

NOTE



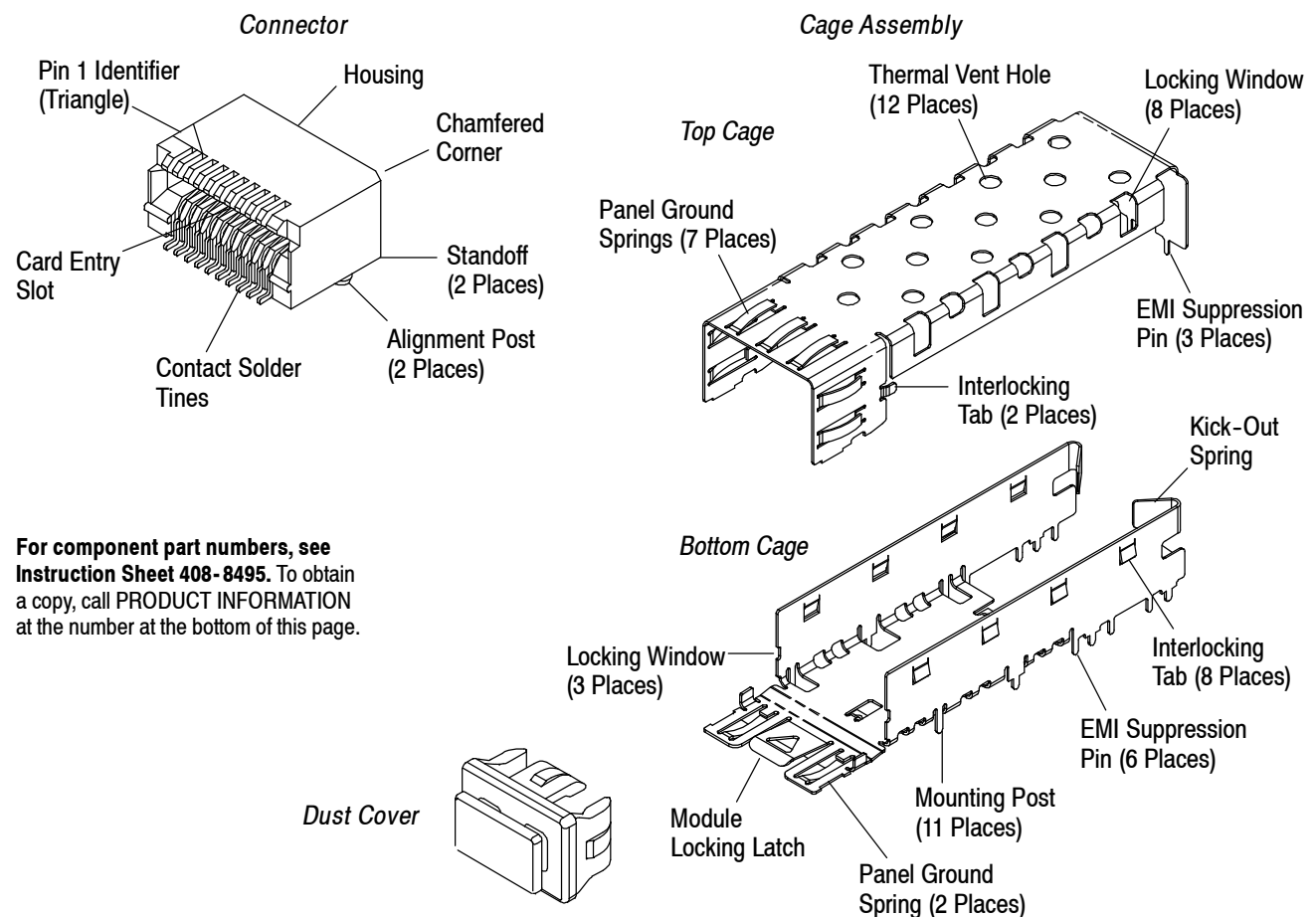
All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of ± 0.13 and angles have a tolerance of $\pm 2^\circ$. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of SFP Connector and Cage Assembly to interconnect SFP fiber optic or copper transceiver modules to printed circuit (pc) boards. The connector consists of a housing with right angle surface mount contacts. The connector is available in 20 positions with contact spacing on 0.8 mm centerlines. The housing features an embossed triangle for Pin 1 identification and a chamfered corner for orientation. Also featured are alignment posts that provide stability for placement on the pc board, standoffs to allow easy pc board cleaning after soldering, and a card entry slot that accepts a 1.0 ± 0.1 mm thick integrated circuit card housed in the module.

The cage assembly consists of a top cage and a bottom cage. The cage assembly is designed to be bezel mounted. The top cage and bottom cage feature panel ground springs to provide electrical contact to the bezel. In addition, each have interlocking tabs and locking windows for positive locking after assembly. The top cage features thermal vent holes. The bottom cage features a locking latch for holding the mating module in place and a kick-out spring to release the module for removal. The cage assembly features mounting posts and electromagnetic interference (EMI) suppression pins. A dust cover is used to prevent contaminants from entering the chassis.

When corresponding with TE Connectivity (TE) 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 408-8495. To obtain a copy, call PRODUCT INFORMATION at the number at the bottom of this page.

Figure 1

The top cage is supplied in plastic tray packaging and assembled onto the bottom cage by hand. The connectors and bottom cage are supplied in tape-and-reel form for manual or high-speed automatic machine placement (typically vacuum pick and place).

2. REFERENCE MATERIAL

2.1. Revision Summary

- Updated document to corporate requirements
- New logo

2.2. Customer Assistance

Product Part Number 1367073 and Product Code A438 are representative of SFP Connector and Cage Assemblies. 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 TE Representative or, after purchase, by calling the Product Information Center 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 the Product Information Center 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 108-1950 (cage assembly) provides expected 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:

- 408-8495 SFP Connector 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].

The bezel requirements given in this document are specifically configured for products used in the communications industry. It is strongly recommended that this bezel configuration NOT be used for peripheral component interconnect (PCI) applications.

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-lead. The dust cover is made of thermoplastic.

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, mounting posts, and EMI suppression pins. The connectors should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

C. Reeled Components

Connectors and bottom cages are supplied in reels on carrier tapes approved under EIA-481. These reels have a maximum diameter of 360. Store coil wound reels horizontally and traverse wound reels vertically.



Refer to Section 5 for carrier tape dimensions. Contact the Product Information Center at the number listed at the bottom of page 1 for quantity per reel.

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, mounting posts, or EMI suppression pins.

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

3.6. PC Board

A. Material and Thickness

The pc board material shall be glass epoxy (FR-4 or G-10). There is no required board thickness for mounting the connector and cage assembly to one side of the board. For mounting the connector and cage assembly to both sides of the board, board thickness must be a minimum of 3.0 mm.



Contact the Product Information Center at the number listed at the bottom of page 1 for suitability of other board materials.

B. Tolerance

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

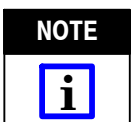
The coplanarity of the pc board circuit pads must be 0.03 mm.

C. Pads

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

D. Layout

The connector alignment post holes and contact circuit pads, and the cage assembly mounting post holes, EMI suppression pin holes, and circuit pads must be precisely located to ensure proper placement and optimum performance of the connector and cage assembly. Recommended pad pattern, dimensions, and tolerances are provided in Figure 2.



For mounting the cage assembly, the pc board must have 11 plated through holes with square circuit pads to accept the mounting posts and 9 unplated through holes to accept the EMI suppression pins. Plating is not necessary for the EMI suppression pin holes, and is also not recommended due to the tight pattern associated with the square circuit pads and unplated holes.

When mounting cage assemblies to both sides of the board, the same EMI suppression pin holes must be shared by the cage assemblies on opposite sides of the board.

Recommended PC Board Layout
(Connector and Cage Assembly)

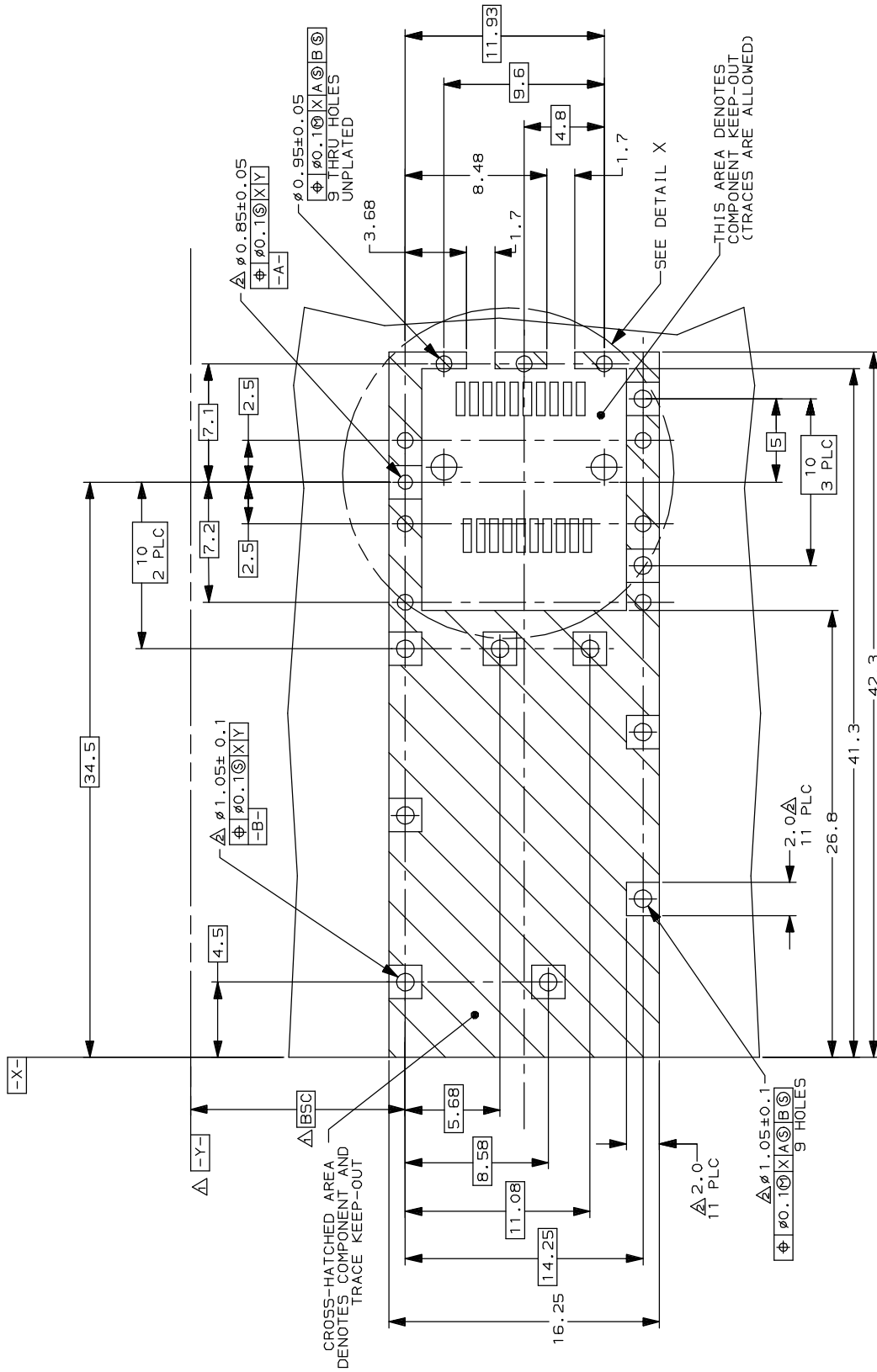


Figure 2 (Cont'd)

△ Datum and Basic Dimension Established by Customer

△ Pads and Vias and Chassis Ground, 11 Places

Recommended PC Board Layout

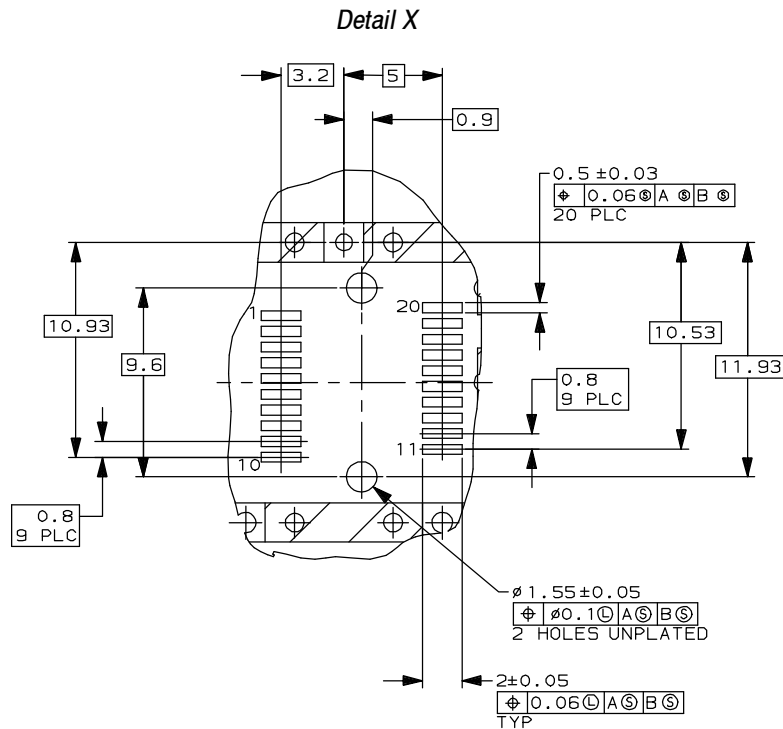


Figure 2 (End)

3.7. Solder Paste Characteristics

1. Alloy type for tin-lead solder 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).

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):

$$2.0(L) \times 2.0(W) \times 0.15(T) = 0.60 \text{ mm}^3 \text{ (V) (Min)}$$

Solder volume for each bottom cage must be a minimum of 0.60 mm³ per circuit pad.

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

Solder volume for each connector must be 0.15 mm³ 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 and bottom cage mounting posts must be at least 0.15 mm.

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 mm thick. For recommended stencil layout, refer to Figure 3.

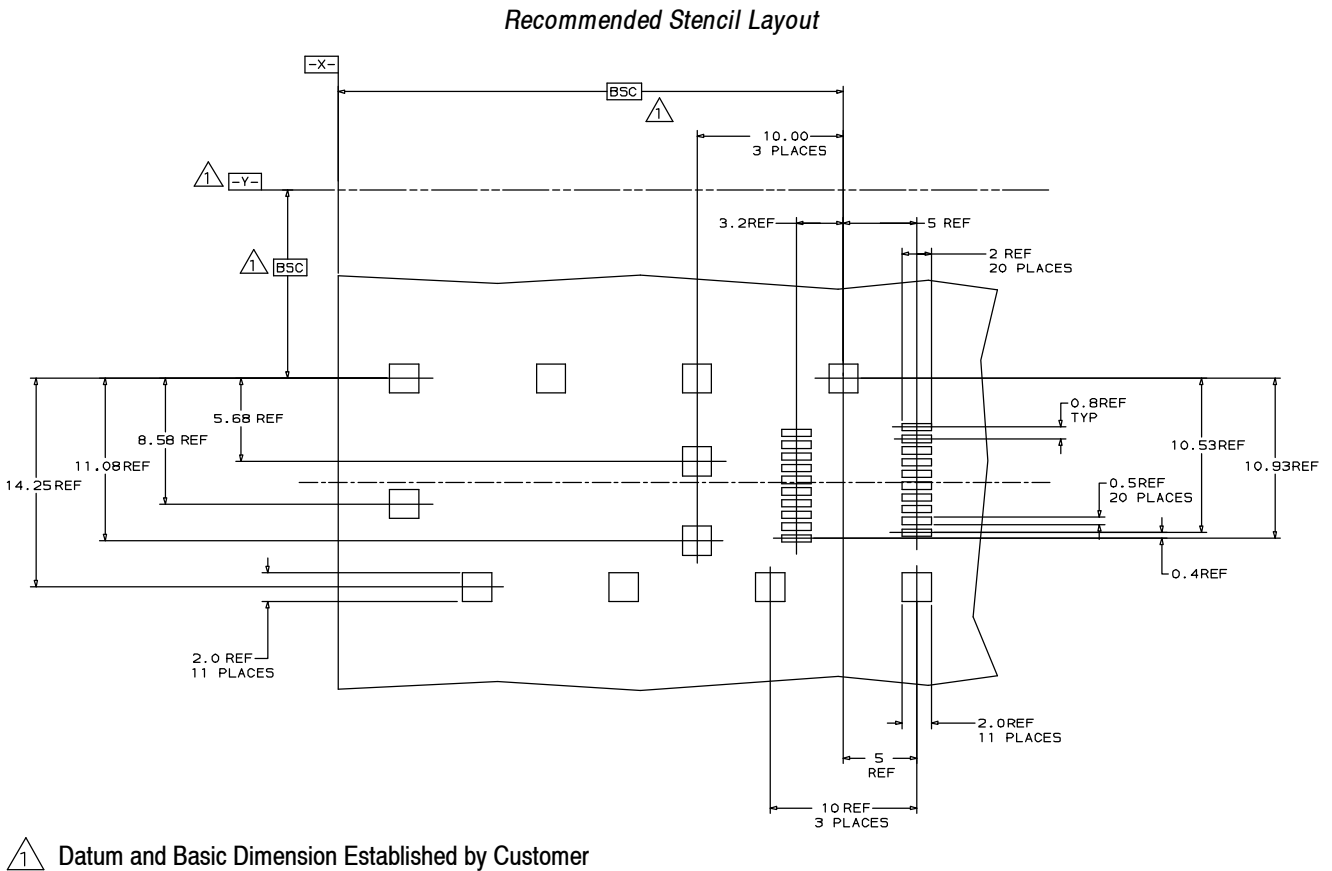


Figure 3

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 and bottom cage mounting posts. Mask most suitable is Liquid Photo Imageable.



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 or mounting posts, producing a weak solder joint.

3.12. Bezel



It is strongly recommended that this bezel configuration NOT be used in PCI applications. The following requirements were intended to be used in the communications industry only.

A. Thickness

The bezel thickness range shall be 0.8 mm through 2.6 mm.

B. Cutout

The bezel must provide a cutout that allows proper mounting of the the cage assembly. The top cage and bottom cage panel ground springs must be compressed by the bezel in order to provide an electrical ground between the cage assembly and bezel for EMI suppression. 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 4.

3.13. PC Board and Bezel Position

The bezel and pc board must be positioned in relation to each other to avoid interference with the function of the bottom cage module locking latch and to ensure proper function of the panel ground springs. This relationship must conform to the dimensions stated in Figure 4.

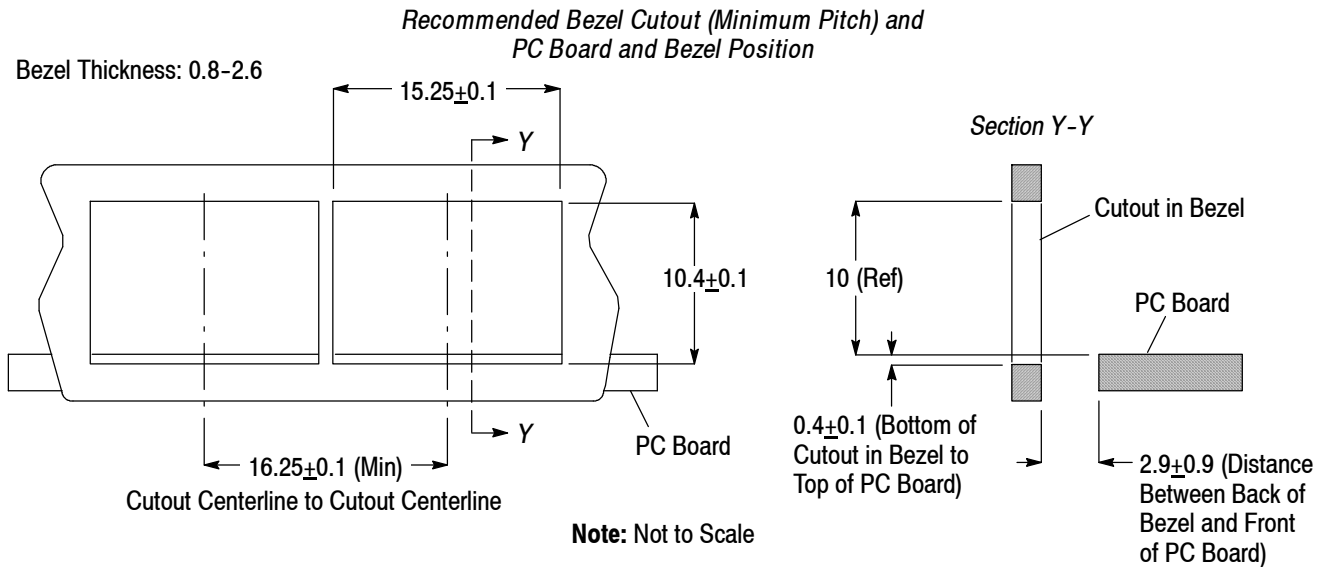


Figure 4

3.14. Connector Placement



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

A. Registration

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

B. Position

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

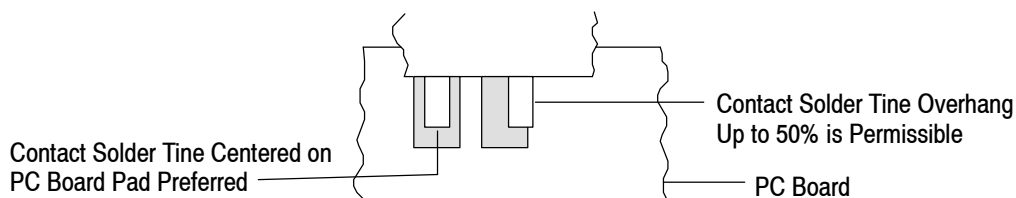


Figure 5

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 contact solder tines must be seated on the circuit pad as shown in Figure 6.

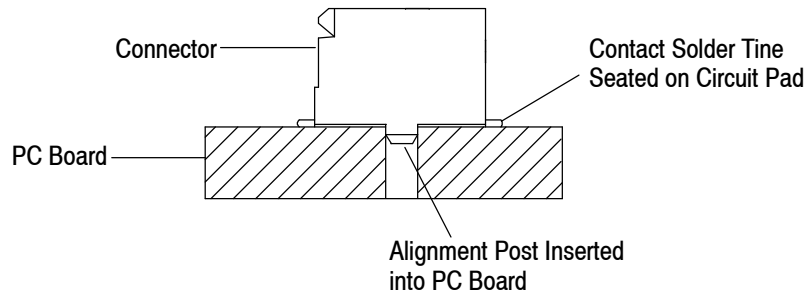


Figure 6

3.15. Bottom Cage Placement

A. Registration

The bottom cage mounting posts and EMI suppression pins must be aligned with matching holes before placing the bottom cage onto the pc board.

B. Seating

Because the bottom cage mounting posts are for clearance and fit only, the force required to seat the bottom cage is minimal. Apply only that force necessary to seat the shoulders of the mounting posts onto the pc board to the dimension shown in Figure 7. Depending upon pc board thickness, the mounting posts may or may not project from the other side of the pc board.

When placing the bottom cage onto the pc board, the EMI suppression pins must enter the pc board holes, and the front of the bottom cage directly behind the module locking latch must be seated on the board to the dimension shown in Figure 7.

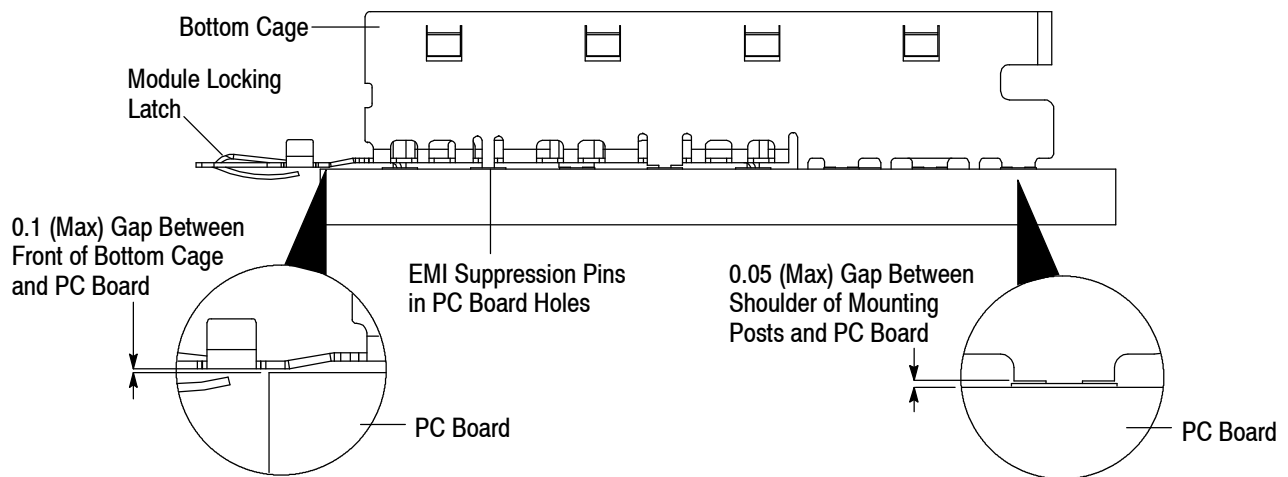


Figure 7

3.16. Soldering



The top cage must NOT be a part of the soldering process. The top cage must be seated onto the pc board AFTER soldering, and by design, the top cage will lock onto the bottom cage after assembly.

A. Process

The connector and bottom cage should be soldered using non-focused infrared (IR) reflow or equivalent soldering technique. For mounting to both sides of the board, optional soldering methods are:

- the bottom cage can be soldered to the pc board during the first pass through the reflow soldering process, or
- two solder pastes with different melting temperatures (a step soldering process) can be used during the second pass through the reflow soldering process (the bottom cage will be retained on the pc board by the solder with the higher melting point)

Reflow temperature and time may vary depending on the size of the pc board and placement of other components. The reflow temperature and approximate time to which the connector and bottom cage can be subjected is specified in Figure 8.



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. If maximum temperatures are exceeded, reflow and pooling of the bottom cage plating can occur.

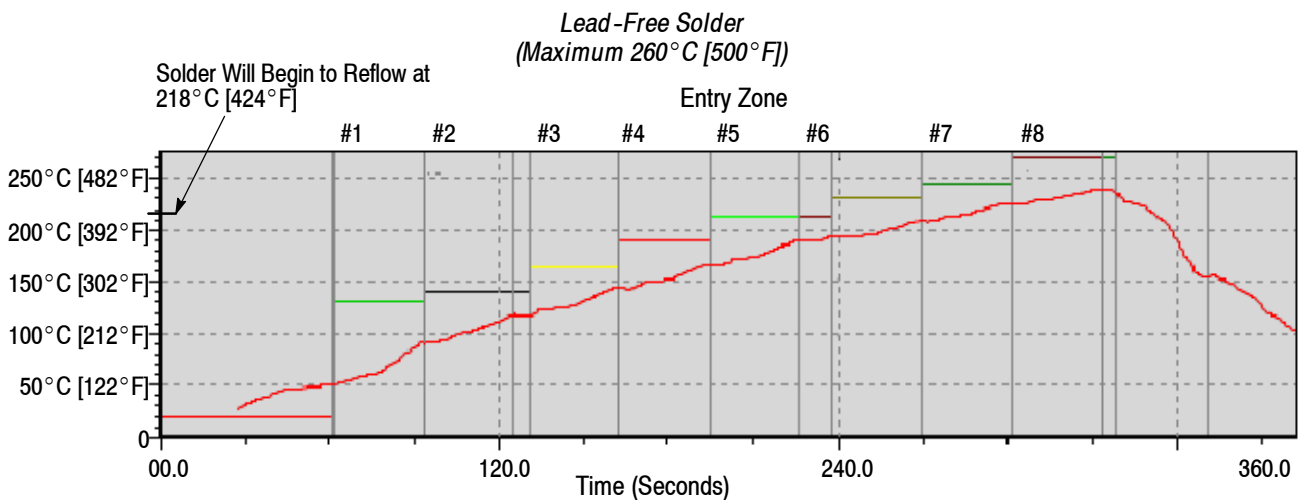
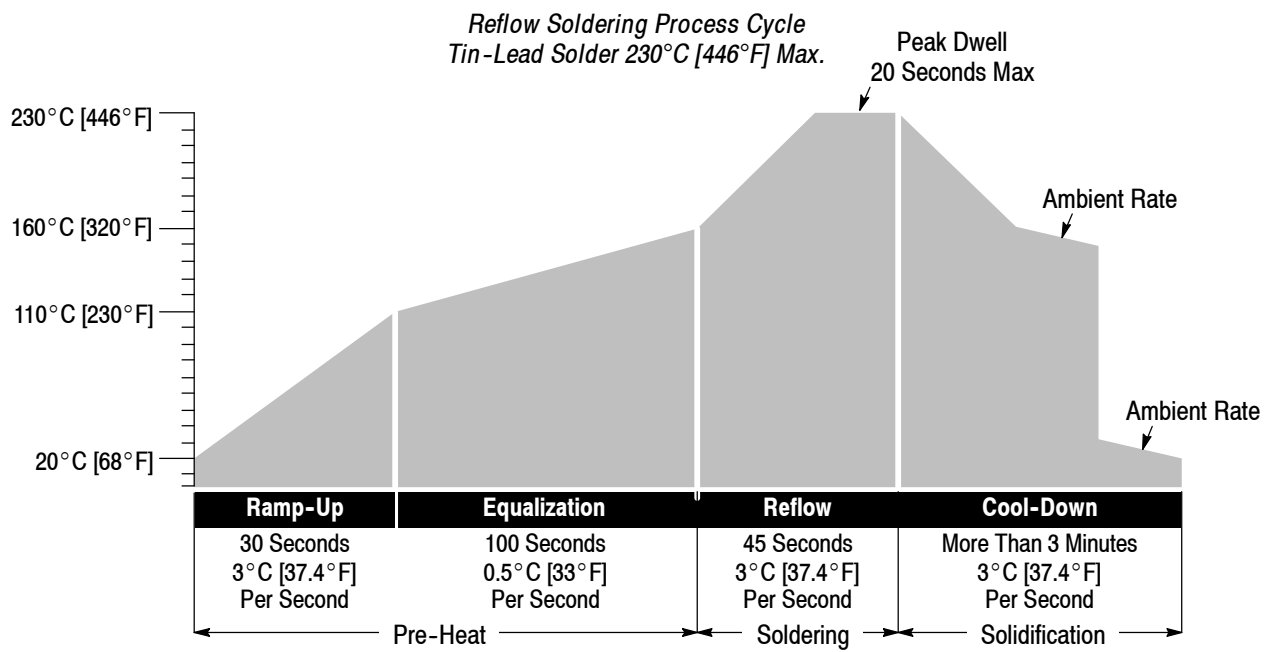
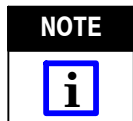


Figure 8

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 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 or bottom cage for the time and temperature specified are listed in Figure 9.



If a particular solvent is not listed, contact Product Information at the number at the bottom of page 1 for recommendations.

CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
Alpha 2110	Aqueous	1	132	270
Isopropyl Alcohol	Solvent	5	100	212
Kester 5778	Aqueous	5	100	212
Kester 5779	Aqueous	5	100	212
Loncoterge 520	Aqueous	5	100	212
Loncoterge 530	Aqueous	5	100	212

Figure 9



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).

C. Drying

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

3.17. 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 10.

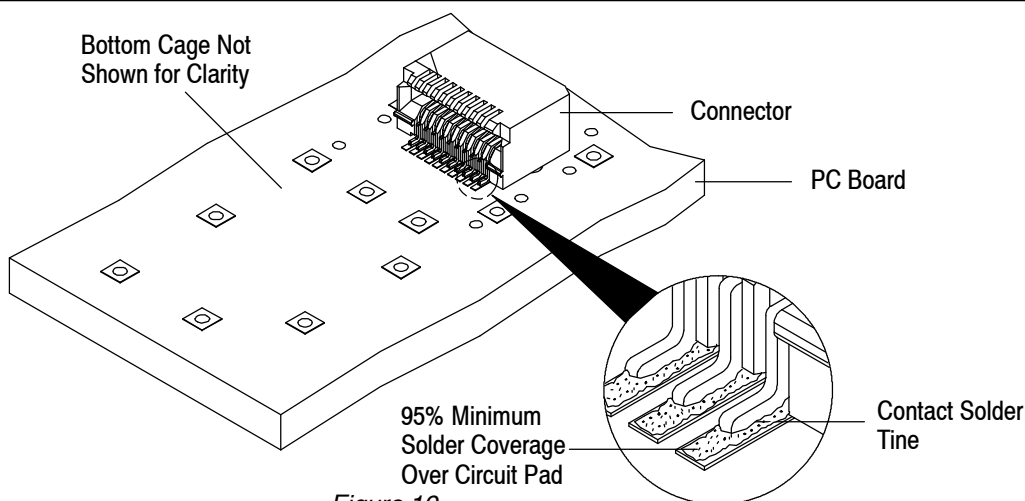


Figure 10

Alpha, Kester and Loncoterge are trademarks of their respective owners.

3.18. Checking Installed Bottom Cage

The installed bottom cage must have solder fillets evenly formed around each mounting post (the mounting posts may or may not project from the other side of the board). Solder must have 95% minimum solder coverage over the circuit pad. Also, it is normal for the bottom cage to have a matte finish (after soldering). Refer to Figure 11.

NOTE



The bottom cage mounting post solder joints cannot be subjected to the same inspection criteria as through hole components. Because the connector and cage assembly were designed as surface mount processed components, a full via and solder joint is not required. This does not affect the stability of the bottom cage on the pc board.

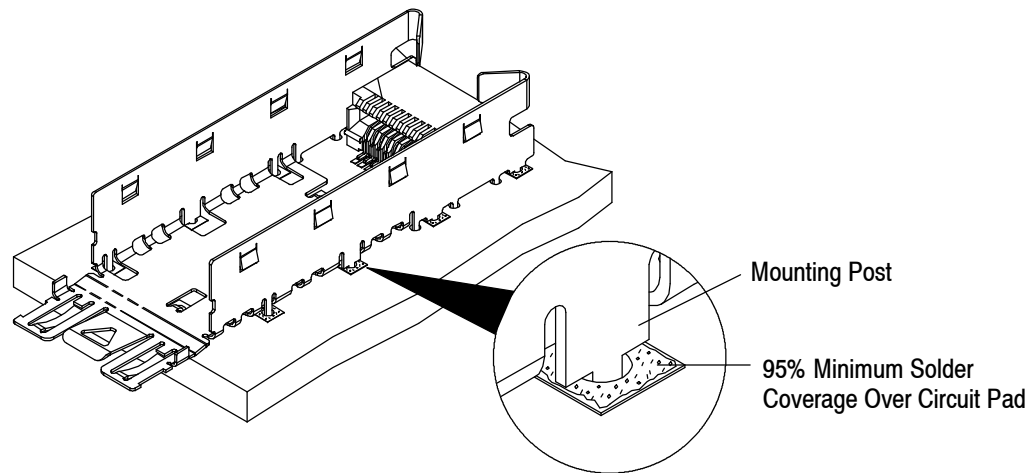


Figure 11

3.19. Top Cage Placement

When placing the top cage over the bottom cage and onto the pc board, the EMI suppression pins must be aligned with the matching holes in the pc board. The top cage locking windows and interlocking tabs must be aligned with the bottom cage locking windows and interlocking tabs before assembling the top cage onto the bottom cage and placement onto the board. Refer to Figure 12.

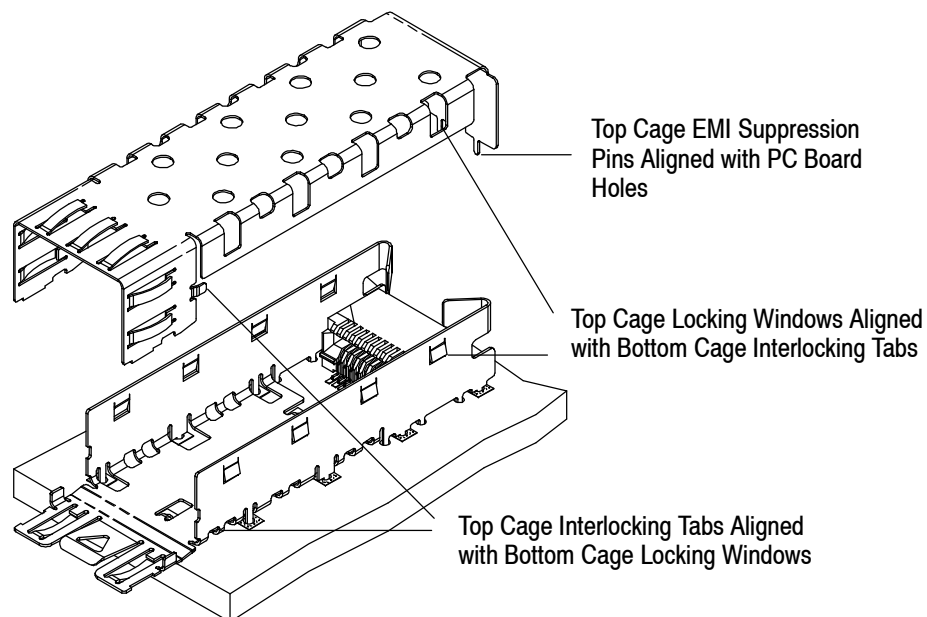


Figure 12

3.20. Checking Installed Top Cage

The EMI suppression pins must be fully inserted into the appropriate holes in the pc board, and the locking windows and interlocking tabs of the top cage must be fully seated and latched onto the bottom cage. Refer to Figure 13.

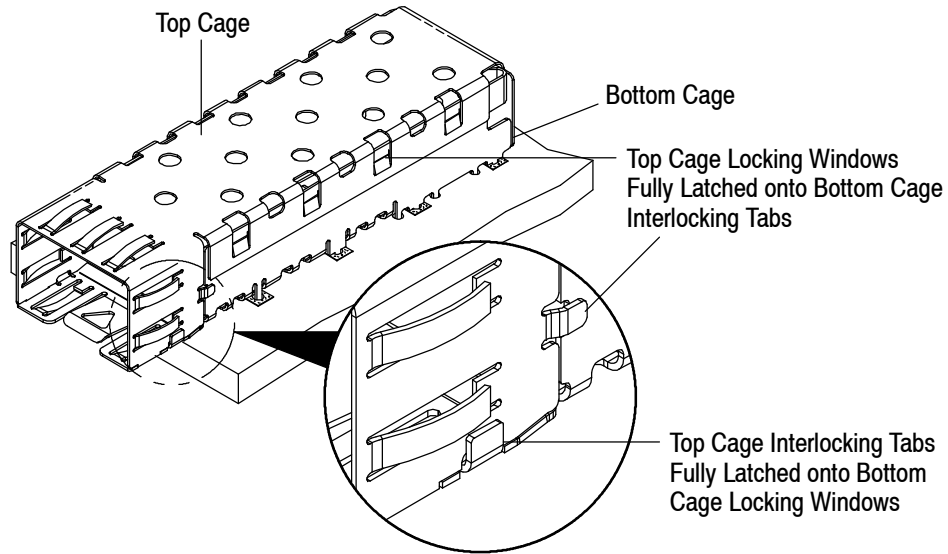


Figure 13

3.21. Checking Assembly

After assembly, the top cage and bottom cage panel ground springs must touch the bezel, and the bottom cage module locking latch must be slightly raised. A slight bow in the cage assembly is permitted. The bezel must not interfere with the function of the bottom cage module locking latch.

The bezel and pc board must be positioned according to the dimensions stated in Figure 14.

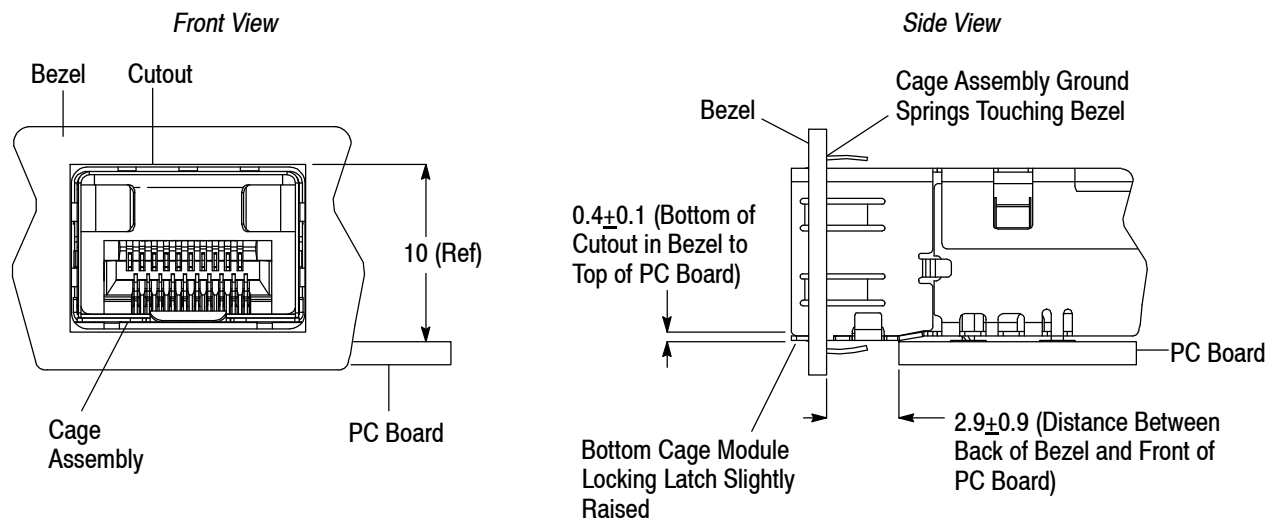


Figure 14

3.22. Repair

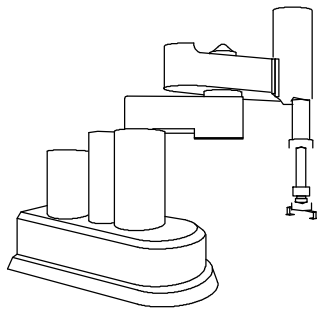
Damaged connectors and cage assemblies must be removed, discarded, and replaced. Connectors will require desoldering of contact solder tines, and the bottom cage will require desoldering of all mounting posts.

4. QUALIFICATION

SFP Connectors are Recognized by Underwriters Laboratories Inc. (UL) in File E28476.

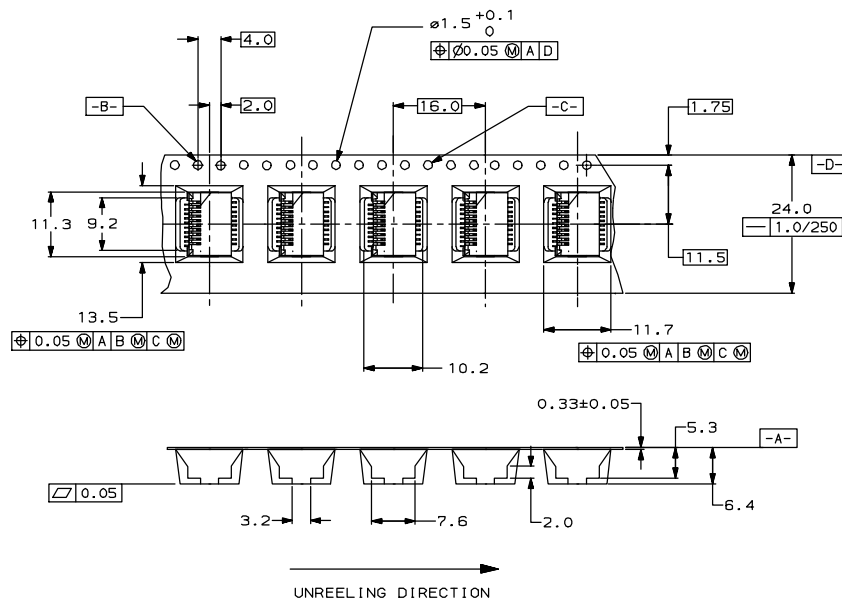
5. TOOLING

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 and bottom cage. This includes gripper and fixture tolerances as well as equipment repeatability. It must use the connector and bottom cage datum surfaces to ensure reliable placement. See Figure 15.



Robotic Equipment (Ref)

**Feed Strip Carrier Dimensions
for Connector**



**Feed Strip Carrier Dimensions
for Bottom Cage**

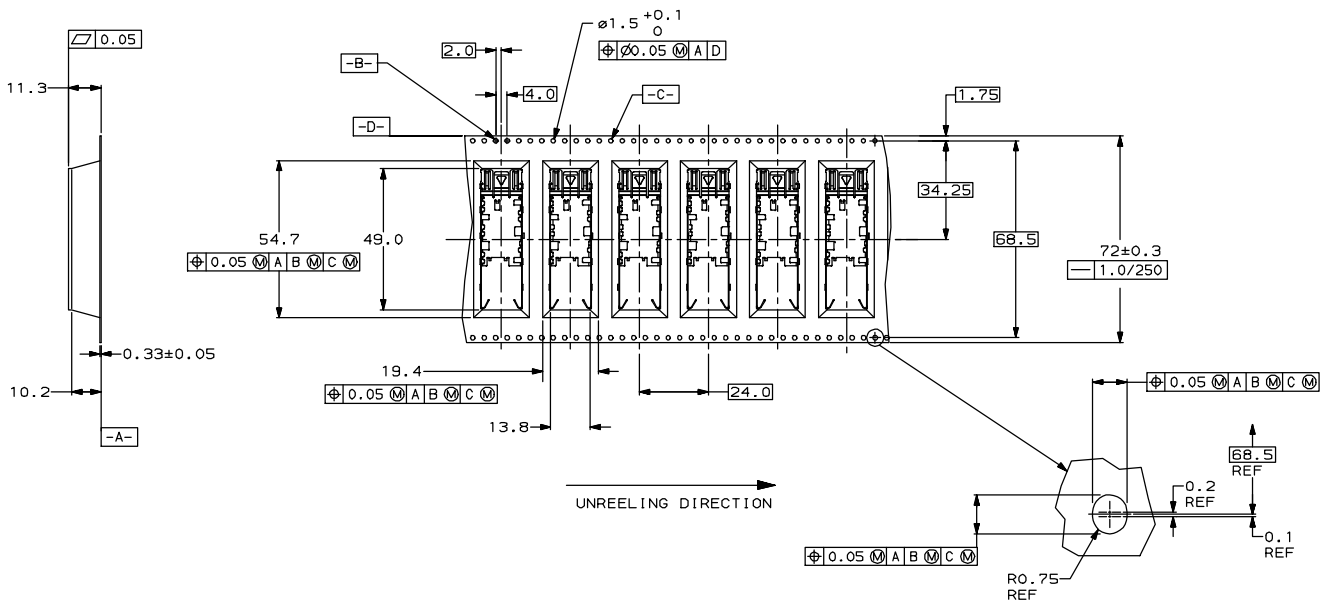
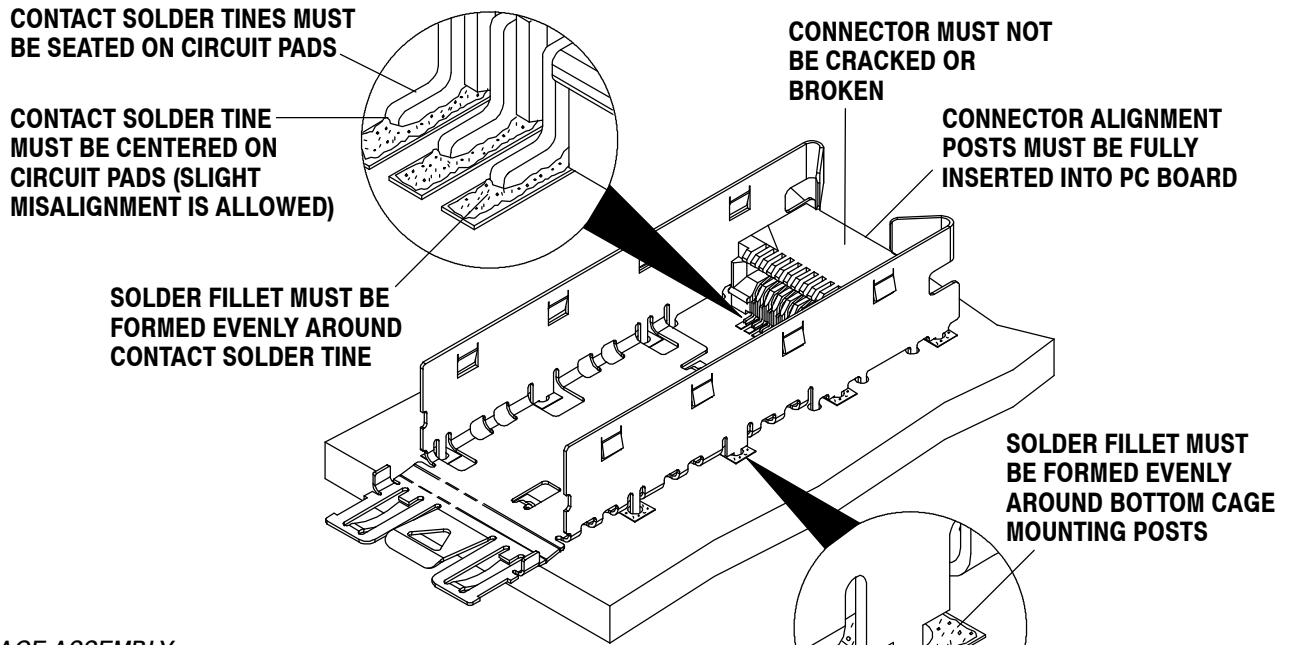


Figure 15

6. VISUAL AID

Figure 16 shows a typical application of a SFP 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.

CONNECTOR AND BOTTOM CAGE



CAGE ASSEMBLY

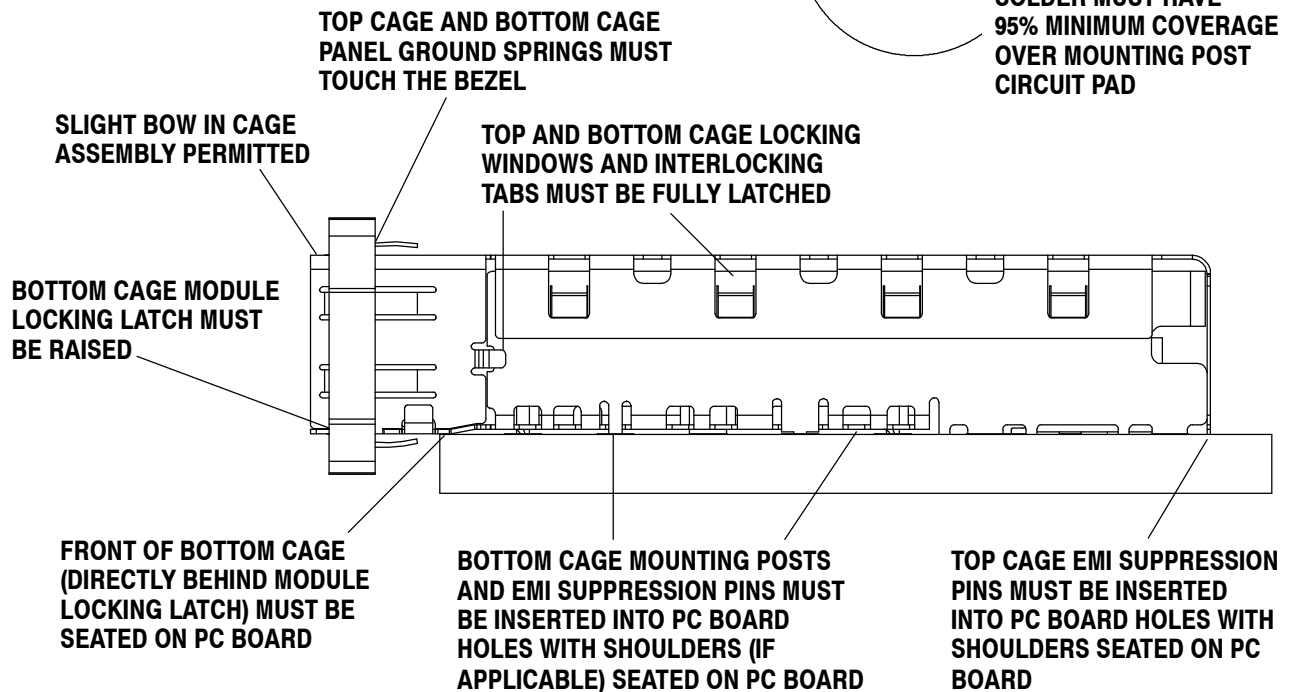


FIGURE 16. VISUAL AID