



**Abstract**

This specification covers the requirements for application of MULTIGIG RT 2, RT 2-R, RT 2-S, and RT 3 connectors used to interconnect printed circuit (pc) boards. RT 2, RT 2-R, and RT 2-S connectors are compliant to the VITA 46 standard for VPX architecture, and RT 3 is defined in the VITA 46.30 standard. RT 3 is interface compatible with all RT 2 variants but utilizes different board footprints with smaller compliant pins and plated thru holes to achieve 25+ Gb/s data rates. The connectors consist of end-to-end stackable modules, available in vertical receptacles (backplane application) and right-angle plugs (daughtercard application). Half and full-size connector modules are used within slots of a backplane/plug-in card application. The VITA 46 standard defines connector requirements and OpenVPX standard slot configurations are defined in VITA 65.0 and 65.1.

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**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 application of MULTIGIG RT 2, RT 2-R, RT 2-S, and RT 3 connectors used to interconnect printed circuit (pc) boards. RT 2, RT 2-R, and RT 2-S connectors are compliant to the VITA 46 standard for VPX architecture, and RT 3 is defined in the VITA 46.30 standard. RT 3 is interface compatible with all RT 2 variants but utilizes different board footprints with smaller compliant pins and plated thru holes to achieve 25+ Gb/s data rates. The connectors consist of end-to-end stackable modules, available in vertical receptacles (backplane application) and right-angle plugs (daughtercard application). Half and full-size connector modules are used within slots of a backplane/plug-in card application. The VITA 46 standard defines connector requirements and OpenVPX standard slot configurations are defined in VITA 65.0 and 65.1.

Mechanical guide hardware is used to align the plug-in module to the backplane slot prior to the connectors mating. The guide hardware consists of guide pins on the backplane and guide modules on the daughtercard. The guide modules also provide keying options, and the guide module features an internal multi-point contact for electrostatic discharge (ESD) protection. The connector modules are capable of being stacked in any configuration within the limitations given in this document to a maximum length of 120mm between guide hardware sets.

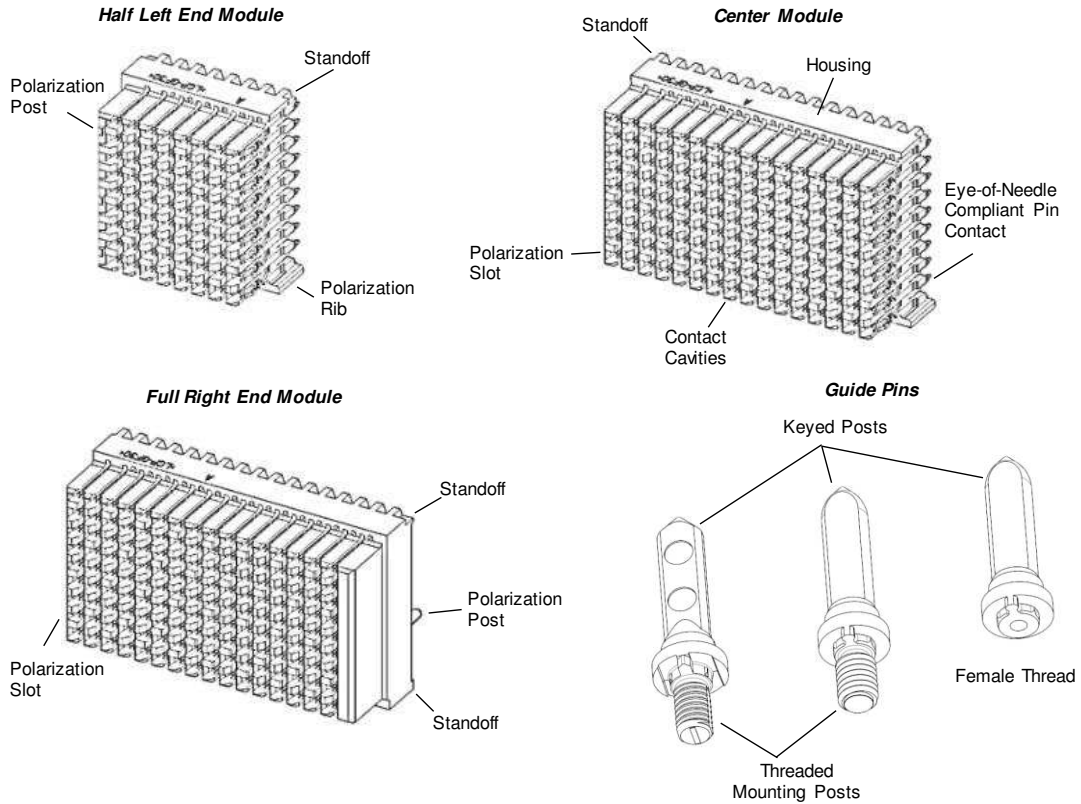
Each connector module has rows of eye-of-needle compliant pin signal contacts. The signal contacts, the ground contacts, and ESD strips provide sequencing for each group of modules. PCB wafers in the daughtercard connectors are designed for power, single-ended signal, and high-speed differential pair applications. Standard and custom wafer configurations are available within half or full connector modules.

MULTIGIG RT 2-R, RT 2-S, and RT 3 include a four-point redundant backplane contact and are recommended for design over MULTIGIG RT 2 in applications with high vibration and durability requirements.

RF (VITA 67) and optical (VITA 66) connector modules can be incorporated into a backplane slot, adjacent to the MULTIGIG connectors. This builds in flexibility, allowing transfer of analog and optical signals in the same plug-in card to backplane interface.

When corresponding with personnel, use the terminology provided in this specification to facilitate inquiries for information. Basic terms and features of this product are provided in Figure 1. Please contact TE for any special application requirements.

**Vertical Receptacle (Backplane) Connector**



**Right-Angle Plug (Daughtercard) Connector**

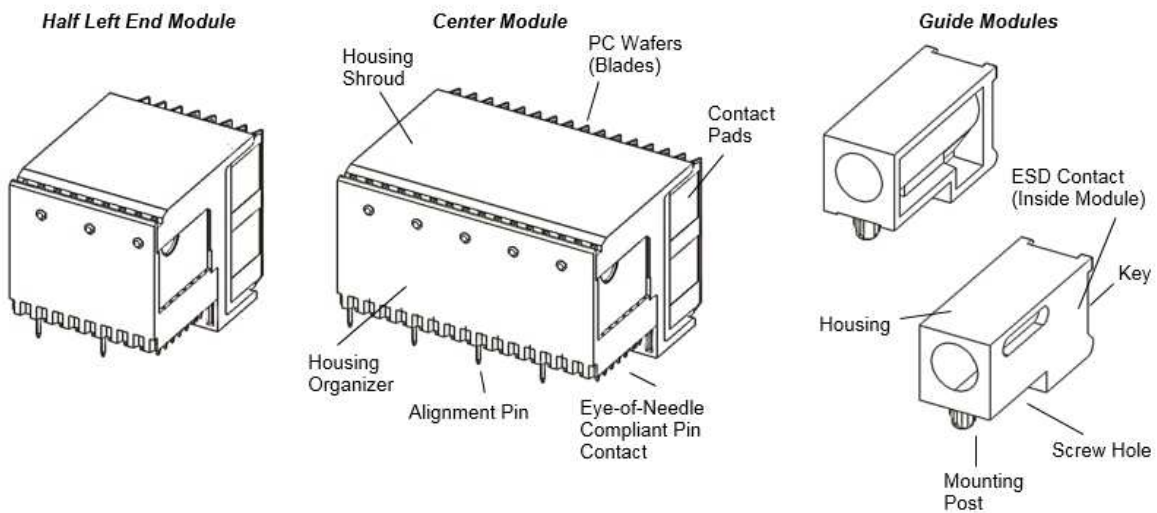


Figure 1: Connectors and Terms

## 1.1. Features

### A. Modules

MULTIGIG RT 2, RT 2-R, RT 2-S, and RT 3 consist of vertical receptacles and right-angle plugs. The vertical receptacles come in three different versions: half left end, center, and full right end modules. They consist of a housing stitched with cantilever spring contacts. The housings have features such as posts, slots, and ribs which provide polarization for proper orientation and alignment on the pc board. The right-angle plugs come in two different versions, half left end and center modules. Right angle plugs consist of a housing shroud, a housing organizer, PC wafers, eye-of-needle compliant pin contacts, and alignment pins.

MULTIGIG RT 2, RT 2-R, and RT 2-S are footprint compatible, with RT 2-R and RT 2-S offering enhanced mechanical performance for severe vibration environments. Both RT 2 and RT 2-R are rated for 10 Gb/s+ performance. RT 2-S is rated for 16+ Gb/s performance.

MULTIGIG RT 3 is similar in construction to RT 2, RT 2-R, and RT 2-S, but uses smaller compliant pin designs on both the daughtercard and backplane. The wafer material and board design have also been optimized to allow RT 3 to reach 25+ Gb/s speeds. It also incorporates enhanced mechanical performance for severe vibration environments.

### B. Guide Assemblies

There are two different versions of guide hardware available for VPX compliant connectors: a die cast hardware set and a ruggedized machined hardware set. They have similar features, with the main differentiation being the style of ESD contact and the materials. The die cast hardware is made from zinc alloy for both the pin and module with a single point of contact ESD spring. The machined hardware has a stainless steel guide pin and aluminum or stainless steel guide module with a 360° ESD multi point of contact spring.

The guide pin features a key post, a collar, and a threaded mounting post. The guide pins are available with various length mounting posts. The mounting post is used with customer supplied hardware to attach the guide pin to the pc board. Guide pins must be chosen according to the thickness of the pc board being used. Guide pins with female threaded posts are also available.

The guide module features a housing with a keying feature, a mounting post, and a screw hole with an alignment boss. The mounting post and alignment boss are used to position the guide module on the pc board, and the screw hole is used with low profile hardware to attach the module to the pc board. The mounting hardware must be chosen according to the thickness of the pc board being used per Figure 14.

## 1.2. Density Levels

Standard density levels for a 16 column daughtercard module, which takes up 28.8mm of board space, are shown below in Figure 2.

**Density Levels**

| MODULE       | TOTAL CONTACTS | DIFF PAIRS | SINGLE ENDED | GROUND |
|--------------|----------------|------------|--------------|--------|
| Differential | 112            | 32         | 8            | 40     |
| Single Ended | 112            | 0          | 80           | 32     |

Figure 2: Density Levels

## 2. REFERENCE MATERIAL

### 2.1. Revision summary **UPDATE**

Additional assembly process instructions.

Min remaining copper in Figure 11 adjusted.

Additional guide hardware installation instructions.  
 Addition of RT 2-S part numbers.  
 Update torque limits for hardware mounting screws

**2.2. Drawings**

Customer Drawings for product part numbers are available from [www.te.com](http://www.te.com).

**2.3. Specifications**

**MULTIGIG RT 2, RT 2-R, RT 2-S**

- Product Specification: [108-2072](#)
- Qualification Test Report: [501-544](#)
- Electrical Performance Report : [505-2](#)
- Backplane Connector Removal: [408-10127](#)
- Daughtercard Connector Removal: [408-10454](#)
- VITA 46 Connector/Module Qualification Test Report: [#204690](#)
- [VITA 72 VPX Connector Report](#)

**MULTIGIG RT 3**

- Product Specification: [108-2072-3](#)
- Qualification Test Report: [501-134091](#)
- Electrical Performance Report : [505-163005](#)

**3. REQUIREMENTS**

**3.1. Limitations**

Refer to 108-2072 and 108-2072-3 for temperature ratings

**3.2. Material**

***Base Materials***

| <b>PART</b>                     | <b>BASE MATERIAL</b>                        |
|---------------------------------|---|
| Housing                         | Liquid Crystal Polymer (LCP) Thermoplastic* |
| Contacts (Signal and Ground)    | Phosphor Bronze                             |
| Alignment Posts                 | Brass (Wire)                                |
| Guide assembly (Module and Pin) | Zinc Alloy (Die Casting)                    |
|                                 | Aluminum (Guide Modules Only)               |
|                                 | Stainless Steel                             |

\*Rated 94 V-0 by Underwriters Laboratories Inc. (UL)

**Platings**

| <b>PART</b>                          | <b>PLATING</b>       |
|--------------------------------------|----------------------|
| Contacts (Signal and Ground)         | Nickel (Underplated) |
| Contact area                         | Gold                 |
| Contact tails                        | Tin-lead or Tin      |
| Alignment Posts                      | Nickel               |
| Zinc Guide Module and Pin            | Silver over Nickel   |
| Aluminum Guide Module                | Nickel               |
| Stainless Steel Guide Module and Pin | Passivated           |

Figure 3: Base Materials and Platings



**NOTE**

The contact area of all contacts is covered with a protectant to ensure low and stable contact resistance for the life of the system.

**3.3. Storage**

**A. Ultraviolet Light**

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

**B. Shelf Life**

The product should remain in the shipping container 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.

**C. Chemical Exposure**

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

- |         |            |          |            |          |                 |
|---------|------------|----------|------------|----------|-----------------|
| Alkalis | Ammonia    | Citrates | Phosphates | Citrates | Sulfur Compound |
| Amines  | Carbonates | Nitrites | Sulfur     | Nitrites | Tartrates       |

**D. Storage Temperature**

The connector can withstand storage temperatures comparable to the operating temperature of -65 to 125°C, but typical ambient warehouse storage temperatures are recommended.

**3.4. Special Assembly Considerations**

**A. System Design**

The system into which the connectors are installed must support the mating and unmating forces of the connector modules.

**B. Soldering Exposure**

If modules are exposed to a soldering process from other components or pc board repair or rework, the following precautions must apply to the modules:

1. It is imperative that the contact interface be kept clean of flux and residue, even when using a “no clean” solder paste.



2. Make certain that temperature limitations are not exceeded during drying: -55° to 105°C [-67° to 257°F]. Excessive temperatures may cause housing degradation.
3. After exposure, an approved protectant (or lubricant) such as Zip-Chem ZC-26\* is recommended to be applied to the contact area (gold surface) of the contacts.

\* *Zip-Chem ZC-026 is a trademark of Zip-Chem Products Inc.*

### 3.5. Module Configuration

- Daughtercard center modules can mate to either backplane center modules or right end modules
- Daughtercard half modules should mate to backplane half modules
- See Figure 4 through Figure 9 for examples of standard VPX configurations and part numbers

The following criteria must apply when arranging modules on the pc board:

#### Daughtercard

- A module grouping must consist of at least one center module.
- Additional center modules can be placed adjacent to the initial center module for additional length.
- One half end module can be used in conjunction with the center modules to form a grouping but must be placed on the proper side.

#### Backplane

- A module grouping must always contain at least one right end module.
- Additional center modules can be placed adjacent to the initial right end module for additional length.
- One half end module can be used in conjunction with the other modules to form a grouping but must be placed on the proper side.

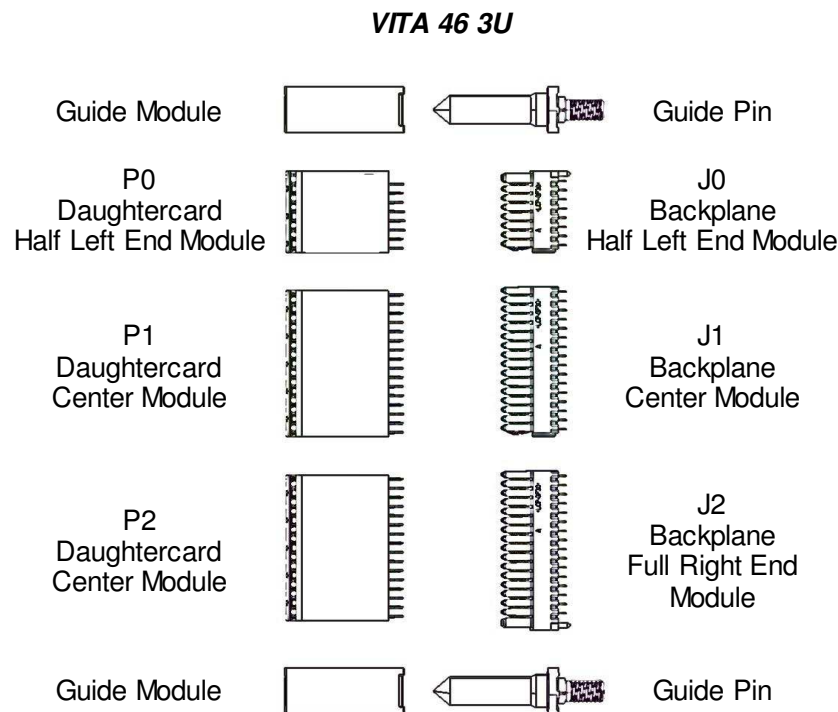


Figure 4: VITA 46 3U Configuration

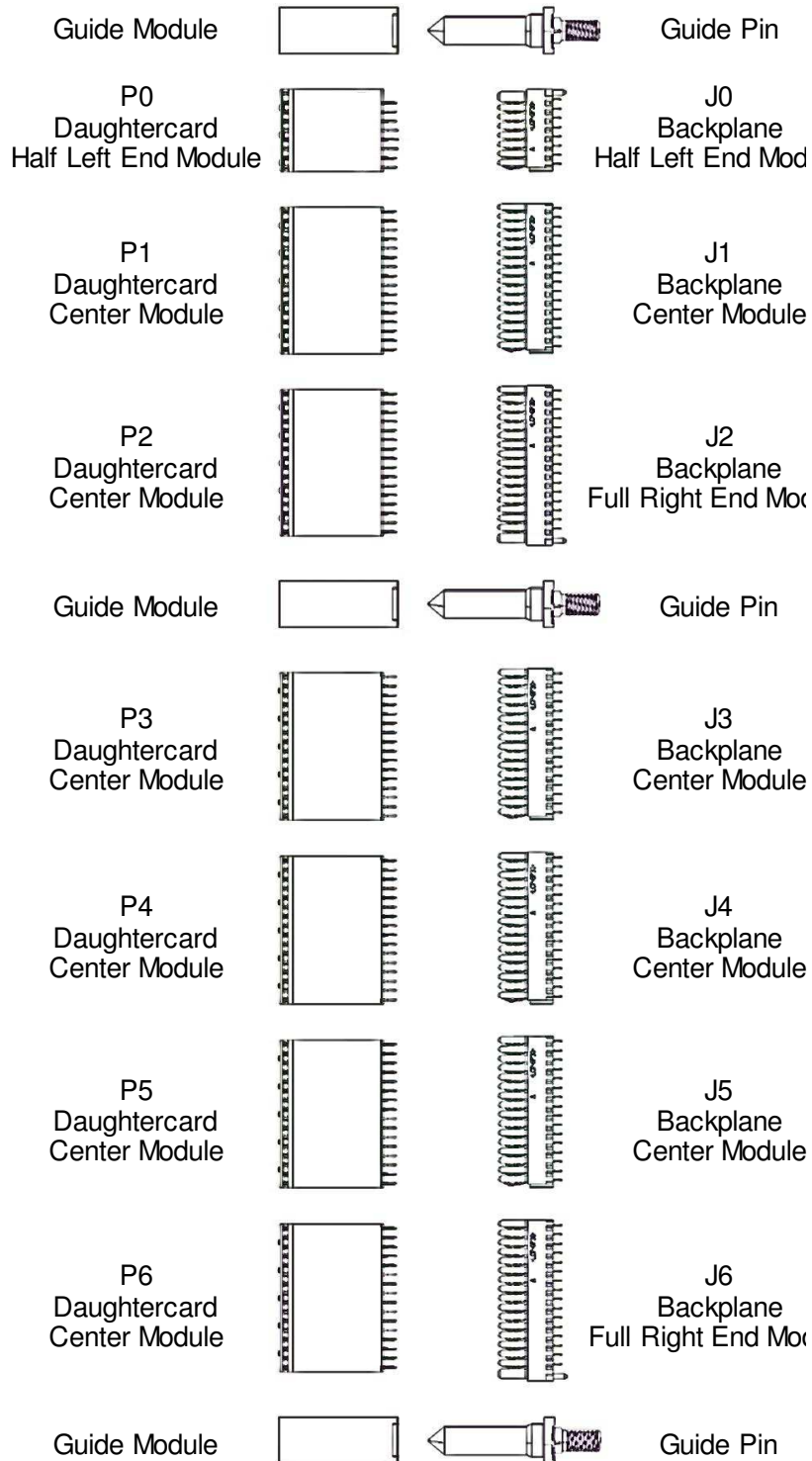
**VITA 46 6U**


Figure 5: VITA 46 6U Configuration



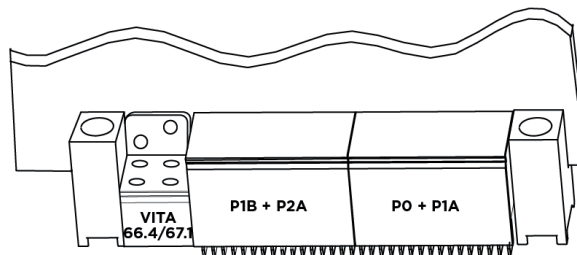
**NOTE**

Tin Lead part numbers are specified in the following table. RoHS compatible part numbers are listed on the drawings.

**VITA 46 VPX Part Numbers**

| Position                | VPX Connector |              |              |              |                |              |
|-------------------------|---------------|--------------|--------------|--------------|----------------|--------------|
|                         | RT 2          |              | RT 2-R       |              | RT 2-S         | RT 3         |
|                         | Differential  | Single Ended | Differential | Single Ended | Differential   | Differential |
| <b>P0</b>               | 1410189-3     |              | 2102772-1    |              | 2302318-1      | 2332816-1    |
| <b>P1</b>               | 1410187-3     | 1410190-3    | 2102771-1    | 2102847-1    | 2302317-1      | 2302785-1    |
| <b>P2</b>               | 1410187-3     | 1410190-3    | 2102771-1    | 2102847-1    | 2302317-1      | 2302785-1    |
| <b>P3</b>               | 1410187-3     | 1410190-3    | 2102771-1    | 2102847-1    | 2302317-1      | 2302785-1    |
| <b>P4</b>               | 1410187-3     | 1410190-3    | 2102771-1    | 2102847-1    | 2302317-1      | 2302785-1    |
| <b>P5</b>               | 1410187-3     | 1410190-3    | 2102771-1    | 2102847-1    | 2302317-1      | 2302785-1    |
| <b>P6</b>               | 1410187-3     | 1410190-3    | 2102771-1    | 2102847-1    | 2302317-1      | 2302785-1    |
| <b>J0</b>               | 1410186-1     |              | 2102735-1    |              | Same as RT 2-R | 2332817-1    |
| <b>J1</b>               | 1410140-1     |              | 2102736-1    |              |                | 2302789-1    |
| <b>J2</b>               | 1410142-1     |              | 2102737-1    |              |                | 2302790-1    |
| <b>J3</b>               | 1410140-1     |              | 2102736-1    |              |                | 2302789-1    |
| <b>J4</b>               | 1410140-1     |              | 2102736-1    |              |                | 2302789-1    |
| <b>J5</b>               | 1410140-1     |              | 2102736-1    |              |                | 2302789-1    |
| <b>J6</b>               | 1410142-1     |              | 2102737-1    |              |                | 2302790-1    |
| <b>Guide Module</b>     | 1-1469492-*   |              | 2000713-*    |              | 2000713-*      | 2000713-*    |
| <b>Guide Pin</b>        | 1-1469491-*   |              | 2000676-*    |              | 2000676-*      | 2000676-*    |
| <b>Female Guide Pin</b> | 2327906-*     |              | 2327906-*    |              | 2327906-*      |              |

Figure 6: VITA 46 Configuration Part Numbers



| Position                  | VPX Connector |           |           |           |
|---------------------------|---------------|-----------|-----------|-----------|
|                           | RT 2          | RT 2-R    | RT 2-S    | RT 3      |
| <b>P0 + P1A</b>           | 1410326-3     | 2286250-1 | 2345723-1 | 2313237-1 |
| <b>J0 + J1A Center</b>    | 1410140-1     | 2102736-1 | 2102736-1 | 2313238-1 |
| <b>J0 + J1A Right End</b> |               |           |           | 2352032-1 |
| <b>P1B + P2A</b>          | 1410187-3     | 2102771-1 | 2302317-1 | 2302785-1 |
| <b>J1B + J2A</b>          | 1410142-1     | 2102737-1 | 2102737-1 | 2302790-1 |

Figure 7: MULTIGIG RT 3U Implementation with VITA 66 or 67 Half Module in Position 2B

### VITA 46 6U REAR TRANSITION MODULE

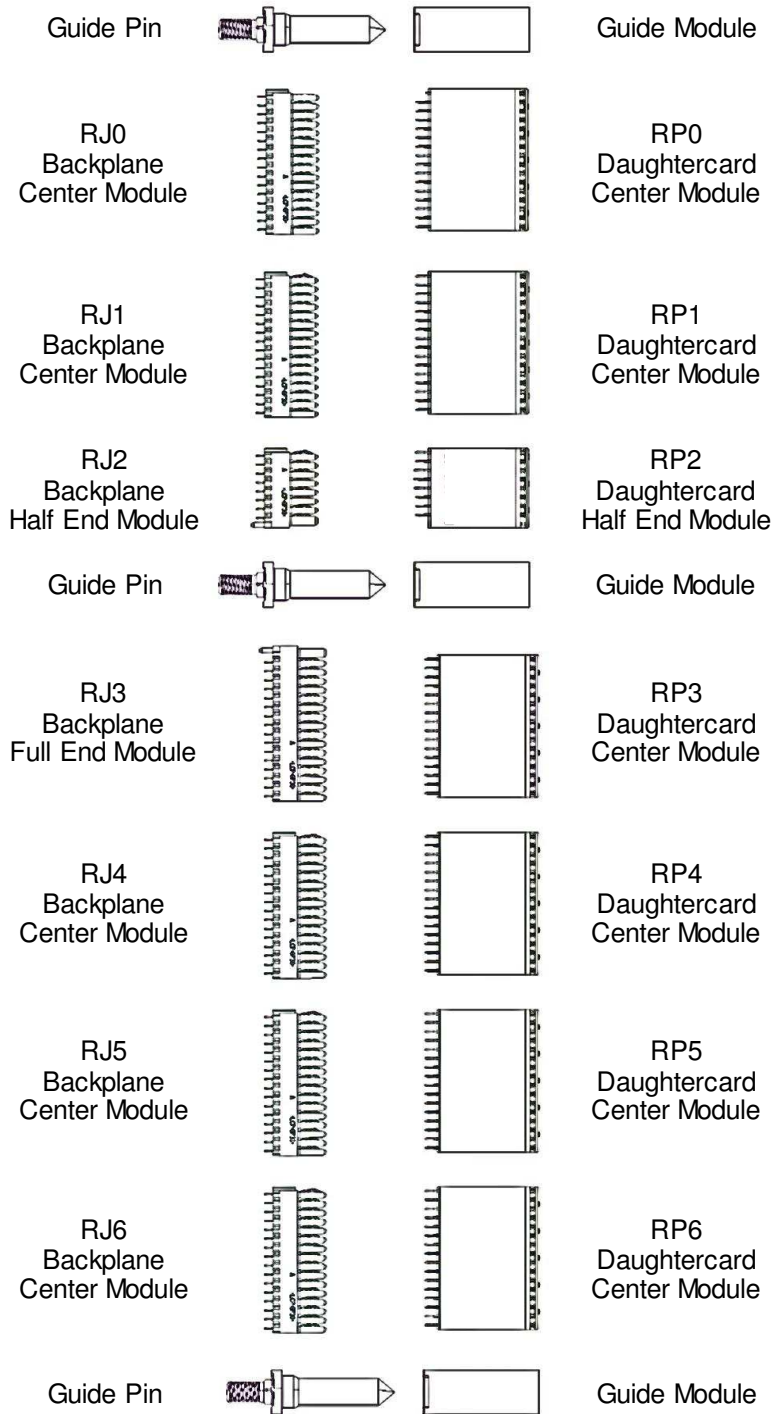


Figure 8: VITA 46.10 RTM Configuration



**NOTE**

Tin Lead part numbers are specified in the following table. RoHS compatible part numbers are listed on the drawing.

**VITA 46.10 RTM Part Numbers  
Daughtercard**

| Position         | VPX Connector |           |              |           |              |           |              |           |
|------------------|---------------|-----------|--------------|-----------|--------------|-----------|--------------|-----------|
|                  | RT 2          |           | RT 2-R       |           | RT 2-S       |           | RT 3         |           |
|                  | Differential  | SE        | Differential | SE        | Differential | SE        | Differential | SE        |
| RP0              | 1410968-3     |           | 2102773-1    |           | 2302319-1    |           | 2302794-1    |           |
| RP1              | 1410975-3     | 1410970-3 | 2102774-1    | 2102849-1 | 2302320-1    | 2102849-1 | 2302795-1    | 2102849-1 |
| RP2              | 1410971-3     | 1410972-3 | 2102775-1    | 2102848-1 | 2302321-1    | 2102848-1 | 2302796-1    | 2102848-1 |
| RP3              | 1410975-3     | 1410190-3 | 2102774-1    | 2102847-1 | 2302320-1    | 2102847-1 | 2302795-1    | 2102847-1 |
| RP4              | 1410975-3     | 1410190-3 | 2102774-1    | 2102847-1 | 2302320-1    | 2102847-1 | 2302795-1    | 2102847-1 |
| RP5              | 1410975-3     | 1410190-3 | 2102774-1    | 2102847-1 | 2302320-1    | 2102847-1 | 2302795-1    | 2102847-1 |
| RP6              | 1410975-3     | 1410190-3 | 2102774-1    | 2102847-1 | 2302320-1    | 2102847-1 | 2302795-1    | 2102847-1 |
| RTM Guide Module | 1-1469492-*   |           | 2000713-*    |           | 2000713-*    |           | 2000713-*    |           |

**Backplane**

| Position | VPX Connector |             |           |             |                |             |           |             |
|----------|---------------|-------------|-----------|-------------|----------------|-------------|-----------|-------------|
|          | RT 2          |             | RT 2-R    |             | RT 2-S         |             | RT 3      |             |
|          | Full Load     | Select Load | Full Load | Select Load | Full Load      | Select Load | Full Load | Select Load |
| RJ0      | 1410964-1     | 1410965-1   | 2102768-1 | 2102850-1   | Same as RT 2-R |             | 2302791-1 | 2302792-1   |
| RJ1      | 1410140-1     | 1410966-1   | 2102736-1 | 2102851-1   |                |             | 2302789-1 | 2302793-1   |
| RJ2      | 1410186-1     | NA          | 2102735-1 | NA          |                |             | 2302788-1 | NA          |
| RJ3      | 1410142-1     |             | 2102737-1 |             |                |             | 2302790-1 |             |
| RJ4      | 1410140-1     |             | 2102736-1 |             |                |             | 2302789-1 |             |
| RJ5      | 1410140-1     |             | 2102736-1 |             |                |             | 2302789-1 |             |
| RJ6      | 1410140-1     |             | 2102736-1 |             |                |             | 2302789-1 |             |
| RTM Pin  | 1410956-1     |             | 2226127-1 |             | 2226127-1      |             | 2226127-1 |             |

Figure 9: VITA 46.10 RTM Configuration Part Numbers

**3.6. PC Board**

**A. Material and Thickness**

All mechanical testing has been performed on FR4 type board material, and additional testing may be required in order to evaluate the performance of alternate board materials. The pc board thickness shall be a minimum of 1.60mm. The minimum backplane thickness for RTM application shall be 3.5mm for RT 2 and RT 2-R or 3.0mm for RT 3.

**B. Tolerance**

Maximum allowable bow of the pc board shall be 0.03 over the length of any one module.

**C. Hole Dimensions**

The contact holes MUST be drilled and plated to the specified dimensions. The plating type and thickness and finished hole size MUST be as stated to provide proper insertion and retention of the contacts. See Figure 10. Plug module alignment posts and guide assembly hardware can be used with or without plated through holes. These holes must be drilled to the dimensions provided on the customer drawing for the module or guide module or guide pin.



**NOTE**

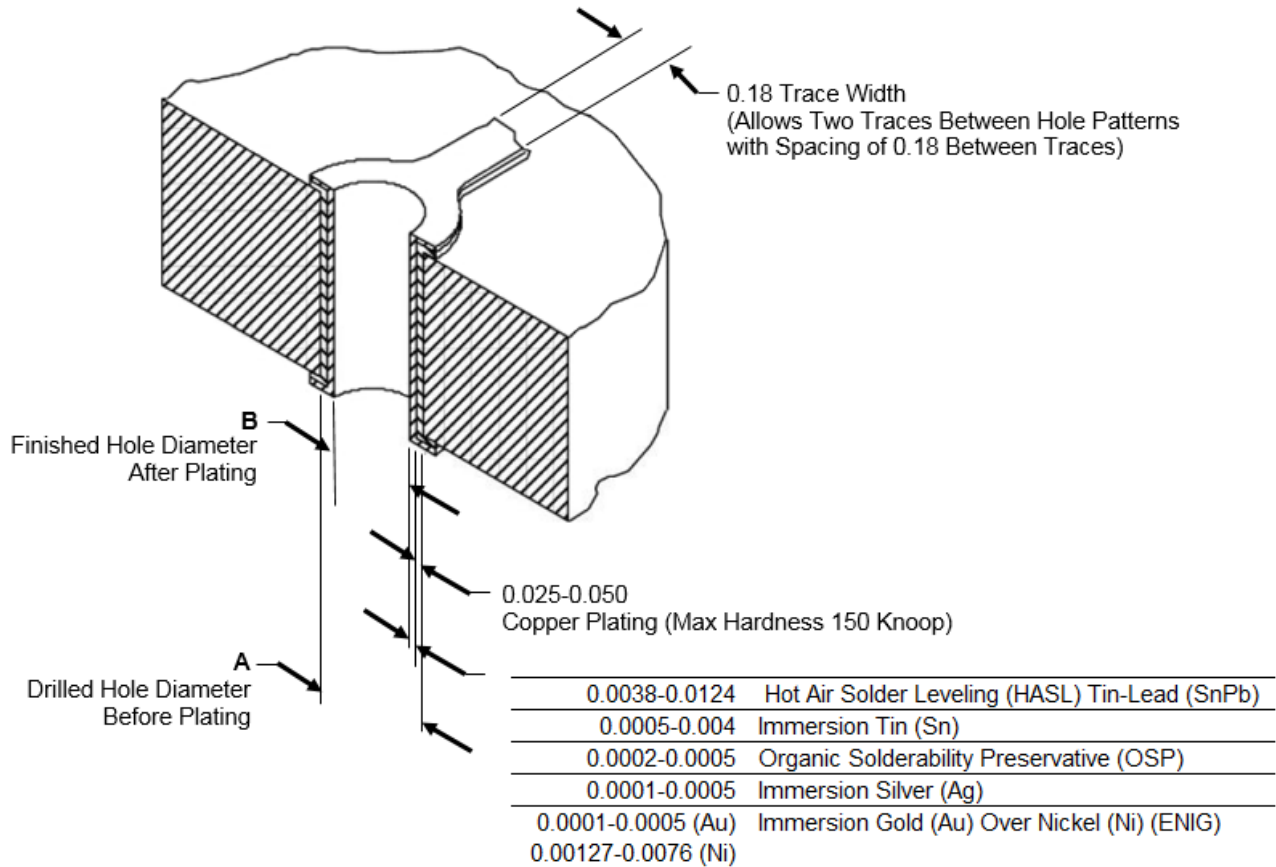
Contact the number at the bottom of page 1 for suitability of other plating types and thicknesses.



**CAUTION**

For applications that require specific electrical performance through the hardware footprint, good design practice should be followed on the metallization of the pc board hardware footprint to meet the grounding needs of the end application. For further help determining appropriate design requirements, call the number at the bottom of page 1.

**PC Board Contact Hole Dimensions**



| TIER   | CONNECTOR                       | DIMENSION |             |
|--------|---------------------------------|-----------|-------------|
|        |                                 | A         | B (Nominal) |
| RT 2   | Vertical Receptacle (Backplane) | 0.63-0.67 | 0.56 (Ref)  |
| RT 2-R | Right-Angle Plug (Daughtercard) | 0.53-0.57 | 0.46 (Ref)  |
| RT 2-S | Vertical Receptacle (Backplane) | 0.43-0.47 | 0.37 (Ref)  |
| RT 3   | Right-Angle Plug (Daughtercard) | 0.38-0.42 | 0.32 (Ref)  |

Figure 10: Plated Thru Hole Dimensions

**D. Layout**

All holes in the pc board must be precisely located to ensure proper placement and optimum performance. The pc board layout must be designed using the dimensions provided on the customer drawing for the module or guide assembly. Reference sample of recommended pc board layouts can be found in the VITA 46 Standard and TE Customer Prints.

## E. Backdrill dimensions

Plated through holes can be backdrilled to improve the signal integrity of the connector footprint. The recommended minimum remaining copper depths are listed below in Figure 11. Testing can be completed to verify additionally reduced copper depths.

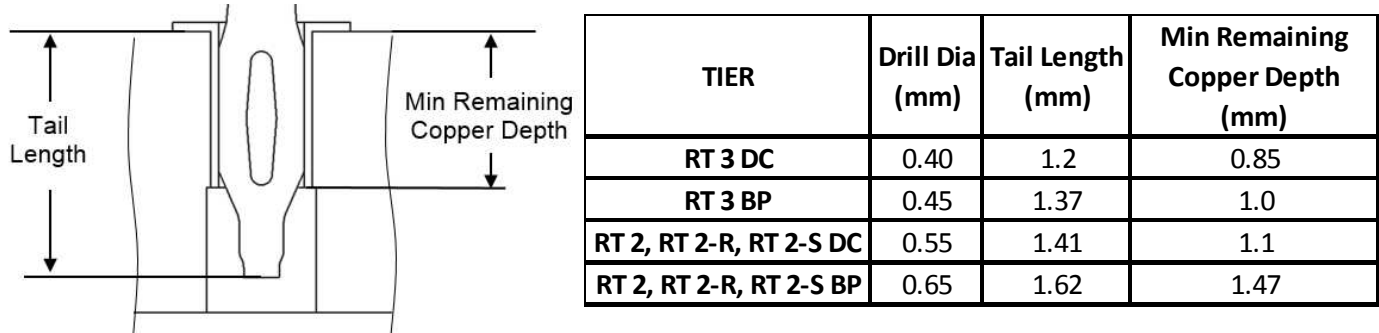


Figure 11: Backdrill Dimensions

## 3.7. Module and Guide Assembly Placement

### A. Spacing

Care must be used to avoid interference between adjacent connectors and other components. The minimum allowable distance between adjacent connectors to ensure proper mating is provided in Figure 12. VITA applications must use spacing specified in corresponding standards.

### B. Polarization

Polarization for stacking backplane modules on the pc board is provided by fitting the module polarization rib into the polarization slot of the adjacent module. Polarization for stacking daughtercard modules on the pc board is provided by matching plug module alignment pins to appropriate pc board holes.

### C. Registration

When placing modules on the board, contacts, alignment pins (plugs only), and polarization posts (receptacle end modules only) must be aligned and started into the matching holes before seating the module onto the board. The contacts and alignment posts must be inserted simultaneously to prevent stubbing of compliant pin contacts.



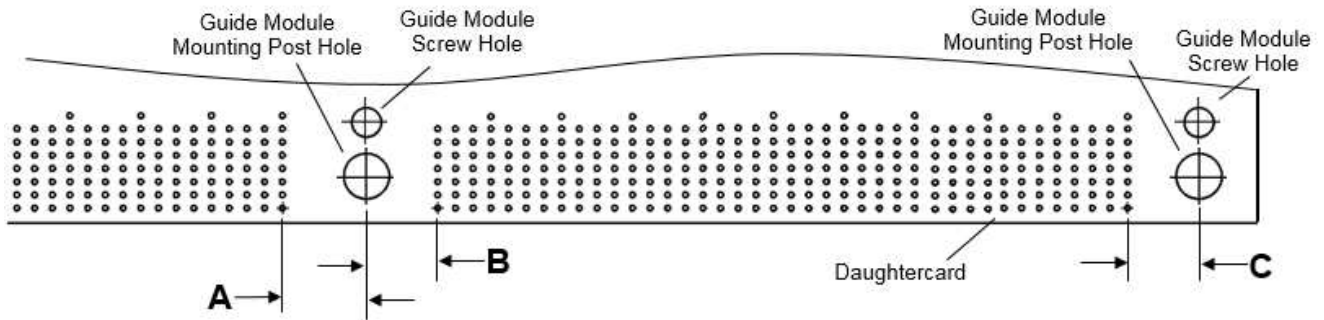
### CAUTION

Modules should be handled only by the housing to avoid deformation, contamination, or damage to the contacts. The module number one position (Pin a1) must be aligned with the number one position pc board.

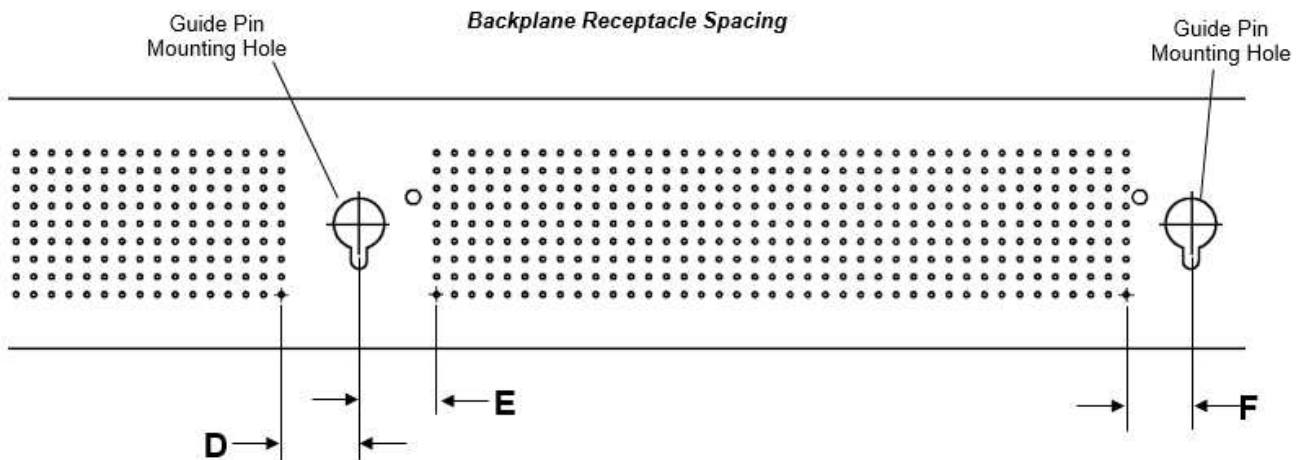


### Guide Hardware Locations

#### Daughtercard Plug Spacing



#### Backplane Receptacle Spacing



| GUIDE HARDWARE LOCATION  | DIMENSION | MEASUREMENT   | MIN VALUE |
|--|-----------|---|-----------|
| To the Right of the Daughtercard Left End Half Module and the Backplane Left End Half Module | C         | Guide Module Mounting Post Hole Centerline to Center Module Nearest Pin Centerline        | 6.18      |
|  | F         | Guide Pin Mounting Post Hole Centerline to Center Module Nearest Pin Centerline           | 5.53      |
| To the Left of the Daughtercard Center Module and the Backplane Right End Module             | B         | Guide Module Mounting Post Hole Centerline to Center Module Nearest Pin Centerline        | 7.34      |
|  | E         | Guide Pin Mounting Post Hole Centerline to Right End Module Nearest Pin Centerline        | 7.99      |
| To the Right of the Daughtercard Center Module and the Backplane Center Module               | A         | Guide Module Mounting Post Hole Centerline to Left End Half Module Nearest Pin Centerline | 7.24      |
|  | D         | Guide Pin Mounting Post Hole Centerline to Left End Module Nearest Pin Centerline         | 6.59      |

Figure 12: Guide Hardware Spacing

### D. Seating

The module maximum insertion force per contact is 31 N [7 lb-force]. The force required to seat the module onto the pc board can be calculated by:

$$\text{Number of module contacts} \times \text{maximum insertion force per contact} = \text{module insertion force}$$

Force should be applied to the entire surface of the connector module opposite of the PCB with a flat tool mounted to an arbor press.

A board support will be required on the daughtercard side if the PCB is less than 3.8mm thick, as the connector overhang will bottom out instead of the connector.

The module housing (plugs) or standoffs (receptacles) must be seated on the pc board not exceeding the dimension shown in Figure 13.

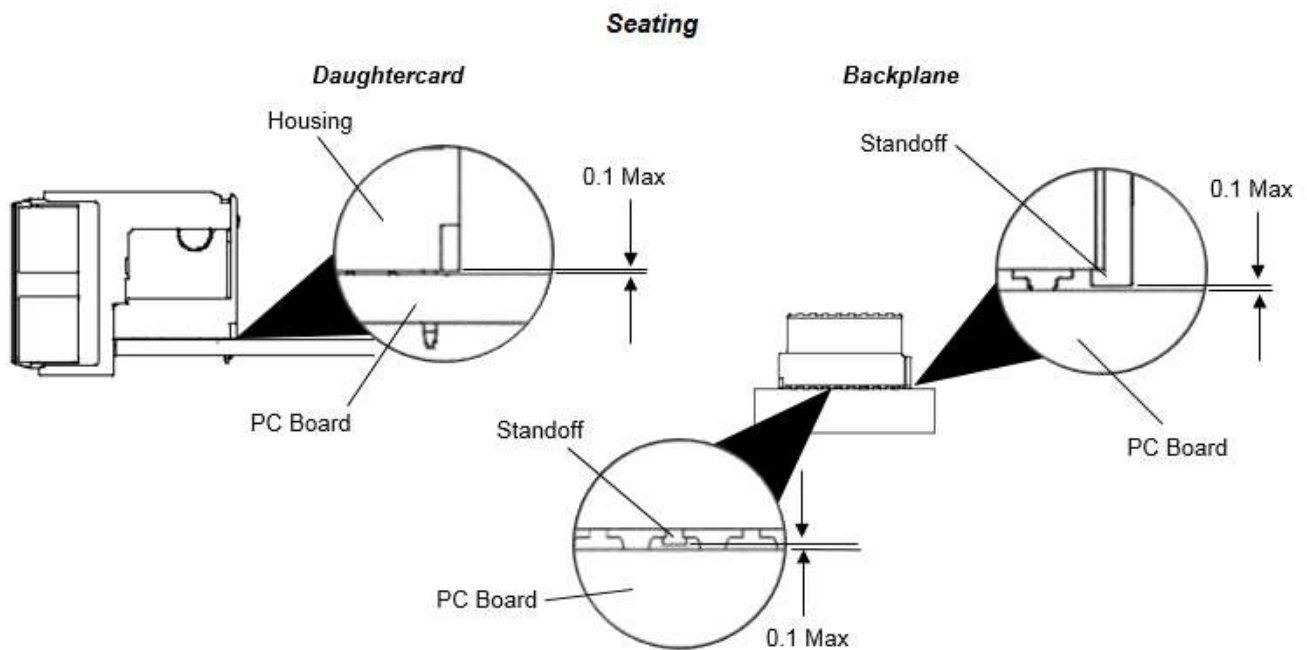


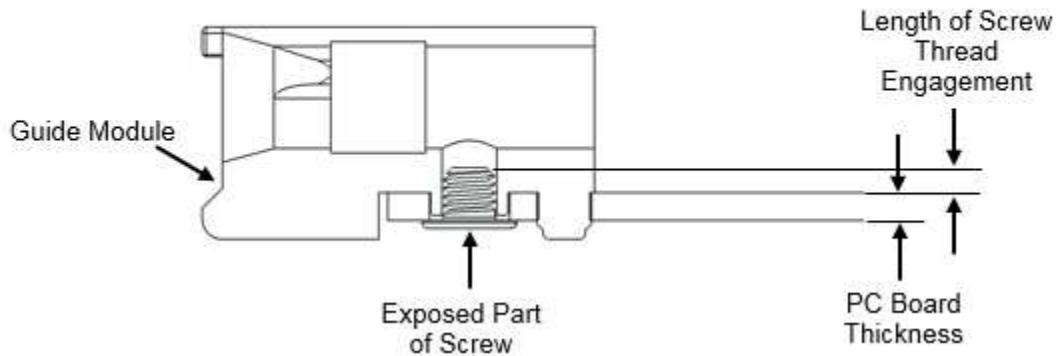
Figure 13: Seating Gap

### E. Mounting Hardware

The daughtercard module can be applied to the PCB with an arbor press to seat it. After the module is seated, the low profile screws shown in Figure 14 can be used to secure the guide module.

The backplane pin can be applied to the PCB by using a guide module as a tool. The guide pin can be inserted into a spare guide module, then an arbor press can be used to seat the guide module/pin subassembly into the backplane hole. The guide module can then be removed and used to apply other guide pins to PCB's. The guide pin can then be secured to the PCB using a standard nut per torque specification in Figure 15.

**Mounting Hardware and Recommended Length of Screw**



| LENGTH | PART NUMBER | BOARD THICKNESS |      |
|--------|-------------|-----------------|------|
|        |             | MIN             | MAX  |
| 3.5    | 1410946-1   | 0.3             | 2.85 |
| 4.5    | 1410946-3   | 1.3             | 3.85 |
| 5.5    | 1410946-2   | 2.3             | 4.85 |

Figure 14: Guide Module Screw Lengths



**CAUTION**

Using hardware other than specified may cause damage to system components.

### Guide Pin Max Torque

| SIZE AND TYPE       | ZINC GUIDE PIN | STAINLESS STEEL GUIDE PIN |                               |
|---------------------|----------------|---------------------------|-------------------------------|
|                     | M5 NUT         | STAINLESS STEEL M5 NUT    | STAINLESS STEEL 10-32 UNF NUT |
| Max Torque (N-m)    | 0.51           | 1.5                       | 1.5                           |
| Max Torque (lbf-in) | 4.51           | 13.28                     | 13.28                         |

### Guide Module Max Torque

| SIZE AND TYPE       | ZINC GUIDE MODULE             | ALUMINUM GUIDE MODULE         | STEEL GUIDE MODULE            |
|---------------------|-------------------------------|-------------------------------|-------------------------------|
|                     | LOW PROFILE M3 SCREW, 1410946 | LOW PROFILE M3 SCREW, 1410946 | LOW PROFILE M3 SCREW, 1410946 |
| Max Torque (N-m)    | 0.36                          | 0.36                          | 0.36                          |
| Max Torque (lbf-in) | 3.19                          | 3.19                          | 3.19                          |

Figure 15: Guide Hardware Torque Specifications

### 3.8. Checking Installed Module

After installation of the modules, the following requirements must apply.

1. The plug housing and all receptacle standoffs are fully seated on the pc board.
2. The housing of the guide module and the collar of the guide pin are fully seated on the pc board.
3. All contacts are straight and the widest section of each contact is inside the pc board hole.
4. Each guide assembly mounting hardware is secure.

### 3.9. Mating and Unmating



#### NOTE

Modules will mate only with the appropriate modules; for example, a size 25.4-mm plug will only mate with a size 25.4-mm receptacle.

#### A. Keying

When mating modules, the guide assemblies ensure positive mating of modules. Interaction of the guide pin and guide module provides error-free mating and prevents damage to the housings and contacts. Guide pins must be in the compatible keying position for the guide modules.

These modules require mechanical assistance for mating and unmating. The force applied to the modules must only take place after the guide pin engages the guide module with the assurance that the keys are properly matched. Guide assemblies are designed to prevent connectors with improperly matched keys from mating beyond this point of initial engagement (Mating Sequence 1), except when any force greater than 145 N [32 lb-force] is used. Mating Sequence 1 is described in Paragraph 3.9.C.



#### CAUTION

Forcing modules to mate with improperly matched keys will cause damage to system components.

## B. Misalignment

When mating modules, the guide assemblies allow blind mating with side-to-side, up-and-down, and rotational misalignment to the dimensions given in Figure 16.

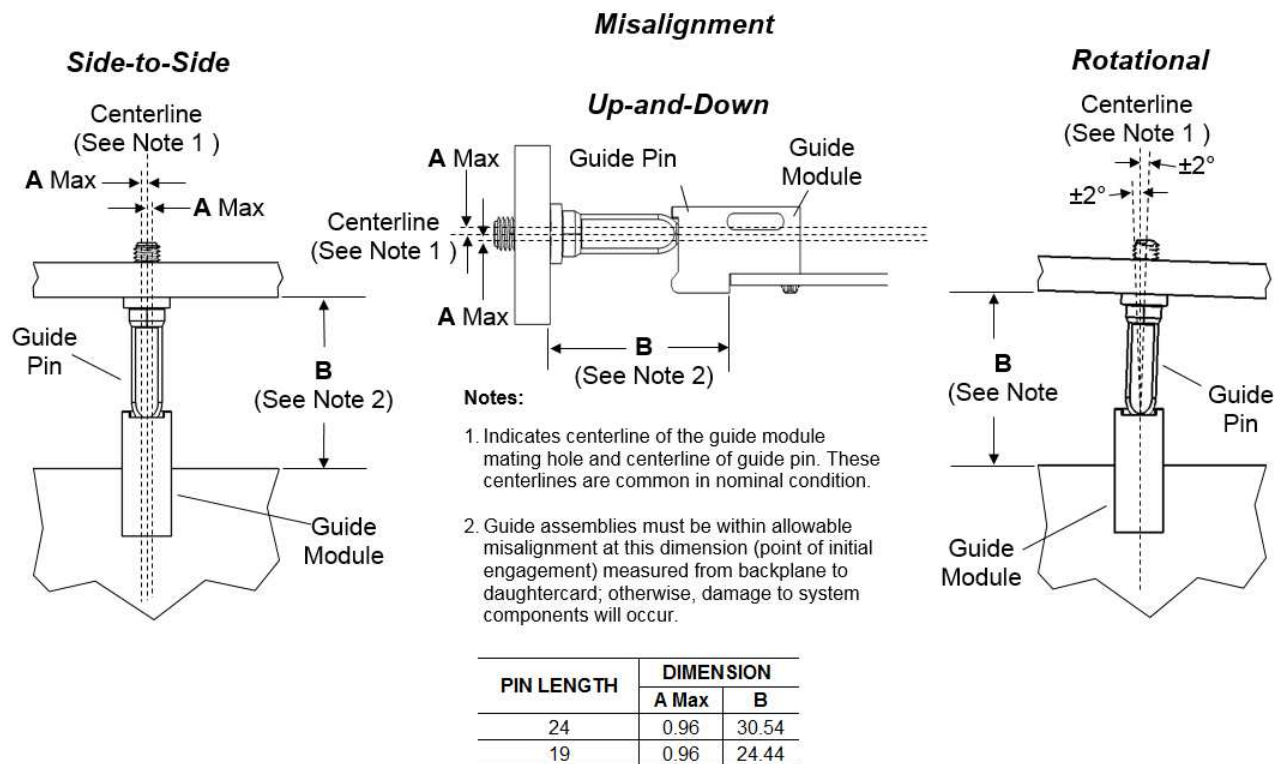


Figure 16: Mating Misalignment

## C. Sequencing

These modules provide a maximum of five mating sequences. The distance, measured from backplane to daughtercard depends on the mating sequence. The distance at each mating sequence is given in Figure 17.

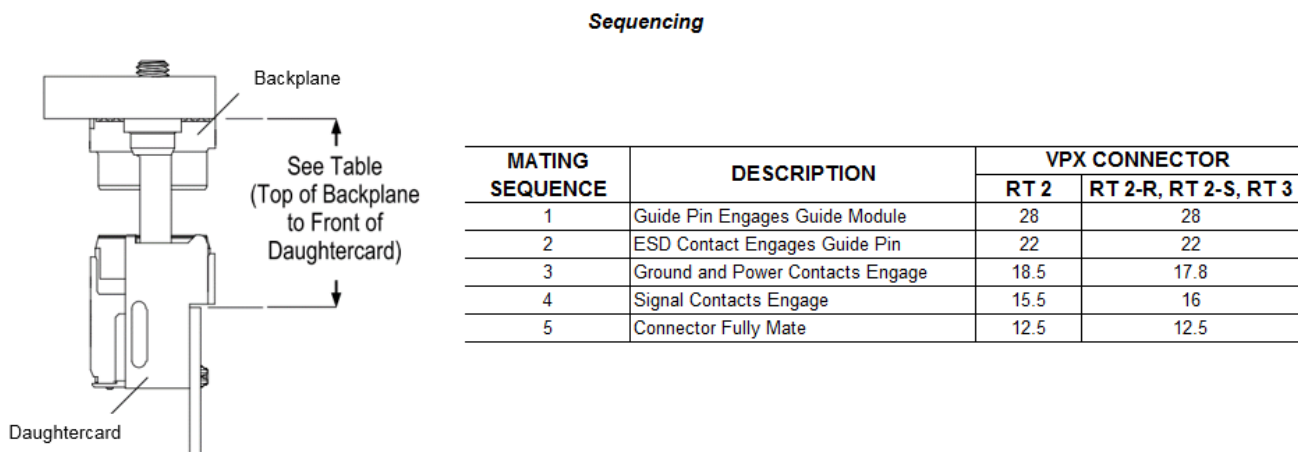


Figure 17: Mating Sequencing

### D. Wipe Length

Wipe length for these modules is defined as that portion (length) of the mating contacts that touches (wipes) from the point of engagement to the point of being fully mated. The wipe length depends on the contact (signal or ground) and mating sequence of each individual contact. The minimum wipe length according to mating sequence for signal and ground contacts is given in Figure 18.

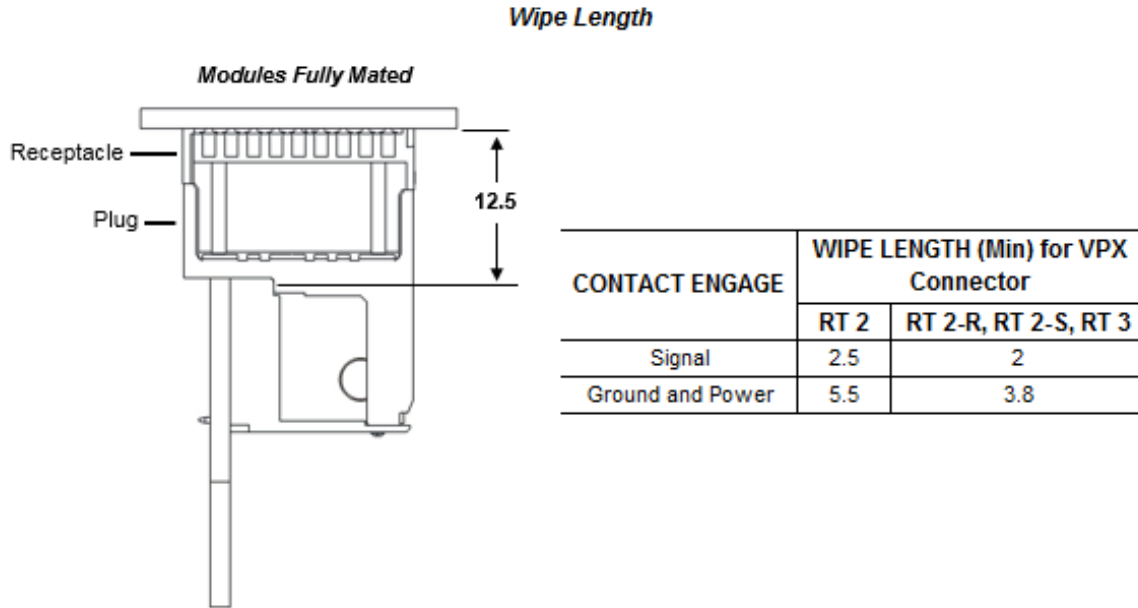


Figure 18: Wipe Length

### E. Mating Dimension

The required dimension between mated modules to ensure full mating of modules is provided in Figure 19.

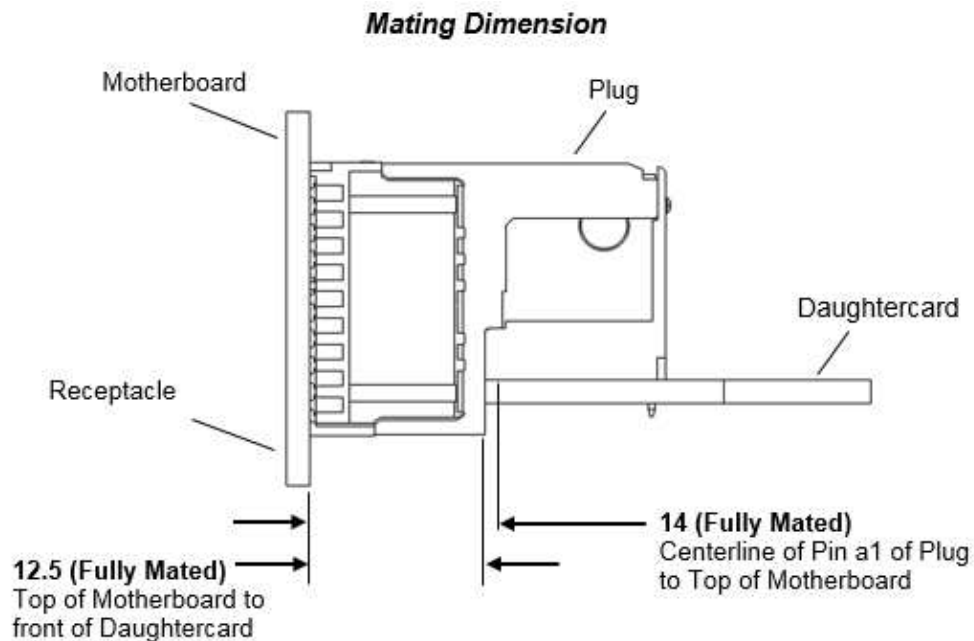


Figure 19: Full Mate Dimension

## F. Mating and Unmating Force

The maximum force required for mating modules is 0.75 N [2.7 oz-force] per contact.

The minimum force required for unmating modules is 0.15 N [.54 oz-force] per contact.

## 4. QUALIFICATION

For product qualification refer to Product Specification [108-2072](#) and [108-2072-3](#). Additional testing has been performed by TE Connectivity and independent laboratories. Please contact TE Customer service if additional test documentation is required.

## 5. TOOLING

Tooling part numbers are shown in Figure 20 and Figure 21.



### NOTE

*Modified designs and additional tooling concepts may be available to meet other application requirements. For assistance in setting up prototype and production line equipment, call the number at the bottom of page 1.*

### 5.1. Application Tooling

The application tooling used to seat the modules (except guide assemblies) must provide enough downward force to drive the tooling to insert the contacts into the pc board holes.

#### A. Manual Arbor Frame

Arbor frames are manually-operated and actuated by a handle. They are designed to be bench mounted and provide for low to medium volume production.

#### B. Automatic Press

These power units are automatic, stand-alone machines provide for high volume, heavy duty production requirements.



### NOTE

*For more information on these power units, call the number at the bottom of page 1.*

### 5.2. Push Bar (Flat Rock)

Commercially available bar stock with a flat surface sized to the width and length of the module must be used with the manual arbor frame.

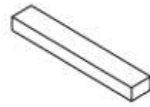
### 5.3. PC Board Support

For machine placement of modules (except guide assemblies), a pc board support must be used to prevent bowing of the pc board during the placement of modules on the board. The board support must have a flat surface with holes or a channel large enough and deep enough to receive any components protruding from the housing. The pc board must be secured to the pc board support to prevent movement of the board.

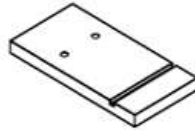
The board support must also be used when removing modules (except guide assemblies) from the pc board. The pc board support should be secured to a flat and stable surface.



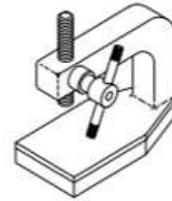
### Application Tools



**Push Bar**  
(Customer Supplied)



**PC Board Support**  
(Must Be Custom Made)



**Typical Manual Arbor Frame**  
(Commercially Available)



**CPB-5T: 2018873-9**  
(5 Ton Manual Benchtop Press)



**CMP-6T: 2216000-1**  
(6 Ton Manual Press)

**CMP-12T: 2216001-1**  
(12 Ton Manual Press)



**CAP-6T: 1689700-1**  
(6 Ton Automatic press)

**CAPI-6T: 1689700-2**  
(6 Ton Inline Automatic Press)

Figure 20: Application Tools

## 5.4. Removal

### A. Guide Hardware

The guide hardware can be removed by disengaging the fastening hardware and pressing the hardware off with an arbor press and a pin.

### B. Backplane Connector Module

The process in Backplane Removal Instruction [408-10127](#) can be used to remove backplane modules if space allows. Alternatively, tool 2828926-\* can be used with an arbor press to remove a module. (except RT 3)

### C. Daughtercard Connector Module

The process in Daughtercard Removal Instruction [408-10454](#) can be used to remove daughtercard modules. Alternatively, tool 2828923-\* can be used with an arbor press to remove a module. (except RT 3)



**Removal Tools**



Figure 21: Removal Tools

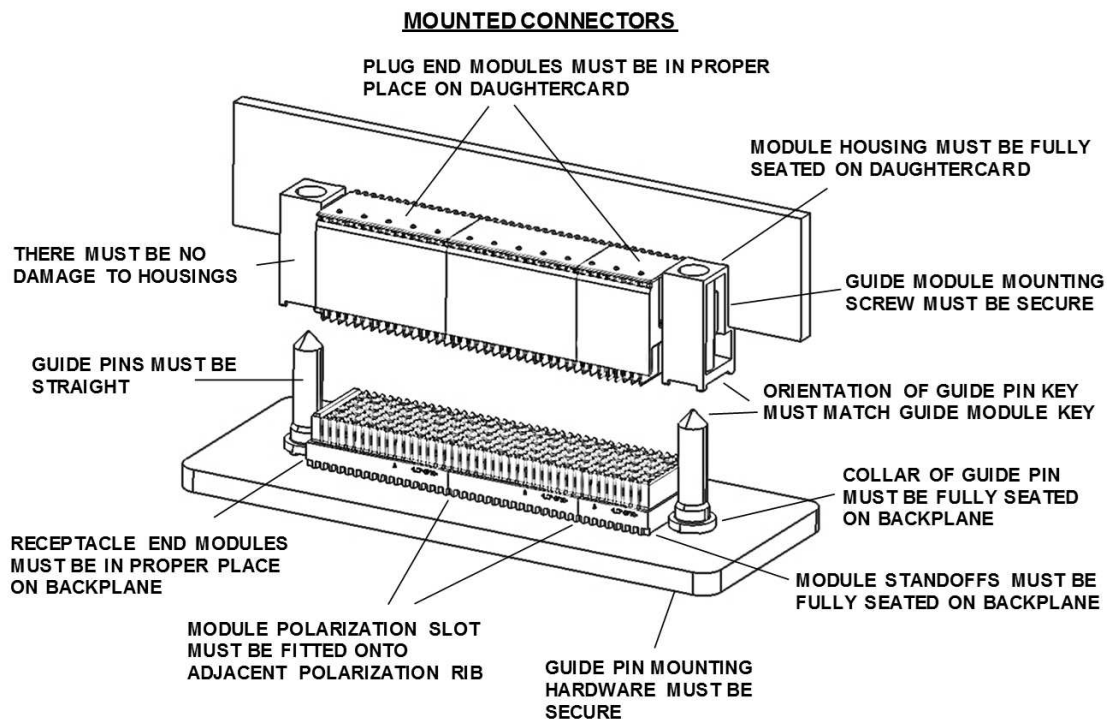
**5.5. Repair**

Damaged or defective modules must not be used; however, entire modules can be removed and replace with new modules. Modules can be removed and replaced up to 2 times, for a total of 3 cycles while maintaining adequate retention forces and radial hole distortion per IEC 60352-5.

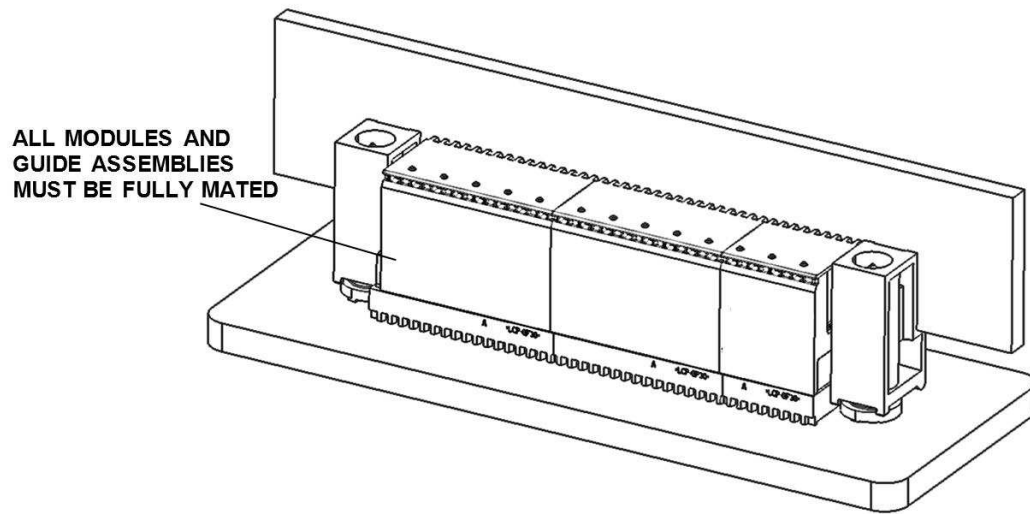
**6. VISUAL AID**

The illustration below shows a typical application of MULTIGIG RT 2, RT 2-R, RT 2-S, and RT 3 signal connectors. This illustration should be used by production personnel to ensure a correctly applied product. Applications that 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.

NOTE: 3U System Shown



**MATED CONNECTORS**



*Figure 22: 3U Visual Aid*