

**XFP Connector and Cage Assembly**
**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.

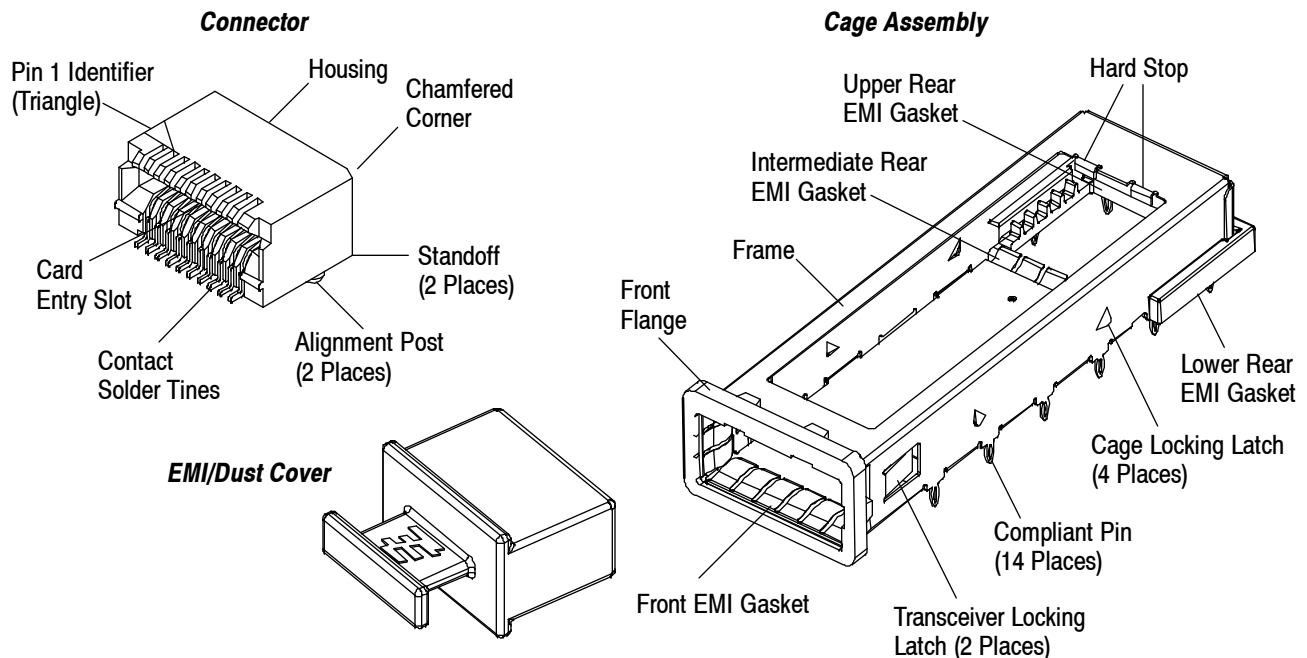
**1. INTRODUCTION**

This specification covers the requirements for application of XFP connector and cage assembly to interconnect XFP fiber optic or copper transceiver modules to host printed circuit (pc) boards used in the communications industry and peripheral component interconnect (PCI) applications. The connector is a housing with right-angle surface mount contacts. The connector is available in 30 positions with contact spacing on 0.8 centerlines. The housing features an embossed triangle for Pin 1 identification and a chamfered corner for orientation. The alignment posts provide stability for placement of the connector on the host pc board, the standoffs allow easy pc board cleaning after soldering, and the card entry slot accepts a 1.0  $\pm 0.1$  thick integrated circuit card housed in the transceiver.

The cage assembly serves as a housing for the connector and mating transceiver. The cage assembly is a frame with compliant pins for mounting onto the host pc board. The cage assembly features front, upper rear, intermediate rear, and lower rear electromagnetic interference (EMI) gaskets. These gaskets block any EMI emissions emanating from the transceiver when installed. The cage assembly is designed to be bezel mounted. The front flange provides a flat surface to contact the EMI gasket (attached to the perimeter of the bezel cutout) and stabilizes the cage assembly during insertion and extraction of the transceiver. The cage assembly transceiver locking latches hold the transceiver in place, and the hard stop controls the insertion depth of the transceiver. The EMI/dust cover is used to prevent contaminants from entering the chassis and confine any EMI emissions when the transceiver is not installed.

The connector is supplied in tape mounted form for manual or high-speed automatic machine placement (typically vacuum pick and place) and the cage assembly is supplied in a thermoformed tray package for manual placement.

When corresponding with personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

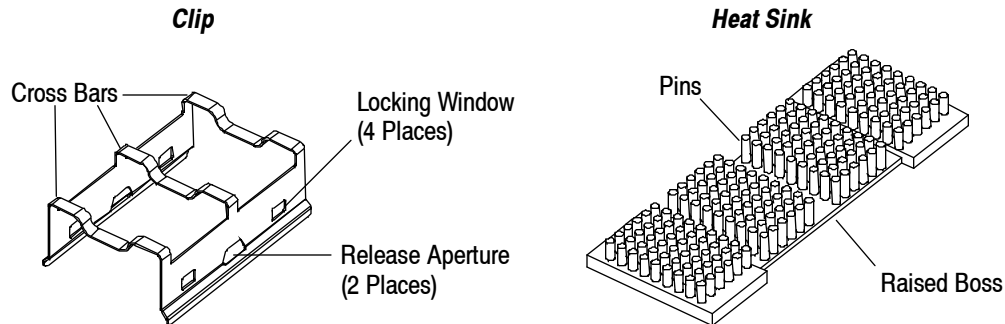


For component part numbers, see Instruction Sheet 408-8723. Contact PRODUCT INFORMATION at the number at the bottom of this page.

Figure 1

In applications where heat dissipation is necessary, a heat sink can be used. The heat sink must be chosen to meet the need of the specific application. A *sample* of available heat sinks are shown in Figure 2.

These heat sinks are designed to be attached to the cage assembly using a clip. This type allows insertion and extraction of the transceiver while maintaining the necessary contact between the heat sink and the transceiver. *Sample* part numbers and basic terms and features of this product are provided in Figure 2.



CLIP	HEAT SINK*	
	With Short Pins	With Long Pins
1489948-1	1542656-1	1542618-1

\* Other heat sinks are available to meet specific application needs.

Figure 2

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

Revisions to this application specification include:

- Changed company name and logo

### 2.2. Customer Assistance

Reference Product Base Part Numbers 788862 and 1489951 and Product Codes L761 and H986 are representative of XFP connector and cage assembly. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local Representative or, after purchase, by calling PRODUCT INFORMATION at the number at the bottom of page 1.

### 2.3. Drawings

Customer Drawings for product part numbers are available from the service network. If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, call PRODUCT INFORMATION at the number at the bottom of page 1.

### 2.4. Manuals

Manual 402-40 is available upon request and can be used as a guide to soldering. This manual provides information on various flux types and characteristics with the commercial designation and flux removal procedures. A checklist is included in the manual as a guide for information on soldering problems.

### 2.5. Specifications

Product Specifications 108-1949 (connector) and 108-2127 (cage assembly) provides product performance and test information.

EIA (Electronic Industries Alliance)-364-52 provides solderability requirements and evaluation methods, and Workmanship Specification 101-21 provides solder fillet requirements for the connector.

## 2.6. Instructional Material

Instruction Sheets (408-series) provide assembly instructions. Documents available which pertain to this product are:

- 408-8723 XFP Connectors and Cage Assembly
- 408-9816 Handling of Reeled Products

## 3. REQUIREMENTS

### 3.1. Safety

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

### 3.2. Limitations

The connectors are designed to operate in a temperature range of -55 to 85°C [-67 to 185°F].

### 3.3. Material

The connector housing is made of liquid crystal polymer (LCP) thermoplastic, UL 94-V-0. The contacts are made of phosphor bronze plated with gold over gold flash and underplated with nickel. The cage assembly is made of phosphor bronze plated with tin over nickel. The EMI/dust cover is made of zinc plated with tin over nickel.

### 3.4. Storage

#### A. Ultraviolet Light

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

#### B. Shelf Life

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

#### C. Reeled Products

Connectors are supplied in reels on carrier tapes approved under EIA-481. These reels have a diameter of 330 with 480 connectors per reel. Coil wound reels must be stored horizontally and traverse wound reels vertically.

**NOTE**

*Refer to Section 5 for carrier tape dimensions.*



### 3.5. Chemical Exposure

Do not store connectors or cage assemblies near any chemical listed below as they may cause stress corrosion cracking in the contacts or compliant pins.

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

### 3.6. Host PC Board

#### A. Material and Thickness

The host pc board material shall be glass epoxy (FR-4 or G-10). The pc board thickness shall be a minimum of 1.57 for mounting the connector and cage assembly to one side of the pc board, and the pc board thickness range shall be 3.0 through 3.6 for mounting the connector and cage assembly to both sides of the pc board.

**NOTE**

*Contact PRODUCT INFORMATION at the number listed at the bottom of page 1 for suitability of other pc board materials.*



## B. Tolerance

Maximum allowable bow of the board shall be 0.08 over the length of the cage assembly.

The coplanarity of the board circuit pads must be 0.03.

## C. Circuit Pads

The circuit pads must be solderable in accordance with EIA-364-52.

## D. Hole Dimensions

The contact alignment post holes and cage assembly compliant pin holes must be drilled and plated through to specific dimensions to prevent stubbing during placement of the connector and cage assembly on the board. The drilled hole size, plating types, and plating thickness are dependent on the application requirements. The finished hole size must be as stated to provide unrestricted insertion. See Figure 3.

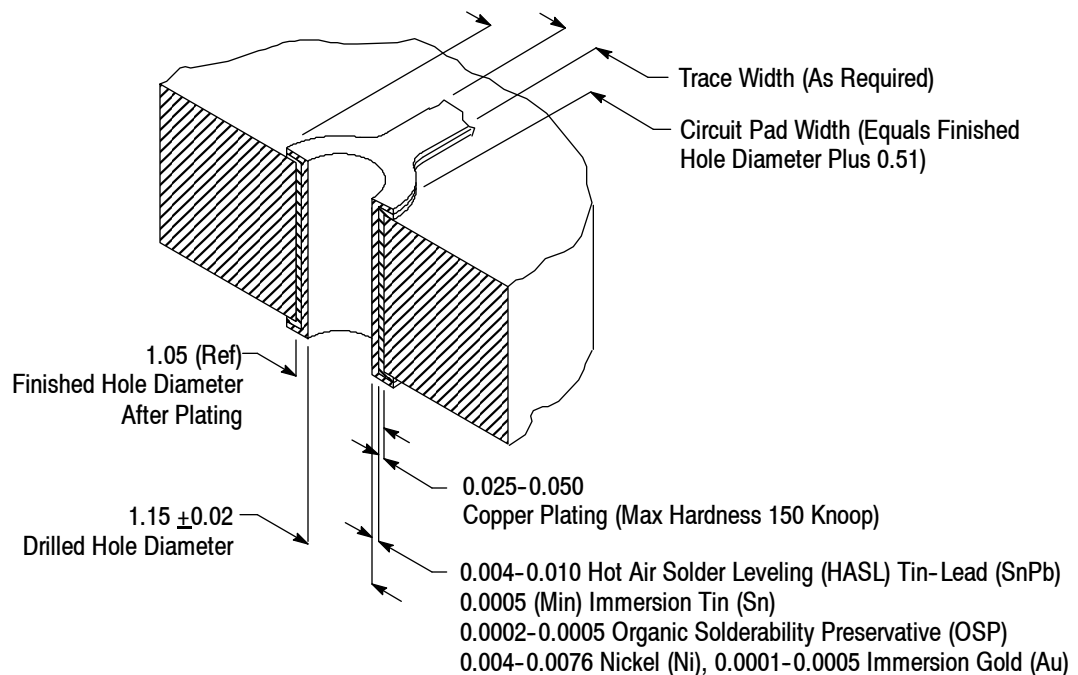


Figure 3

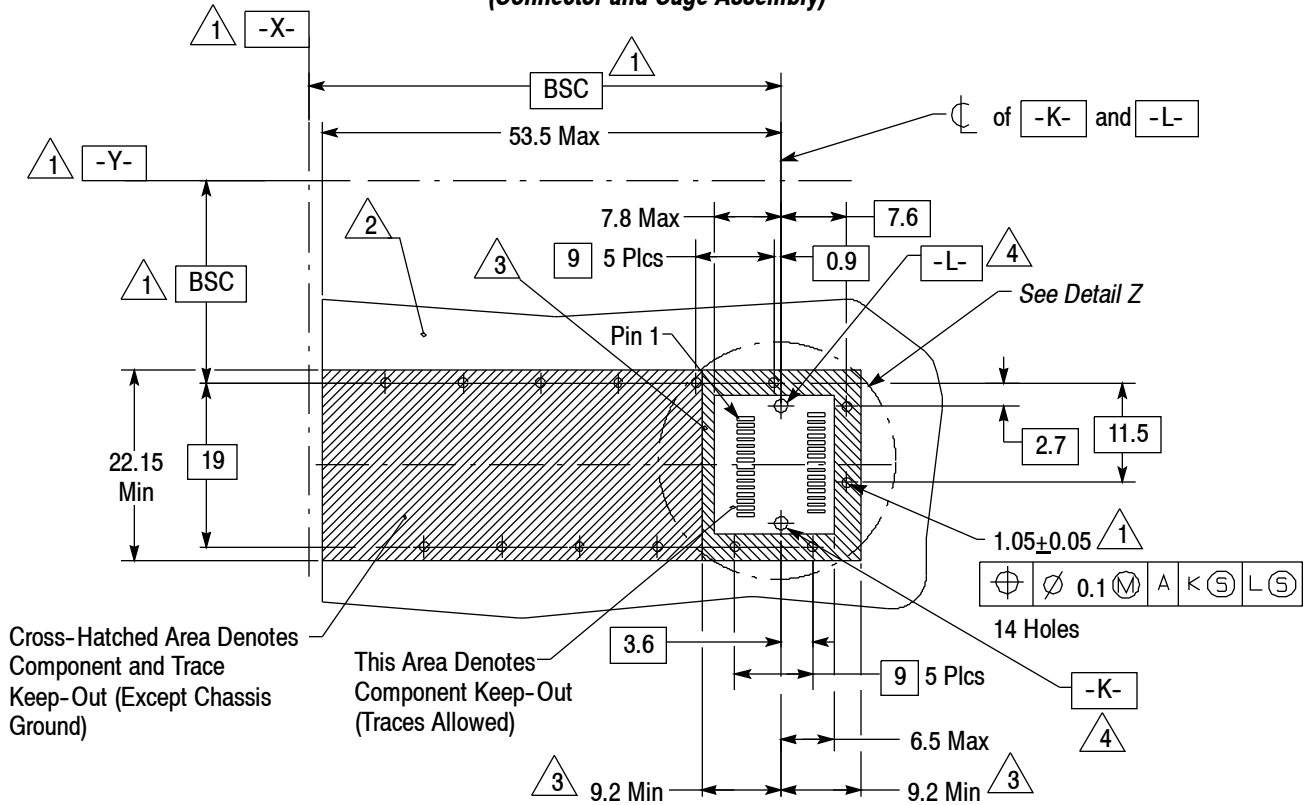
## E. Layout

All holes and circuit pads must be precisely located on the board to ensure proper placement and optimum performance of the connector and cage assembly. Recommended circuit pad pattern, dimensions, and tolerances are provided in Figure 4.

### 3.7. Solder Paste Characteristics

1. Alloy for tin-lead solder type shall be 63 Sn/37 Pb, 60 Sn/40 Pb, or 62 Sn/36 Pb/2 Ag. Alloy type for lead-free solder shall be compatible with pure tin or gold; for example, SAC305 (96.5 Sn/3 Ag/0.5 Cu) or SAC405 (95.5 Sn/4 Ag/0.5 Cu).
2. Flux incorporated in the paste shall be rosin, mildly active (RMA) type.
3. Paste will be at least 80% solids by volume.
4. Mesh designation -200 to +325 (74 to 44 square micron openings, respectively).
5. Minimum viscosity of screen print shall be  $5 \times 10\%$  cp (centipoise).
6. Minimum viscosity of stencil print shall be  $7.5 \times 10\%$  cp (centipoise).

**Recommended Host PC Board Layout  
(Connector and Cage Assembly)**



- 1 Datums X and Y Established by Customer Fiducials
- 2 Datum A is Top Surface of Host PC Board
- 3 Indicated Surfaces to be Conductive and Connected to Chassis Ground
- 4 Connector Alignment Post Holes
- 5 Centerline of Rectangular Circuit Pad

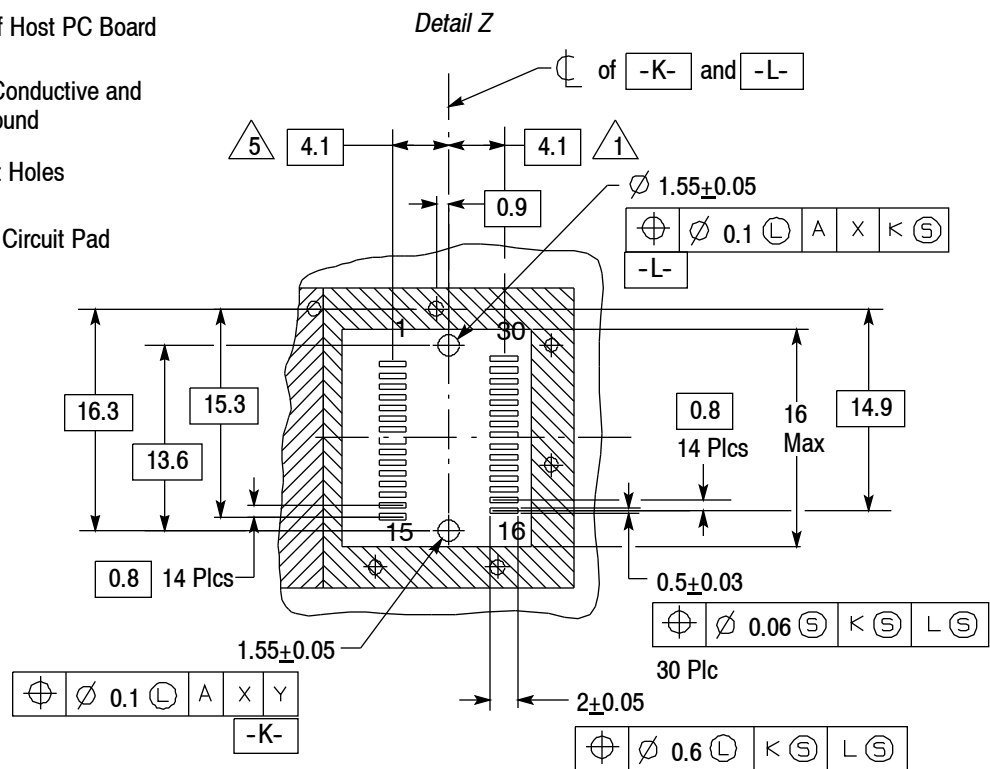


Figure 4


### 3.8. Solder Volume

Minimum solder volume (V) (before curing) for each circuit pad is calculated by multiplying the pad length (L) by the pad width (W) by the stencil thickness (T):

$$2.0(L) \times 0.5(W) \times 0.15(T) = 0.15 \text{ mm}^3 (V)$$

Solder volume for each connector must be 0.15 mm<sup>3</sup> per contact solder tine.

**NOTE** *Solder volume may vary depending on solder paste composition.*



### 3.9. Solder Paste Thickness

Solder paste thickness for the connector contact solder tines must be at least 0.15.


### 3.10. Stencil

The stencil aperture is determined by the circuit pad size and stencil thickness. It may be any shape as long as it prevents solder bridging from one pad to another. Generally, a thinner stencil will need a larger aperture to maintain the given volume of solder paste. The stencil should be 0.15 thick.

### 3.11. Solder Mask


When soldering, solder mask is recommended between all circuit pads to minimize solder bridging between pads. The mask must not exceed the height of the pad. If a trace is run between adjacent pads on the pc board, a solder mask must be applied over the trace to prevent bridging and wicking of solder away from the connector contact solder tines. Mask most suitable is Liquid Photo Imageable.

**CAUTION** *All traces must be covered by solder mask in the solder deposit area. Exposed traces could cause bridging and create a short, or wick solder away from the solder tines, producing a weak solder joint.*




### 3.12. Connector Placement

**CAUTION** *Connectors should be handled only by the housing to avoid deformation, contamination, or damage to the contact solder tines.*



**CAUTION** *The connector must be soldered to the host pc board before seating the cage assembly. The soldering process will cause damage to the cage assembly.*



#### A. Registration

The connector contact solder tines must be aligned with matching circuit pads and alignment posts aligned with matching holes before placing the connector onto the host pc board.

#### B. Position

Optimally, the contact solder tines should be centered on the host pc board circuit pads. However, slight misalignment is permissible as shown in Figure 5.

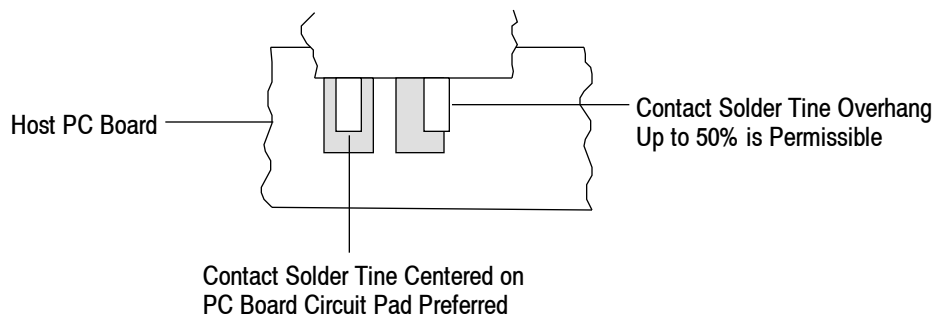


Figure 5

### C. Seating

Because the connector alignment posts are for clearance and fit only, the force required to seat the connector is minimal. Apply only that force necessary to seat the contact solder tines into the top surface of the solder paste. The alignment posts must be inserted into the host pc board holes and the standoffs must be seated on the board. See Figure 6.

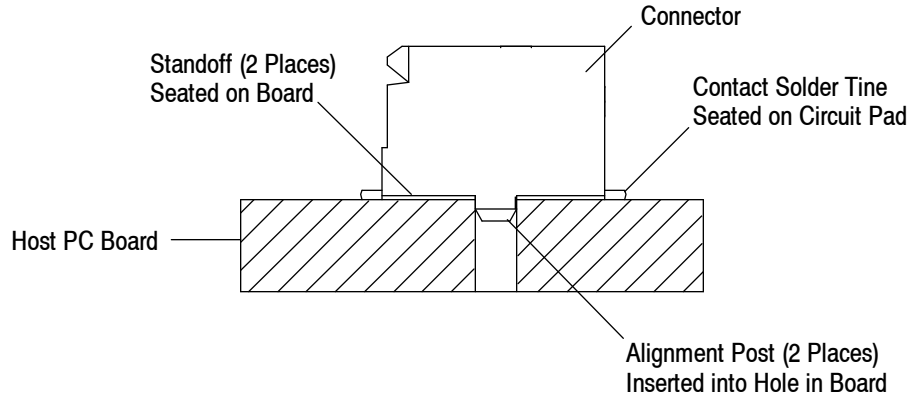


Figure 6

### 3.13. Soldering

#### A. Process

The connector must be soldered using non-focused infrared (IR) reflow or equivalent soldering technique. When mounting to both sides of the host pc board, the surface tension of the solder when it is in the liquid state will hold the connector on the board.

Reflow temperature and time may vary depending on the size of the host pc board and placement of other components. The reflow temperature and approximate time to which the connector can be subjected is specified in Figure 7.



*The cage assembly must not be exposed to the soldering process. The soldering process will cause damage to the cage assembly.*



*Excessive temperatures may cause connector housing degradation or plating deterioration. It is recommended that component temperatures not exceed 230°C [446°F] when using tin-lead solder and 260°C [500°F] when using lead-free solder.*

#### B. Cleaning

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Cleaners must be free of dissolved flux and other contaminants. It is recommended cleaning the host pc board on its edge. If using aqueous cleaner, standard equipment such as a soak-tank or an automatic in-line machine should be used. Common cleaning solvents that will not affect the connector for the time and temperature specified are listed in Figure 8.



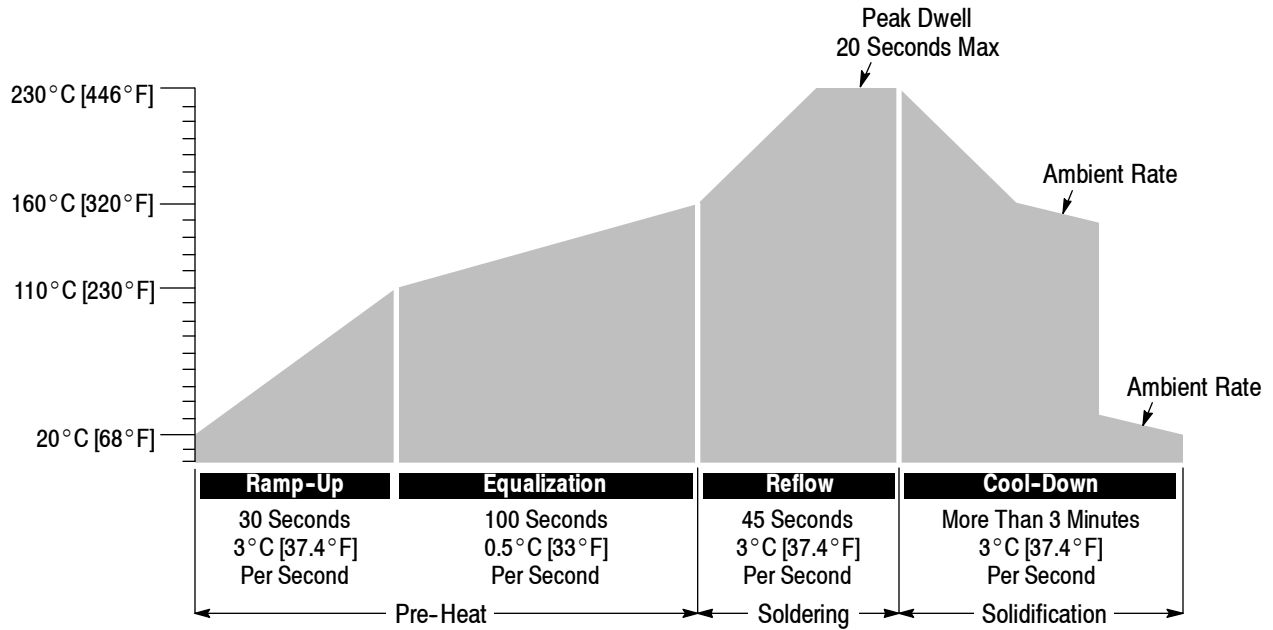
*Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Refer to the manufacturer's Material Safety Data Sheet (MSDS) for characteristics and handling of cleaners. Trichloroethylene and Methylene Chloride is not recommended because of harmful occupational and environmental effects. Both are carcinogenic (cancer-causing).*



*If a particular solvent is not listed, contact PRODUCT INFORMATION at the number at the bottom of page 1 for recommendations.*

### Reflow Soldering Process Cycle

#### Tin-Lead Solder (Maximum 230°C [446°F])



#### Lead-Free Solder (Maximum 260°C [500°F])

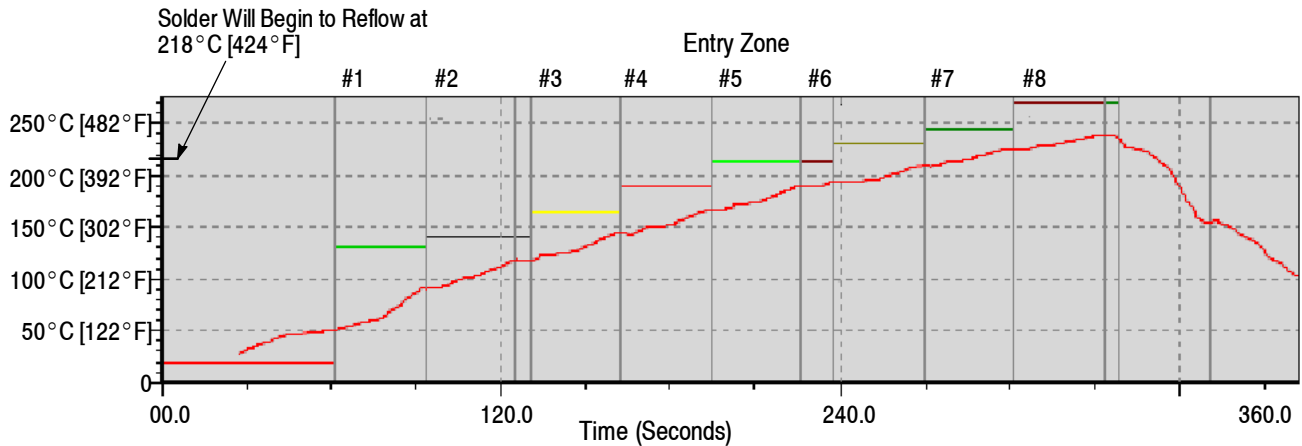


Figure 7

CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)
NAME	TYPE		
ALPHA 2110	Aqueous	1	132°C [270°F]
Isopropyl Alcohol	Solvent	5	100°C [212°F]
KESTER 5778	Aqueous		
KESTER 5779	Aqueous		
LONCOTERGE 520	Aqueous		
LONCOTERGE 530	Aqueous		

Figure 8

ALPHA, KESTER, and LONCOTERGE are trademarks.



## C. Drying

When drying cleaned assemblies and host pc boards, make certain that temperatures do not exceed 85°C [185°F]. Excessive temperatures may cause connector housing degradation.

### 3.14. Checking Installed Connector

All solder joints must conform to those specified in Workmanship Specification 101-21 and all other requirements specified in this document. The installed connector must have solder fillets evenly formed around each contact solder tine. Solder must have 95% minimum coverage over the circuit pad. See Figure 9.

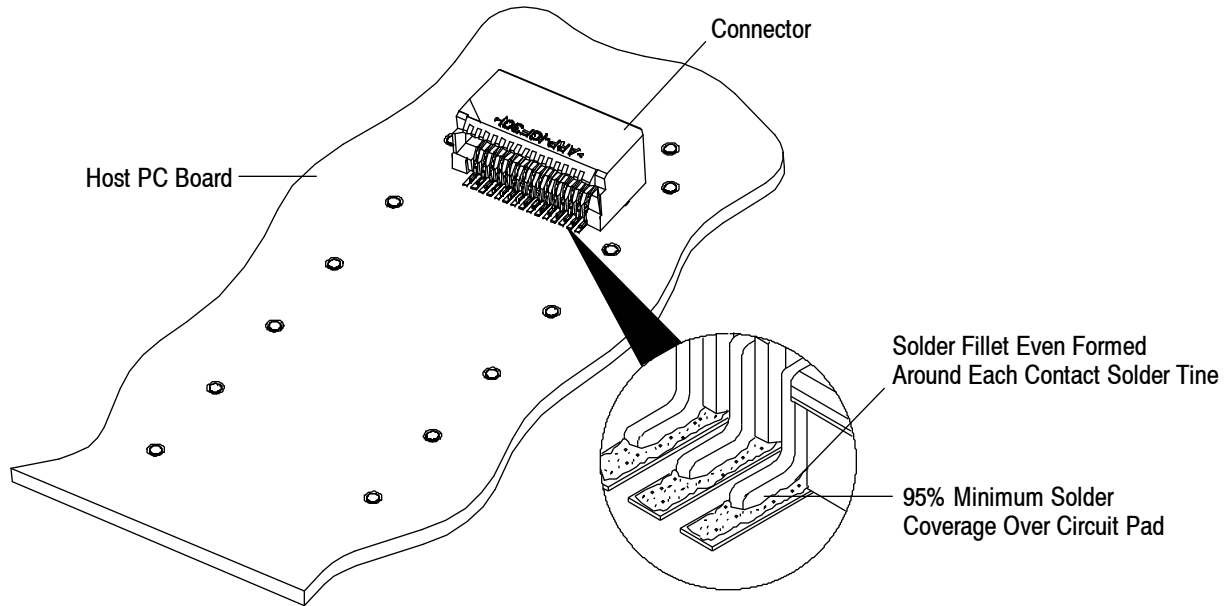


Figure 9

### 3.15. EMI Gasket

It is recommended that a gasket be installed onto the back of the bezel for EMI suppression (between the cage assembly and bezel). The design and material of the gasket can be specific to the application, but must cover the perimeter of the bezel cutout. The gasket can be attached to the bezel using a pressure-sensitive adhesive. There must be no gap between the gasket and the bezel.

When the cage assembly (with the host pc board) is mounted onto the bezel, the gasket must be compressed to the recommended thickness specified by the manufacturer of the gasket. The thickness of the gasket can be determined by the following calculation:

$$GT = BKL - 56.3 \pm 0.2 \text{ (distance from cage assembly front flange to hard stop)}$$

GT= thickness of compressed gasket

BKL= distance between back of bezel at Datum B and centerline of Datums K and L in Figure 4 (the distance between the front of the bezel and the centerline of Datums K and L must not exceed 61.7)

### 3.16. Bezel

#### A. Material and Thickness

There is no required bezel thickness; however, the bezel must possess sufficient mechanical strength to support the compressive force on the EMI gasket. The portion of the bezel that touches the EMI gasket must be conductive and connected to the chassis ground.

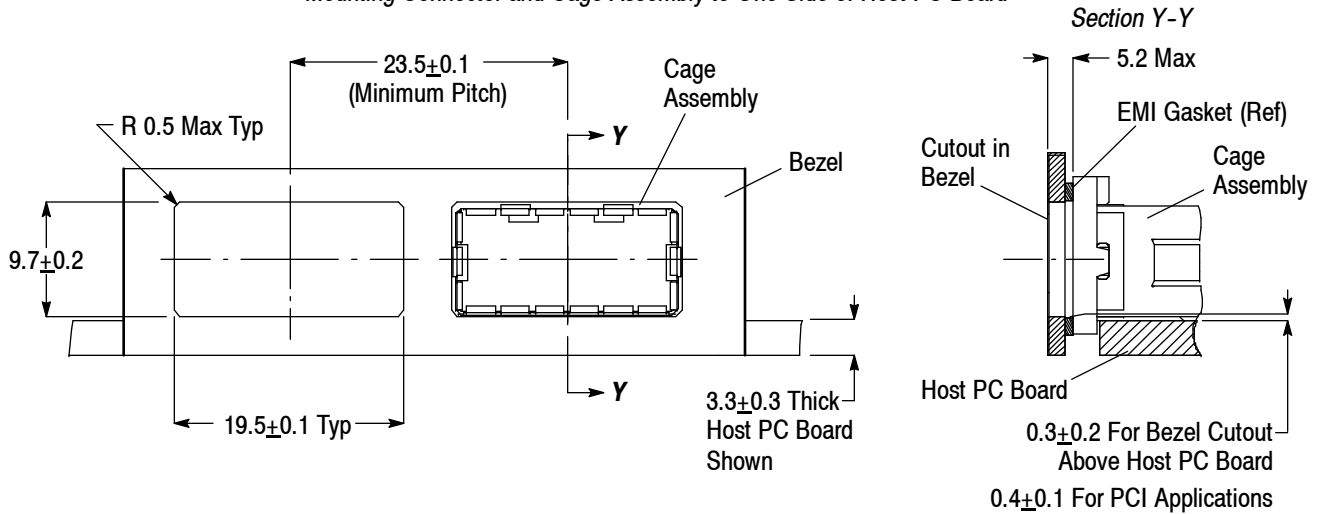
#### B. Cutout

The cutout must allow proper mounting of the cage assembly (with host pc board). Care must be used to avoid interference between adjacent cage assemblies and other components. The minimum allowable distance between cage assemblies must be considered to ensure proper assembly. Dimensions for bezel cutout and minimum allowable distance between cutouts are shown in Figure 10.

### Recommended Bezel Cutout and Host PC Board and Bezel Position

Note: Not to Scale

#### Mounting Connector and Cage Assembly to One Side of Host PC Board



#### Mounting Connector and Cage Assembly to Both Sides of Host PC Board

Dimensions and References for Mounting to One Side of PC Board Also Apply

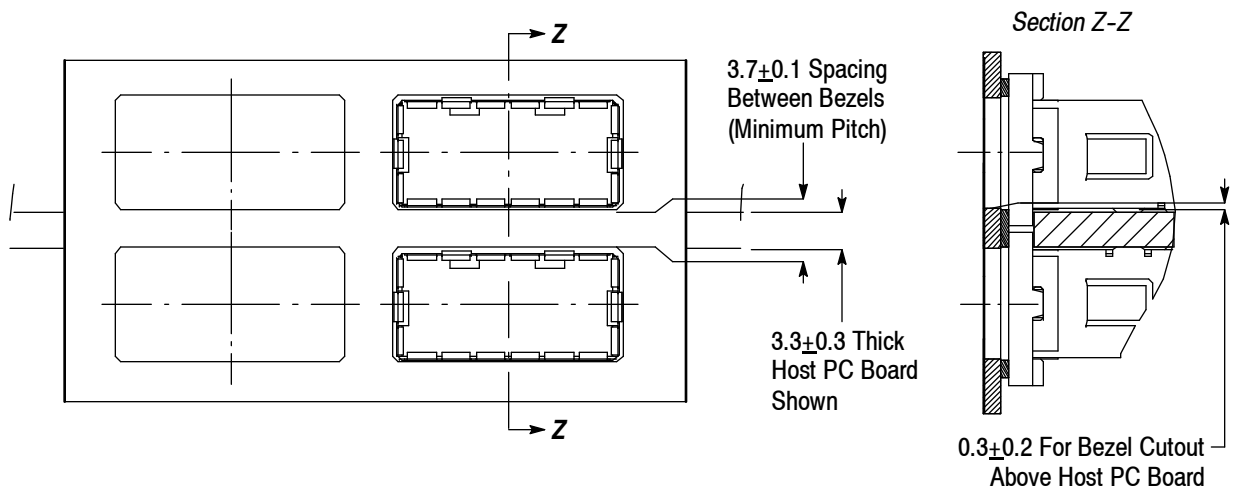


Figure 10

### C. Position

The bezel and host pc board must be positioned in relation to each other to avoid interference with the insertion and extraction of the transceiver. This relationship must conform to the dimensions given in Figure 10.

### 3.17. Cage Assembly Placement

#### A. Registration

The cage assembly compliant pins must be aligned with matching holes before placing the cage assembly onto the host pc board.

## B. Seating

### CAUTION



A pc board support fixture must be used to provide proper support for the host pc board, and to prevent damage to the host pc board and its adjacent components. Refer to Section 5 for design requirements.

Even pressure must be applied across the cage assembly to seat the cage assembly onto the host pc board. Apply only that force necessary to seat the shoulders of the compliant pins onto the host pc board to the dimension shown in Figure 11.

### CAUTION



To avoid deformation or damage to components, an even pressure must be applied across the cage assembly when being seated.

After seating, the cage assembly must conform to the requirements stated in Figure 11.

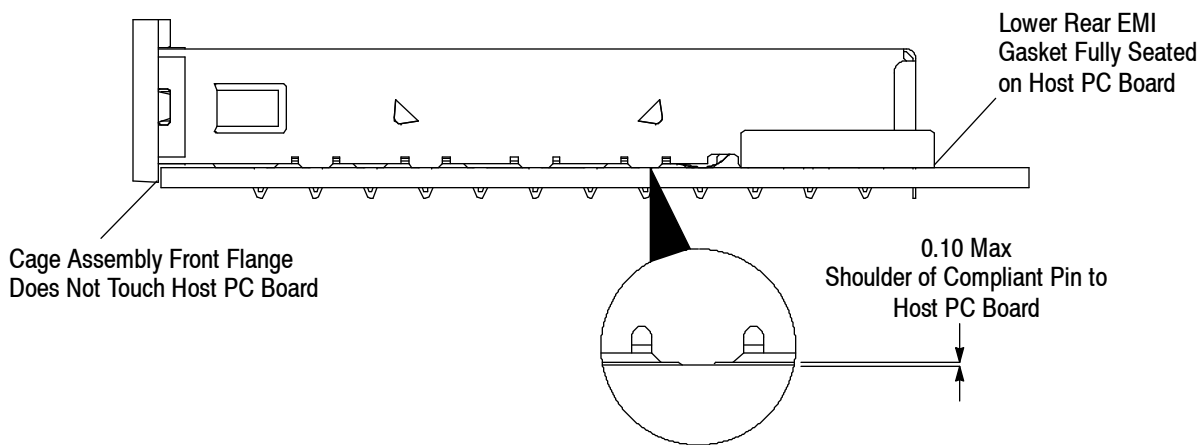


Figure 11

### 3.18. Installing Cage Assembly onto Bezel

The cage assembly (with host pc board) must be installed onto the bezel so that the opening of the cage assembly is centered over the cutout of the bezel. The front flange of the cage assembly must be against the EMI gasket.

### 3.19. Heat Sink and Clip

The heat sink must be placed on the cage assembly and secured to the cage assembly using the clip. After the heat sink and clip are installed, the following requirements must apply (refer to Figure 12):

- the perimeter of the heat sink must be flush with the top of the frame of the cage assembly
- the raised boss must be centered in the cavity of the cage assembly
- the clip locking windows must be fully latched onto the cage locking latches of the cage assembly

Any heat sink used must be flush with and securely attached to the cage assembly.

**Note:** For Clarity, Connector, PC Board, and Bezel Are Not Shown

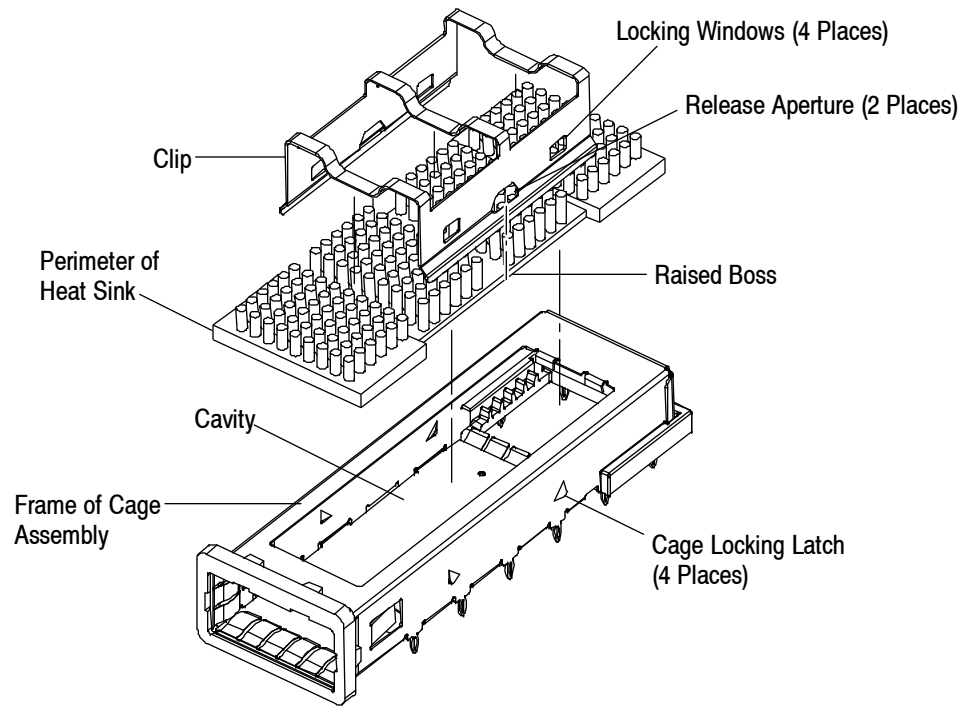


Figure 12

### 3.20. Removal and Repair

The clip (that secures the heat sink) must be removed using a tool (such as a small screwdriver) according to the following:

1. Insert the tip of the tool into either release aperture of the clip, and rotate the tool until the corresponding locking windows are released from the cage locking latches of the cage assembly. Repeat this step for the remaining release aperture.
2. Lift the clip and heat sink from the cage assembly.

The heat sink must be removed from the cage assembly before removing the cage assembly from the host pc board. The dust cover or a flat metal bar (or similar object) can be partially inserted into the front of the cage assembly (the object **MUST NOT** touch the connector; otherwise, damage to the contacts could occur), then the cage assembly can be removed by lifting it off of the board. The cage assembly **MUST NOT** be re-used after removal.

The cage assembly must be removed from the host pc board before removing the connector. Standard de-soldering methods must be used to remove the connector from the host pc board. The connector **MUST NOT** be re-used after removal .

The connector and cage assembly are not repairable. Any defective or damaged products **MUST NOT** be used.

## 4. QUALIFICATION

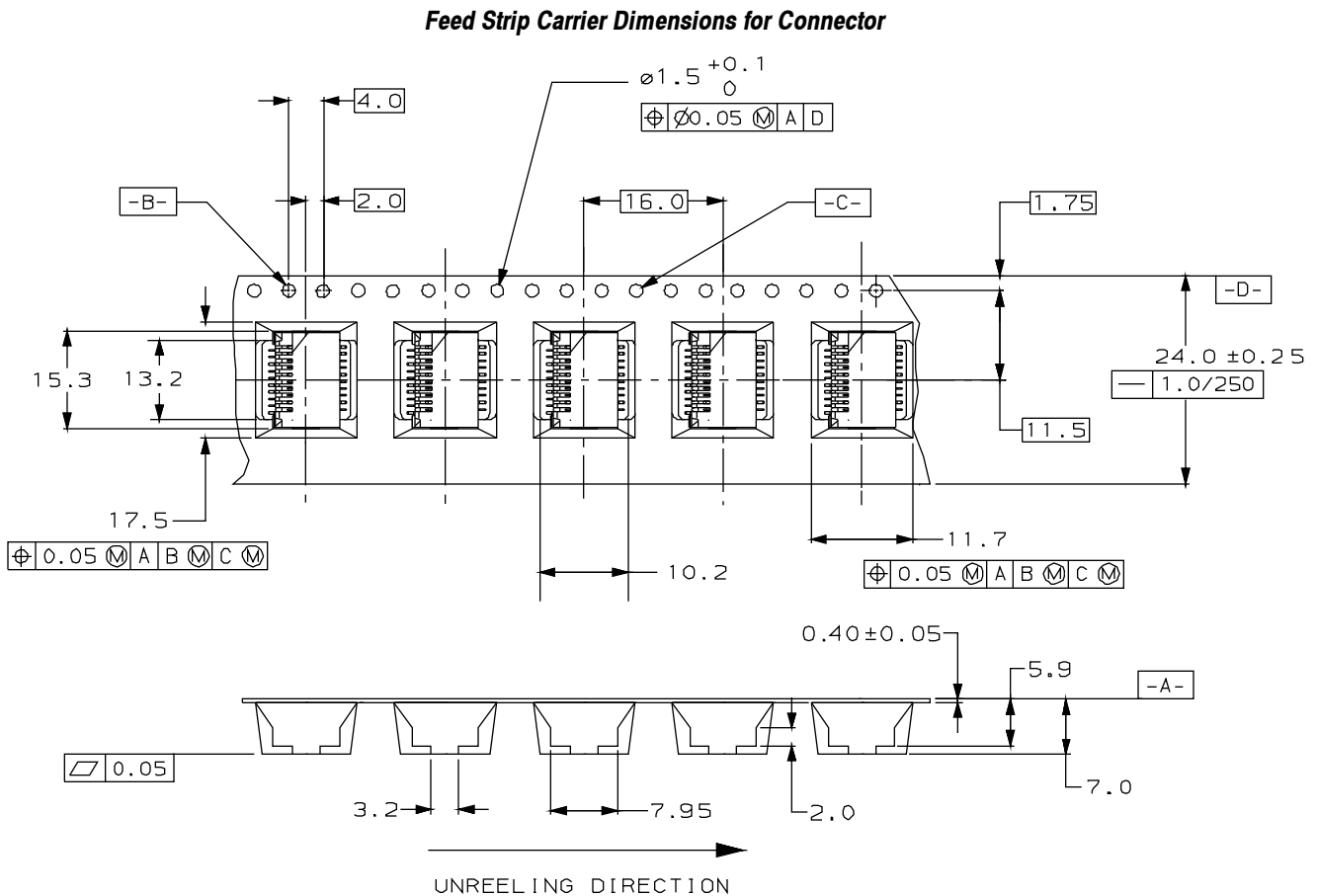
XFP connectors are Recognized by Underwriters Laboratories Inc. (UL) in File E28476.

## 5. TOOLING

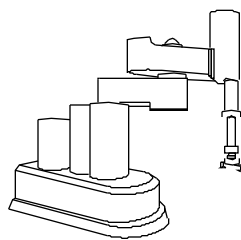
No tooling is required for manual placement of the connector or cage assembly onto the pc board.

For automatic machine placement, the robotic equipment must have a true position accuracy tolerance sufficient to properly locate the connector. This includes gripper and fixture tolerances as well as equipment repeatability. It must use the connector datum surfaces to ensure reliable placement. See Figure 13.

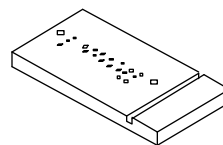
A pc board support fixture must be used to provide proper support for the host pc board, and to prevent damage to the host pc board and its adjacent components during seating of the cage assembly. It must have a flat surface with holes or a channel wide and deep enough to receive any protruding components during seating of the cage assembly on the host pc board. See Figure 13.



### Tooling



Robotic Equipment

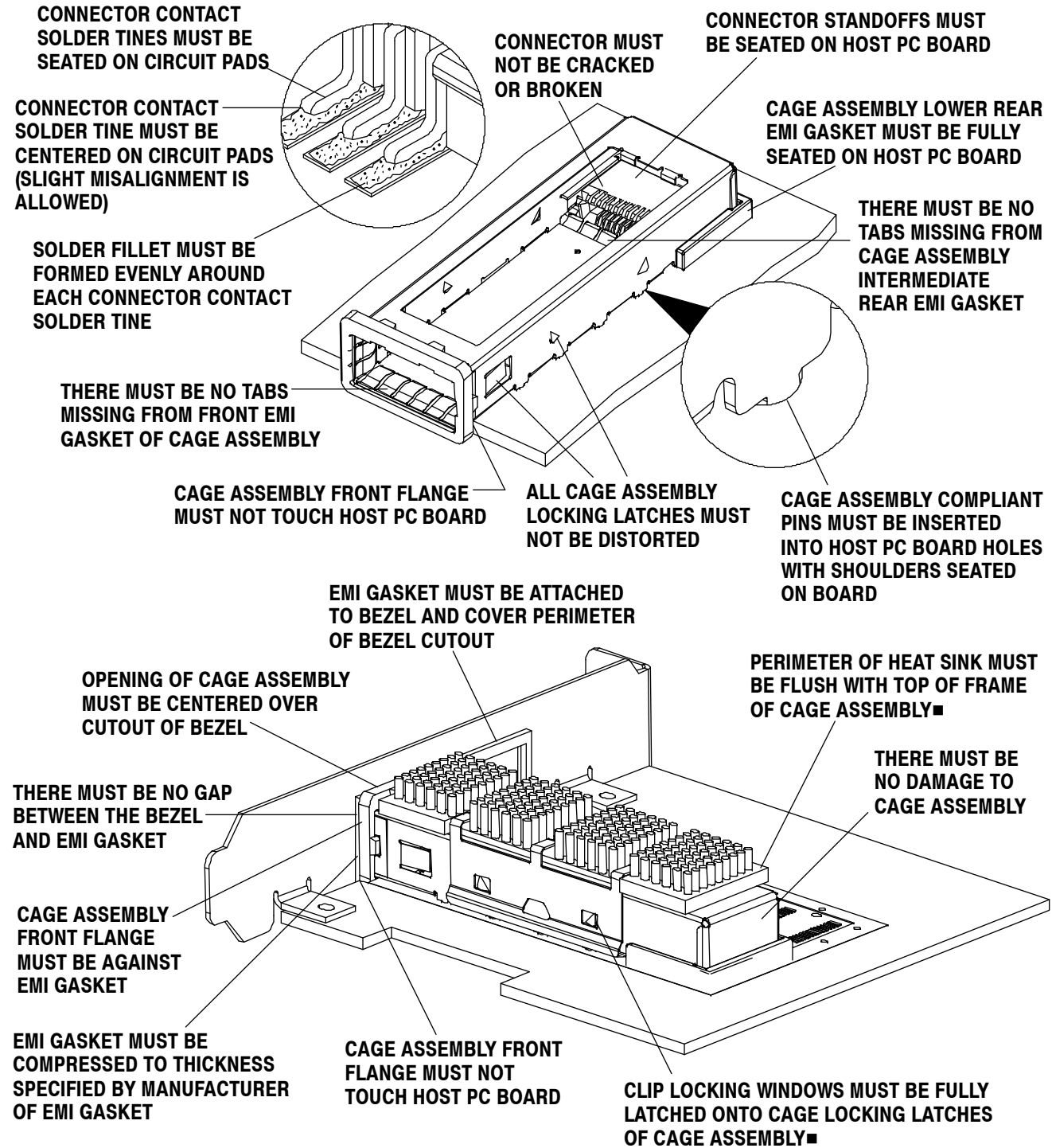


PC Board Support Fixture  
(Application Specific, Customer Supplied)

Figure 13

## 6. VISUAL AID

Figure 14 shows a typical application of XFP connector and cage assembly. 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.



■ Any Heat Sink Used Must Be Flush With and Securely Attached to the Cage Assembly

**FIGURE 14. VISUAL AID**