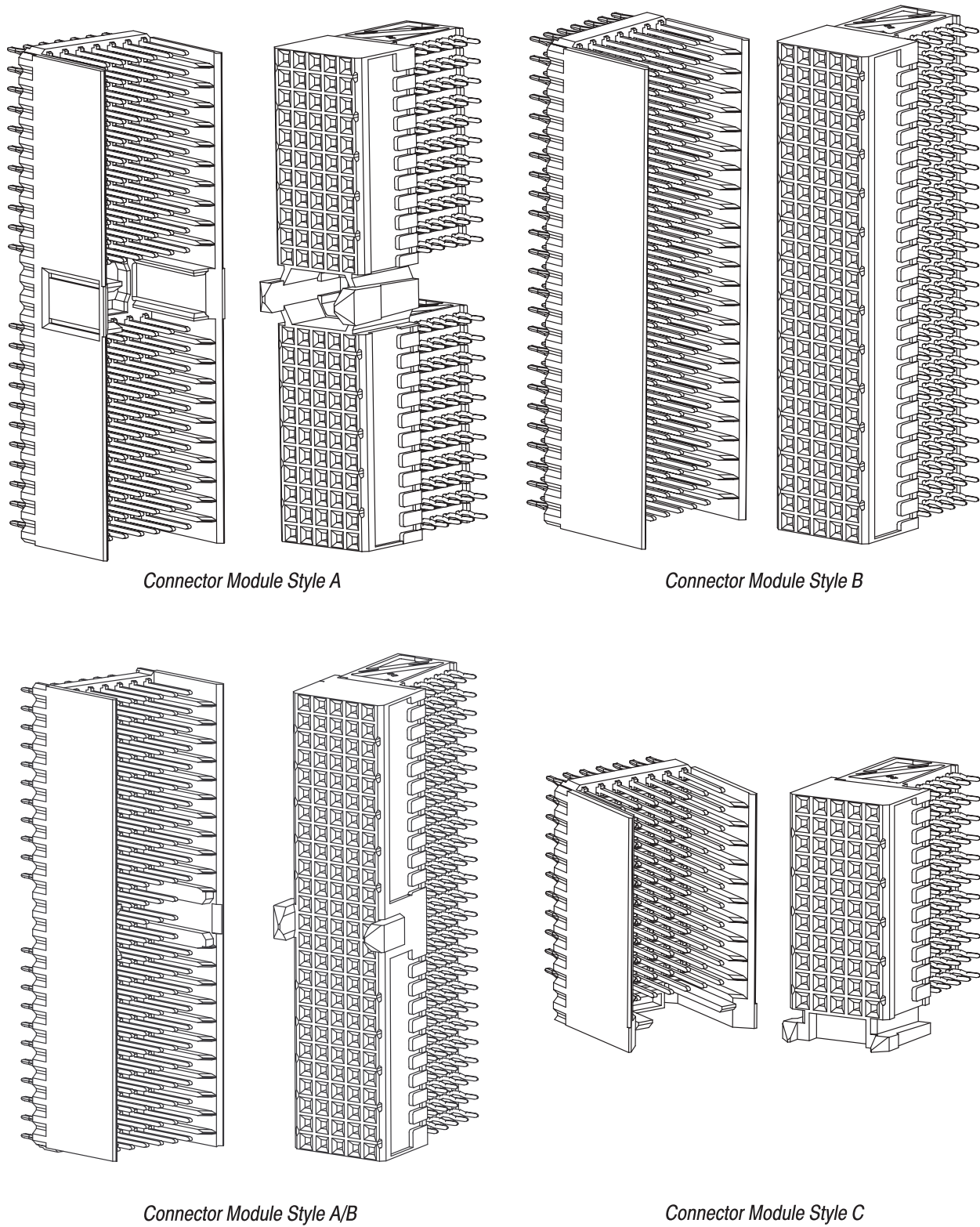


Figure 2



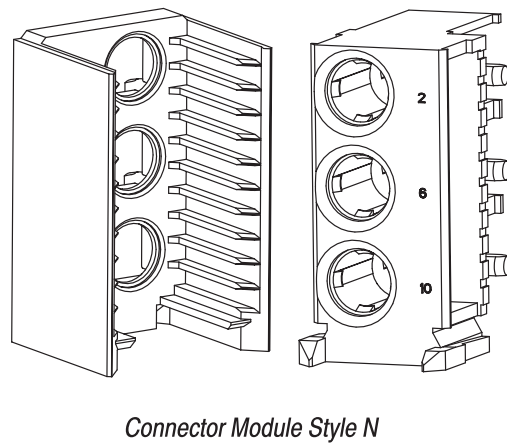
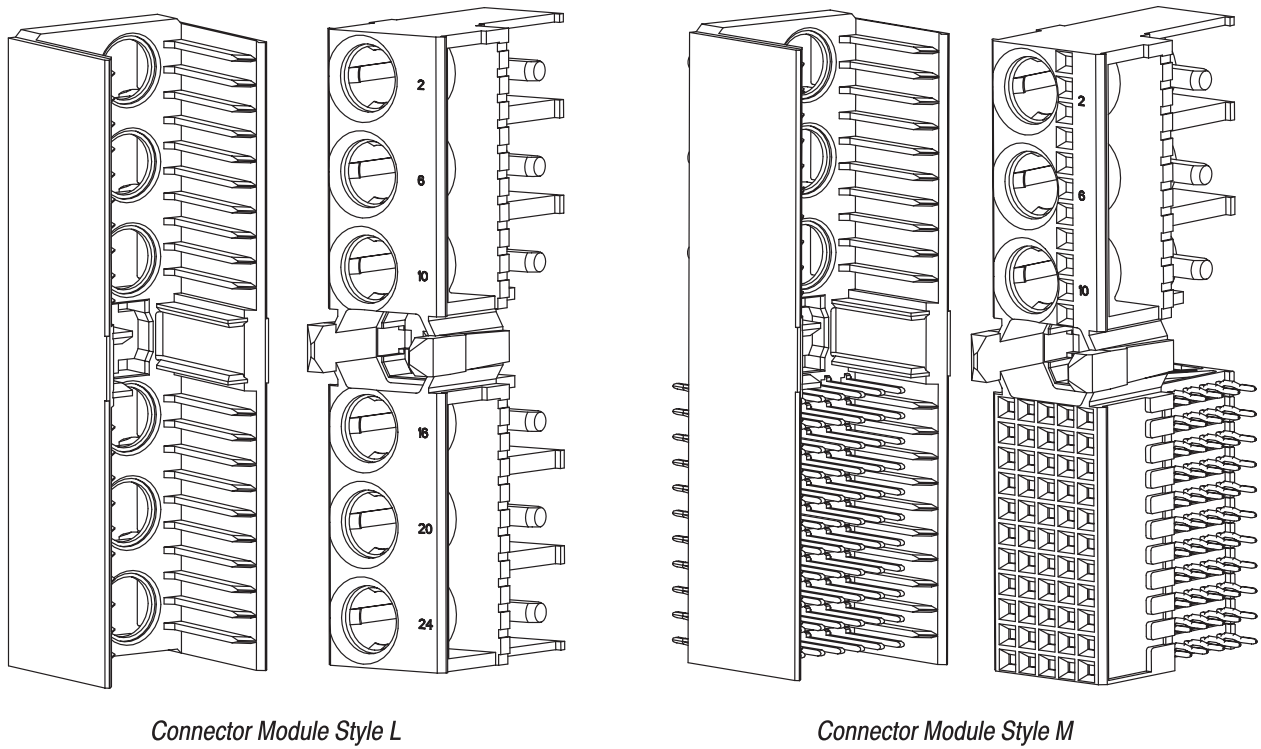
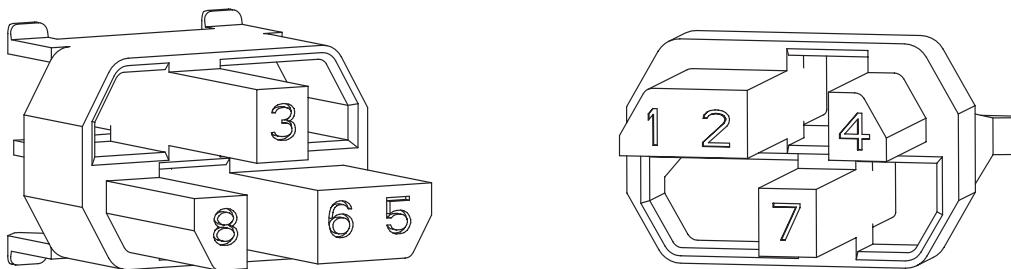


Figure 3

The MPC coding device is shown in Figure 4.



Coding Devices  
Figure 4

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

- Updated document to corporate requirements
- Changed text in Power Unit paragraph in Section 5, TOOLING

### 2.2. Customer Assistance

Reference Base Part Numbers 100143, 100147, and Product Codes 6250 and 6251 are representative numbers of the Z-PACK 2 mm HM Interconnection System. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product information. Such information can be obtained through a local Tyco Electronics Representative or, after purchase, by calling the Tooling Assistance Center or the Product Information Center number at the bottom of page 1.

### 2.3. Drawings

Customer Drawings for each connector are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any technical documentation supplied by Tyco Electronics.

### 2.4. Specifications

The Z-PACK 2 mm HM Interconnection System complies fully with the (International Electrotechnical Commission) IEC917, and IEC 61076-4-101 requirements based on experience in connector applications; is compatible with the (German Institute for Standardization) DIN 41626 and 43356; and the (Institute of Electrical and Electronic Engineers) IEEE 1301.

Product Specifications 108-19082 and 108-1622 provides performance requirements and test results for 5- and 8-row products respectively.

The following application specifications are applicable to this interconnection system:

<u>Document Number</u>	<u>Document Title</u>
114-19031	Z-PACK 2 mm HM Midplane Through Board Application
114-19036	Z-PACK 2 mm HM Ground Return Shield
114-19038	Z-PACK 2 mm HM MU Fiber-Optic Interconnection System
114-19039	Low Frequency (LF) Cable Connector

### 2.5. Reports

Technical Report R 041-1566 level 2 and R041-1738 level 1 cover the release test of the Z-PACK 2 mm Signal Contact Connector System. R041-1654 covers the release test of the press-in connections of the connector system.

### 2.6. Instructional Material

The following list of instruction sheets provides information on operation, maintenance, and repair of related tooling. Refer to Section 5, TOOLING for additional instructional material associated with termination tooling in the table in Figure 12.

<u>Document Number</u>	<u>Document Title</u>
411-19296	Single Feed Contact Removal Tool, 5-Row, Z-PACK HM Male, P/N 434814-1
411-19297	All Feed Through Contact Removal Tool, 7-Row, Z-PACK HM Male, P/N 434812
411-19298	Housing Support, Anvil, Auxiliary Tool to Remove Z-PACK, P/N 434857-1
411-19299	Housing Removal Tool, Z-PACK HM, Female, P/N 434865-1
411-19300	All Feed Through Contact Removal Tool, 5-Row, Z-PACK Midplane, P/N 434858
411-19301	All Feed To Contact Removal Tool, 7-Row, Z-PACK HM, Male, P/N 434811-1
411-19354	Instruction for Housing Removal Tool Right-Angle Male
411-19356	Instruction for Contact Removal Tool

### 3. REQUIREMENTS

#### 3.1. Safety

Do not stack component packages so high that the shipping containers buckle or deform.

#### 3.2. Storage

##### A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the connector material.

##### B. Shelf Life

The connectors should remain in the shipping containers until ready for use to prevent deformation to the contacts. The connectors should be used on a first in, first out basis to avoid storage contamination that could adversely affect connector performance.

##### C. Chemical Exposure Limitations

Do not store connectors or components near any chemical listed below as they may cause stress corrosion cracking in the components.

Alkalies	Ammonia	Citrates	Phosphates	Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur Nitrites		Tartrates

#### 3.3. Product Materials

All Z-PACK 2 mm HM Connector housings and chicklets are molded of UL94V-O rated, glass-filled polyesters.

The signal pin contacts are phosphor bronze and plated at the contact interface with gold. The signal receptacle contacts are copper alloy and plated at the contact interface with gold. All contacts have a nickel underplate and tin or tin-lead plated press-fit leads.

Ground contacts are phosphor bronze and plated at the contact interface with gold. All contacts have a nickel underplate and tin or tin-lead plated press-fit leads.

#### 3.4. Stacking of Connectors

A complete connector is composed by stacking one or more connector modules, end to end. All types of modules can be stacked provided the following rules are obeyed:

- A module without guiding and polarization posts (Types B and E), shall only be used between modules with guiding and polarization posts, otherwise it cannot cope with the allowed transverse and angular misalignment.
- Extension modules (Types C, F, and N) shall only be used at the bottom end of a connector, together with at least one module with Multi-Purpose Center.
- All modules are 50 mm long, except the extension modules, which are 25 mm, 38 mm, and 44 mm long.
- Every module with a guiding and polarizing post has all the features of a complete connector and can be used on its own.

#### 3.5. Sequencing

In order to have an earlier engagement of specific contacts, three levels of contacts are defined. The following rules apply to the usage of these levels:

- Contact row b shall only be loaded with male contacts level 1 and 2. This is because the available insertion depth of the free board connector is restricted in row b by the edge of the PC-board.

#### CAUTION

*The use of level 3 contacts in row b will definitely lead to stubbing problems when used with right-angle receptacles.*



- To neutralize the effect of inclination on the sequencing, the contacts of a specific level shall be located at the outer corners of the complete connector.

### 3.6. Coding

Coding devices are clicked into the Multi-Purpose Centers of the connector modules. They are polarized and have sufficient clicking latches for fixed and free modules. A pair of tweezers is sufficient for easy mounting. The coding devices are extractable by releasing the latches. This can be done by any object with a sharp point, (e.g.) a small screwdriver. Only matching coding devices shall be equipped on mating connectors.

### 3.7. Shielding/Grounding

In case of the ground return connection the grounding rows (f and z) of the Male connectors shall be equipped with level 3 contacts. Female connectors can be purchased with the upper ground return shield pre-applied.

### 3.8. Mid-Plane/Feedthrough

Applications utilizing a mid-plane connection will require a spacer and a shroud for the opposite side of the connector.

### 3.9. PC Boards

#### A. Material

The allowed material for pc boards is glass-epoxy (NEMA grade G10, G11, FR 4, FR 5) corresponding to DIN 7735 Hgw-Types or DIN 40802 EP-Types.

#### B. PC Board Thickness

Fixed boards shall have a thickness between 1.4 and 5.6 mm, free boards shall have a thickness between 1.4 and 4.2 mm. When using tin-plated product on pc boards less than 2 mm thick, contact Tyco Electronics Product Information number at the bottom of page 1 for reduced insertion force product.

#### C. PC Board Layouts

Figure 5 shows typical layouts of pc boards.



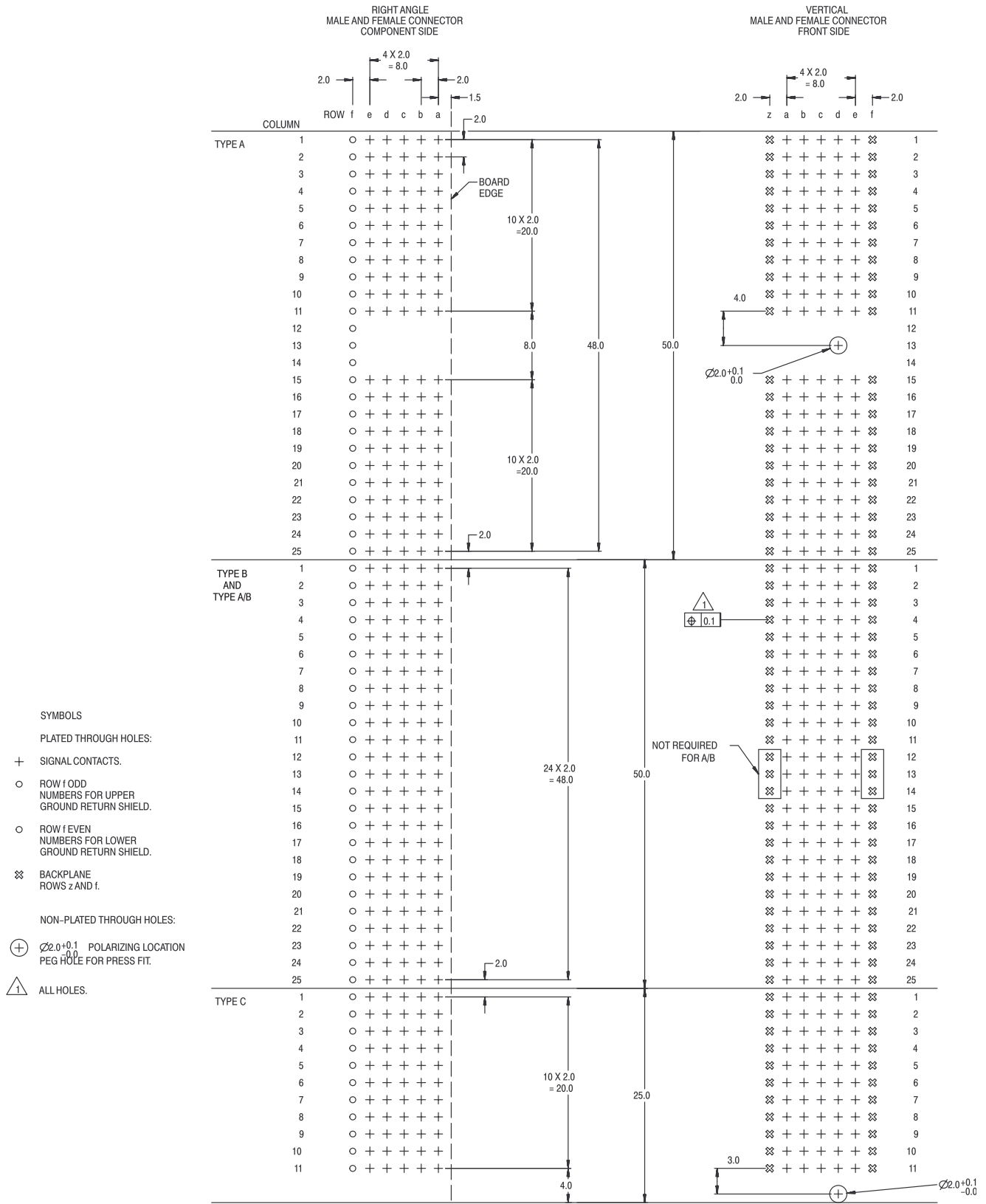


Figure 5 (cont'd)

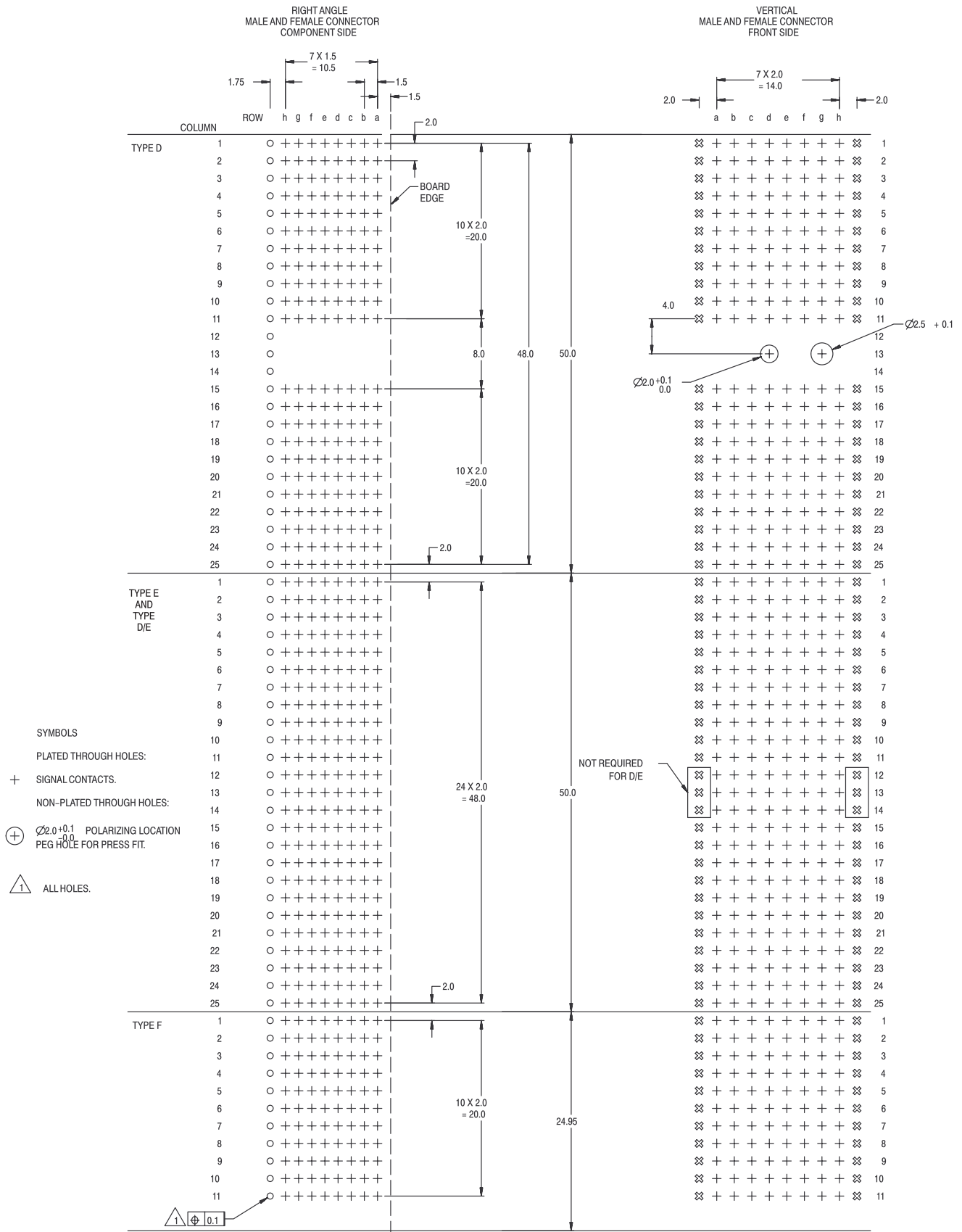


Figure 5 (cont'd)

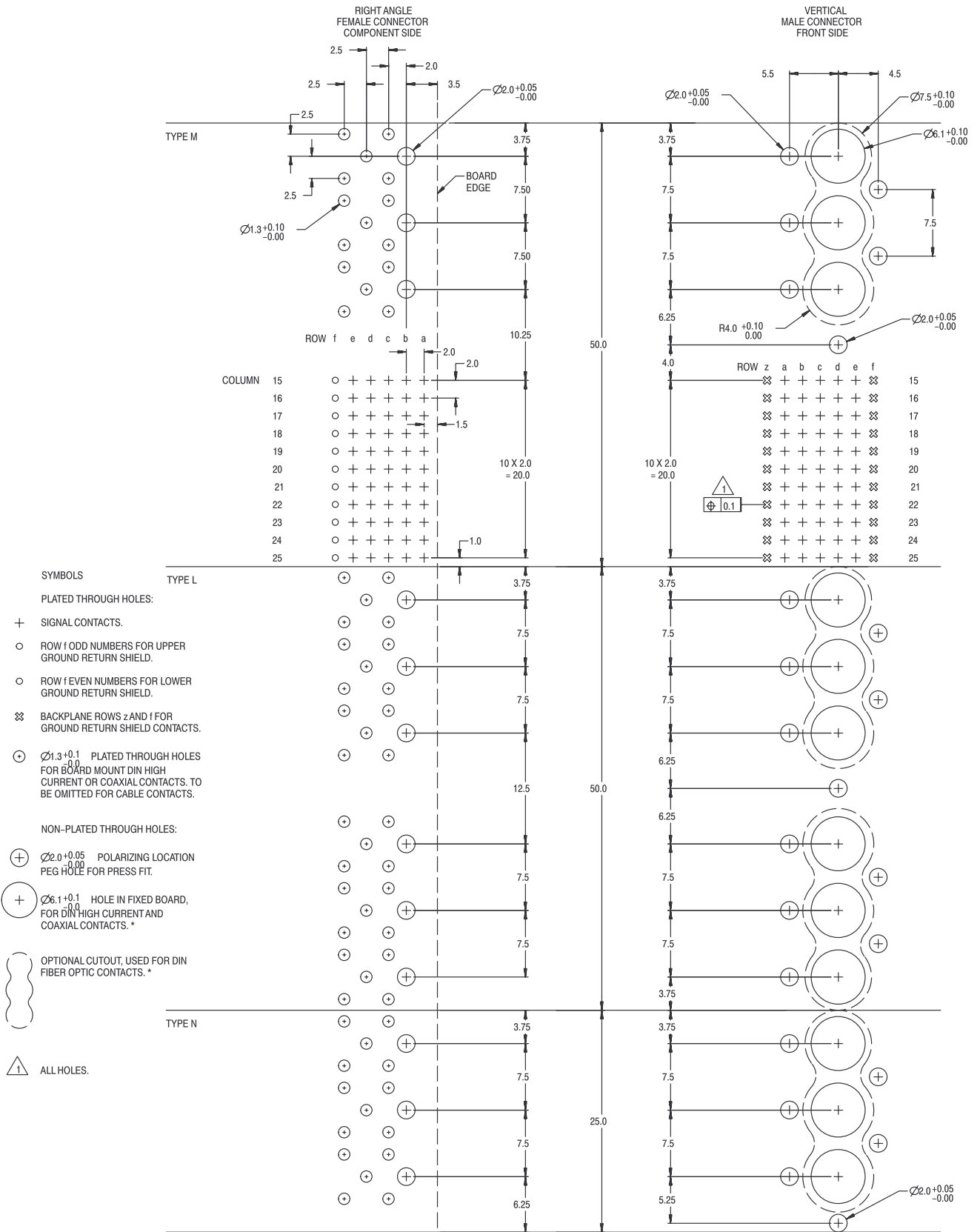


Figure 5 (cont'd)

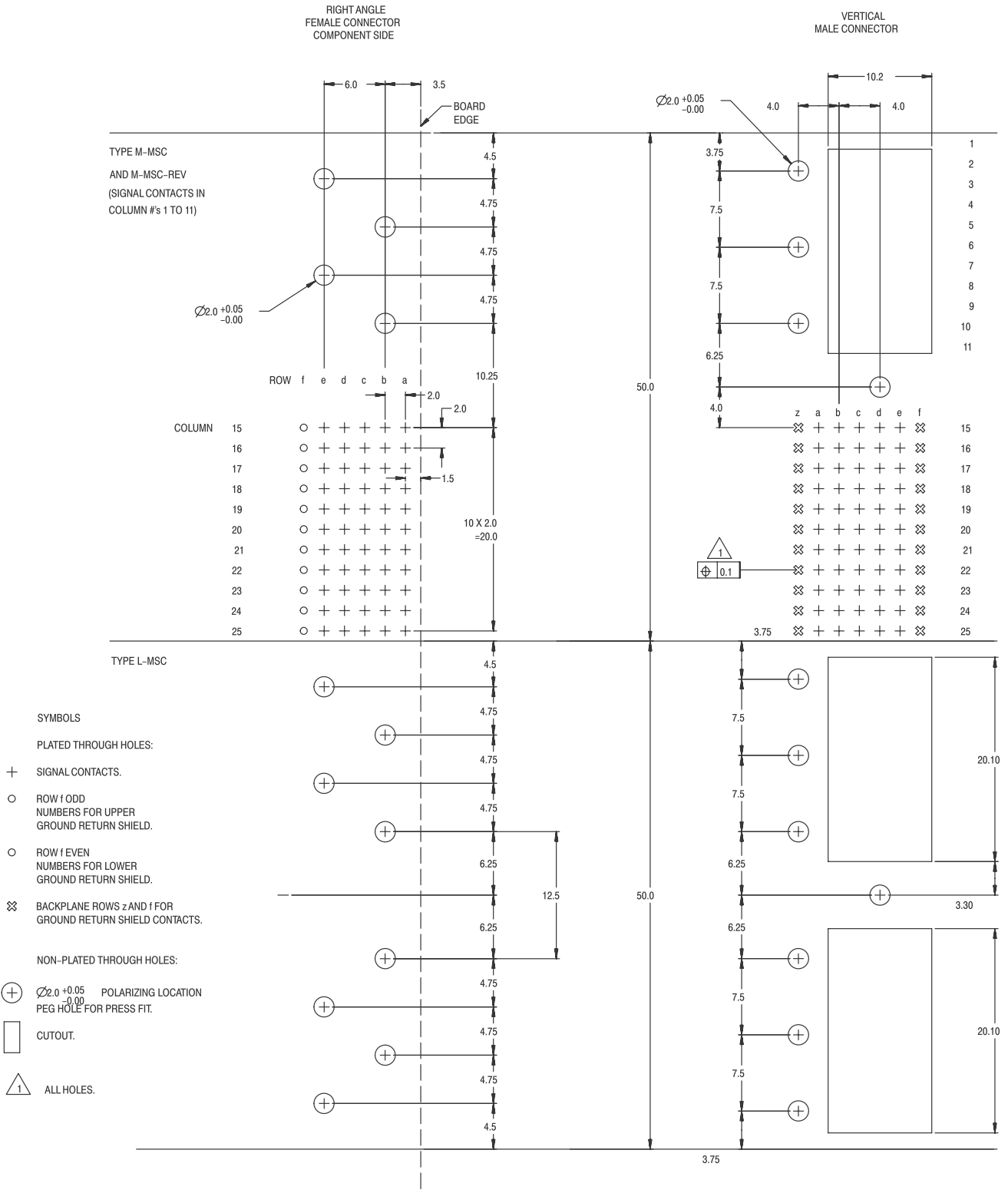


Figure 5 (end)

### 3.10. Contact Hole Configuration

The holes in the pc board for all contacts must be drilled and plated through to the dimensions shown in Figure 6.



● Applications using pc boards less than 2 mm thick and tin-plated product should contact Tyco Electronics Product Information number at the bottom of page 1 for reduced insertion force product.

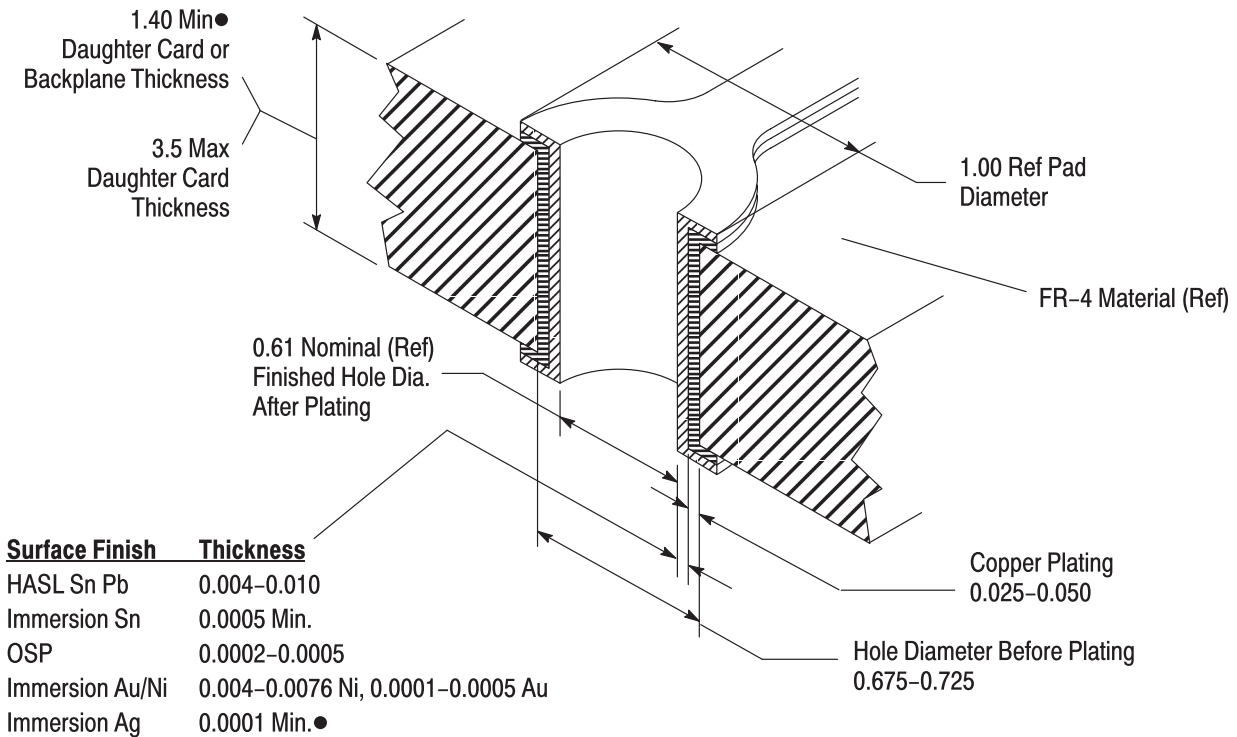


Figure 6

### 3.11. Special Contacts (Figure 7)

Tyco Electronics offers a variety of contacts which can be used with connector Types L, M, and N, and all comply with DIN 41626 standardized 4.8 mm diameter contacts. Tyco Electronics Catalog 65911 offers additional information regarding these contacts.

#### A. Power Contacts

Power contacts can either be applied to the pc board or used to terminate a wire. Depending on the type used, power contacts are rated for 10-40 Amps and can be used as a first-mate, last break contact.

#### B. Coaxial Contacts

Coaxial contacts for both 50 and 75 ohm impedance are available and can either be applied to a pc board or cable.

#### C. Fiber-Optic Plugs

MSC fiber-optic plugs can only be used with connector Types L-MS, M-MS, and M-MS rev.



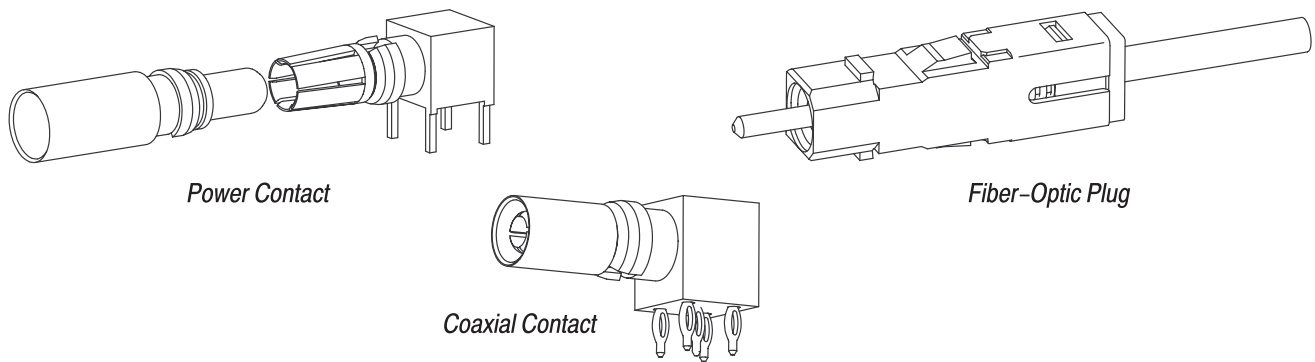


Figure 7

### 3.12. Connector Seating

The fixed board connectors are attached to the backplane and pressed into the pc board. These connectors can only be mounted one way on the board. All modules, except modules B, A/B, E, and D/E have a location peg for this purpose and Type B, A/B, E, and D/E modules can only be stacked in one way to them because the modules are polarized. Care has to be taken to mount the Type B, A/B, E, and D/E connectors in the proper direction.

Connectors must be inserted in such a way that a max. distance of 0.2 mm between the pc board surface and the connector is obtained and a maximum difference in insertion depth of 0.1 mm between adjacent connectors. Refer to Figure 8. Connectors must be inserted parallel to the board. For free board connectors care should be taken to prevent exerting force on the front housing. The free board connector modules are mounted along the edge and pressed into the pc board.

Where the board connector modules are sufficiently held on the pc board by their ACTION PIN contact termination, location pegs are not provided. Location pegs are present on Type L, M, N. Fixed board connectors Type A, C, D, and F only have a location peg to prevent wrong assembly.

Pressing the connectors in the pc board shall only be done by special tools. These tools can be mounted in various insertion machines. See Section 5, TOOLING.

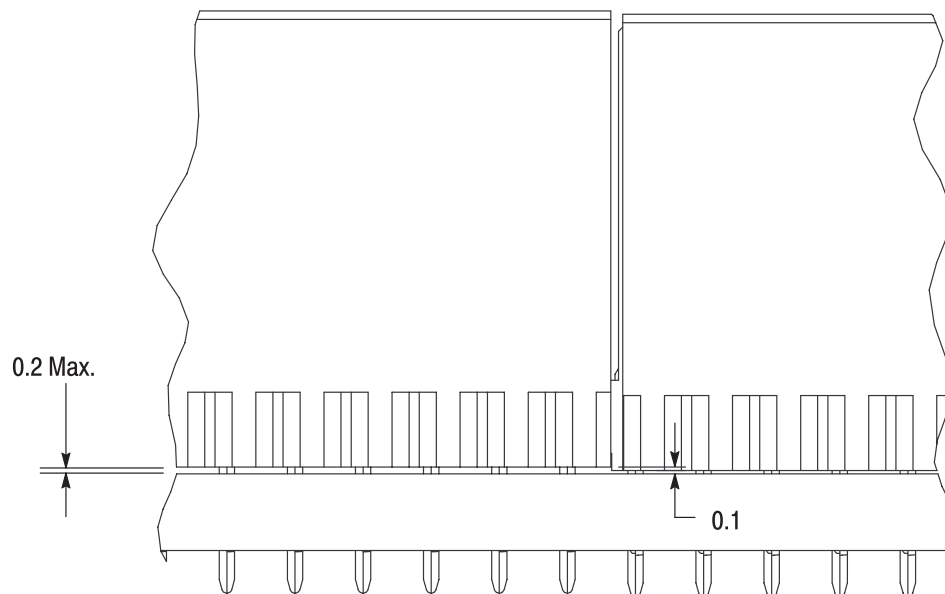


Figure 8

**3.13. Shield Installation**

**A. Ground Return Shield**

Ground return shields are only applied to the standard female connector. The upper shield is applied to the connector by Tyco Electronics. Once the upper shield and connector are inserted in the pc board, the lower ground return shield may be applied. See Application Specification 114-19036 for more details. Figure 9 shows the connector with both shields applied.

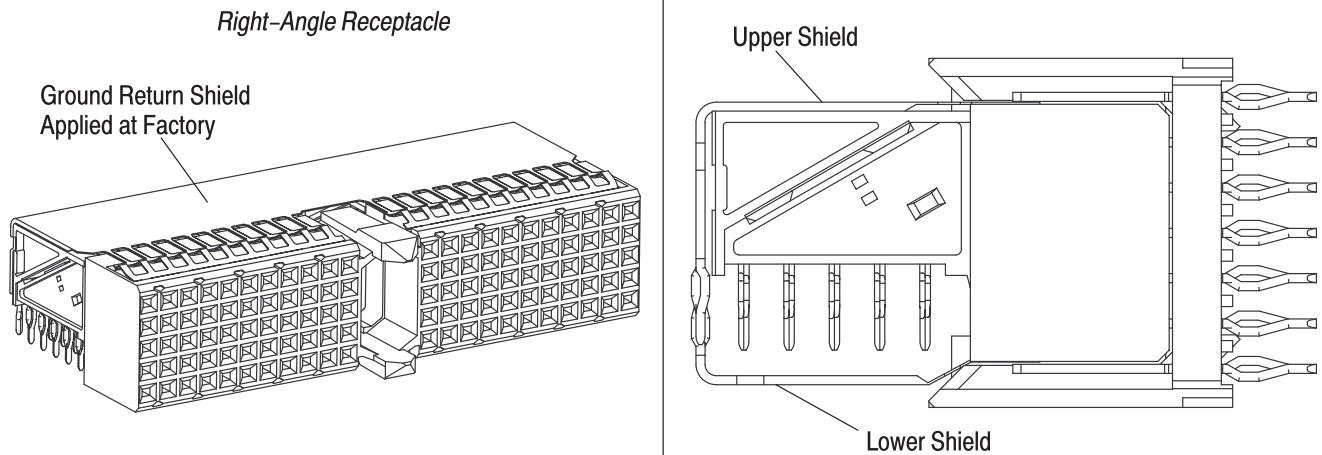


Figure 9

**B. Reduced Crosstalk Shielding**

RC shielding is inside a female connector and does not need special application treatment.

**3.14. Mating**



*Before mating or unmating connectors, electrical current shall be disconnected.*

**A. Misalignment and Inclination**

In the direction perpendicular to the mating direction a misalignment of 2 mm may exist without any effect. An inclination of 2° around the normal axis will not effect proper mating of the connectors. Tolerances can be seen in Figure 10 and apply only when connectors with guide lugs are separated by only one Type B or E module without lugs. Guiding and polarizing lugs at the MPC are of Types A, D, M, and L at the ends of Types C, F, and N and also in the middle of Types A/B and D/E.

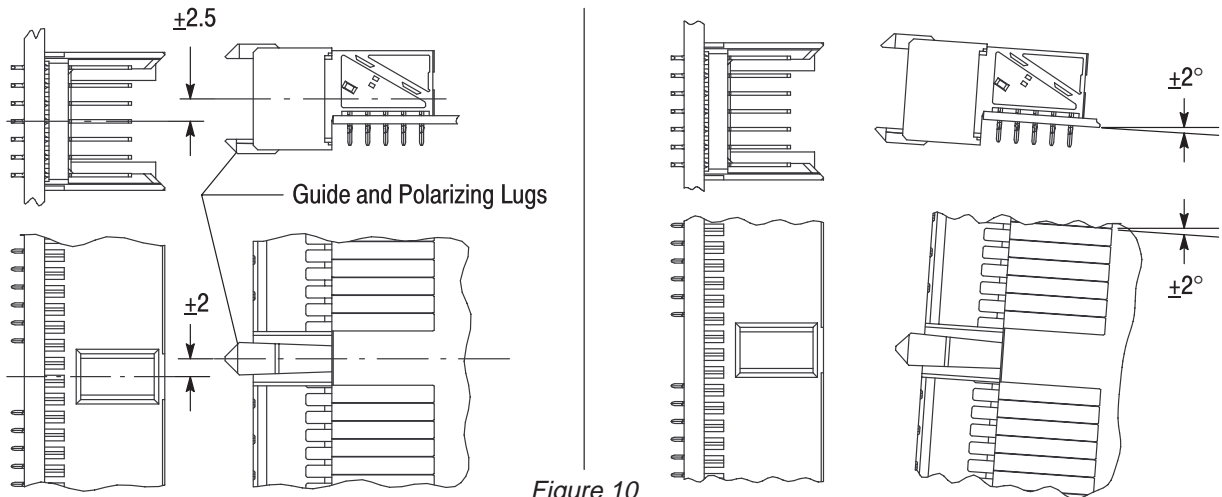
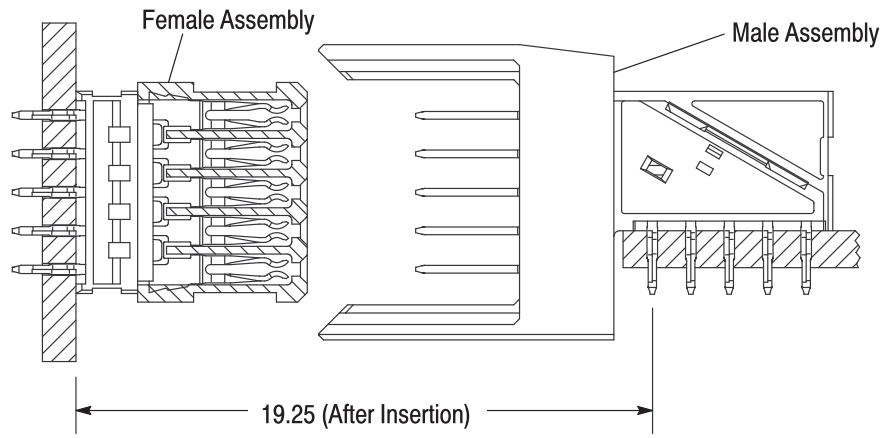


Figure 10

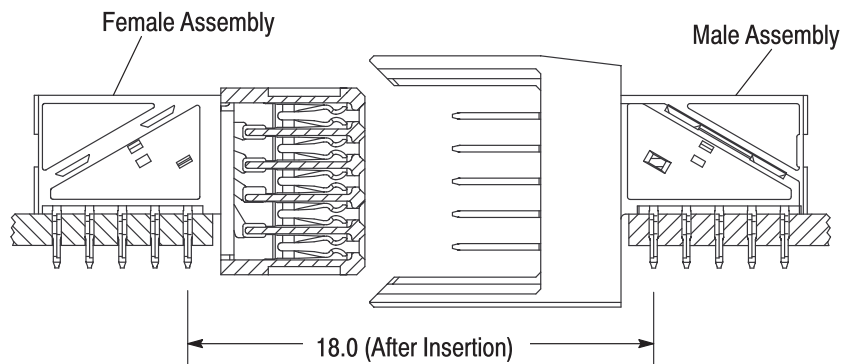
**B. Mating Dimension**

Full mating of connectors is necessary to ensure a good connection and to obtain the maximum signal transmission performance. The fully-mated dimension from the top surface of the pc board to which the pin header is mounted and the first row of contacts in the receptacle is given in Figure 11.

*Inversed Connection*



*Card-Extender Connection*



*Midplane or Standard Connection*

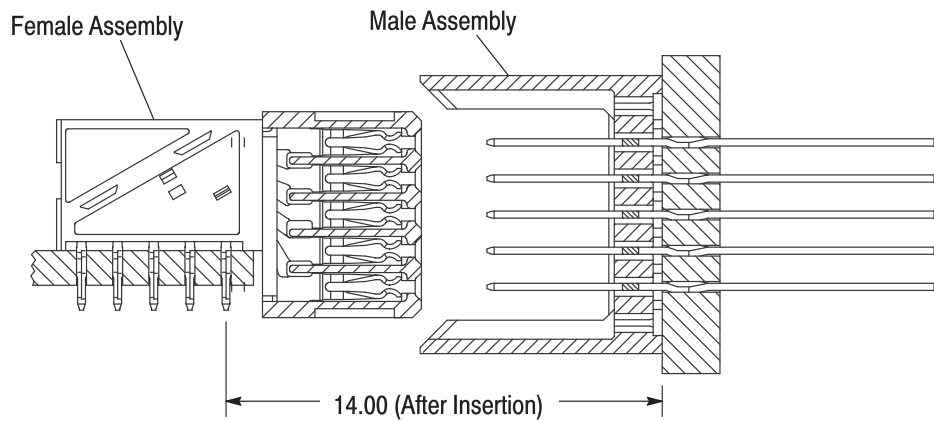
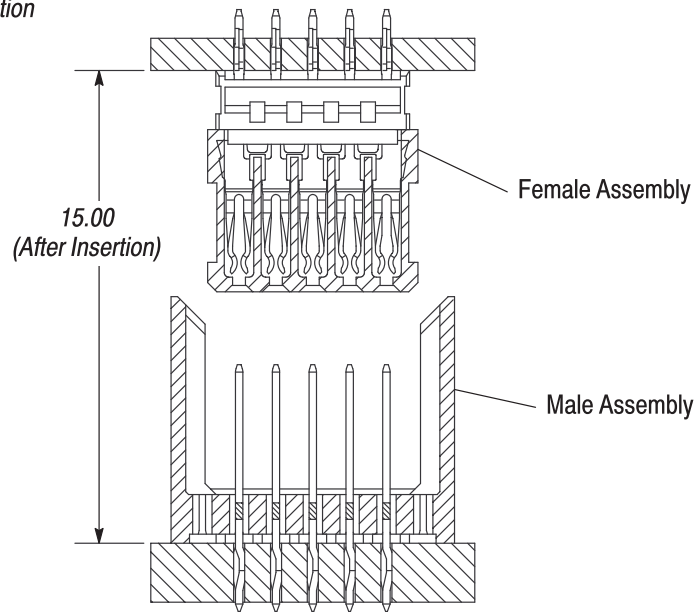
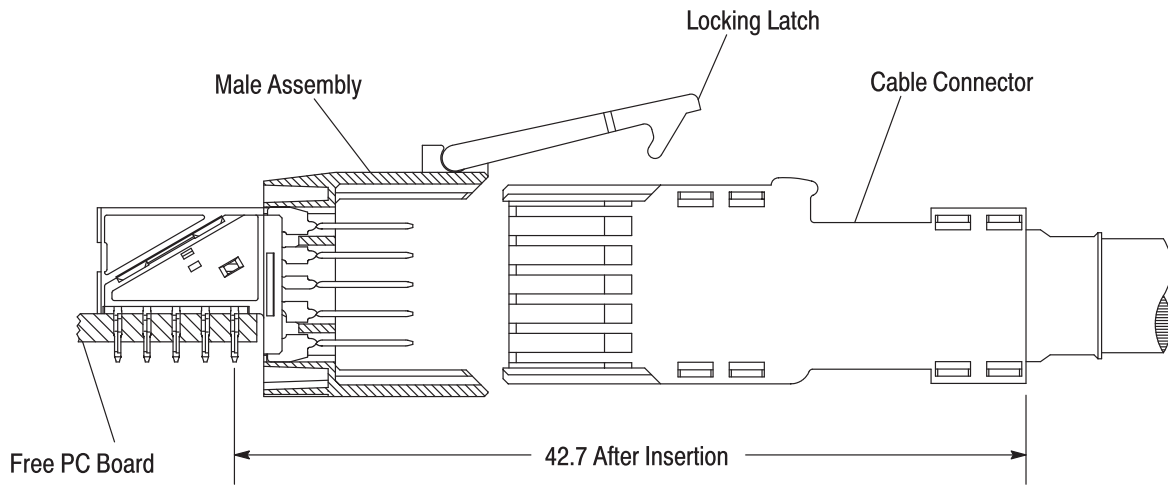


Figure 11 (cont'd)

Mezzanine (Parallel Board) Connection



Front Panel Cable Connection



Back Panel Cable Connection

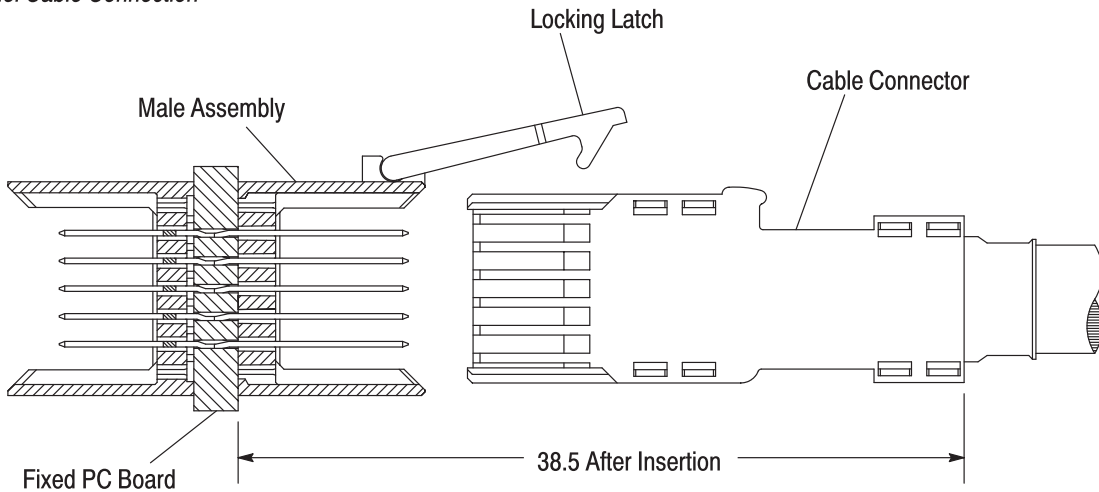


Figure 11 (end)

### 3.15. Repair/Replacement

#### A. Signal Contacts

Damaged signal contacts must not be used. If a damaged signal contact is evident, it must be removed and replaced with a new one. Signal contacts can only be replaced in male connectors.

#### B. Power and Coaxial Contacts

Damaged power and coaxial contacts must not be used. If a damaged power or coaxial contact is evident, it must be removed and replaced with a new one. Extraction tool 106242-1 may be used to remove these contacts.

#### C. Fiber-Optic Contacts

Damaged fiber-optic contacts must not be used. If a damaged fiber-optic contact is evident, it must be removed and replaced with a new one. For female fiber-optic contacts, a reaming tool (434779-1) is required to remove the guide ridges used in the female housing.

#### D. Connectors

Damaged connectors and chicklets must not be used. If a damaged connector or chicklet is evident, the entire connector must be removed and replaced with a new connector. To ensure plated through-hole integrity, connectors should only be replaced no more than two times, or a max of three insertions per pc board. Tools for removing connectors from pc boards are provided in Section 5, TOOLING.

## 4. QUALIFICATIONS

### 4.1. General

The Z-PACK 2 mm HM Interconnection System is qualified according to IEC 60512 and has been Recognized by Underwriters Laboratories Inc. (UL) in File E28476, Vol. 54.

### 4.2. Part Qualification Levels

Tyco Electronics offers four different levels of performance based on industry standard qualifications. A connector's performance level is distinguished by its dash number as shown below in increasing level of performance:

xxx-1	IEC 61076-4-101 performance level 2
xxx-4	IEC 61076-4-101 performance level 1
xxx-9	Telcordia GR-1217-CORE quality Level III, Central Office Applications
1-xxx-9	Telcordia GR-1217-CORE quality Level III, Uncontrolled Environment Applications

## 5. TOOLING

Figure 12 provides tooling part numbers related to the Z-PACK 2 mm HM Interconnection System.

- **PC Board Support**

A pc board support must be used to prevent bowing of the pc board during the insertion of a connector into the board. It should have flat surfaces with holes or a channel wide and deep enough to receive any contact pins that may protrude below the pc board surface during installation of the connector.

- **Seating Tools**

Seating tools have been designed to push on the contact and seat the connector on the pc board. The tool will prevent contacts from backing out of the housing and prevent damage to the housing.

- **Power Units**

Power units are automatic or semi-automatic machines used to assist in the application of a product. A power unit supplies the force to seat the connector onto the pc board using seating tools. Power for the insertion tool must be provided by application tools (with a ram) capable of supplying a minimum downward force of 89 N [20 lbs] per contact. Total insertion force is dependent on the size of the connector and number of connectors being simultaneously inserted.

- **Arbor Frame Assembly**

Manual arbor frame assemblies are used to exert a downward force used to apply connectors to a pc board using seating tools. Commercially made arbor frame assemblies are available.



CONNECTOR INSERTION TOOLING - "FLAT ROCK STYLE"				
CONNECTOR STYLE/SEX	CONNECTOR TYPE (COLUMNS)	UPPER INSERTION TOOLING	SUPPORT TOOLING	INSERTION TOOLING DOCUMENT
Vertical Male	A	90753-1	Customer Supplied	408-9912
	A/B	91346-1		
	A/B (22)	91346-2		
	A/B (19)	91346-3		
	B	90755-1		408-9914
	B (22)	90755-2		
	B (19)	90755-3		
	C	90757-1		
	D	224671-2		408-4281
	D/E	91345-1		
	F	224668-2		
	E	224668-3		
Unshielded Right-Angle Female	A	122559-1	122561-1	408-4216
	B (All Columns)†			
	C†			
	A/B (All Columns)†	318866-1	318867-1	408-4304
	D			
	E			
	D/E			
F	91326-1			
Shielded Right-Angle Female	A (Except TDM J4)	122562-1	122561-1	408-4382
	B (All Columns)†			
	C†			
	A/B (All Columns)†	318868-1	318867-1	408-4430
	A (For TDM J4)			
	D			
	E			
	D/E			
F	91327-1			
Lower Shield Right-Angle Female	A	122563-1	122562-1	408-4383
	B (All Columns)†			
	C†			
	A/B (All Columns)†			
	M	318869-1	318868-1	408-4429
	D			
	E			
	D/E			
F†				

†Tool length may exceed connector length; check that tool does not interfere with other components.

Figure 12 (cont'd)

CONNECTOR INSERTION TOOLING - "FLAT ROCK STYLE"				
CONNECTOR STYLE/SEX	CONNECTOR TYPE (COLUMNS)	UPPER INSERTION TOOLING	SUPPORT TOOLING	INSERTION TOOLING DOCUMENT
Right-Angle Males	A	N/A	122561-1	408-4216
	B (All Columns)†			
	C†			
Vertical Female	A	N/A	122561-1	N/A
	B (All Columns)†			
	A/B (All Columns)†			
	C†		318867-1	
	D			
	E			
	D/E			
F†				
1-Piece Shroud or 2-Piece Shroud and Spacer	A	90753-1	90753-1	408-9912
	A/B	91346-1	91346-1	
	A/B (22)	91346-2	91346-2	
	A/B (19)	91346-3	91346-3	
	B	90755-1	90755-1	408-9914
	B (22)	90755-2	90755-2	
	B (19)	90755-3	90755-3	
	C	90757-1	90757-1	408-9916
	D	224671-2	224671-2	408-4281
	D/E	91345-1	91345-1	
	E	224668-3	224668-3	408-4282
	F	224668-2	224668-2	
CONNECTOR INSERTION TOOLING - "QUICK CHANGE"				
CONNECTOR STYLE/SEX	CONNECTOR TYPE (COLUMNS)	UPPER INSERTION TOOLING	SUPPORT TOOLING	INSERTION TOOLING DOCUMENT
Vertical Male	A	438001-1	438051-1	411-19312
	B	438002-1		
	B (22)	438002-2	438051-4	411-19313
	B (19)	438002-3	438051-6	
	C	438003-1	438051-2	411-19314
	D	438051-2	438051-3	411-19432
	E	439491-1		
	L	438001-1	438056-1	411-193115
	L-MSD	438014-1		411-19318
	M	438001-1	438057-1	411-19316
	M-MSD	438015-1		411-19319
	M-MSD (Reverse)	438015-1		411-19320
	N	438003-1	438056-2	411-19317

†Tool length may exceed connector length; check that tool does not interfere with other components.

Figure 12 (cont'd)

CONNECTOR INSERTION TOOLING - "QUICK CHANGE"				
CONNECTOR STYLE/SEX	CONNECTOR TYPE (COLUMNS)	UPPER INSERTION TOOLING	SUPPORT TOOLING	INSERTION TOOLING DOCUMENT
Unshielded Right-Angle Female	A	438031-1	438051-1	411-19324
	B (All Columns)†			411-19325
	L		438052-1	411-19327
	M		438054-1	411-19328
	C	438032-1	438051-2	411-19326
	N		438052-2	411-19329
	L-MSD	438070-1	438056-1	411-19330
	M-MSD	438072-1	438057-1	411-19331
	M-MSD (Reverse)	438071-1		411-19332
Shielded Right-Angle Female	A (Except TDM J4)	438036-1	438051-1	411-19334
	B			
	A/B			
	B (19)	438036-3	438051-6	411-19437
	A/B (19)			
	B (22)	438036-2	438051-4	
	A/B (22)			
	A (For TDM J4)	1115335-1	438051-1	411-19334
	C	438037-1	438051-2	411-19437
	D	439491-1	438051-7	411-19351
E	411-19434			
Lower Shield Right-Angle Female	A	438041-[-]■	438053-1	411-19335
	B (All Columns)†			
	C	438042-[-]■	438053-2	411-19352
	M			
Right-Angle Males	A	438031-1	438051-1	411-19344
	B			
	B (22)	438036-2	438051-4	411-19345
	B (19)	438036-3	438051-6	411-19346
	C	438032-1	438051-2	
Vertical Female	A	438076-1	438051-1	411-19377
	B			
	B (22)†		438051-4	
	B (19)†		438051-6	
	C	438077-1	438051-2	
1-Piece Shroud or 2-Piece Shroud and Spacer	A	438001-1	438058-1	411-19337
	B	438002-1		
	B (22)†	438002-2		411-19338
	B (19)†	438002-3		
	C	438003-1		411-19339

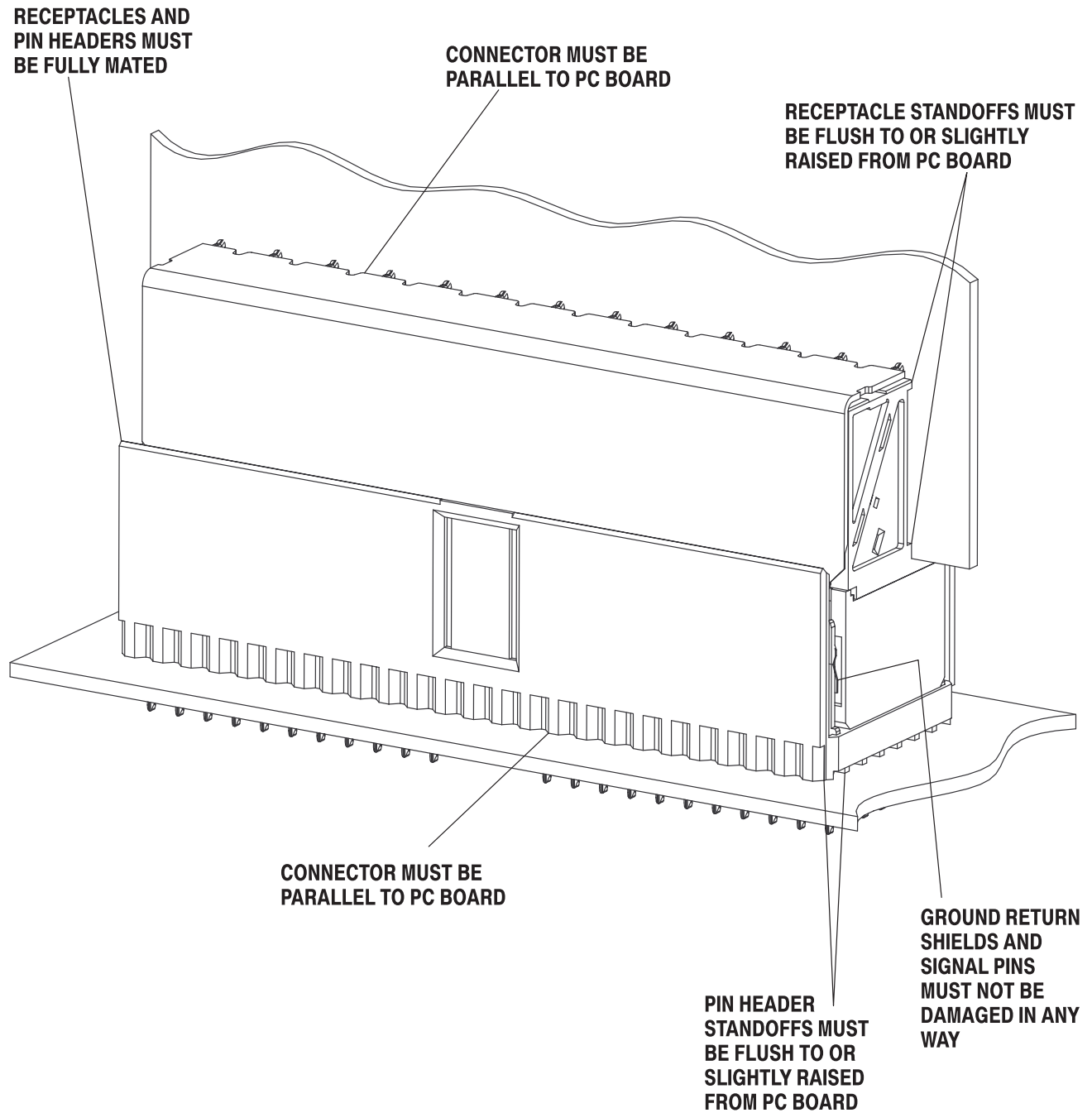
†Tool length exceeds connector length; check that tool does not interfere with other components.

■Part (-) dash number depends on application. Refer to specific instruction sheet for details.

Figure 12 (end)

## 6. VISUAL AID

Figure 13 shows a typical application of Z-PACK 2 mm HM Interconnection System. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product.



**FIGURE 13. VISUAL AID**