

Fortis Zd* Modular Connector System



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 ± 0.13 and angles have a tolerance of $\pm 2^\circ$. Figures are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of the Fortis Zd modular connector system used in the aerospace and defense industry and in applications requiring robust high-speed connectors.

Basic terms and features of this product are provided in Figure 1.

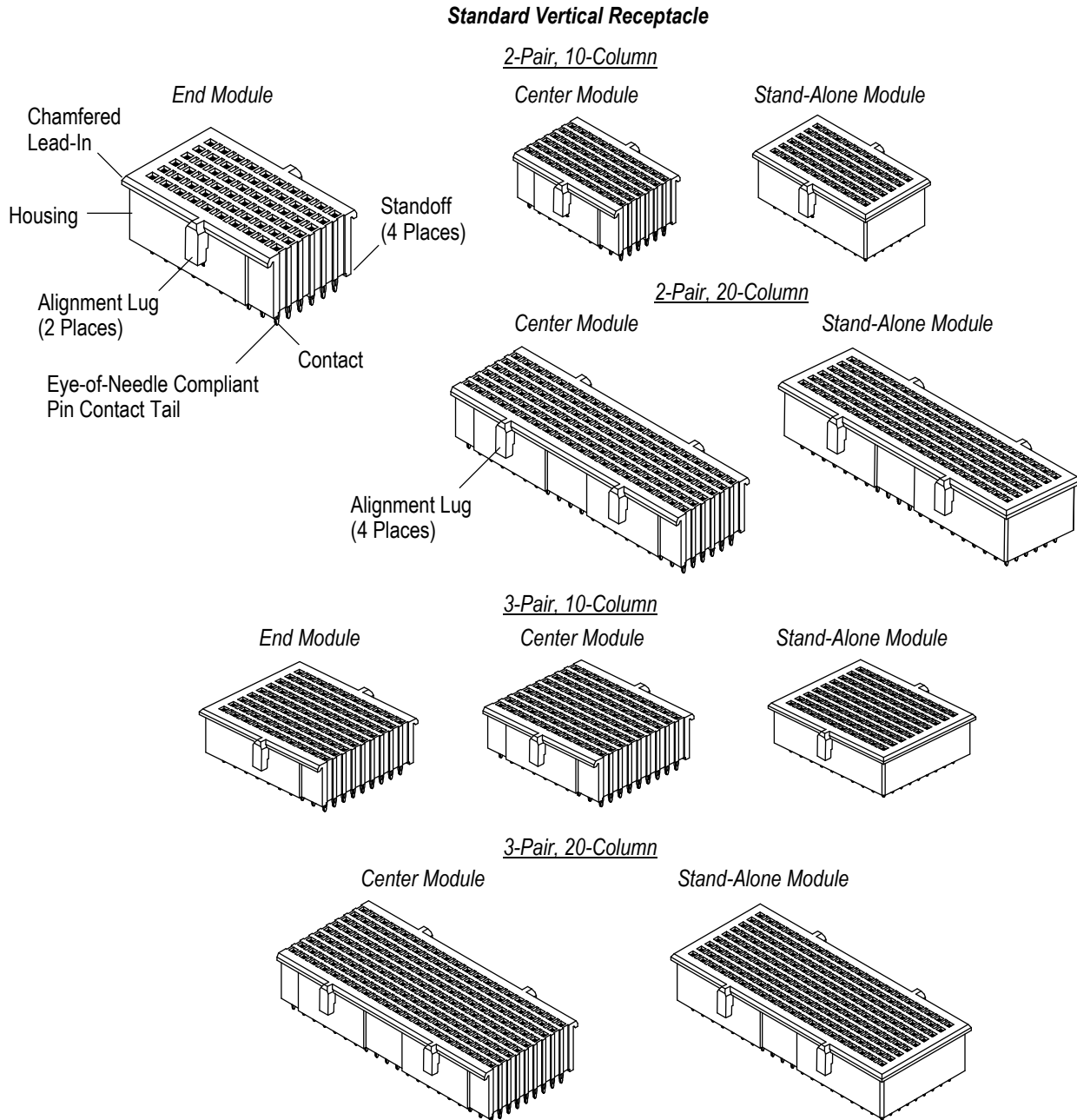


Figure 1 (Cont'd)

Standard Right-Angle Header

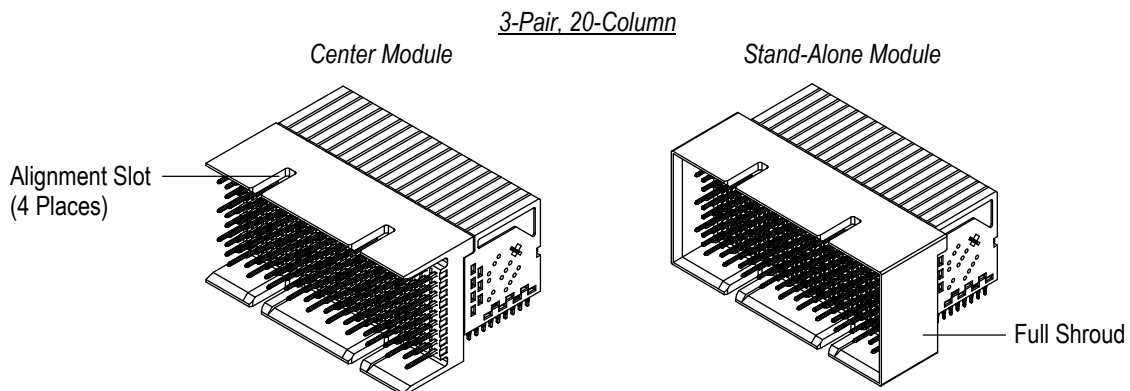
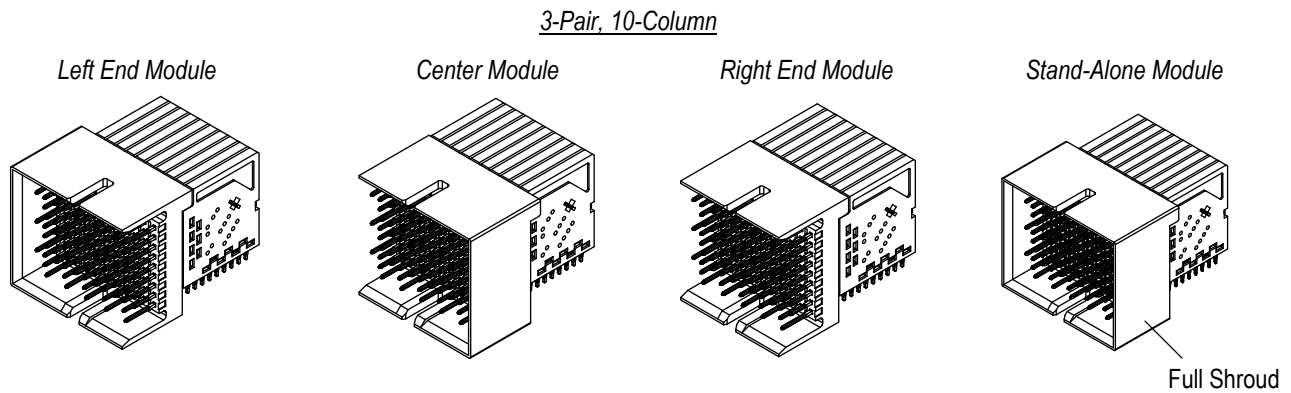
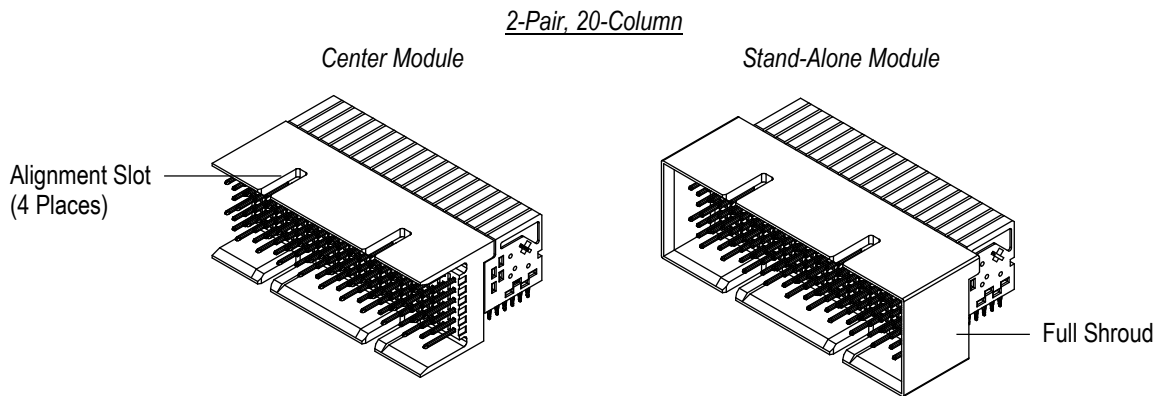
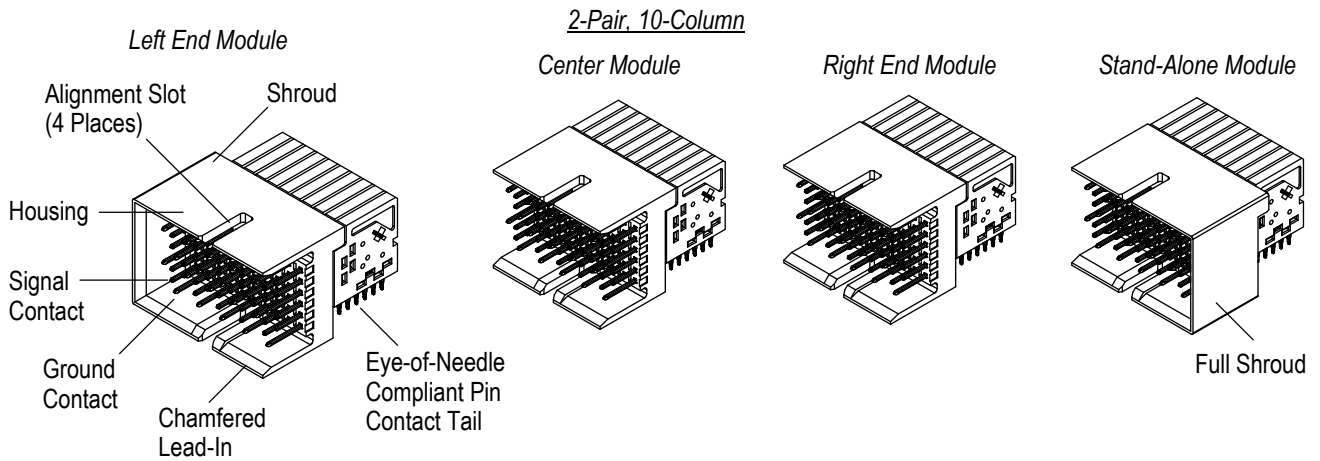
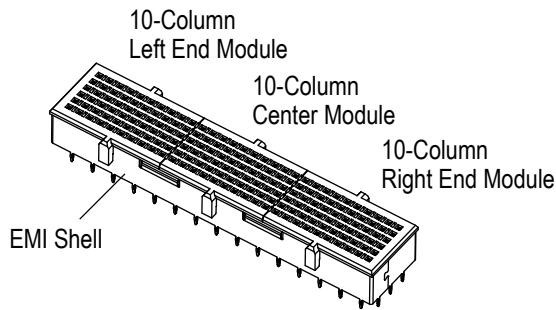


Figure 1 (Cont'd)

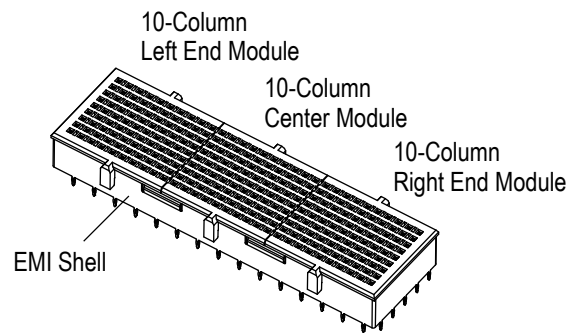
Note: Features of electromagnetic interference (EMI) shielded connector and metal shell connector are identical to standard connector.

EMI Shielded Vertical Receptacle

2-Pair, 30-Column

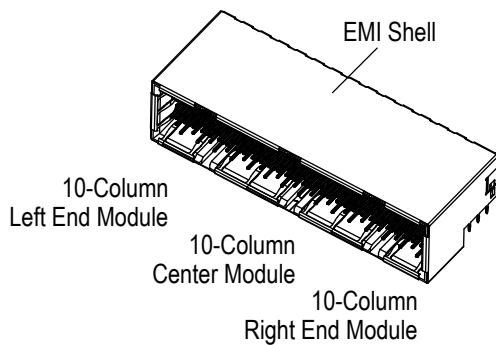


3-Pair, 30-Column

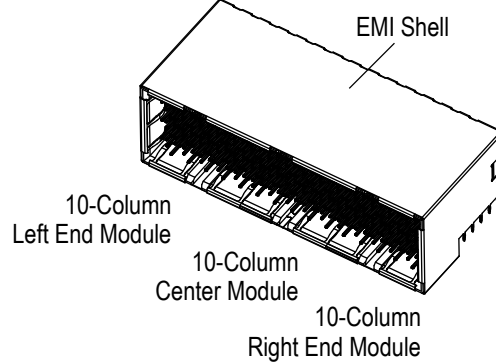


EMI Shielded Right-Angle Receptacle

2-Pair, 30-Column

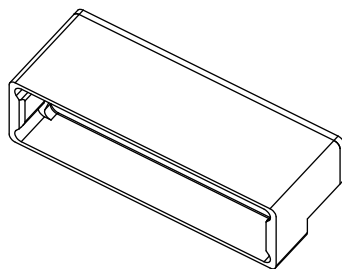


3-Pair, 30-Column

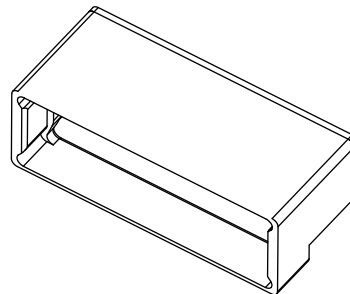


Metal Shell (for Right-Angle Header)

2-Pair, 30-Column



3-Pair, 30-Column



Metal Shell Installed onto Right-Angle Header

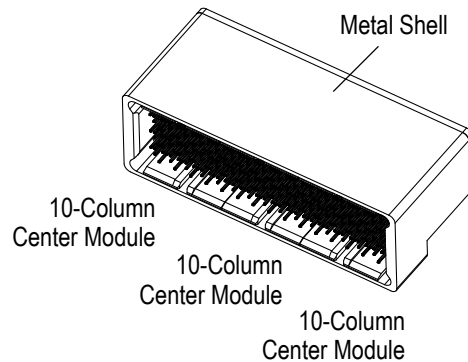
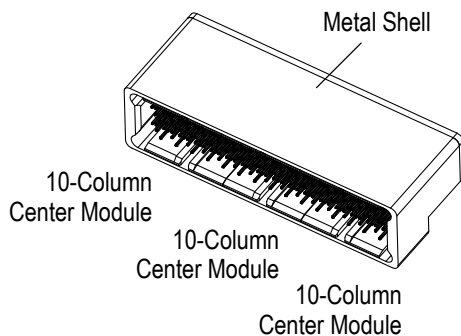


Figure 1 (End)

This system provides an electrical connection between two perpendicular printed circuit (pc) boards using a modular concept. This specification covers application to the pc boards using manual tooling.

The connector system consists of vertical receptacles (motherboard) and right-angle headers (daughtercard) consisting of a configuration of end modules, center modules, and stand-alone modules. The stand-alone modules have full shrouds. Each module contains signal and ground contacts, with each contact having an eye-of-needle compliant pin (press-fit) contact tail. The connector modules are available with 2-pair or 3-pair versions having 10 or 20 columns. The 2-pair module has 6 rows of contacts and the 3-pair module has 9 rows of contacts. The connector is available in standard or EMI shielded. Also, available separately is a metal shell designed to be installed onto the connector and provide a ruggedized exterior for the connector.

The modules can be used in a differential pair or single-ended arrangement. The 3-pair right-angle header is available in a differential pair arrangement with the ground contacts communed and a single-ended arrangement with an open pin field. The 2-pair right-angle header can be used for either differential pair signals or single-ended signals.

For initial alignment during mating, the chamfered lead-in around the edges of the mating side of the right-angle header modules captures and guides the mating side of the vertical receptacle module. Alignment lugs and alignment slots are molded onto the ends of the modules to provide blind mating. Universal and keyed guide hardware are available for proper mating and allow up to ± 3.0 offset for blind mating. The guide hardware consists of a guide pin and guide module. The connectors require 2 guide pins (for the receptacle) and 2 guide modules (for the header) and must be attached to the pc board. Refer to Figure 2.

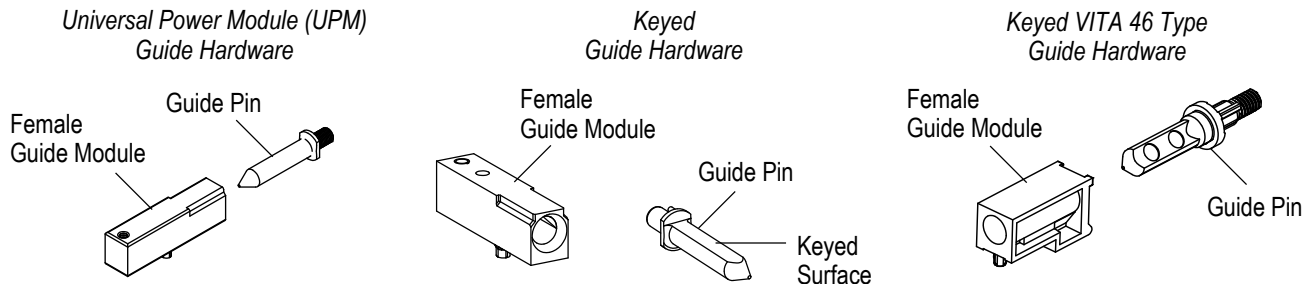


Figure 2

The number of contacts and differential pairs per module is provided in Figure 3.

MODULE TYPE	COLUMNS	2-PAIR		3-PAIR	
		Contacts	Differential Pairs	Contacts	Differential Pairs
End, Center, Stand-Alone	10	60	20	90	30
Center, Stand-Alone	20	120	40	180	60

Figure 3

1.1. Contact Length

Length of the contacts is given in Figure 4.

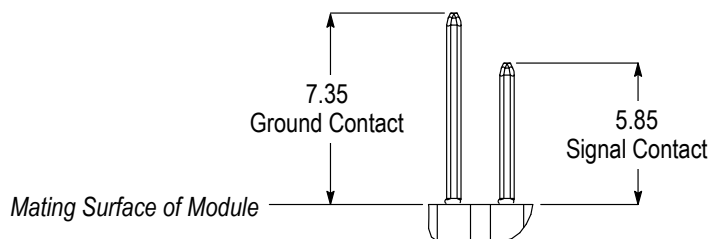


Figure 4

1.2. Connector Configuration

The minimum and maximum amount of modules used in a configuration and possible connector configurations are shown in Figure 5. The configurations shown include guide hardware.

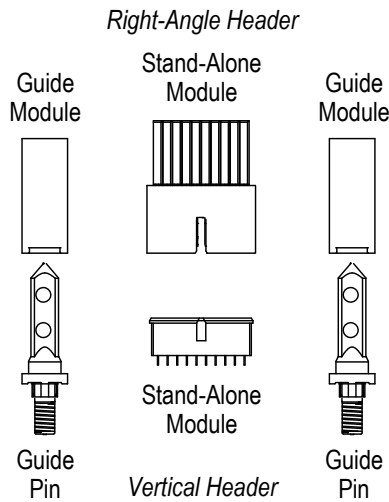


NOTE

A 20-column module can be mated to two 10-column modules. Center modules can be mated to end modules. Although all center modules can be used in a configuration, it is recommended that end modules be used in a configuration for best pin protection.

Standard Connector Configurations

Minimum Amount of Modules



Recommended Maximum Amount of Modules Between Guide Hardware

60 Columns

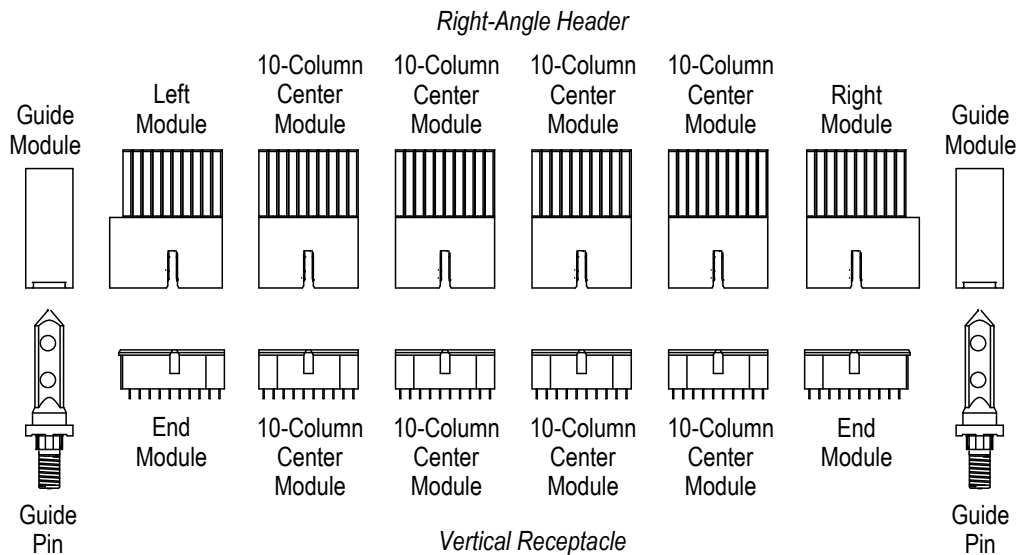
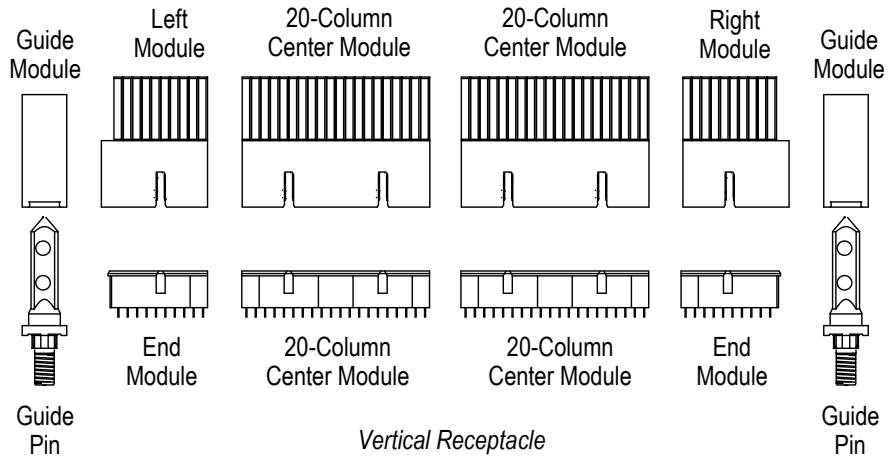


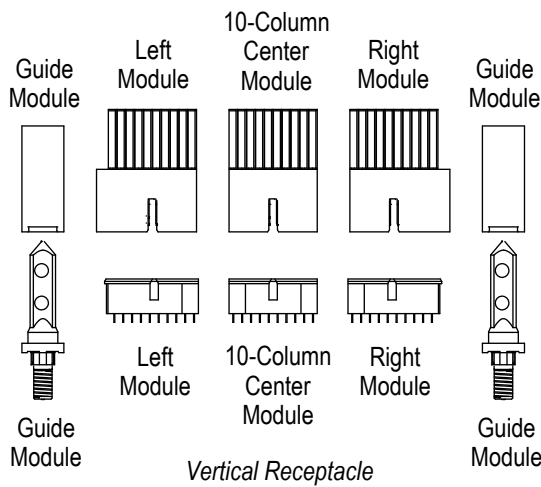
Figure 5 (Cont'd)

Possible Amount of Modules

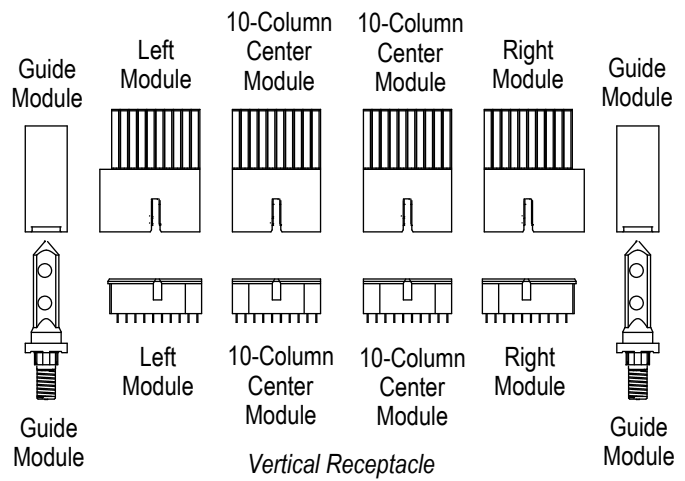
Right-Angle Header



Right-Angle Header



Right-Angle Header



Right-Angle Header

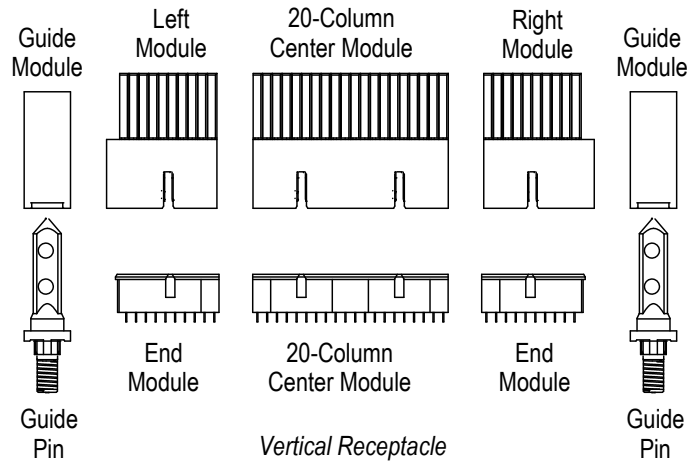
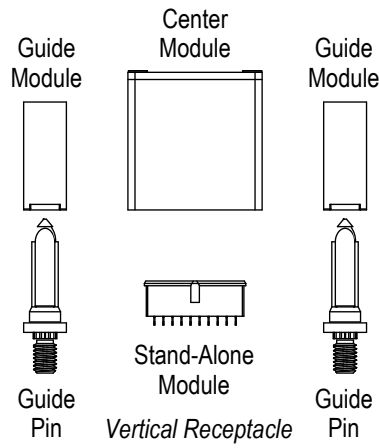


Figure 5 (Cont'd)

Metal Shell Connector Configurations

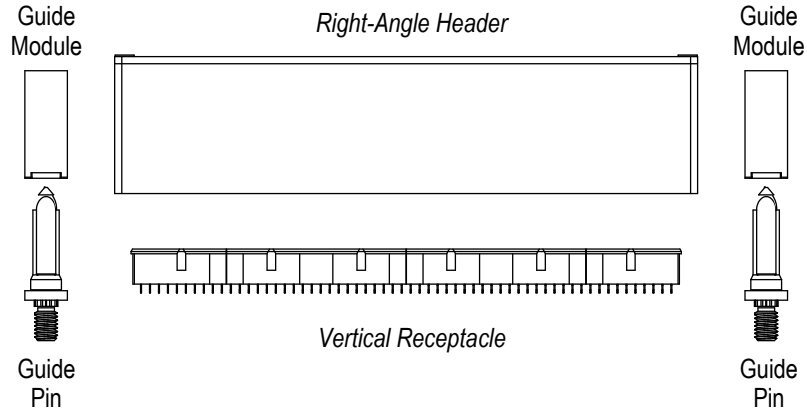
Possible Amount of Modules

Right-Angle Header



Recommended Maximum Amount of Modules Between Guide Hardware

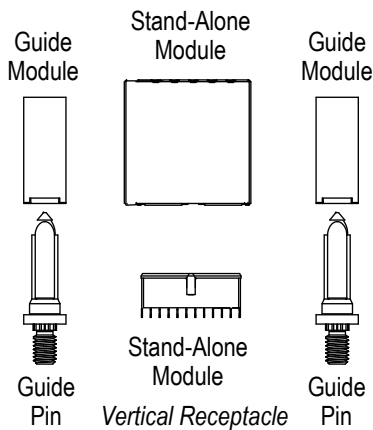
60 Columns



EMI Shielded Connector Configurations

Minimum Amount of Modules

Right-Angle Header



Recommended Maximum Amount of Modules Between Guide Hardware

60 Columns

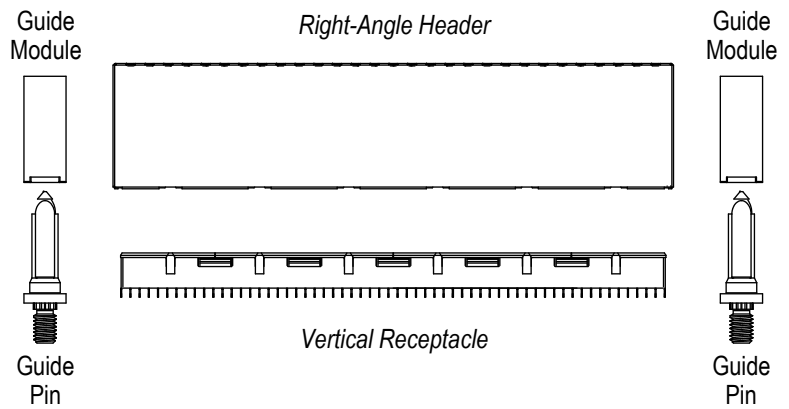


Figure 5 (End)

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Added tooling to Section 5

2.2. Customer Assistance

Reference Product Base Part Numbers 2000891 and 2000896 and Product Code L723 are representative of the Fortis Zd modular connector system. Use of these numbers will identify the product line and help you to obtain product and tooling information when visiting www.te.com or calling the number at the bottom of page 1.

2.3. Customer Drawings

Customer drawings for product part numbers are available from www.te.com. Information contained in the customer drawing takes priority.

2.4. Specifications

Product Specification [108-2409](#) provides product performance and test results.

2.5. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions or tooling setup and operation procedures. The instructional material that pertains to this product is:

[408-32056](#) Fortis Zd Metal Shell Module Assembly Kits 2102114-[] and 2102077-[]

2.6. Standards and Publications

IEC 60352-5, "Solderless Connections Part 5: Press-In Connections—General Requirements, Test Methods and Practical Guidance"

3. REQUIREMENTS

3.1. Safety

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



DANGER

To avoid personal injury, connectors must be handled with care; components may be sharp.

3.2. Operating Temperature

The connector system is designed to operate in a temperature range of -65° to 125°C [-85° to 257°F].

3.3. Material

Each module housing is made of molded high-temperature rated polyesters (UL 94V-0). The header contacts are made of phosphor bronze, and the receptacle contacts are made of beryllium copper; both are plated with gold at the contact interface and both are underplated with nickel and have tin, tin-lead, or gold contact tails.

The EMI shield is made of unplated nickel silver, which is a copper, nickel, zinc alloy. The metal shell is made of aluminum coated with trivalent chromate.

3.4. Storage

A. Shelf Life

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

B. Chemical Exposure

Do not store product near any chemical listed below as they may cause stress corrosion cracking in the material.

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

3.5. PC Board

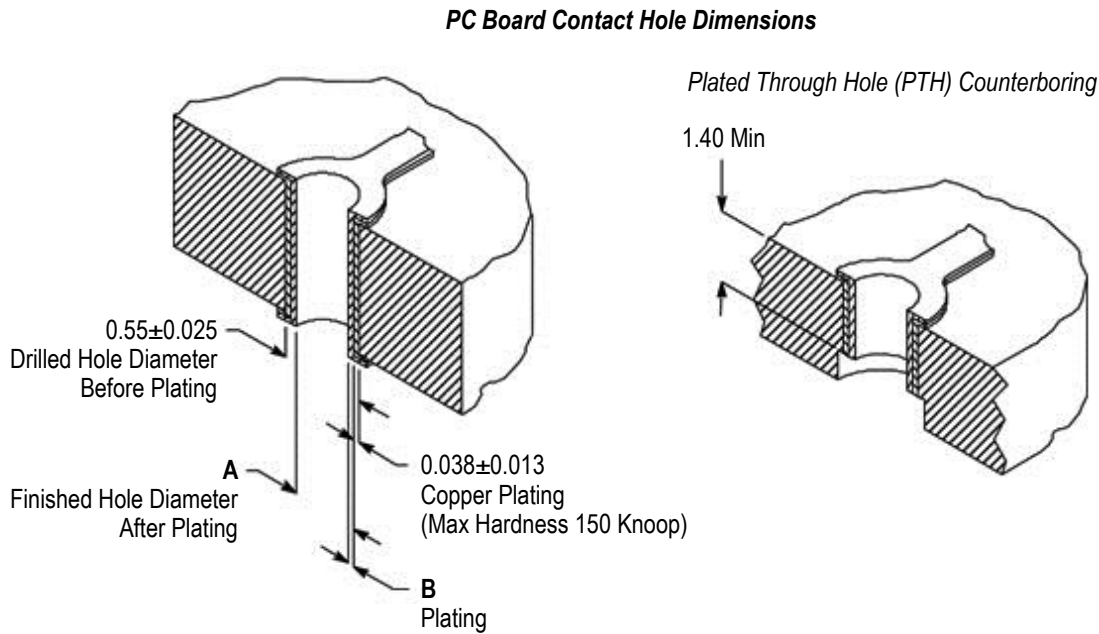
A. Material and Thickness

The recommended pc board material is glass epoxy (FR-4 or G-10). The pc board thickness shall be a minimum of 1.40 to allow positive retention of the contacts. For mid plane application, the backplane thickness shall be a minimum of 3.8. Thicker pc boards will not affect retention of the contacts.

B. Holes

The contact holes must be drilled and plated through to specific dimensions. The plating type and thickness and finished hole size must be as stated to provide unrestricted insertion of the contacts. See Figure 6.

Pc boards can be back-drilled (counterbored) for signal integrity performance using no more than the overall plating thickness dimension provided in Figure 6.



DIMENSION		
A	B	
	Surface Finish	Thickness Range
0.46	Tin-Lead (SnPb)	0.008±0.004
	Immersion Tin (Sn)	0.0005-0.004
	Organic Solderability Preservative (OSP)	0.0002-0.0005
0.47	Immersion Silver (Ag)	0.0003±0.0002
	Immersion Gold (Au) Over Nickel (Ni) (ENIG)	0.0001-0.0005 Au 0.00127-0.0026 Ni

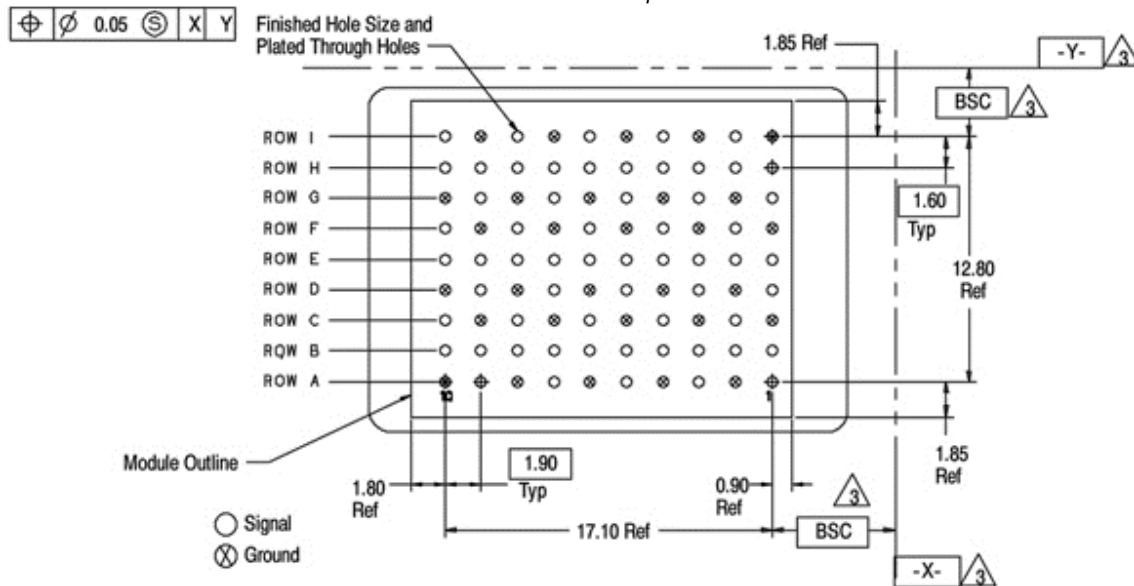
Figure 6

C. Layout

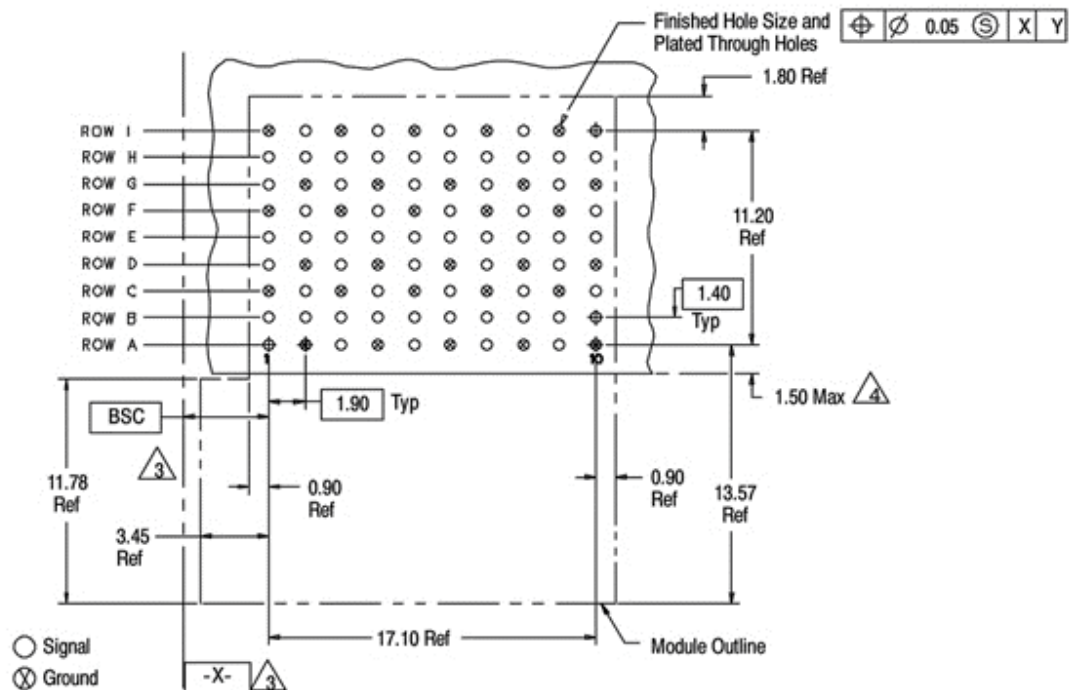
The holes in the pc board must be precisely located to ensure proper placement and optimum performance of the module. The pc board layout must be designed using the dimensions provided on the customer drawing for the specific module. A reference sample of the recommended pc board layouts are shown in Figure 7.

Sample Recommended PC Board Layouts (Component Side Shown)

Standard Vertical Receptacle End Module



Standard Right-Angle Header Left End Module

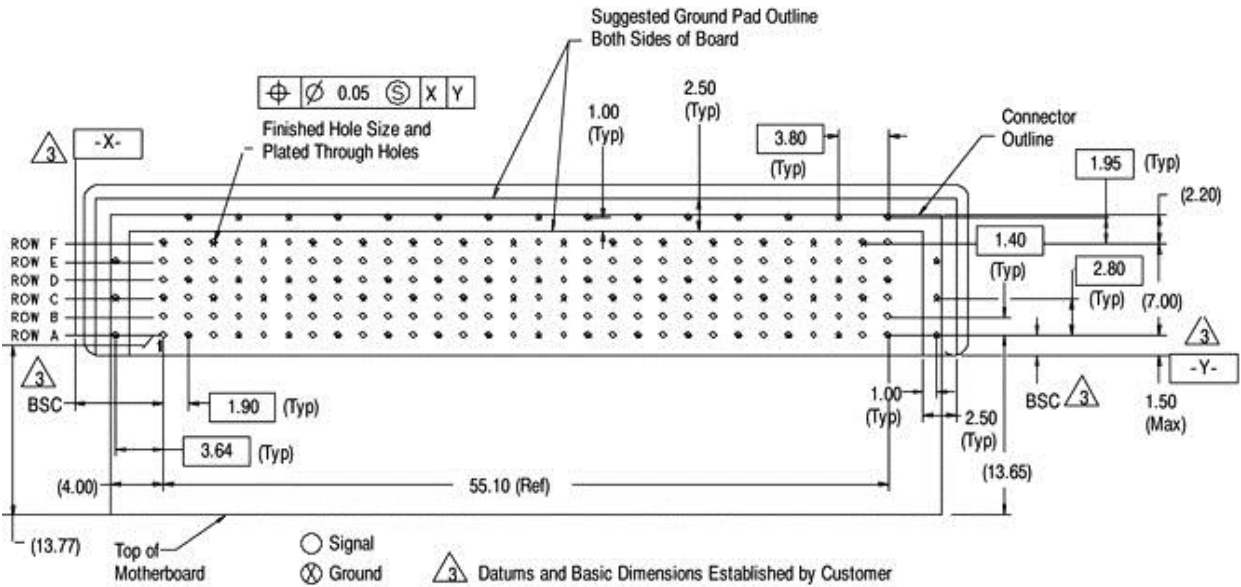


$\triangle 3$ Datums and Basic Dimensions Established by Customer

$\triangle 4$ Dimension Applies to Centerline of Through Hole

Figure 7 (Cont'd)

2-Pair EMI Shielded Right-Angle Header



2-Pair EMI Shielded Vertical Receptacle

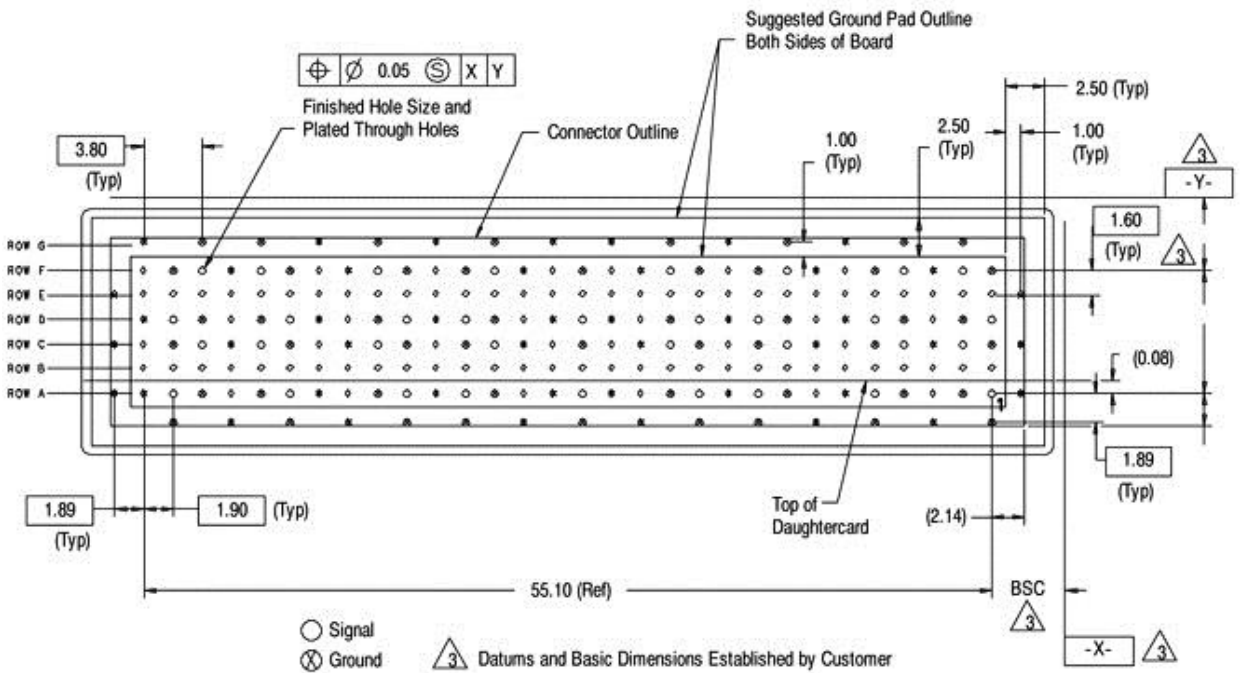
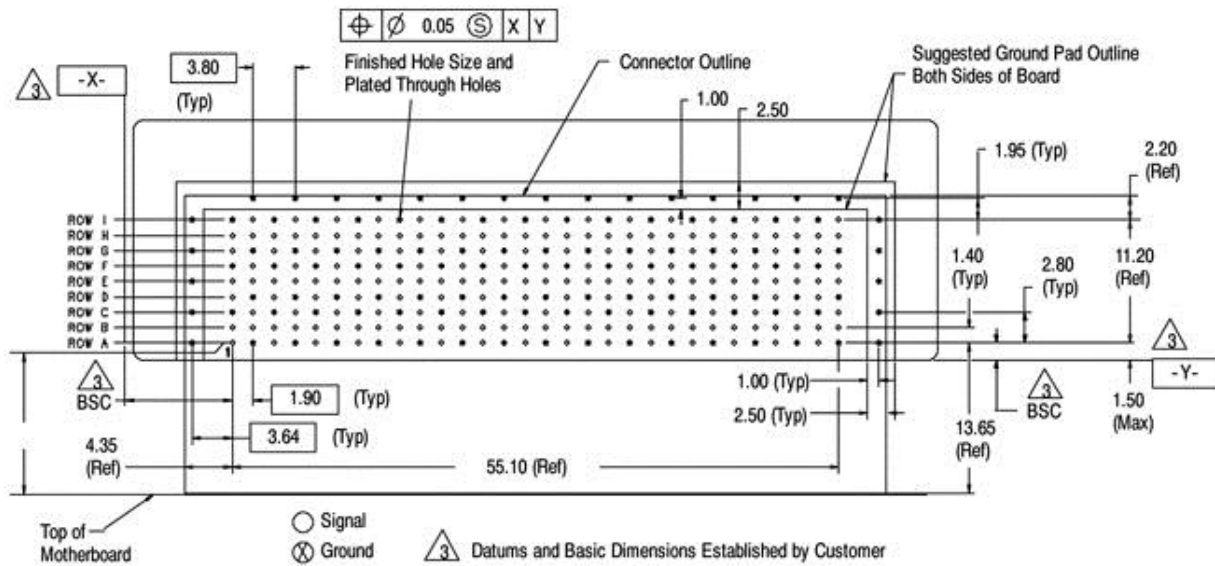


Figure 7 (Cont'd)

3-Pair EMI Shielded Right-Angle Header



3-Pair EMI Shielded Vertical Receptacle

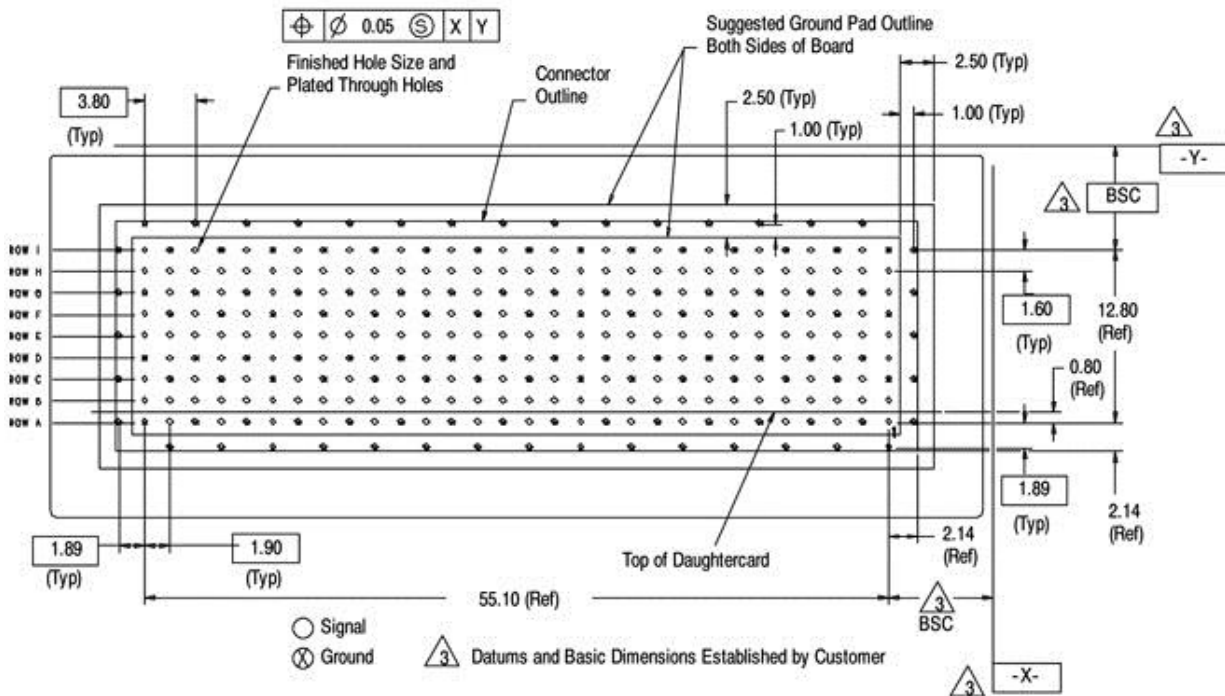


Figure 7 (Cont'd)

3-Pair Metal Shell Right-Angle Header

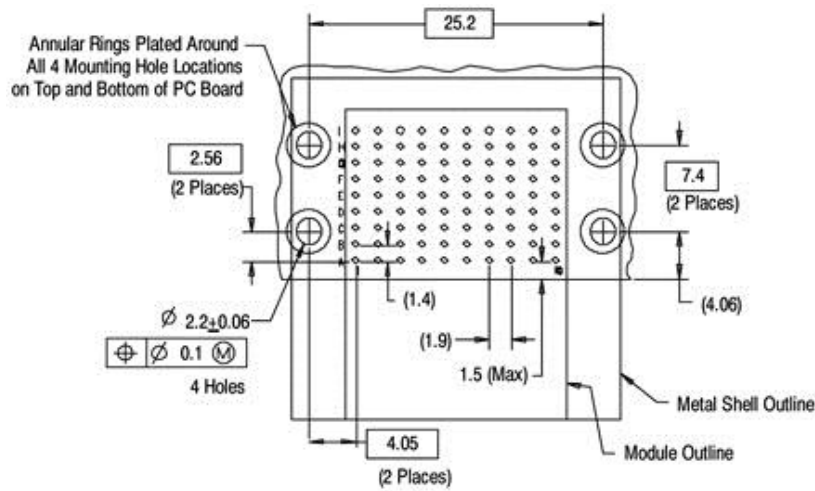


Figure 7 (End)

3.6. Placement

A. Module

The module number one position must be aligned with the number one position board hole. When placing modules on the pc board, make sure that the contacts are aligned and started into the matching holes before seating the module onto the pc board.



CAUTION

Modules should be handled only by the housing to avoid deformation, contamination, or damage to the contacts.

B. Guide Hardware

The interaction of the guide pin and guide module provide error-free mating and prevents damage to the housings and contacts. See Figure 8.

Guide hardware is recommended for multi-connector, large and heavy daughtercard applications, and conditions where misalignment tolerances given in Paragraph 3.9 cannot be met.

Placement of the guide hardware onto the pc boards must be applied with tooling capable of supplying a downward force between 222 and 667 N [50 and 150 lb-force]. The guide hardware must be fully seated on the pc board. A customer-supplied screw must be used with the guide module.

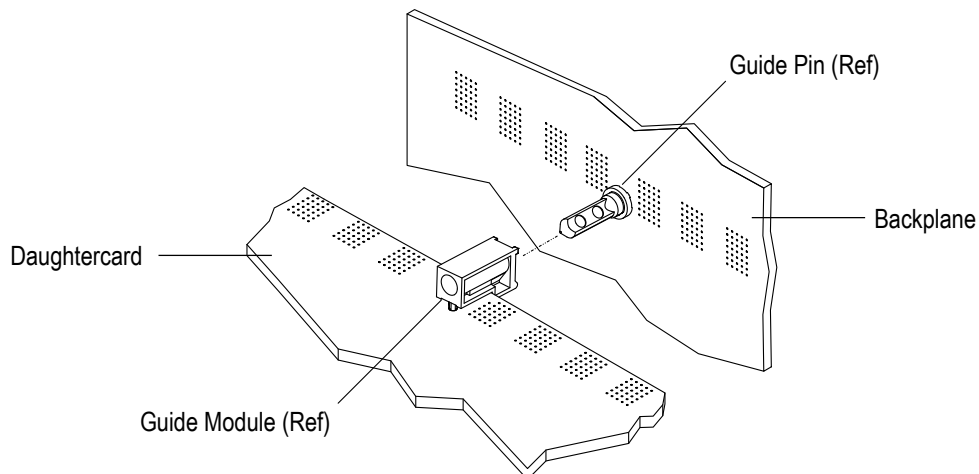


Figure 8

3.7. Spacing

A. Modules End-to-End

Care must be used to avoid interference between adjacent modules. The recommended minimum distance between modules to ensure proper connector mating is provided in Figure 9. When using these modules with other connectors or components, call product information at the number at the bottom of page 1 for recommended spacing.

i **NOTE**
 The information provided is for manual placement of modules. If robotic equipment is used, other space allowances will be required for the grippers.

Recommended Module End-to-End Spacing (Component Side Shown)

Note: Dimensions are for reference only.

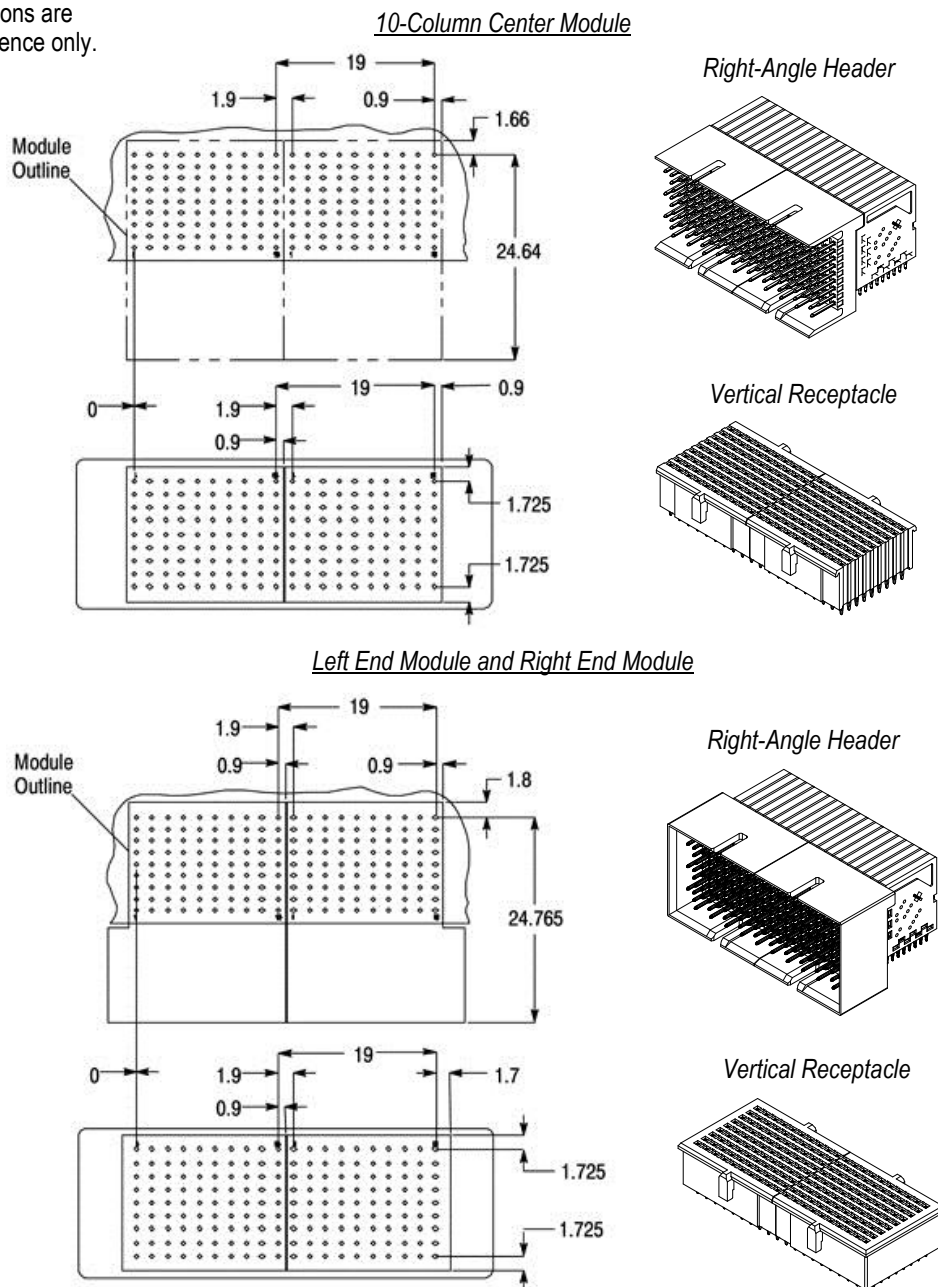


Figure 9 (Cont'd)

Note: Dimensions are for reference only.

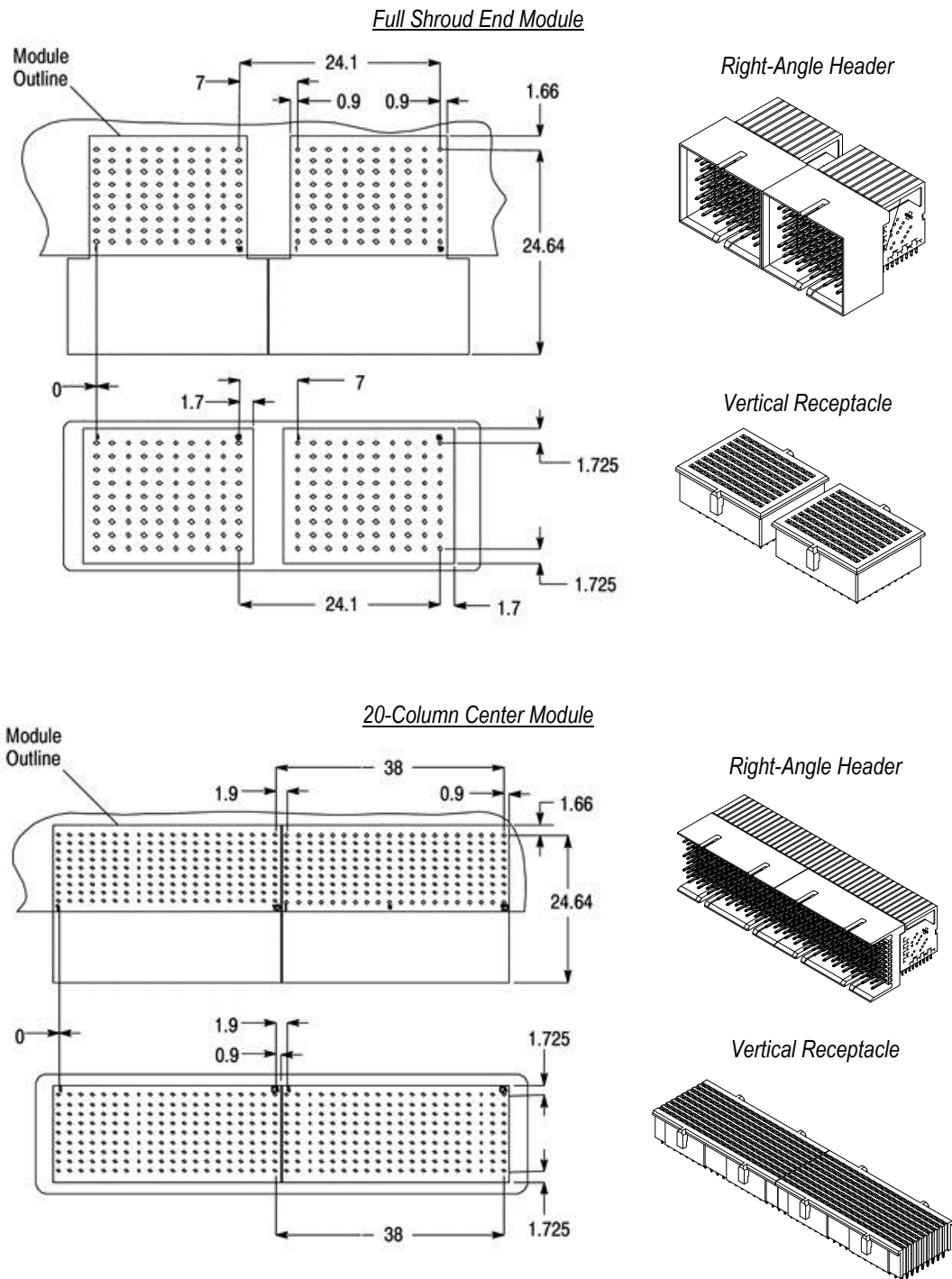
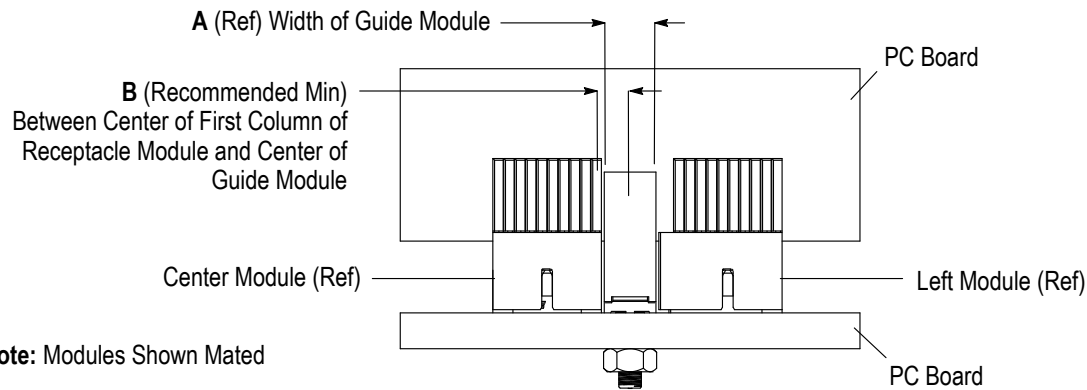


Figure 9 (End)

B. Modules and Guide Hardware

The recommended minimum distance between the module and guide hardware is given in Figure 10.

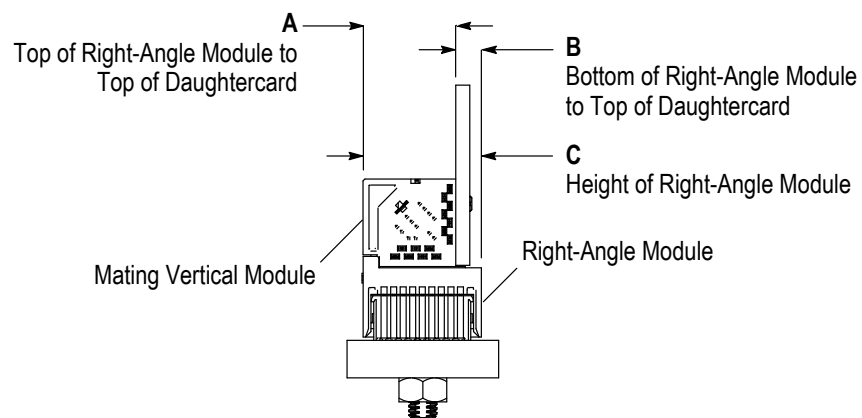


GUIDE HARDWARE	DIMENSION				
	A	B			
		Center Module	Left, Right, or Full Shroud Module	Module With EMI Shield	Module With Metal Shell
UPM and Keyed	7.9	5.35	7.9	8.8	10.0
VITA 46 Type	9.0	5.9	8.45	9.35	10.55

Figure 10

C. Daughtercard to Daughtercard

Care must be used to avoid interference between adjacent daughtercards. Dimensions needed to determine the appropriate daughtercard to daughtercard spacing are provided in Figure 11.



CONNECTOR TYPE	DIMENSION					
	2-PAIR			3-PAIR		
	A	B	C	A	B	C
Standard	10.7	4.3	15	15.5	4.3	19.8
EMI Shielded Vertical Receptacle	10.98	4.57	15.55	15.78	4.57	20.35
Metal Shell Right-Angle Header	11.93	5.52	17.46	16.73	5.52	22.25

Figure 11

3.8. Seating Modules

The module must be seated onto the pc board using the tooling described in Section 5. The maximum amount of force (determined from an average) required to seat the module onto the pc board is 44.5 N [10 lb-force] per compliant pin contact. After seating, the entire “eye” of each contact must be within the pc board hole. Depending on the thickness of the pc board, the contact tails may or may not protrude from the pc board. The maximum gap between the pc board and the module after seating is given in Figure 12.

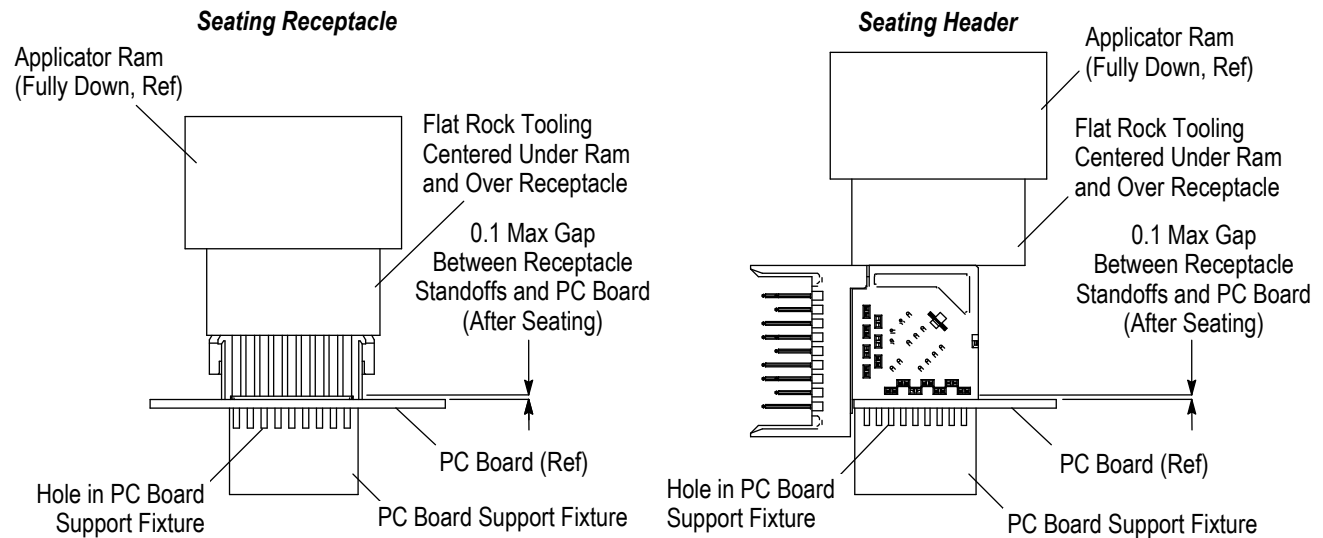


Figure 12

3.9. Optional Enhancement for EMI Shielded Connector

The protection provided by the EMI shield can be strengthened by enclosing the board footprint, board ground pad, and connector overhang area with conductive tape. The plated through-hole field and connector compliant pins must first be insulated by a polyimide film with silicone adhesive tape. Refer to Figure 13.

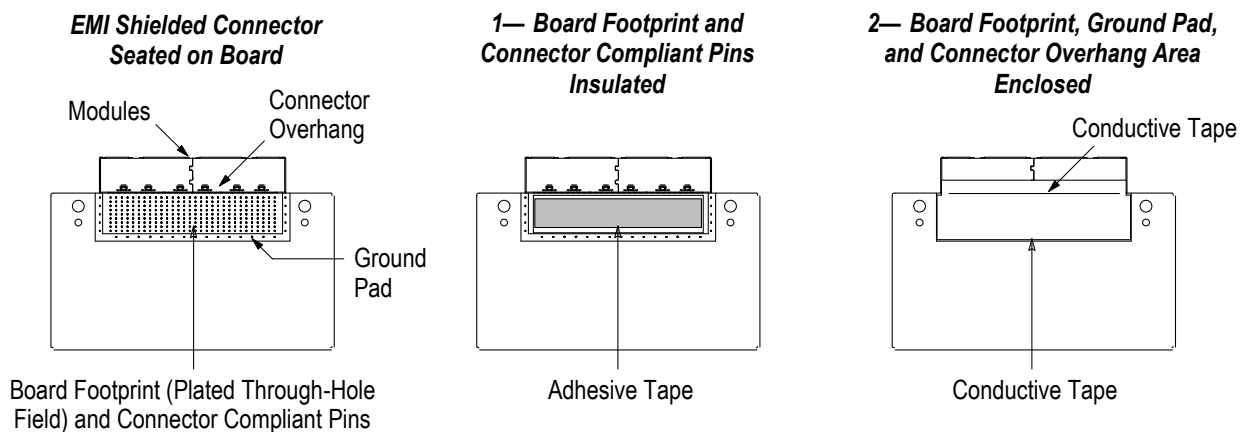


Figure 13

3.10. Mating Modules

For optimum performance, the right-angle modules should mate with the vertical modules according to the type: standard with standard, EMI shielded with EMI shielded, and metal shell with standard. However, all of the modules are intermateable and backward-compatible for possible combinations such as, the metal shell right-angle module mating with the EMI shielded vertical module and the EMI shielded right-angle module mating with the standard vertical module.

A. Alignment

Proper alignment is essential to ensure full engagement of mating modules and that contacts are not bent or otherwise damaged during mating.

Tolerance limitations for single plane application are given Figure 14.

Tolerance limitations for mid plane application are given Figure 16.

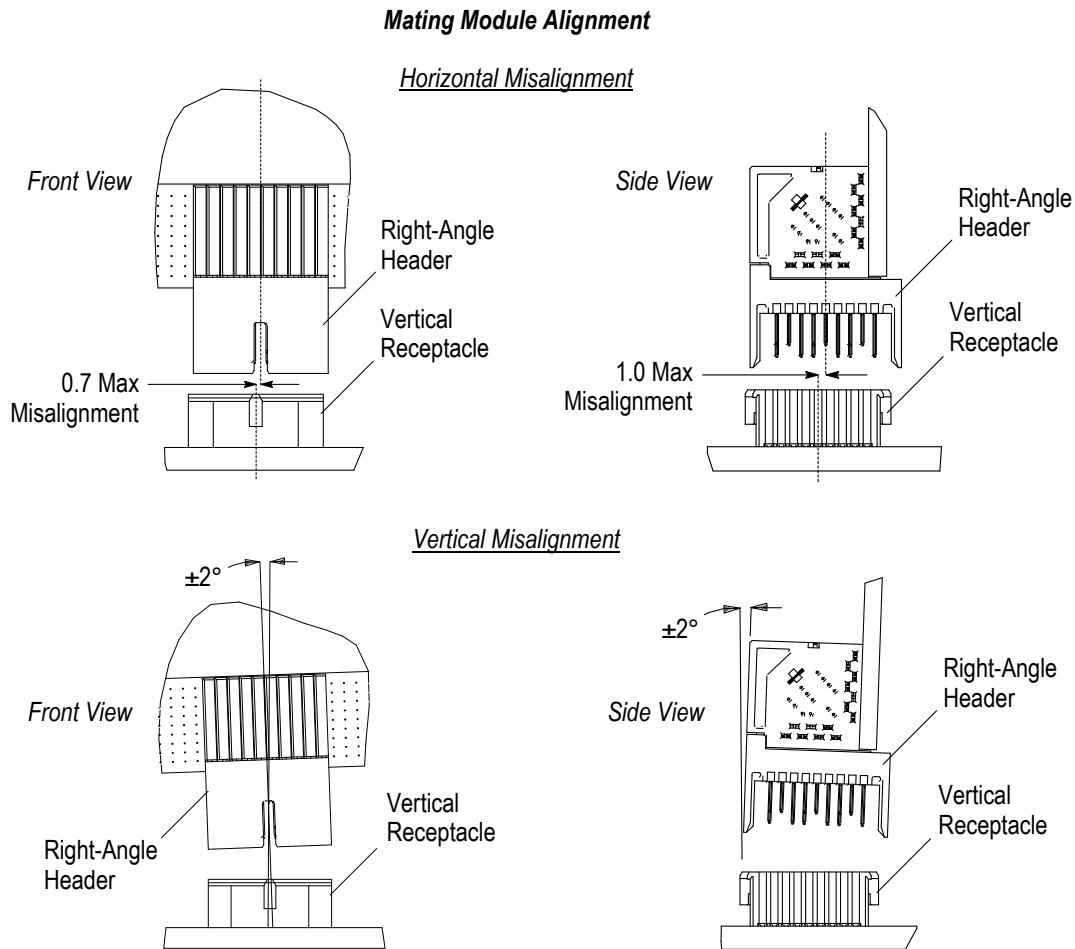


Figure 14

B. Mating Force

A maximum amount of force (determined from an average) required for full mating of the modules is 1.11 N [4 oz-force] per separable interface contact.

C. Mating Sequence and Wipe Length

These connectors have 3 levels of sequencing during mating: first mate, last break (FMLB), reliable mate, and fully mated. The relative distances between sequencing levels as a function of the distance between the top of the backplane and the centerline of Row A of the daughtercard module is given in Figure 15.

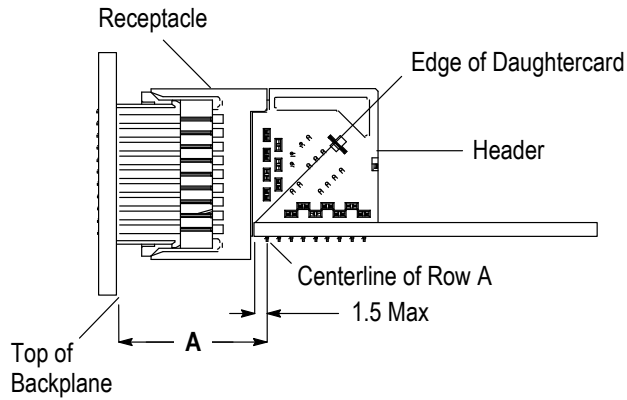
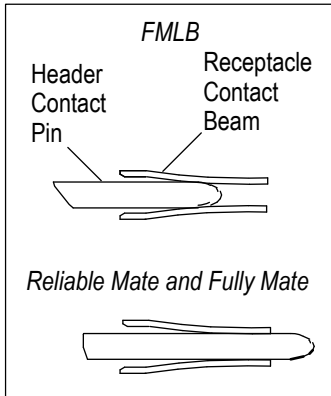
To ensure full mating of modules, the recommended minimum distance between the top of the backplane and the centerline of Row A of the header (daughtercard module) and related dimensions are given in Figure 15.

Wipe length is calculated by subtracting the reliable mating point dimension and the fully mated condition dimension.

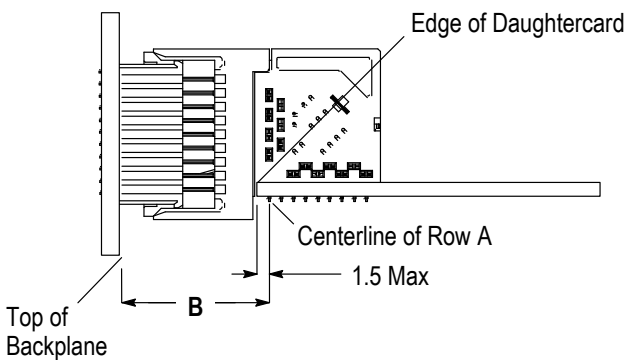
i **NOTE**
Dimensions are based on modules being fully seated on the pc board.

Mating Sequence

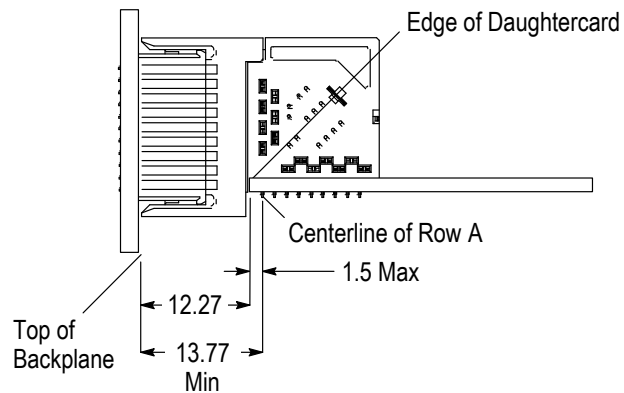
First Mate Last Break (FMLB)



Reliable Mate



Fully Mate



i **NOTE**
FMLB is the first and last instance in a mating cycle where the pin comes in contact with the beam, but has not deflected the beam. Reliable mate is the first and last instance in a mating cycle where the pin has completely deflected the beam and the beam is supplying full normal force to the pin.

COMPONENT	DIMENSION		WIPE LENGTH (Max)
	A (FMLB)	B (Reliable Mate)	
Plastic Housing (Alignment)	20.00	—	—
Ground Contact	17.27	17.12	3.35
Signal Contact	15.92	15.77	2.00

Figure 15

D. Mid Plane Application

Alignment for mid plane applications are shown in Figure 16.

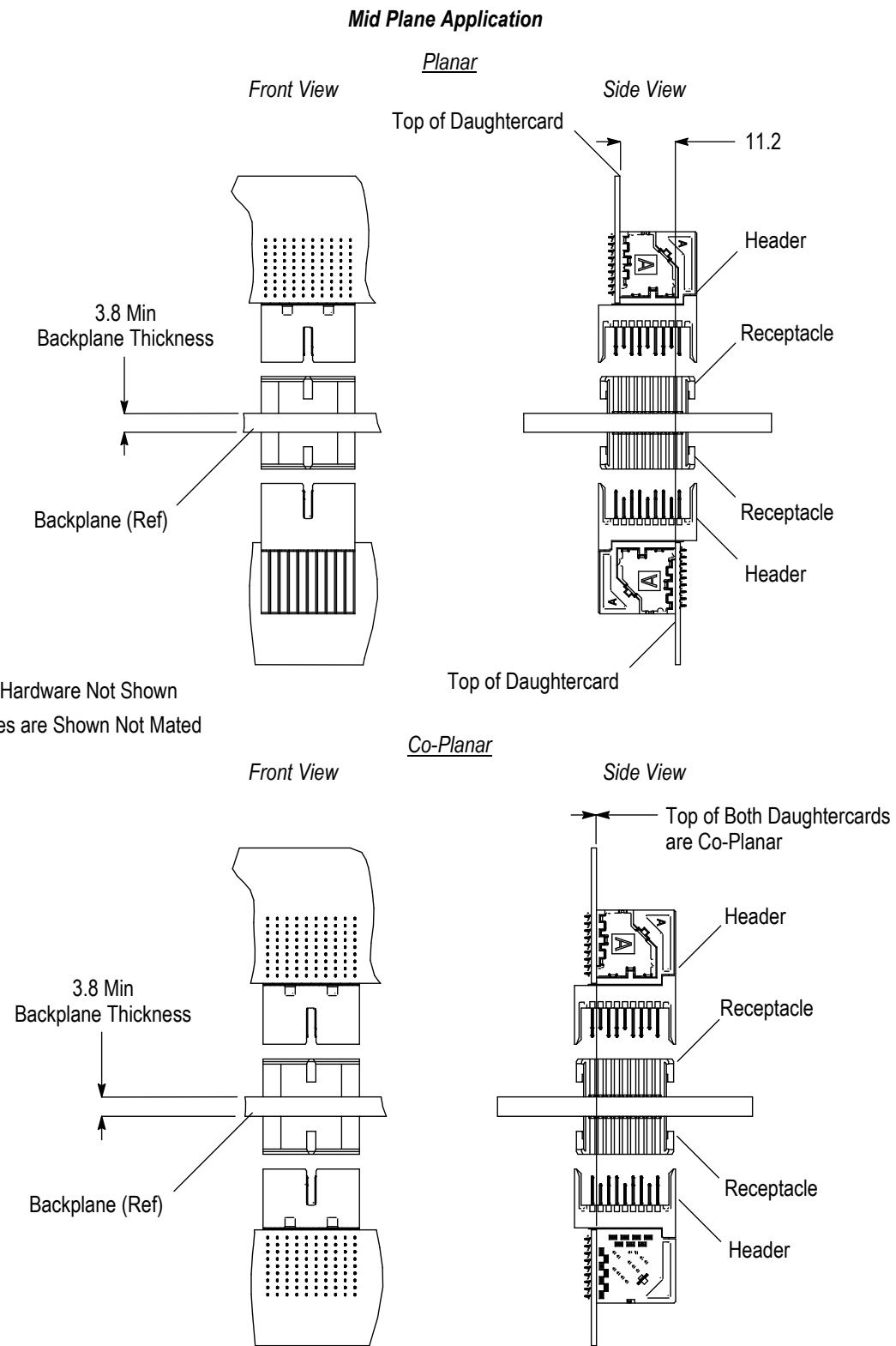


Figure 16

3.11. Unmating Force

The minimum amount of force (determined from an average) required to unmate the modules is 0.4 N [1.44 oz-force] per separable interface contact.

3.12. Module Removal from PC Board

The minimum amount of force (determined from an average) required to remove the module from the pc board is 4.44 N [1 lb-force] per compliant pin contact.

3.13. Replacement and Repair

Damaged or defective modules must not be used. The modules can be replaced a maximum of two times.

4. QUALIFICATION

No outside agency approvals were defined at the time of publication of this document.

5. TOOLING

Tooling needed to seat the modules are shown in Figure 17.

5.1. Application Tooling

The application tooling (such as a manual arbor press) used to seat these modules must provide sufficient amount of downward force to insert the contacts into the pc board holes.

5.2. PC Board Support Fixture

A pc board support fixture must be used to prevent bowing of the pc board during the seating of the modules on the pc board. The support fixture must have a flat surface with holes or a channel large enough and deep enough to receive any protruding components, such as contact compliant tails. The pc board must be secured to the support fixture to prevent movement of the pc board during seating.

The pc board support fixture must also be used when removing the modules from the pc board.

5.3. Seating and Removal Tools

A. 2-Pair Modules and 3-Pair Vertical Module

Commercially available bar stock (flat rock tooling) with a flat surface large enough to cover all contacts must be used with the application tooling to seat and remove these modules.

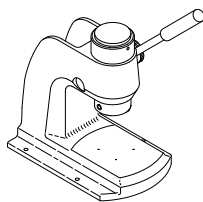
B. 3-Pair Right-Angle Module

Customer-supplied tooling meeting the dimensions given in Figure 17 must be used with the application tooling to seat and remove these modules.

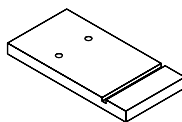


NOTE

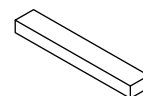
When removing the modules from the pc board, it is suggested that the pc board be supported from the connector side.



Manual Arbor Press
(Typical)



PC Board Support
(Must Be Custom Made)



Flat Rock Tooling for 2-Pair Modules and
3-Pair Vertical Module (Must Be Custom Made)

Figure 17 (Cont'd)

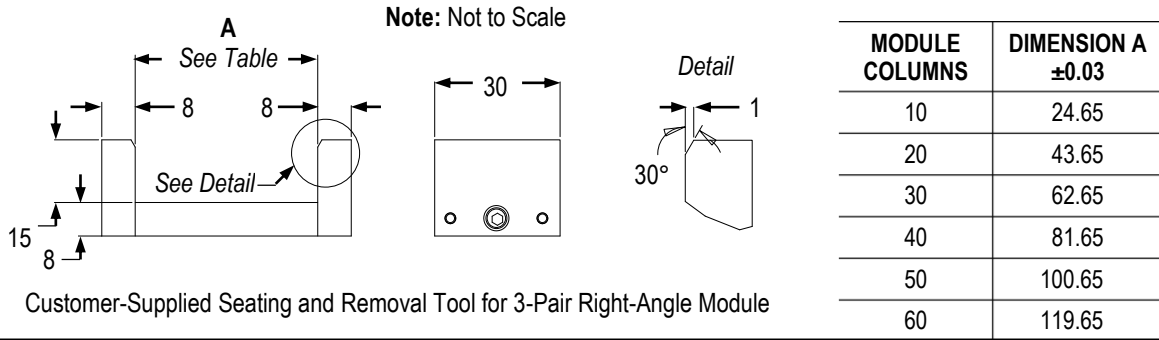


Figure 17 (End)

6. VISUAL AID

The illustration below shows a typical application of Fortis Zd modular connector 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 or tooling.

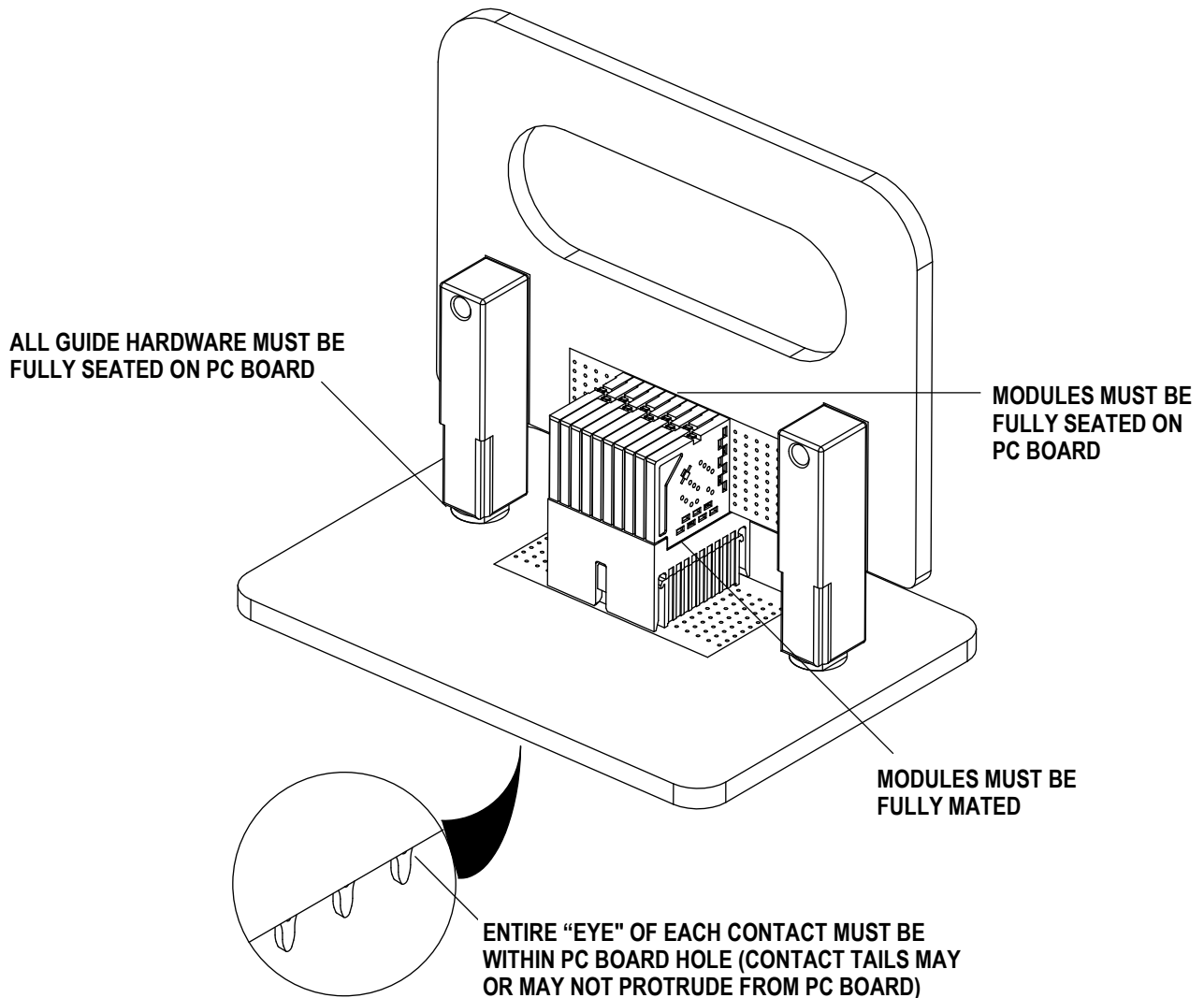


FIGURE 18. VISUAL AID