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 ±2°. Figures are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of the 4.5-mm STRADA Whisper connector system. The connector system uses a modular concept and interconnects two printed circuit (pc) boards. The connectors are available in a vertical open-end press-fit pin header and right-angle press-fit receptacle.

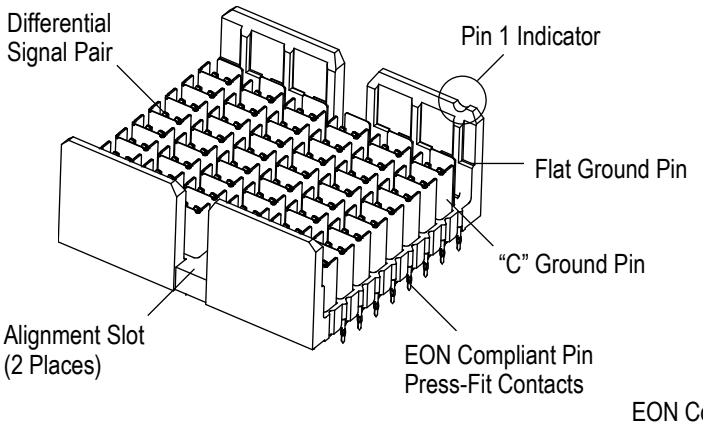
The connectors are connected to the pc board via eye-of-needle (EON) compliant pin press-fit contacts. Typical connector densities are given in Figure 1.

When mating, connector alignment features help align contacts prior to engagement of the connectors. The receptacle alignment bosses fit into the pin header alignment slots, which have a guide-in feature. In addition, STRADA Whisper connector guides are available and should be used with the connectors to provide error-free mating and prevent damage to the connector housings and contacts. The female guide module and male guide pin are designed to be installed onto the pc board. These guides are also recommended for multi-connector, large and heavy daughtercard applications, and conditions where the misalignment tolerances cannot be met.

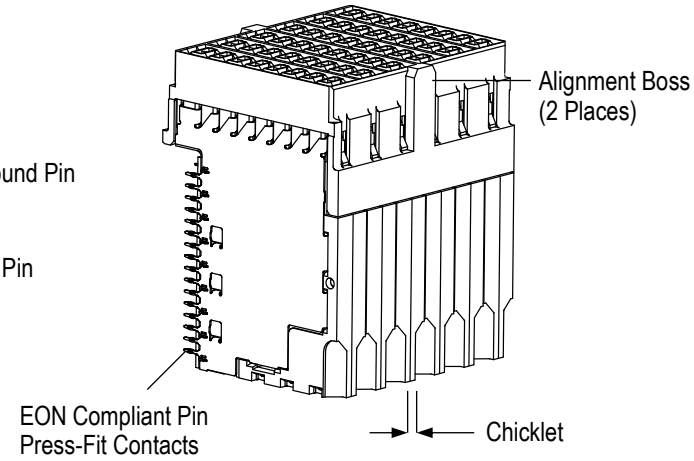
Basic terms and features of this product are provided in Figure 1.

Connectors

Vertical Open-End Press-Fit Pin Header (8×6 Shown)



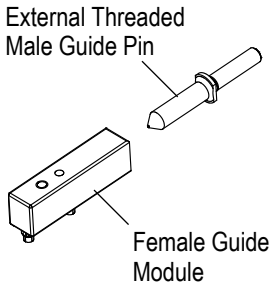
Right-Angle Press-Fit Receptacle (8×6 Shown)



TYPICAL CONNECTOR DENSITIES (For 25.4-mm PC Board Pitch)	
SIZE (Contact Pairs×Columns)	**CONTACT PAIRS PER 25.4 mm**
8×8	45
8×6	
6×8	34
6×6	
4×8	23
4×6	

STRADA Whisper Connector Guides

Without Standoff



With Standoff

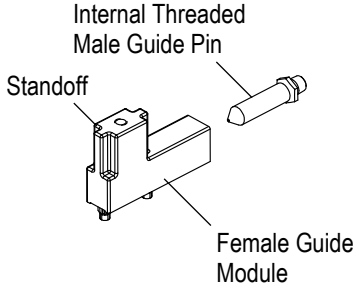


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Updated document to more accurately reflect current products.
- Edited document to clarify meaning and intent for ease of use by customer.

2.2. Customer Assistance

Reference Product Base Part Numbers 2180822 (pin header), 2198263 (receptacle), 2149782 (female guide module), and 2149783 (male guide pin) and the Product Codes listed below are representative of 4.5-mm STRADA Whisper 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.

L803	Pin Header Assemblies
M284	Receptacle Assemblies
M285	Miscellaneous Assemblies
M286	Components

2.3. 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 108-2413 provides product performance and test results.

2.5. Instructional Material

Instruction sheets (408-series) provide product assembly instructions. Instructional material that pertain to this product are:

408-32054	Removal Kits 2161745-1, 2161752-1, and 2161754-1 for STRADA Whisper Receptacles
408-32059	Removal Kits 2161742-1, 2161744-1, and 2161756-1 for STRADA Whisper Pin Headers

3. REQUIREMENTS

3.1. 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.

Connectors that are removed from the shipping container (tube or tray), but not used, must be carefully placed back into the original container as soon as possible.

B. Chemical Exposure

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

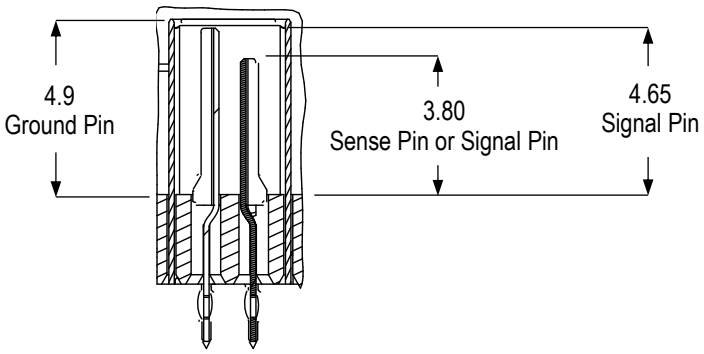
Alkalies	Ammonia	Citrates	Phosphates Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur Nitrites	Tartrates

3.2. Material

The housings and chicklets are molded of high-temperature, UL94V-0 rated thermoplastic. The contacts are made of copper alloy and plated at the contact interface with precious metal. All contacts have a nickel underplate and tin plated press-fit leads. Refer to the specific customer drawing for details.

3.3. Pin Lengths

The lengths of signal pins, sense pins, and ground pins are given in Figure 2.



Note: Contact TE Connectivity (TE) for other pin lengths.

Figure 2

3.4. PC Board

A. Material and Thickness

The pc board material shall be glass epoxy.

For connector compliant pins, the pc board must have a minimum thickness of 1.00. For pc boards with a thickness of 1 to 2, a pc board support must be positioned directly under the connector area. In addition to the pc board support design requirements described in Section 5, the pc board support must have clearance holes that accommodate the protruding length of the compliant pins.

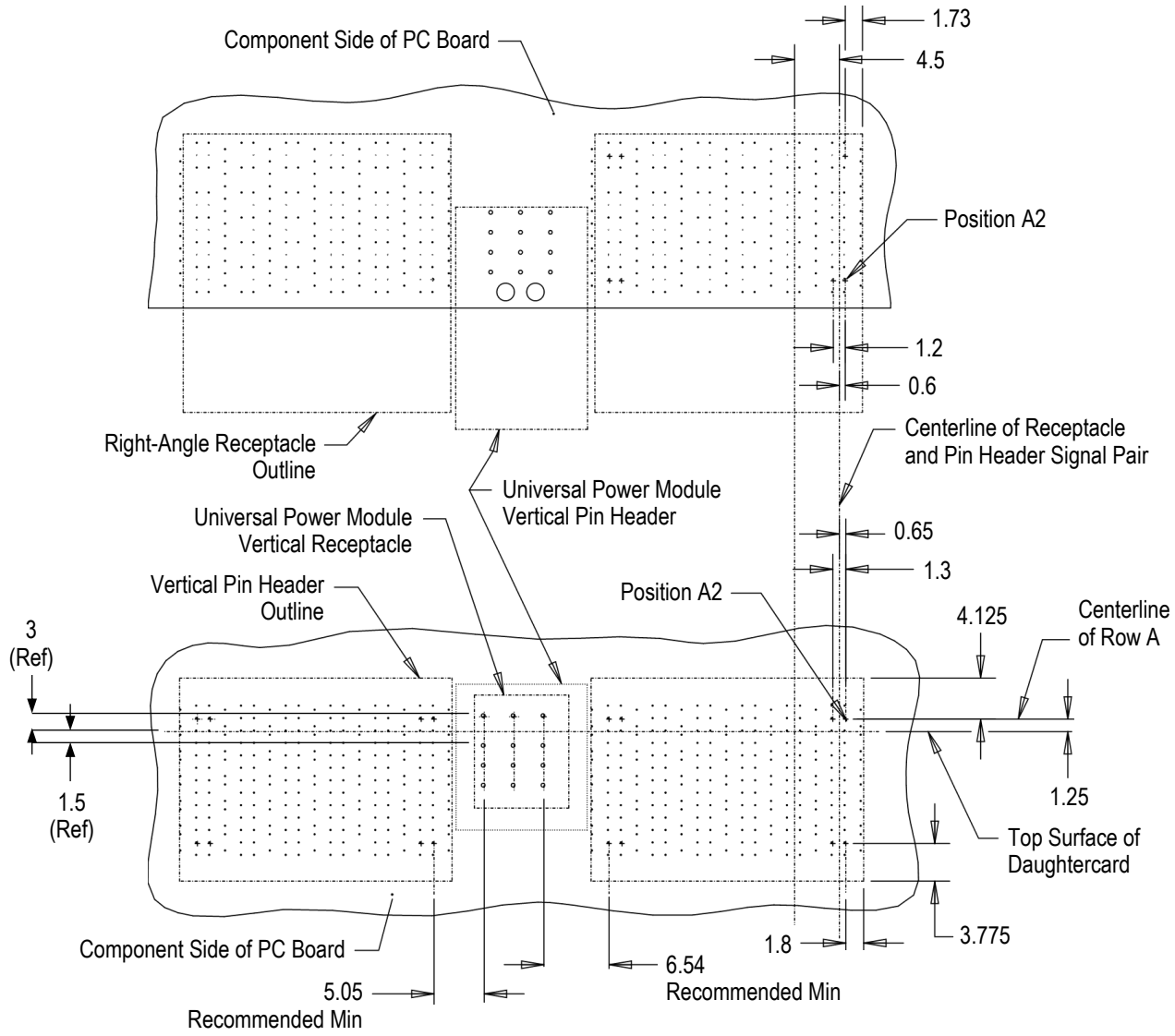
The thread length of the external threaded guide pin is 6.5 or 16.5, and the thread length of the internal threaded guide pin is 3.0 or 4.0. To accommodate the guide pin, the pc board must have a thickness equal to or greater than the thread length of the guide pin. A pc board with a thickness less than the guide pin thread length can be used as long as a pc board support is positioned directly under the connector area. In addition to the pc board support design requirements described in Section 5, the pc board support must have clearance holes that accommodate the protruding length of the guide pin.

For STRADA Whisper connector guide modules, the thickness of the pc board must allow the post of each press-fit contact to be exposed 4.5 from the top of the pc board. The post of each press-fit contact can be exposed less than 4.5 from the top of the pc board as long as a pc board support is positioned directly under the connector area.

B. Layout

The pc board hole patterns for the placement of these connectors are provided on the specific customer drawing. Recommended spacing for vertical pin header open-end and right-angle receptacle connectors with power modules and STRADA Whisper connector guides are given in Figure 3.

Recommended Spacing for Vertical Pin Header Open-End and Right-Angle Receptacle Connectors with Power Modules



Note: True position from pin header A2 to pin header A2 and receptacle A2 to receptacle A2 is 0.12 maximum material condition (mmc).

Figure 3

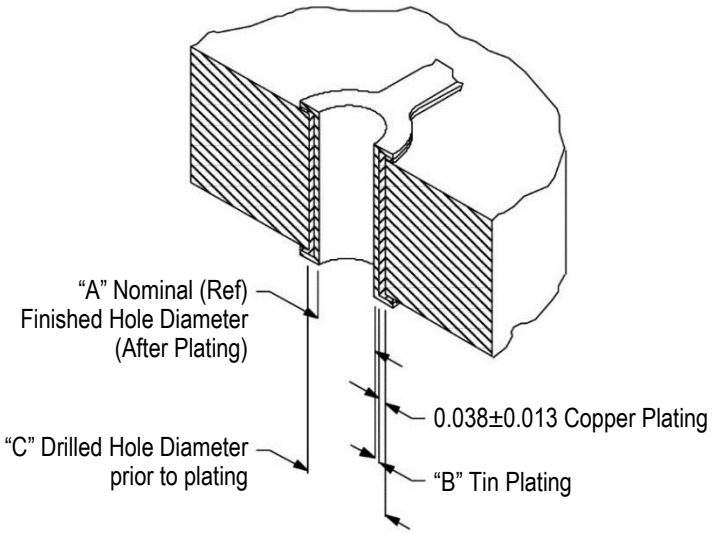
C. Hole Configuration

The holes in the pc board for all contacts must be drilled and plated through to the dimensions given in Figure 4. Dimension for pc boards that are to be back-drilled (counterbored) for signal integrity performance is also given.

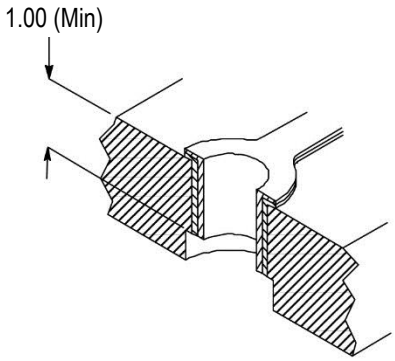
NOTE

The nominal finished hole diameter (dimension A) is supplied for reference only. Although it may be used as an inspection dimension, proper plated through hole (PTH) composition can only be determined via radial and longitudinal cross sectioning of the PTH. Radial sectioning verifies that the specified PTH component dimensions are achieved, i.e., drill diameter, copper plating, and other specified plating thicknesses. Longitudinal sectioning will verify plating uniformity throughout the pc board thickness. Deviation from the requirements listed in Figure 4 may have adverse effects on compliant pin insertion force and related performance.

PC Board Holes



PTH Counterboring
(For Signal Contacts Only)



Note: PTH tolerance applies to the top and bottom 1.00 of the pc board for all contacts; after 1.00, standard PTH tolerances apply.

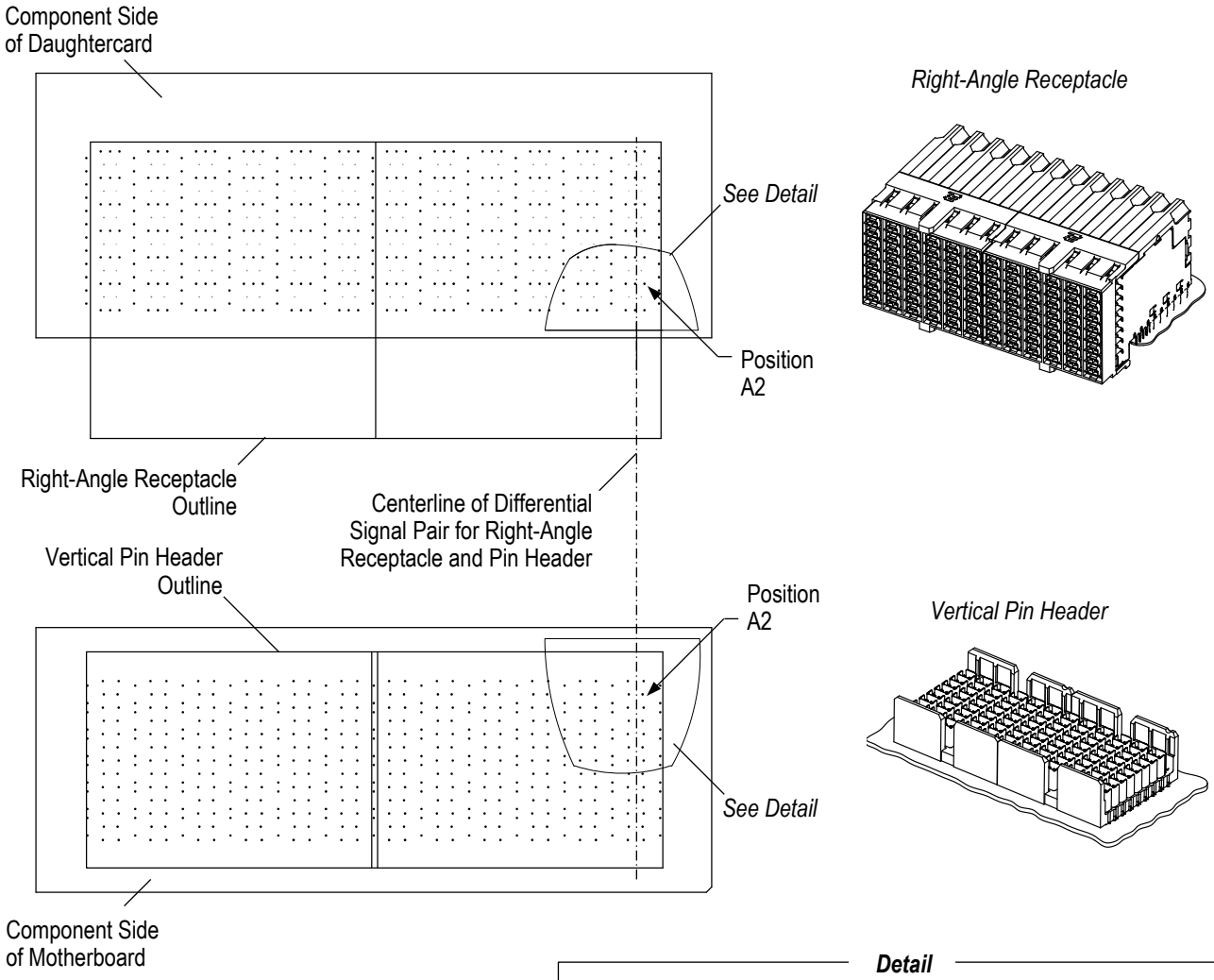
CONNECTOR	CONTACT TYPE	DIMENSION		
		A	B ±0.00013	C
Receptacle	Signal	0.244**±0.039**	0.00051	0.32±0.013
	Ground	0.344**±0.039**		0.42±0.013
Pin Header	Ground	0.344±0.046	0.00051	0.42-0.435

Figure 4

3.5. Connector End-to-End Placement

Connectors can be mounted end-to-end on the pc board within specified dimensions. See Figure 5.

NOTE
When using these connectors with similar connectors or components, call the number at the bottom of page 1 for the recommended spacing.



Note: Ground contact columns line up directly from motherboard to daughtercard. Signal contact columns are offset as shown in the detail.

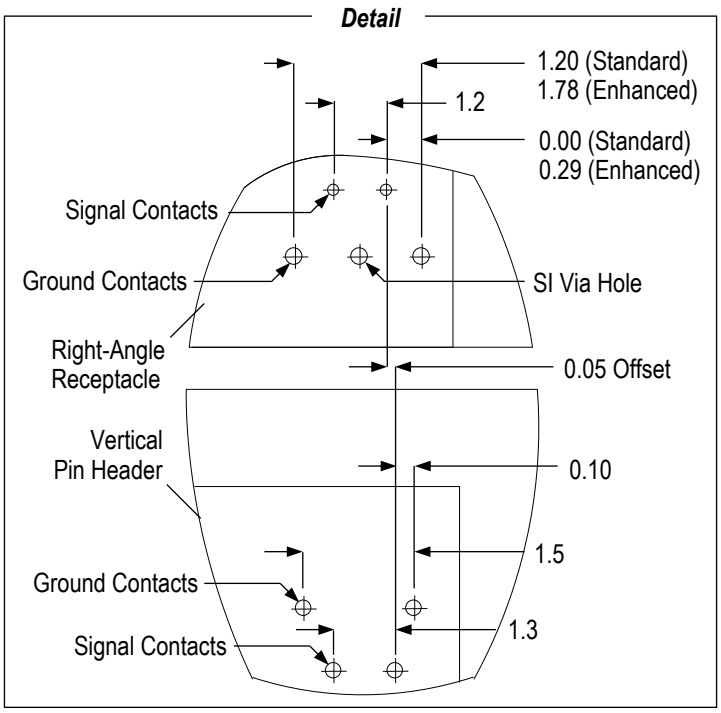


Figure 5

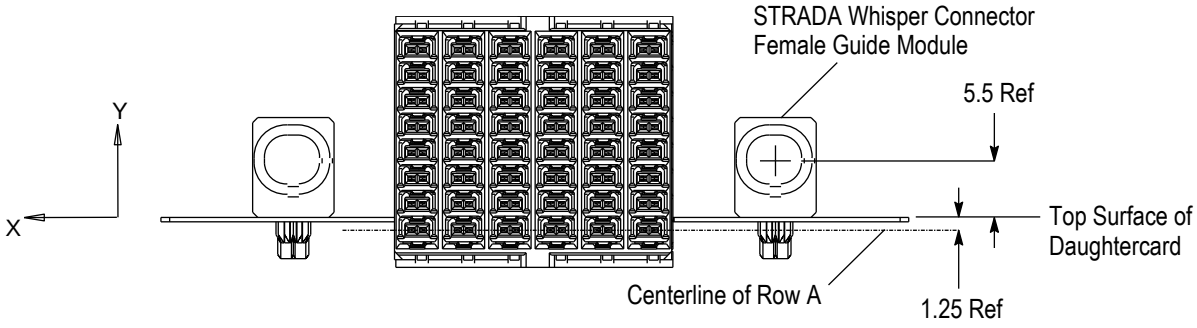
3.6. STRADA Whisper Connector Guide

A. Placement

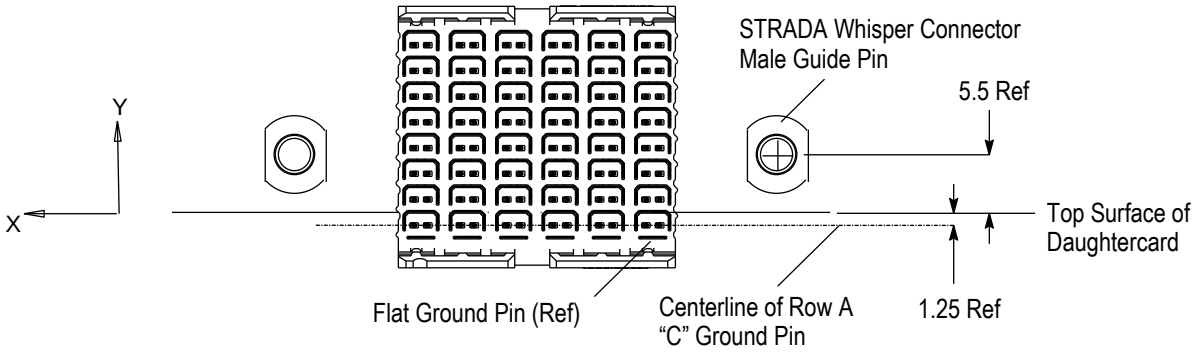
The STRADA Whisper connector guides are designed to accommodate 0.3 of shrink to the pc board. Pick-up capability of these guides is 3.56 in the X direction and 3.26 in the Y direction. An excessively stiff pc board with bow might require a stiffener. For requirements, call the number at the bottom of page 1. Placement of these guides with the connectors on the pc board is shown in Figure 6.

Recommended STRADA Whisper Connector Guide Placement

Vertical Placement with Receptacle



Vertical Placement with Pin Header



Horizontal Placement with Connectors Side-By-Side

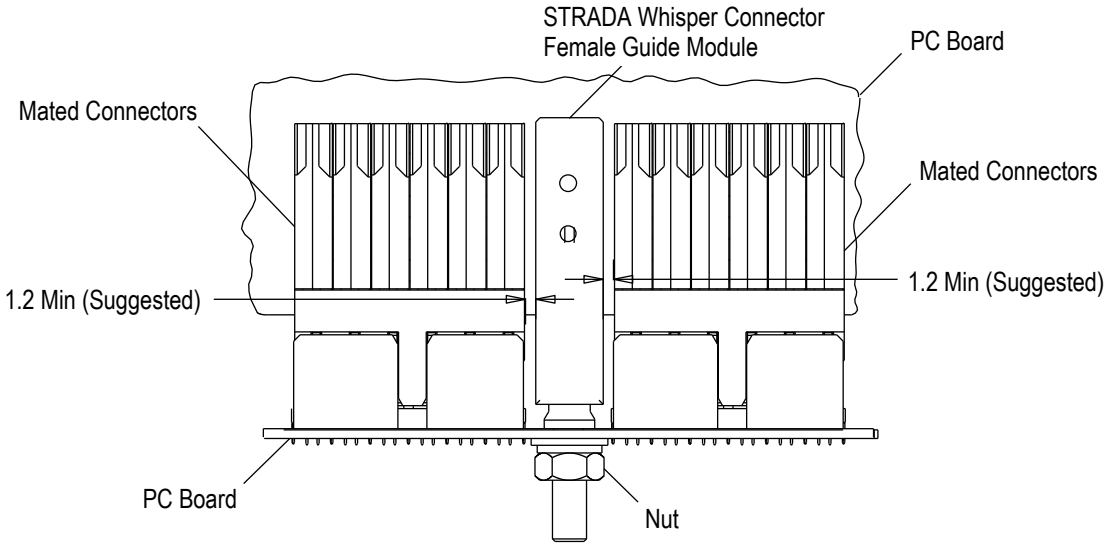
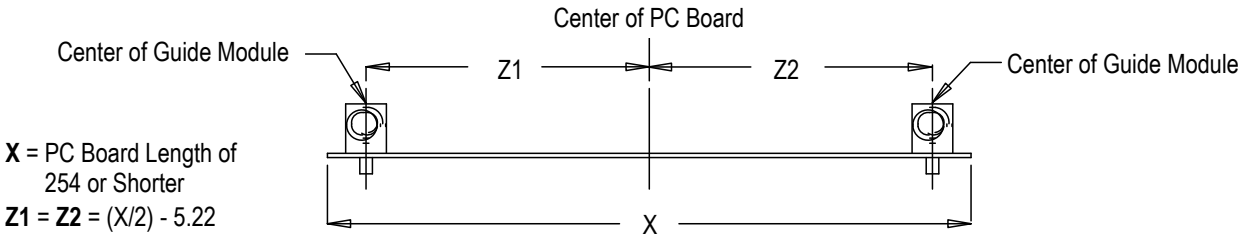


Figure 6 (Cont'd)

Placement of 2 STRADA Whisper Connector Female Guide Modules



Note: For pc boards longer than 254, call the number at the bottom of page 1.

Placement of 3 STRADA Whisper Connector Female Guide Modules

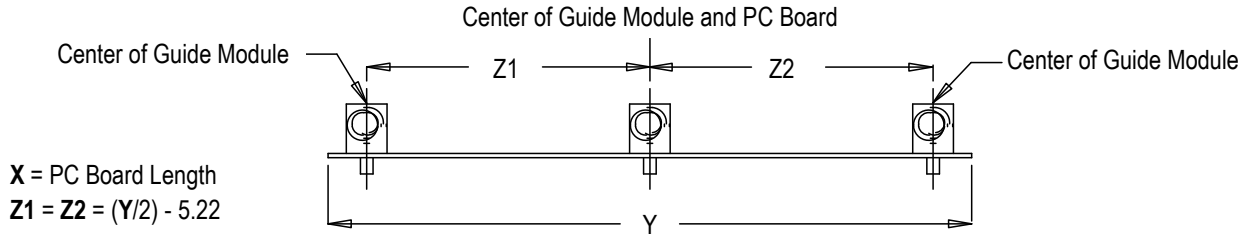


Figure 6 (End)

B. Installation

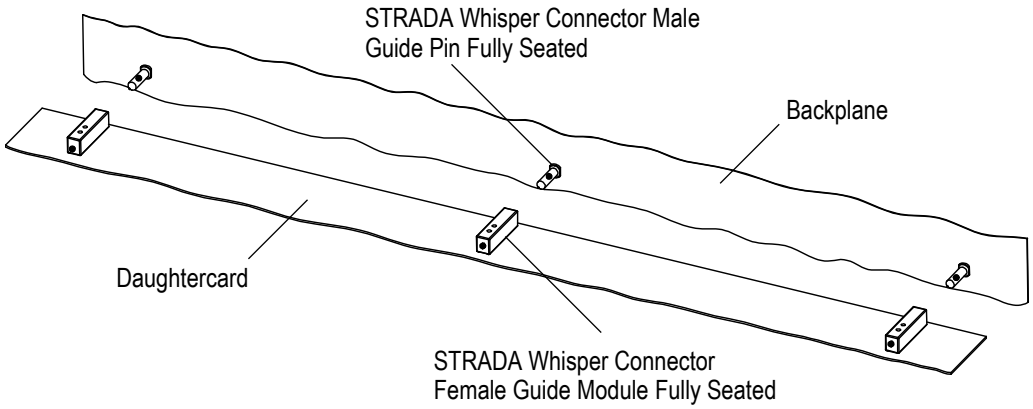
Insertion of STRADA Whisper connector guides into the pc boards must be applied with tooling capable of applying a downward force between 222 and 1112 N [50 and 250 lb-force.]. For pc boards having a thickness under 4.45, a pc board support must be used (refer to Section 5 for design details).

The STRADA Whisper connector guides must be fully seated on the pc board. The female guide module screw (M3×0.5) and male guide pin screw and each must be tighten to a maximum torque of 1.01 Nm [9 in.-lbs].

CAUTION
To avoid damage of the guide pin, do not apply force directly to the tip.

Typical application of these guides is shown in Figure 7.

Typical Application of STRADA Whisper Connector Guides



Note: PC board holes for connectors not shown.

Figure 7

3.7. Connector Installation

A. Initial Positioning

These connectors are typically applied to the pc board manually using nitrile gloves or using an automatic machine. Connectors should be gripped by the housing and/or chicklets only and not by the contacts.

When placing the connector onto the pc board, all contact leads should be aligned and inserted into the pc board simultaneously to prevent twisting or bending of the contacts. In addition, when manually placing the receptacle on the pc board, the row of contact leads closest to the pc board edge should be aligned first, then the remainder of the rows should be aligned by rolling the receptacle from front to back.

These connectors must be placed on the pc board so that pin 1 to position 1 orientation is maintained. After the connector is placed on the pc board, the open portion of all contacts must be inside the pc board hole as shown in Figure 8.

NOTE
These connectors must be placed on the pc board so that pin 1 to position 1 orientation is maintained. See Figure 8.

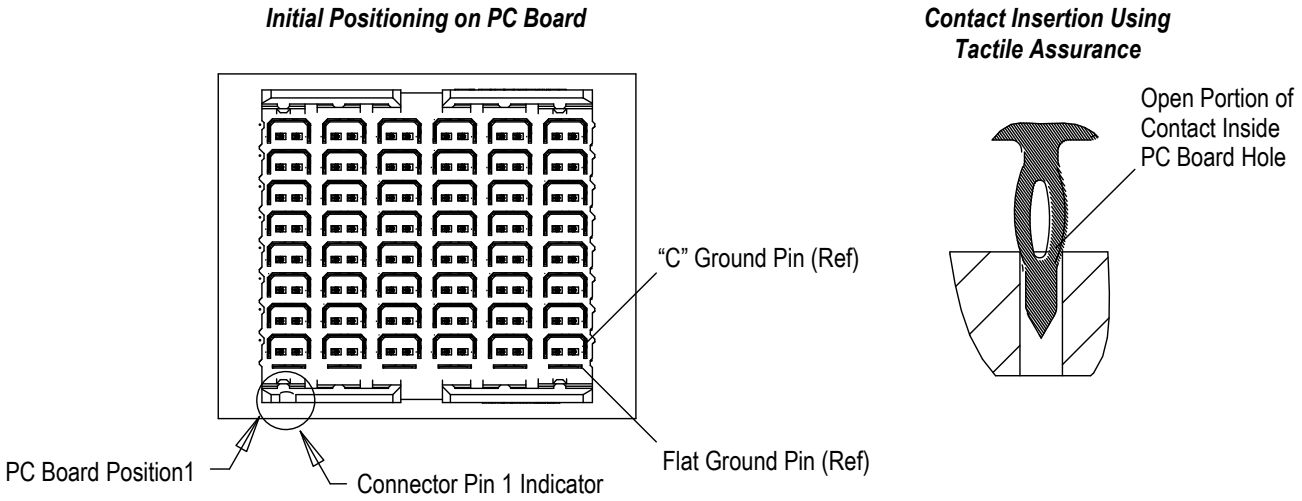


Figure 8

B. Seating

Seating force must be applied evenly on the connectors to prevent deformation or other damage to the contacts and housings. When installing the pin header, the insertion force must be evenly applied to the assembly using the appropriate seating tool. When installing the receptacle, the insertion force must be evenly applied to the assembly as shown in Figure 9.

Tooling used to seat these connectors must be capable of supplying a controllable downward force needed to seat the connector. Seating force will vary according to pc board variations and signal pin count. The average insertion force is around 8.7 N [1.96 lb-force] per compliant pin press-fit contact. The maximum insertion force is 17.8 N [4.0 lb-force] per compliant pin press-fit contact.

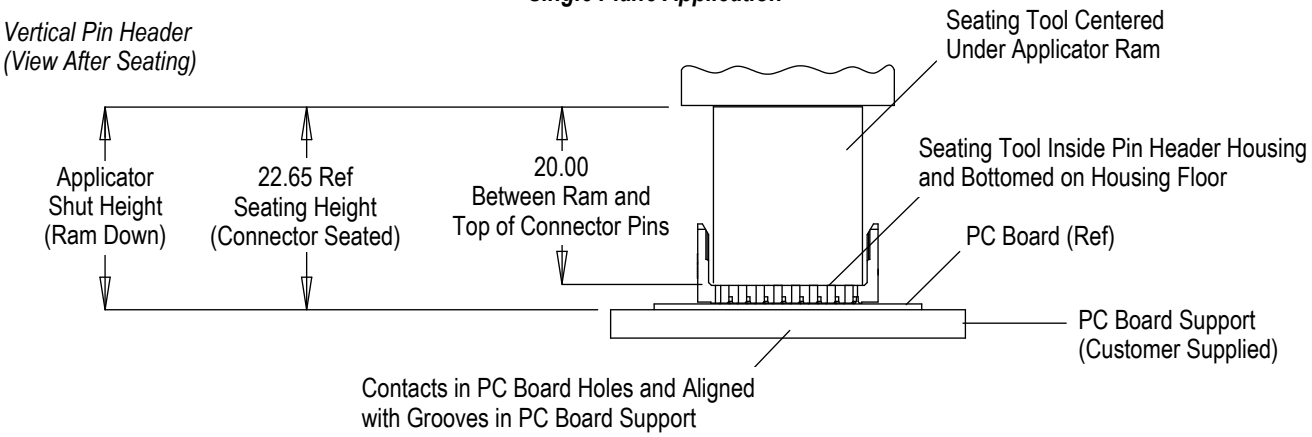
CAUTION
Correct seating of connector is essential to interconnection performance. This includes correct seating height (see Figure 9) and force applied. Over-seating of connectors will deform parts critical to the quality of the connector. Maximum force occurs prior to the connector bottoming on the pc board.

C. Seating Height

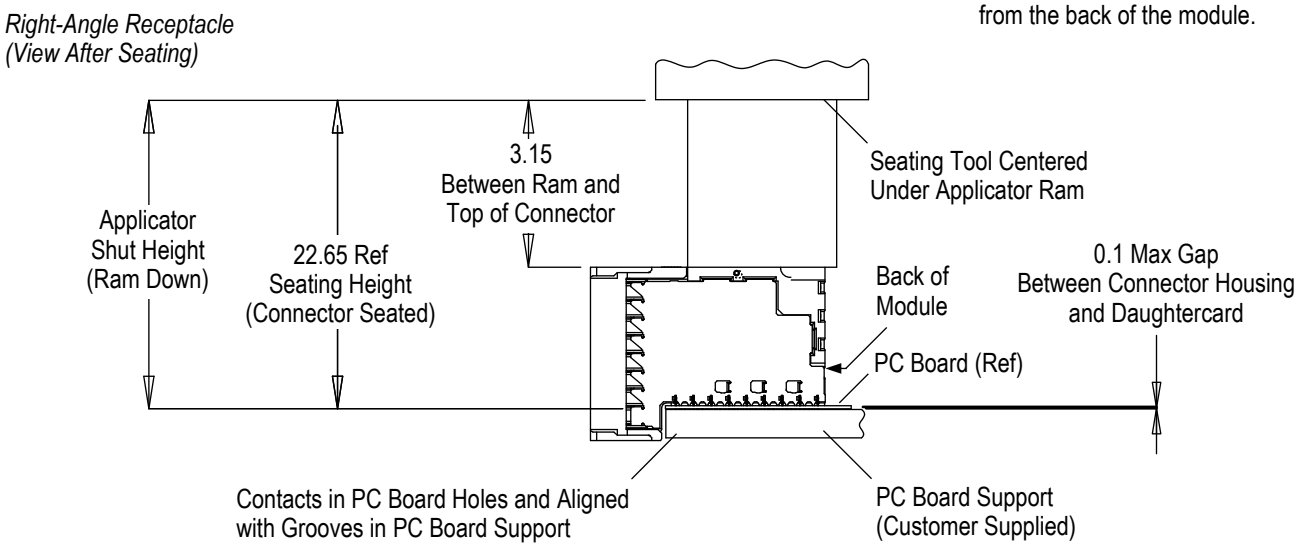
Pin headers and receptacles must be seated to the dimensions shown in Figure 9. If using a copper border on the pc board for the vertical pin header, seating dimensions are also given.

For mid-plane applications, a pc board support must be used for both connectors when seating the second connector. Refer to Figure 9.

Single Plane Application



Note: For these dimensions, measure from the back of the module.



Mid Plane Application

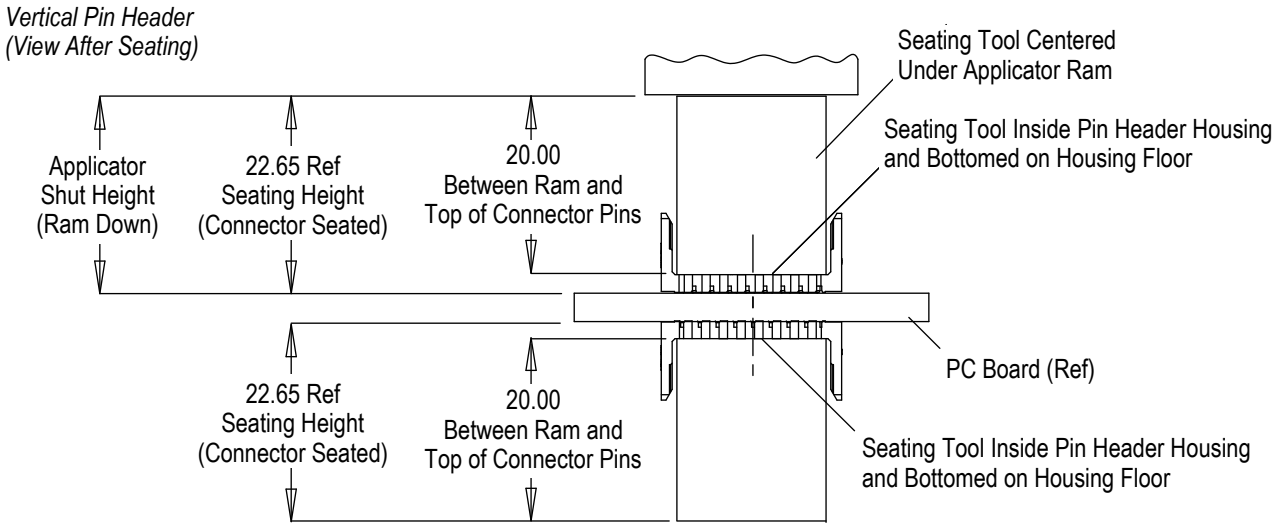


Figure 9 (Cont'd)

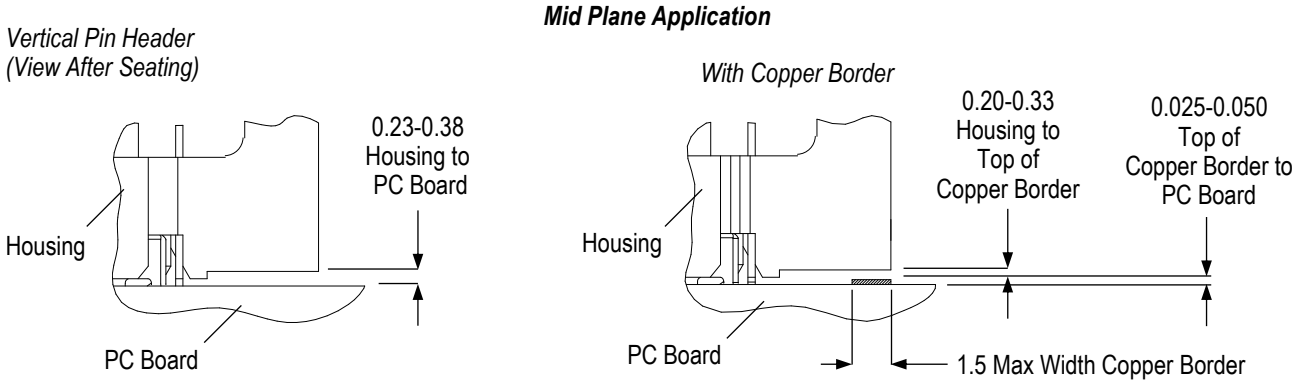


Figure 9 (End)

3.8. Mating

A. Alignment

Proper alignment is essential to ensure full engagement of mating connectors and to ensure that contacts are not bent or otherwise damaged during mating and unmating. For tolerance limitations, see Figure 10.

Note: 8-Pair Vertical Pin Header and Right-Angle Receptacle Shown for Reference

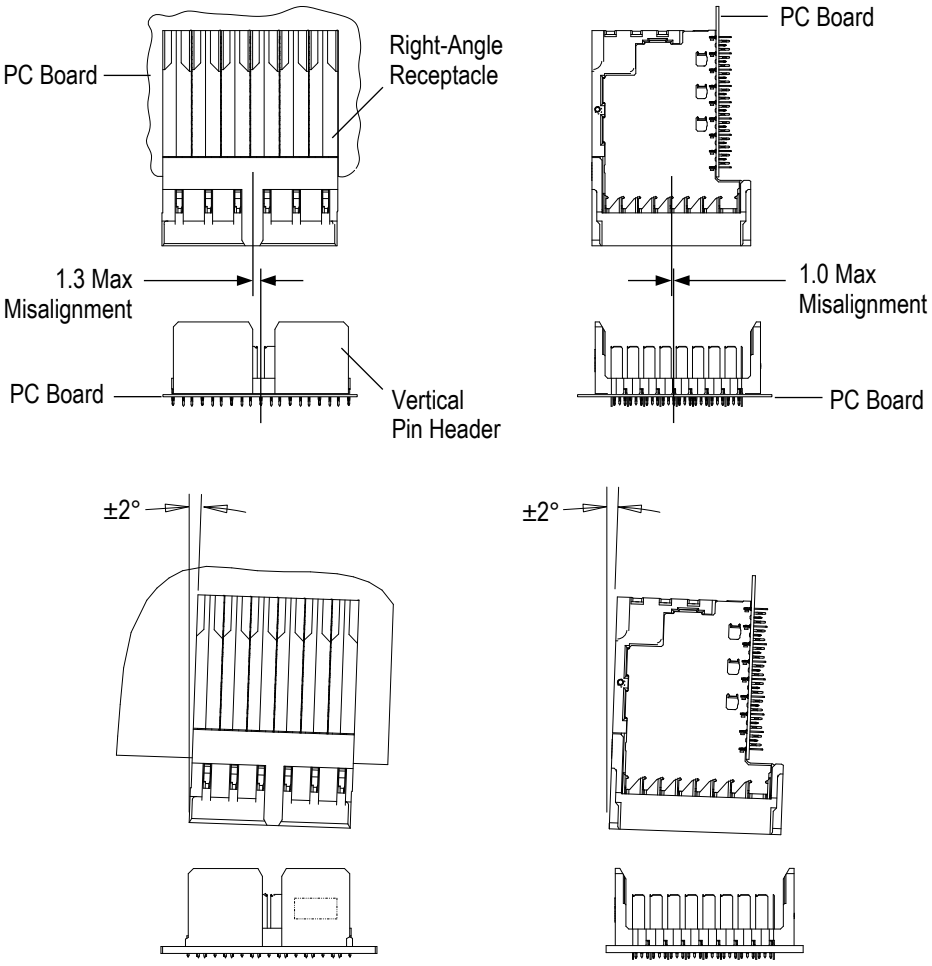


Figure 10

B. Sequences and Wipe Length

This connector system has three basic levels of sequencing during mating. The order of mating is: ground pin, signal pin, and sense pin. The relative distances between sequencing events as a function of the distance between the surface of the backplane and the centerline of row A of the daughtercard connector is shown in Figure 11.

Full mating of connectors is necessary to ensure a good connection and to obtain the maximum signal transmission performance. The dimension shown for the fully mated condition from the surface of the backplane to the first row of contacts of the daughtercard connector is recommended; however, the maximum pull-out dimension given in Figure 11 is acceptable.

Connector wipe length is calculated by subtracting the fully mated condition from the reliable mating point data. Wipe lengths are shown in Figure 11.

NOTE
For circuit routing concerns, call the number at the bottom of page 1.

3.9. Guide Removal

A pc board support must be used when removing any guides. Refer to Section 5 for design requirements.

A. STRADA Whisper Connector Female Guide Module

The female guide module can be removed from the pc board using tooling capable of applying downward force of 333 N [75 lb-force].

B. STRADA Whisper Connector Male Guide Pin

The male guide pin can be removed from the pc board using tooling capable of applying downward force of 556 N [125 lb-force].

For the external threaded male guide pin, the nut must be removed, then downward pressure can be applied to the threads to remove the male guide pin. For the internal threaded male guide pin, the screw must be removed, a 3.5 diameter pin can be inserted into the screw hole, then downward force can be applied to the pin to remove the male guide pin.

3.10. Replacement and Repair

Damaged or defective connectors must not be used. Connectors can be removed from the pc board and replaced.

NOTE

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.

CAUTION
To avoid damage to the connectors, ammonia should not be used in the removal process.

A. Rework

Even though this connector system uses press-in compliant pins and does not require solder, pc board repair or rework could require soldering after the connectors are inserted in the pc board; therefore, the following applies:

— Ammonia must not be used for cleaning the assemblies. Material in STRADA Whisper connector signal contacts will have a reaction to ammonia.

— Air drying of cleaned connectors is recommended.

— If a cleaning agent is used, gold surfaces of contact tines must be re-lubricated with a Telcordia-approved lubricant.

CAUTION
Even when using "no clean" solder paste, it is imperative that the contact interface be kept clean of flux and residue, since it acts as an insulator.

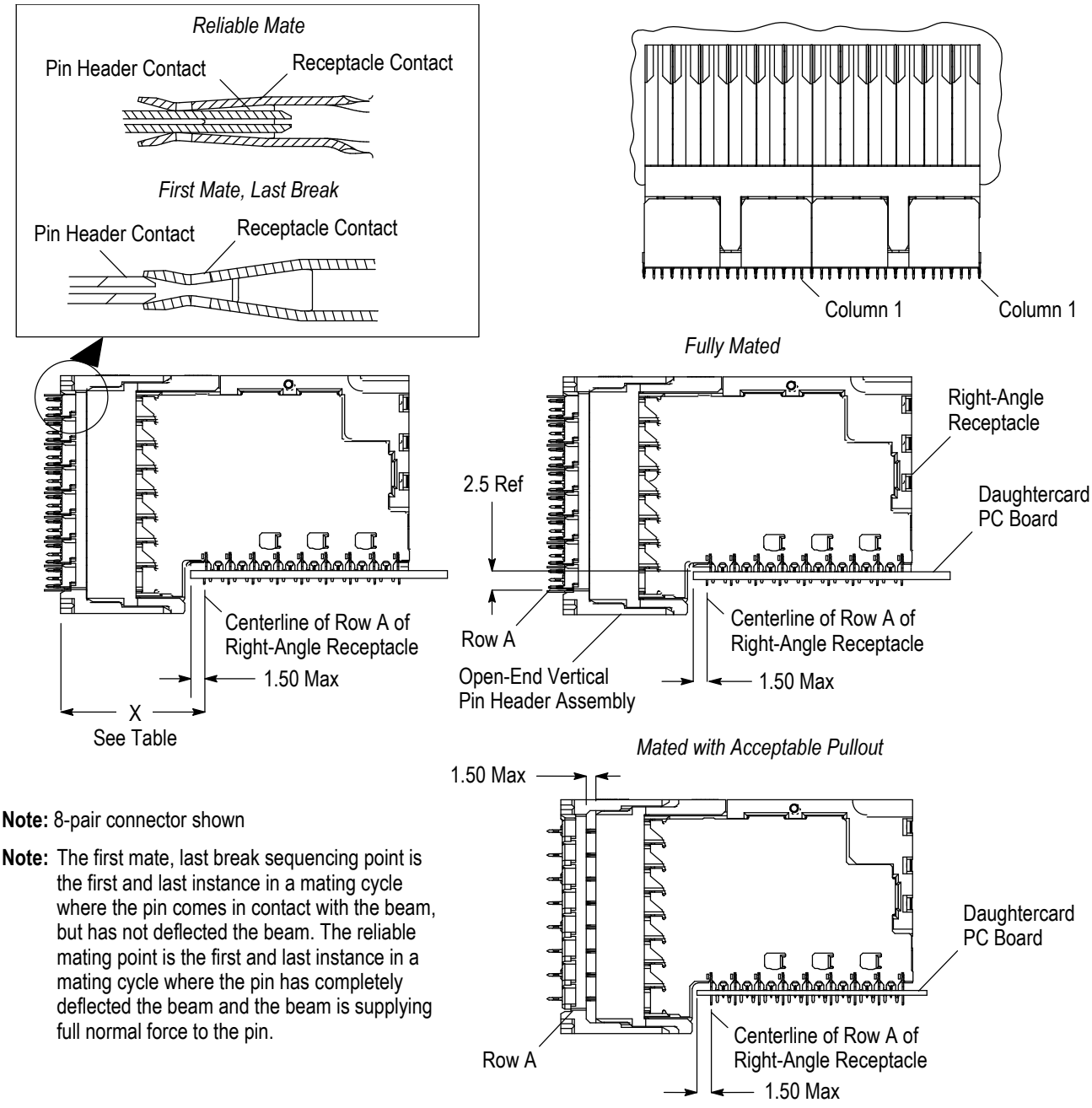
Telcordia is a trademark

DANGER
Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Refer to the manufacturer's material safety data sheet (MSDS) for characteristics and handling of cleaners. Trichloroethylene and methylene chloride is not recommended because of harmful occupational and environmental effects.

PIN		DIMENSION X		FULLY MATED WIPE LENGTH
TYPE	LENGTH	RELIABLE MATE	FIRST MATE, LAST BREAK	
Plastic Alignment	NA	NA	23.40	NA
Ground	7.40	18.66	19.07	3.91
Signal	7.15	17.60	18.23	2.95
Sense	6.30	16.75	17.38	2.10

Note: Dimensions are calculated using nominal connector conditions. Connectors are assumed to be seated flush with the pc board.

Mating Sequences and Wipe Length



Note: 8-pair connector shown

Note: The first mate, last break sequencing point 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. The reliable mating point 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.

Figure 11

— Temperature should not exceed:

1. -55°C [-67°F]
2. 125±5°C [257±9°F] for a 24-hour bake cycle with a maximum of 15 cycles
3. 220±5°C [428±9°F] for a ball grid array (BGA) replacement with a maximum of 30 cycles

The connector(s) must be shielded with aluminum having a thickness of 1.6.

The profile for temperature and exposure time is given in Figure 12.

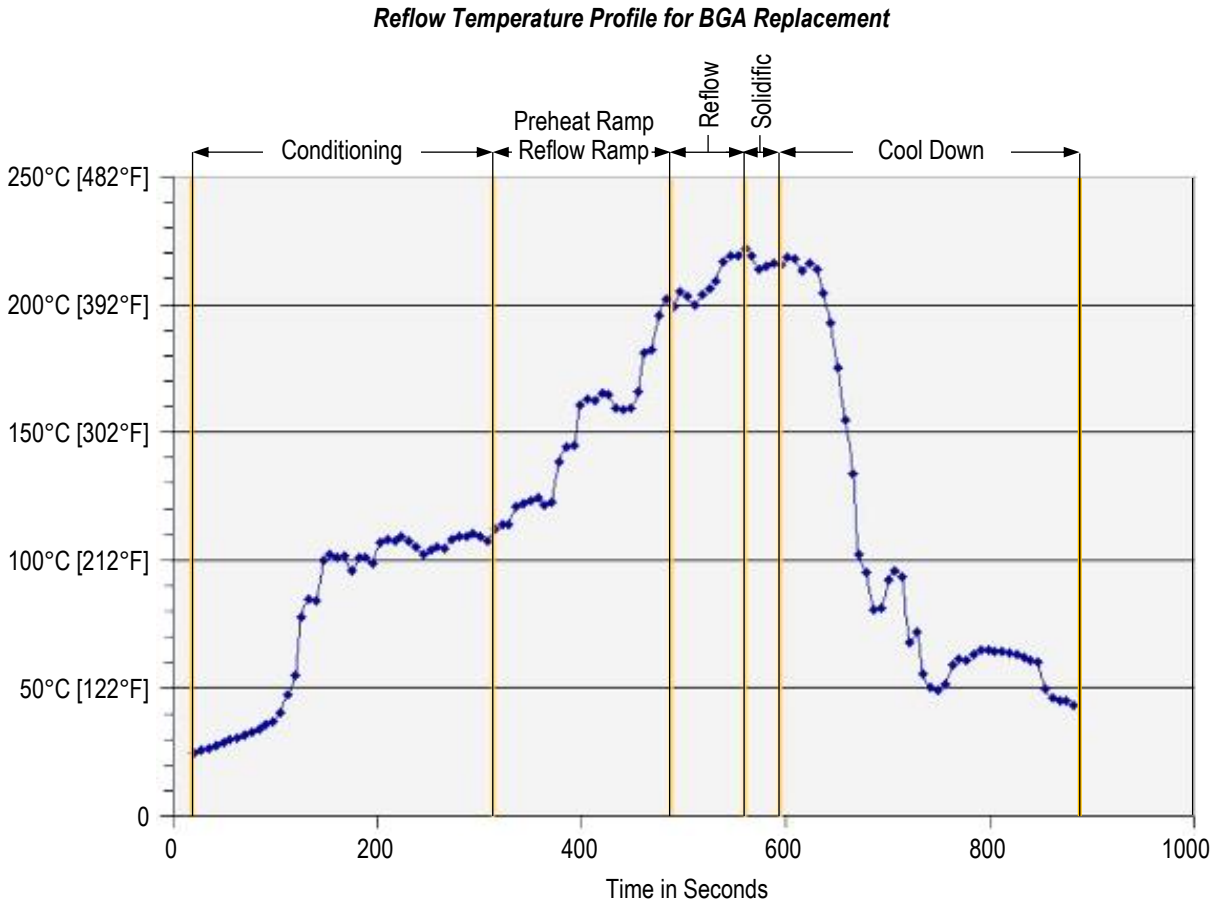


Figure 12

B. Replacement

For pin headers containing damaged or defective “C” ground pin or flat ground pin, the entire pin header must be removed from the pc board. Individual signal contacts can be replaced without removing the pin header from the pc board. Tooling to remove individual signal contacts had not been defined at the time of publication of this application specification.

For receptacles, individual contacts cannot be replaced. The entire receptacle connector must be removed from the pc board and replaced with a new one.

4. QUALIFICATION

Agency evaluation for 4.5-mm STRADA Whisper connectors was not defined at the time of publication of this specification.

5. TOOLING

Tooling part numbers and instructional material packaged with the tooling for these connectors are given in Figure 13.

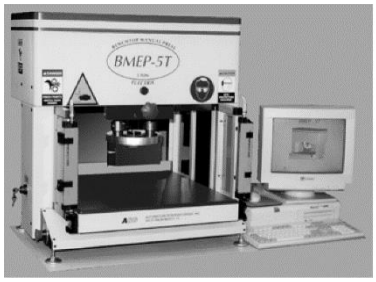
5.1. PC Board Support

The pc board support with a minimum thickness of 1 must be used to prevent bowing of the pc board during the seating of a connector onto and removal of any guide from the pc board. It should have a flat surface with holes or a channel wide and deep enough to receive any protruding parts during seating or removal.

5.2. Seating Tools and Removal Tool Kits

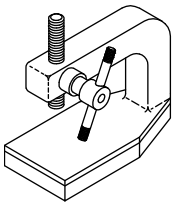
The seating tool assembly for the pin header is designed to push on the contacts and seat the pin header on the pc board. The seating tool will prevent contacts from backing out of the housing and prevent damage to the pin header. A customer-designed flat rock must be used to seat the receptacle.

The removal kits contain all of the tooling to remove a connector from the pc board. The tooling is designed to be used based on the connector size and position on the pc board.

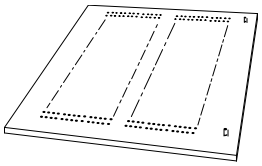


Model BMEP 5T
Machine 1585696-1

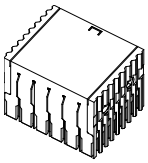
Model MEP 6T
Machine 1585699-1



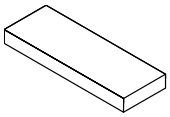
Manual Arbor Frame Assembly (Commercially Available)



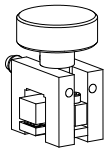
PC Board Support (Customer Supplied)



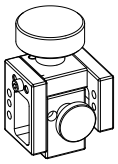
Seating Tool Assembly for Pin Header (Refer to Table)



Flat Rock for Seating Receptacle (Customer Designed)



Removal Kits for Pin Header (Refer to Table) (408-32059)



Removal Kits for Receptacle (Refer to Table) (408-32054)

TYPICAL CONNECTOR SIZE	SEATING TOOL ASSEMBLY FOR PIN HEADER
8×8	2018844-[ ]
8×6	2018843-[ ]
6×8	2018850-[ ]
6×6	2018849-[ ]
4×8	2018855-[ ]
4×6	2018854-[ ]

TYPICAL CONNECTOR SIZE	REMOVAL KIT	
	PIN HEADER	RECEPTACLE
8×6	2161756-1	2161754-1
6×6	2161744-1	2161752-1
4×6	2161742-1	2161745-1

Figure 13

5.3. Power Unit

The power unit is an automatic or semi-automatic machine used to supply the force to seat the connector onto the pc board using seating tools. The power unit must have a ram and be capable of supplying a downward force needed to seat the connector. Typical TE Connectivity power units include, but are not limited to, the power units given in Figure 13.

5.4. Manual Arbor Frame Assembly

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

5.5. Drilling Holes in PC Board

Recommended drill bits for drilling contact holes in the pc board are available from:

CONTACT HOLE DIAMETER	COMPANY AND DRILL BIT PART NUMBER	
	Carbide Related Technologies (CRT) 355 Sackett Point Road, Unit 5 North Haven, CT 06473 USA Phone: 203-281-1266 www.carbiderelatedtech.com	Shanghai Topoint Precision Technology Company No. 505, Fengdeng Road, Malu Industrial Park Jiading District, Shanghai, 201801 China Phone: 86 21 59157365 — Fax: 86 21 59157367 Email: rockyhuang@topoint.tw www.topoint.tw/en/
0.32	DSP0126L05A	H0320-DUS40030
0.42	DSP0165L05A	H0420-DUS40055

NOTE
Drill bits other than recommended may be used as long as the drill hole size tolerance prior to plating is achieved.

6. VISUAL AID

The illustration below shows a typical application of 4.5-mm STRADA Whisper 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.

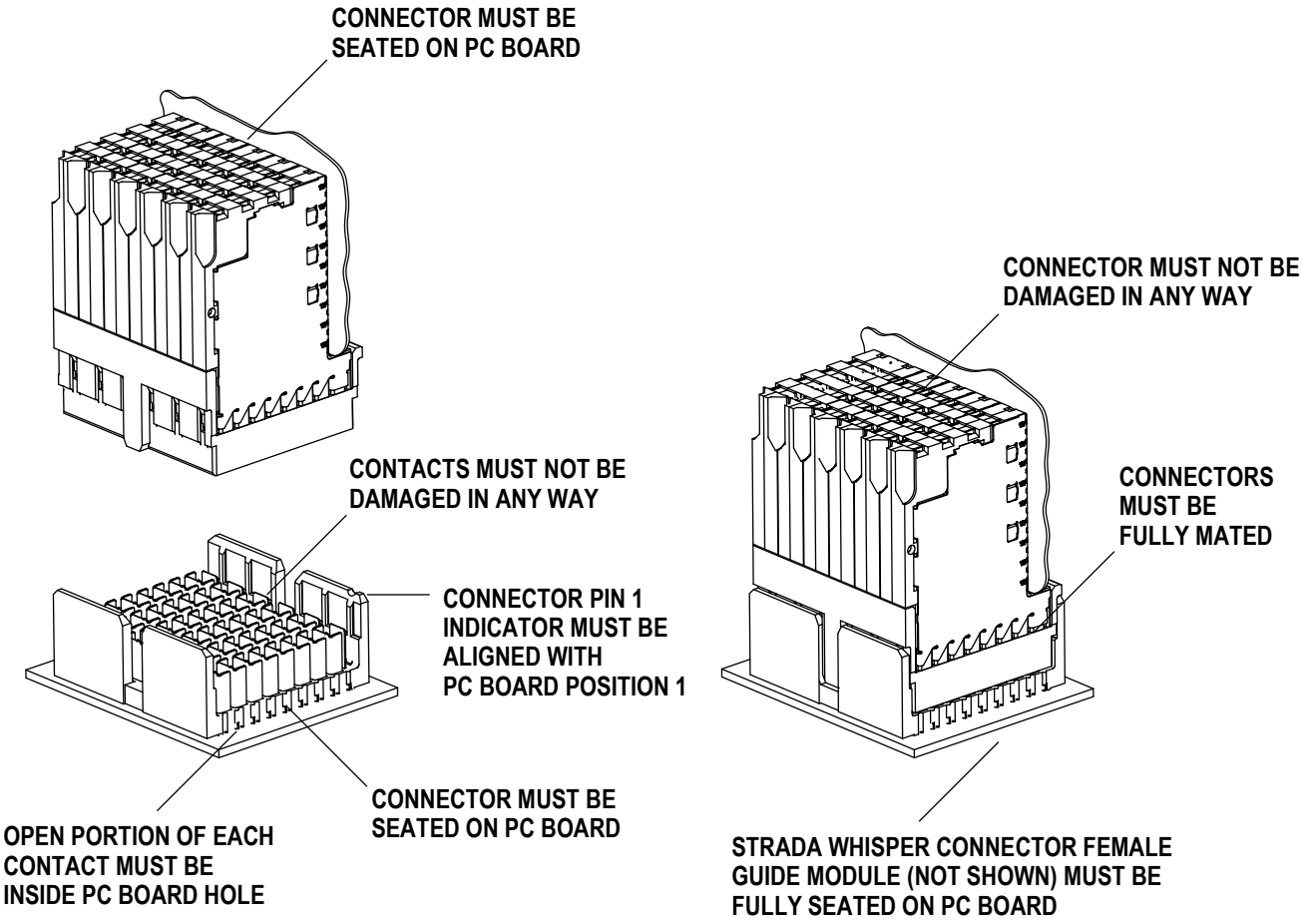


FIGURE 14. VISUAL AID