



NUMBER <b>GS-20-045</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE  Hard Metric Connectors		PAGE 1 of 14	REVISION D
		AUTHORIZED BY Tan Chen Hong	DATE 1 <sup>st</sup> Jul 09
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## 1.0 OBJECTIVE

This specification provides information and requirements for customer application of Hard Metric Guide Connectors. It is intended to provide general guidance for 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 processes vary from the recommended one, FCI cannot guarantee acceptable results.

## 2.0 SCOPE

This specification provides information and requirements regarding application of Hard Metric Guide pins and receptacles to printed circuit boards (PCB).

## 3.0 DRAWINGS AND APPLICABLE DOCUMENTS

- FCI Product Specification GS-12-239 (AirMax VS<sup>®</sup> Connector System, press-fit products)
- FCI Application Specification GS-20-035 (AirMax VS<sup>®</sup> Connector System, press-fit products)
- FCI Product Specification GS-12-220 (2mm High Power Connector System)
- FCI Application Specification GS-20-023 (2mm High Power Connector System)
- FCI customer drawing 10035911c (PCB LAYOUT FOR AirMax VS<sup>®</sup> SIGNAL, POWER, AND GUIDE MODULES)
- Applicable FCI product customer drawings


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.

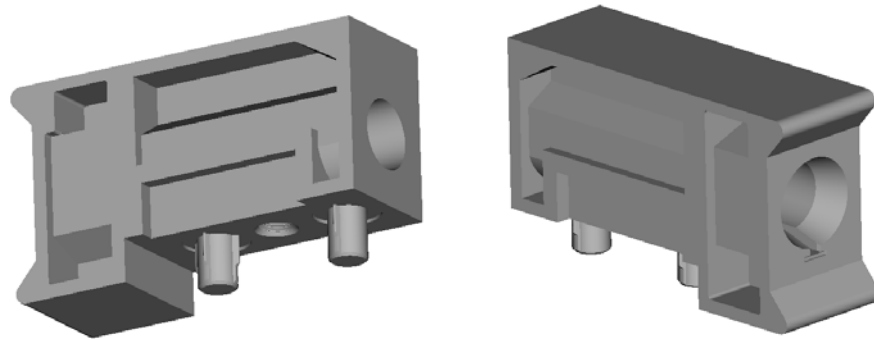
## 4.0 GENERAL CUSTOMER INFORMATION

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

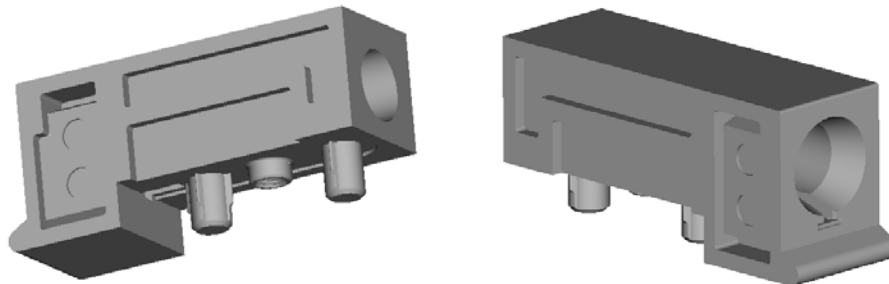
### 4.1 GUIDE CONNECTOR CONFIGURATIONS

Hard Metric Guide Connectors are offered in 10.8mm and 7.2mm module widths. The 10.8mm versions offer guidance, keying, and ESD protection while the 7.2mm versions offer guidance only. Each module width is also offered in two different height profiles relative to the top surface of the card. The larger height offering is most similar to AirMax VS<sup>®</sup> 4 and 5 pair signal products, while the smaller height offering is most similar to AirMax VS<sup>®</sup> 2 and 3 pair signal products (note: AirMax VS<sup>®</sup> 2 pair signal products are still in product development and are not yet available for sale). See Figures 2a – 2f for illustrations the 10.8mm guide configurations. See Figures 3a – 3f for illustrations of the 7.2mm guide connectors.

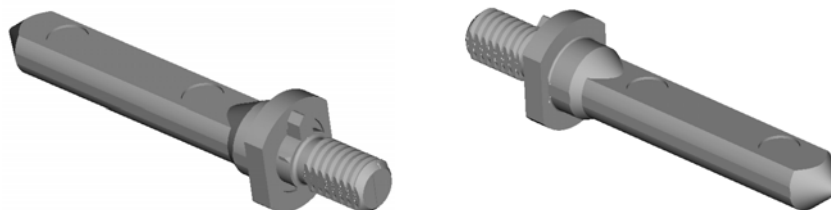
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**Figure 2a: 10.8mm guide receptacle (ESD and keying optional); AirMax VS<sup>®</sup> 4/5 pair profile**

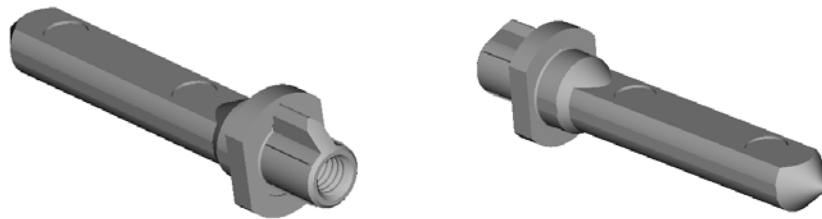


**Figure 2b: 10.8mm guide receptacle (ESD and keying optional); AirMax VS<sup>®</sup> 2/3 pair profile**

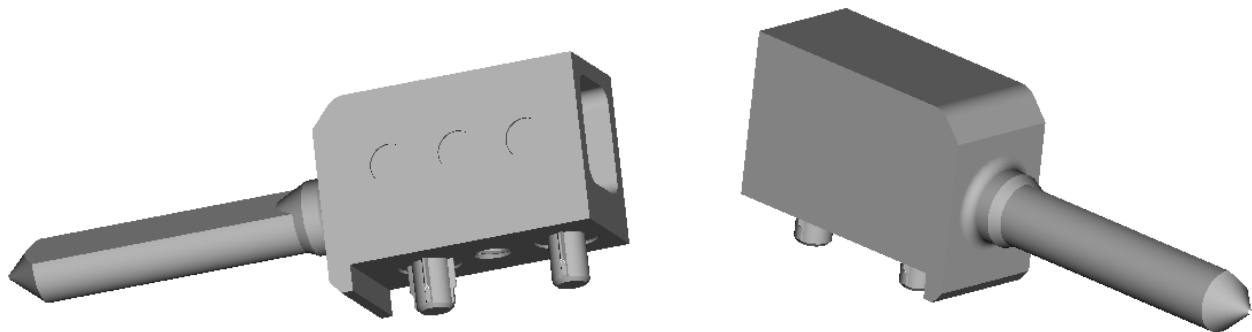


**Figure 2c: 10.8mm straight guide pin with external threads  
(Used with 2/3 pair and 4/5 pair guide receptacle profiles)**

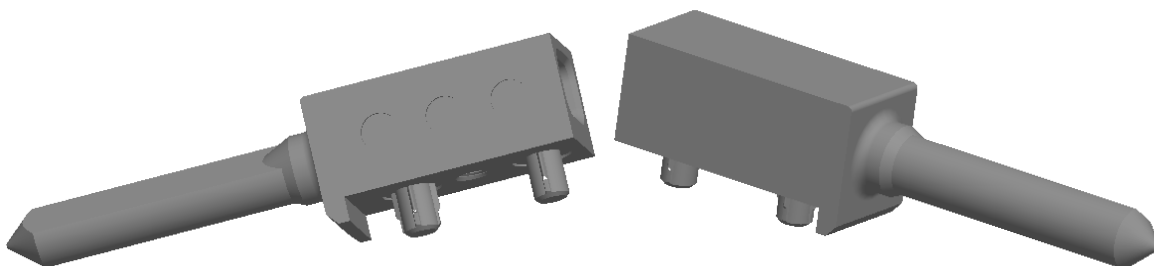
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**Figure 2d: 10.8mm straight guide pin with internal threads  
(used with 2/3 pair and 4/5 pair guide receptacle profiles)**

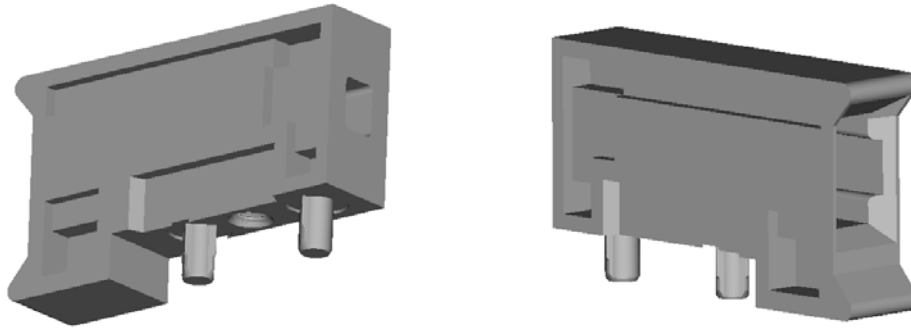


**Figure 2e: 10.8mm r/a guide pin; AirMax VS<sup>®</sup> 4/5 pair profile**

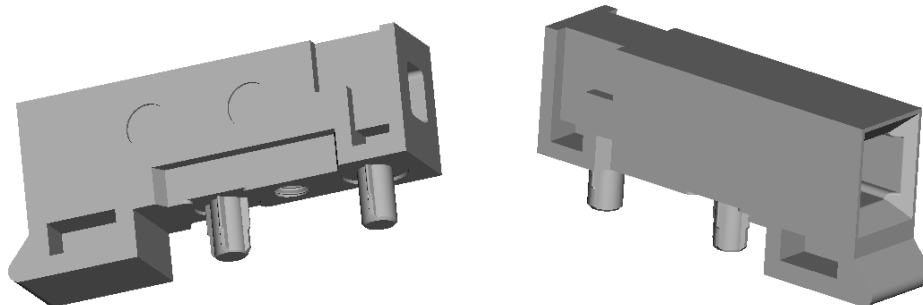


**Figure 2f: 10.8mm r/a guide pin; AirMax VS<sup>®</sup> 2/3 pair profile**

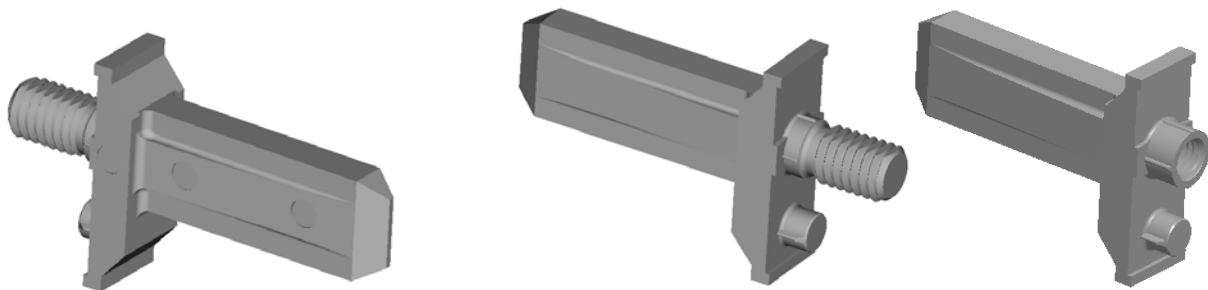
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**Figure 3a: 7.2mm guide receptacle; AirMax VS<sup>®</sup> 4/5 pair profile**

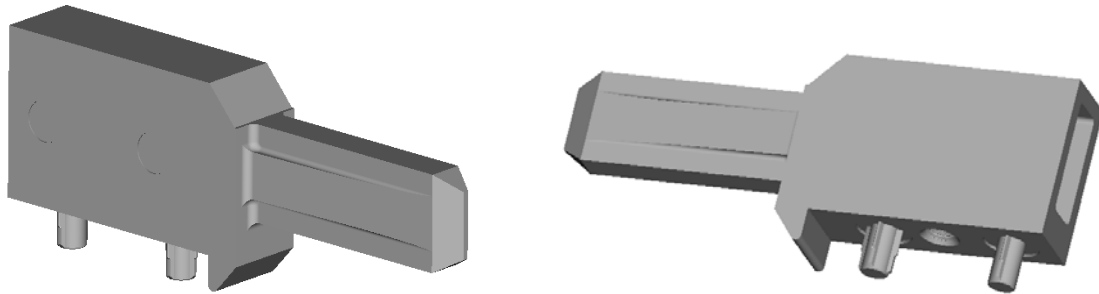


**Figure 3b: 7.2mm guide receptacle; AirMax VS<sup>®</sup> 2/3 pair profile**

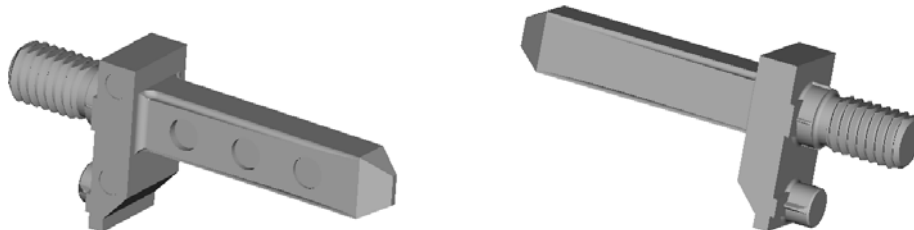


**Figure 3c: 7.2mm guide pin; AirMax VS<sup>®</sup> 4/5 pair profile  
(With internal thread or external thread)**

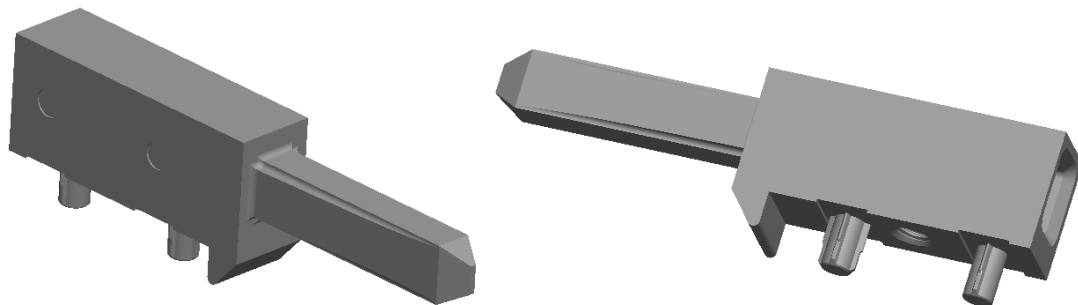
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**Figure 3d: 7.2mm r/a guide pin; AirMax VS<sup>®</sup> 4/5 pair profile**



**Figure 3e: 7.2mm guide pin; AirMax VS<sup>®</sup> 2/3 pair profile**



**Figure 3f: 7.2mm r/a guide pin; AirMax VS<sup>®</sup> 2/3 pair profile**

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## 4.2 COMPATIBILITY WITH HARD METRIC PRODUCTS:

Hard Metric Guide Connectors are compatible with hard metric standards in that the distance between the backplane and front edge of the daughter card is 12.5mm. The distance between front edges of daughter card is 12.5mm in a coplanar application. See Figure 4 and Table 1 for dimensions relative to daughter card for each guide connector configuration.

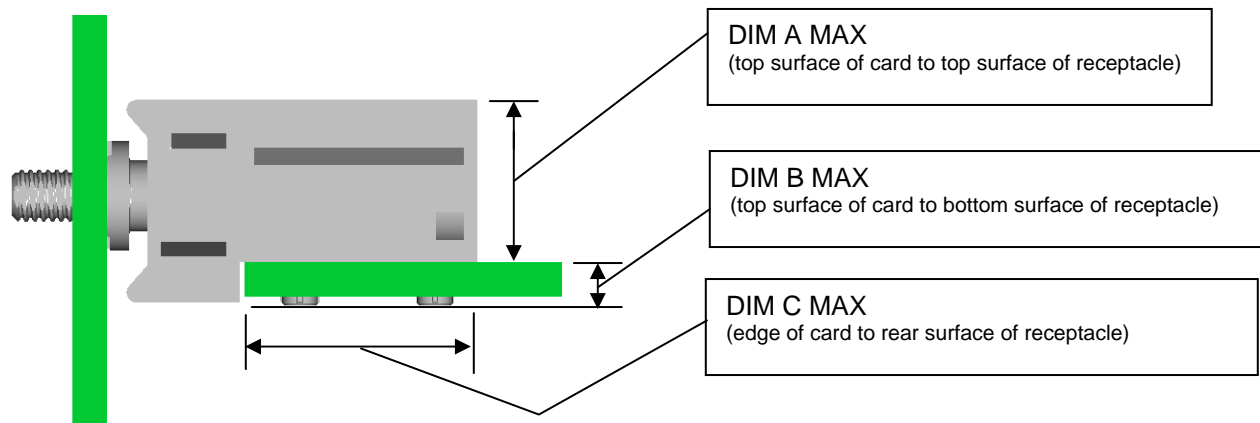


Fig 4a: end view of 10.8mm guide receptacle and straight pin (mounting hardware not shown assembled)

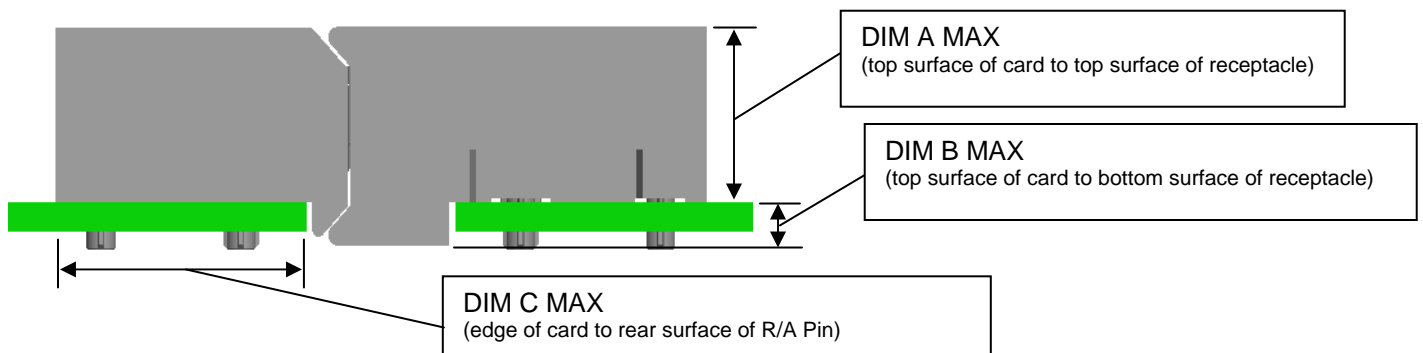



Fig 4b: end view of 7.2mm guide receptacle and R/A pin (mounting hardware not shown assembled)

Module width	Height profile	DIM A, mm	DIM B, mm	DIM C, mm
10.8mm	4/5 pair	14.7	3.7	21.5
7.2mm				
10.8mm	2/3 pair	9.95	3.7	21.5
7.2mm				

Table 1: dimensions relative to the daughter card

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### 4.3 GUIDING FEATURES:

The 10.8mm guide system will correct a maximum misalignment of **+/- 3.5 mm** in the direction perpendicular to the daughter card and **+/- 3.5 mm** in the direction parallel to the daughter card. The nominal wipe distance for a 10.8mm guide pin after it has been fully guided is **22.4 mm**. After fully guided the nominal clearance between the guide pin and receptacle is equal to **0.35 mm** (surrounding the pin).

The 7.2mm guide system will correct a maximum misalignment of **+/- 2.9 mm** in the direction perpendicular to the daughter card and **+/- 2.9 mm** in the direction parallel to the daughter card. The nominal wipe distance for a 7.2mm guide pin after it has been fully guided is **17.9 mm**. After fully guided the nominal clearance between the pin and receptacle is **0.25 mm** in the direction perpendicular to the daughter card and **0.30 mm** in the direction parallel to the daughter card.

### 4.4 QUANTITY AND LOCATION OF GUIDES RELATIVE TO SIGNAL MODULES:

Two guide connectors should be placed onto each daughter card. They should be positioned outside of any signal modules to maximize effectiveness. In cases where there is a very large span of signal connectors (larger than 12 inches) an extra guide may be needed near the center of the daughter card. This would only be necessary if the expected amount of board bow is larger than the amount of guidance provided by the signal connector housing guide features. Weight of daughter card would also determine the quantity of guides required; see section 4.10 for load rating of guide pin.

### 4.5 KEYING OPTIONS:

The purpose of keying is to prevent connectors with improperly matched keys from mating beyond the point of initial contact.


The 10.8mm guide connector offers up to 8 different keying options (plus an option without keying). A different receptacle is required for each keying option but the same guide pin is used for all. The footprint on the printed circuit board holds the guide pin in the proper keying orientation. Refer to the product customer drawing for PCB layout information.

The 7.2mm guide connector does not offer keying options.

### 4.6 PCB LAYOUT

Refer to the product customer drawing for recommendations regarding hole size and location for Hard Metric Guide connectors. For the 10.8mm guide pin the PCB layout will be partially defined by the chosen keying option.



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#### 4.7 ESD PIN OPTION:

The 10.8mm guide connector offers an ESD pin option. The nominal wipe distance of the ESD contact at full normal force is **15.1mm**.

The 7.2mm guide connector does not offer an ESD pin option.

#### 4.8 SPECIAL CONSIDERATION FOR GUIDE CONNECTOR MOUNTING HARDWARE

**When a Hard Metric Guide connector is placed adjacent to a signal or power connector, care must be taken to ensure that no interference condition exists on the hardware side of the daughter card or backplane.** One example of this type of issue could occur if the tails of an adjacent power connector protrude through the backplane and the mounting nut for the guide pin interferes with the power pin tips when tightened.

#### 4.9 PRINTED CIRCUIT BOARD THICKNESS


In general the minimum PCB thickness to be used with Hard Metric Guide Connectors is **1.60 mm**.

##### 4.9.1 For guide pins

The type of guide pin used in a system will be defined by the backplane thickness. For a backplane thickness less than **5.8 mm** the only option would be to use a guide pin with external threads. For thicker backplanes the guide pin with internal threads may be used also. Only the 10.8mm guide pin offers a version with internal threads. Refer to section 7.1 for mounting hardware information for both types of pins.

##### 4.9.2 For guide receptacles

The same guide receptacle will be used regardless of PCB thickness. Refer to section 7.2 for mounting screw information. **Care must be taken in applications with thin cards to ensure that mounting screws for right angle receptacle modules do not extend into the cavity that accepts a mating guide pin.**

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## 4.10 GUIDE WEIGHT RATING

The weight rating of each connector guide is specified as follows. The weight rating specifies below assumes a worst case deflection of 0.2mm for the given allowable load at the extreme end of the guide.

### 4.10.1 For 10.8mm guide pins

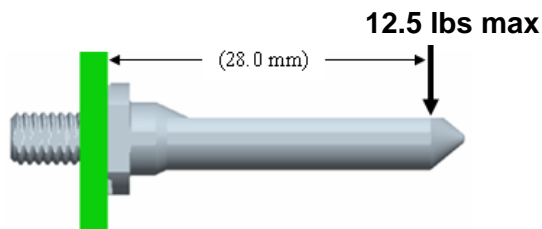


Figure 4c. Horizontal or Vertical Loading

### 4.10.2 For 7.2mm guide pins – 4/5Pair

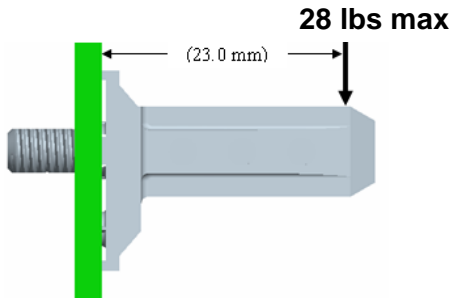


Figure 4d. Horizontal Loading

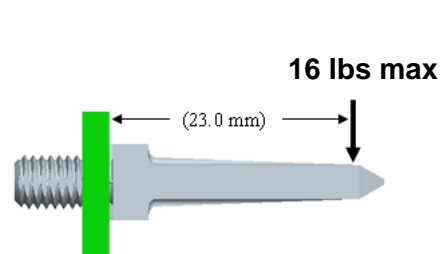


Figure 4e. Vertical Loading

### 4.10.3 For 7.2mm guide pins – 2/3Pair

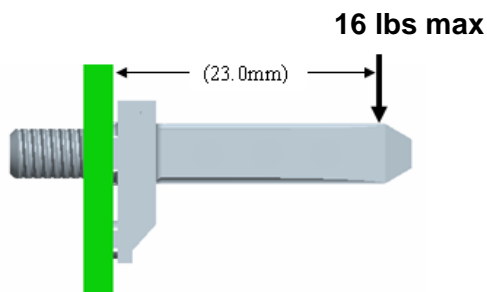


Figure 4f. Horizontal Loading

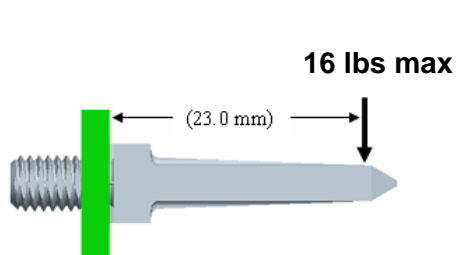



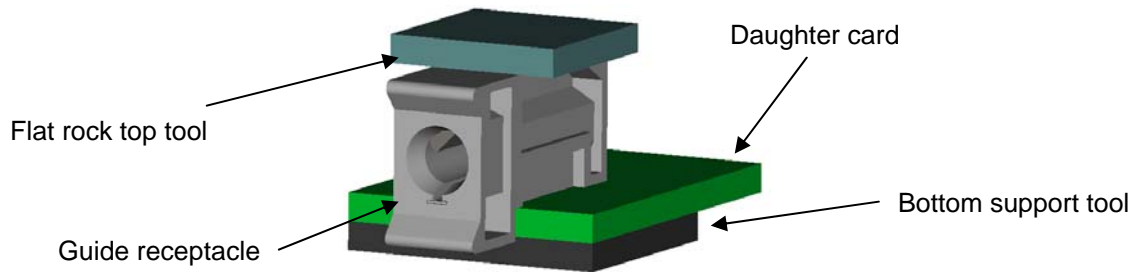
Figure 4g. Vertical Loading

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## 5.0 CONNECTOR APPLICATION

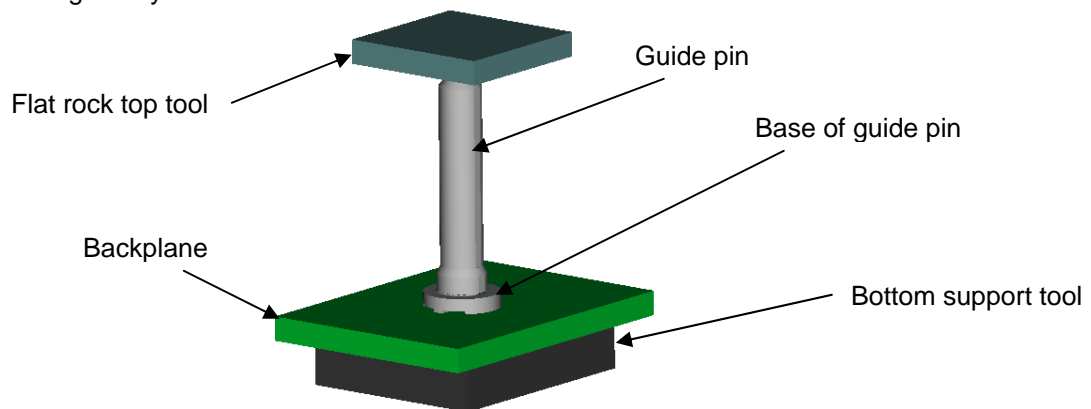
### 5.1 RECEPTACLE (10.8mm module shown)

A flat rock application tool may be used for pressing Hard Metric Guide receptacles into boards. If the press pegs extend through the daughter card, then a bottom support tool with clearance for the pegs will be necessary. This tool could be a PCB with oversized holes or a custom tool designed by the user.



### 5.2 PIN (10.8mm version shown)

A flat rock application tool may be used to press Hard Metric Guide pins into boards. An alternative method would be to use a round tube that presses on the base of the round guide pin or a U-shaped bar that presses on the base of a rectangular pin. When applying a pin with external threads a bottom support tool with clearance for the threaded stud must be used. This tool could be a PCB with oversized holes or a custom tool designed by the user.



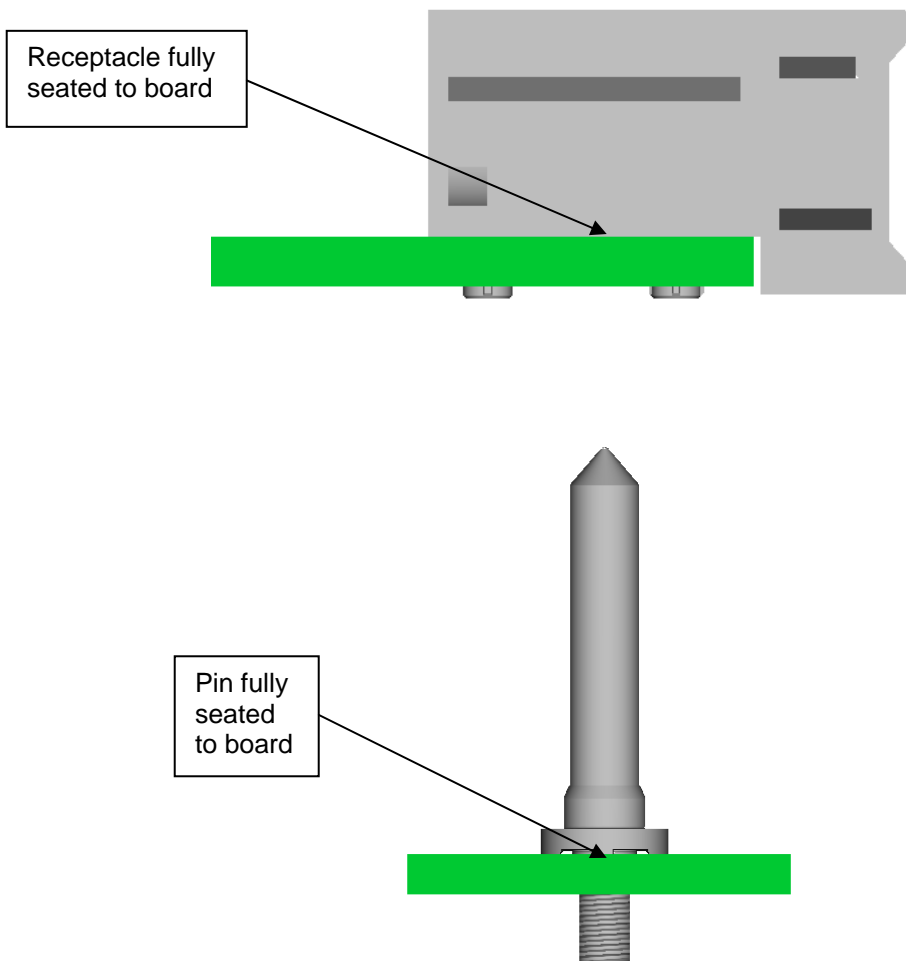
### 5.3 CUSTOM TOOLING

Custom application tooling can be provided by FCI for pressing mixed products simultaneously.


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## 6.0 POST-APPLICATION INSPECTION

Visually assure that the seating surfaces on the bottom of each guide connector are fully seated before applying hardware on the back side (see Figure 7).



**Figure 5: Proper seating**

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## 7.0 MOUNTING HARDWARE

Standard zinc-plated steel machine screws with a minimum engagement of 3 threads were used for all FCI evaluations.

### 7.1 FOR GUIDE PINS

#### 7.1.1 With external threads

A commercially available M5 nut must be used to secure this type of pin. The maximum recommended torque for the nut is **1.58 N-m (14 in-lbs)**.

#### 7.1.2 With internal threads

A commercially available M3.5 screw secures this type of guide pin to the backplane. When selecting a screw length, consider that the minimum depth of the threaded hole in a 10.8mm guide pin is **4.5 mm**. Add the minimum backplane thickness to this value to determine the maximum screw length.

The maximum recommended torque for the M3.5 screw is **0.90 N-m (8 in-lbs)**.


### 7.2 FOR GUIDE RECEPTACLES (10.8mm and 7.2mm)

For all guide receptacles, a commercially available M3 screw must be used to secure the module to the daughter card. One exception is the 2/3 pair guide receptacle part number 10045597 where a commercially available M2.5 screw must be used. When selecting a screw length, consider that the minimum depth of the threaded hole in a guide receptacle is **2.9 mm**. Add the minimum daughter card thickness to this value to determine the optimum screw length. Be careful not to select a screw length that would protrude into the guide pin cavity of the guide receptacle causing interference with a mating guide pin.

The maximum recommended torque for guide module screws is **0.90 N-m (8 in-lbs)**.

## 8.0 CONNECTOR REMOVAL

The mounting hardware must be removed prior to removing any guide connector. Guide pins and receptacles should be pushed from the back side of the board with an appropriate tool.

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### REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	All	Initial release	V05-0243	03/15/04
B	1,12	Change Author; Add 2/3 pair screws to paragraph 7.2	V05-0492	05/25/05
C	4, 5 7 10	Add new product to fig 2f & 3c Add Dim C in section 4.2 Add section 4.10	S07-0440	12/11/07
D	8	Section 4.3, second paragraph: Remove "per side" for 0.25mm nominal clearance between pin and receptacle in direction perpendicular to daughter; Update 0.30mm nominal clearance in direction parallel to daughter card	S09-0220	6/29/07