Small Form-Factor Pluggable (SFP) DWDM (Dense Wavelength Division Multiplexer) Connector and Cage Assembly

NOTE

All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ±0.13 [±.005] and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of SFP DWDM connector and cage assembly to interconnect SFP DWDM fiber optic transceivers to host printed circuit (pc) boards used in the communications industry and peripheral component interconnect (PCI) applications. The connector is available in 20 positions with contact spacing on 0.8-mm centerlines. The cage assembly serves as a housing for the connector and transceiver. The cage assembly is designed to be bezel-mounted.

The connector is a housing with right-angle surface mount contacts. The connector features an embossed triangle for Pin 1 identification, a chamfered corner for orientation, alignment posts that provide stability for placement on the host 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 transceiver.

The cage assembly is a frame with a cavity and a port having compliant pin contacts for mechanical retention to the host pc board and electromagnetic interference (EMI) suppression pins to provide EMI suppression. The cavity accepts a heat sink (if used) and the port accepts the transceiver. The cage assembly features a hard stop which controls the insertion depth of the transceiver and a transceiver locking latch which holds the transceiver in place. Along the front perimeter of the cage assembly are EMI suppression springs which impede any EMI emissions coming from the mated transceiver.

The dust cover is used to prevent contaminants from entering the chassis when the transceiver is not installed.

The connectors are supplied in tape-mounted form for manual or high-speed automatic machine placement (typically vacuum pick and place). The cage assemblies are supplied in thermo-formed tray packaging for manual placement.

When corresponding with TE Connectivity 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.

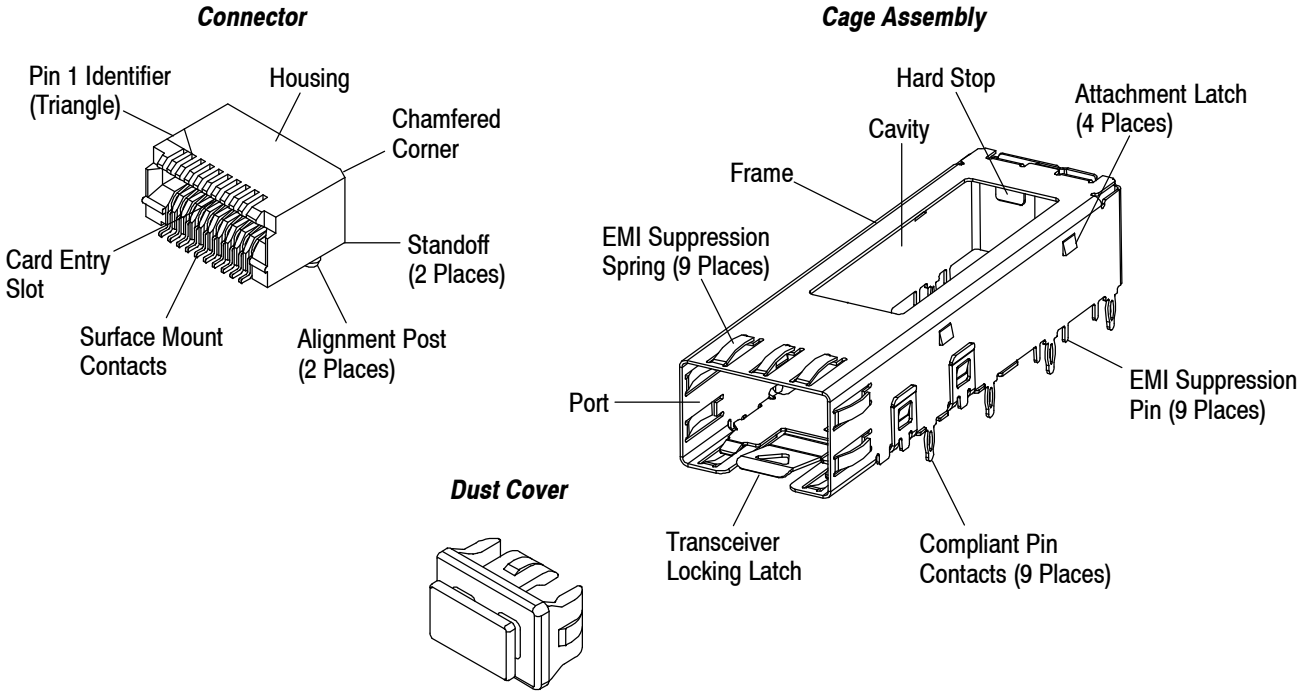
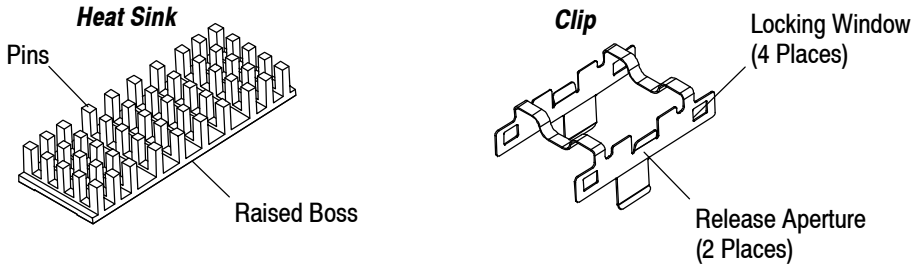


Figure 1

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 heats 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 these products are provided in Figure 2.



HEAT SINK			CLIP
4.2-mm Pins	6.5-mm Pins	13.5-mm Pins	
1829903-2	1829904-2	1829905-2	1367646-1

Figure 2

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Updated document to corporate requirements.

2.2. Customer Assistance

Reference Product Base Part Numbers 1367073 (connector) and 1367643 (cage assembly) and Product Code K639 are representative of SFP DWDM 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 TE 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, the information contained in the Customer Drawings takes priority.

2.4. Manuals

Manual 402–40 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. Standards and Publications

Standards and publications developed by the Electronic Industries Alliance (EIA) provide industry test and performance requirements. The document available which pertains to this product is:

EIA–364–52, “Solderability of Contact Terminations Test Procedure for Electrical Connectors and Sockets.”

2.6. Specifications

Product Specifications 108–1949 (connector) and 108–1950 (cage assembly) provides product performance and test information.

Workmanship Specification 101–21 provides solder fillet requirements for the connector.

2.7. Instructional Material

Instruction Sheets (408–series) provide product assembly instructions or tooling setup and operation procedures. Documents available which pertain to this product are:

408–9816 Handling of Reeled Products
408–10084 SFP DWDM Connectors and Cage Assembly

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 top surface of the transceiver must maintain a flatness of 0.08.

3.3. Material

The connector housing is made of liquid crystal polymer (LCP) thermoplastic, UL 94-V-0. The surface mount and compliant pin contacts are made of phosphor bronze plated with gold over gold flash and underplated with nickel. The cage assembly is made of copper alloy plated with tin. The dust cover is made of thermoplastic. The heat sink is made of cast aluminum plated with electroless nickel, and the clip is made of stainless steel.

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 connector and cage assembly should remain in the shipping containers until ready for use to prevent deformation to any protruding parts. The connectors and cage assemblies should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

C. Reeled Components

The connectors are supplied in reels on carrier tapes approved under EIA-481, “8-mm Through 200-mm Embossed Carrier Taping and 8-mm and 12-mm Punched Carrier Taping of Surface Mount Components for Automatic Handling.” These reels have a diameter of 330 with 480 connectors per reel. Store coil wound reels 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.

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 minimum board thickness must be 1.45 mm for mounting the connector and cage assembly to one side of the board. For mounting to both sides of the board, the pc board thickness must be 3.0 mm minimum.

NOTE

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

B. Tolerance

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

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

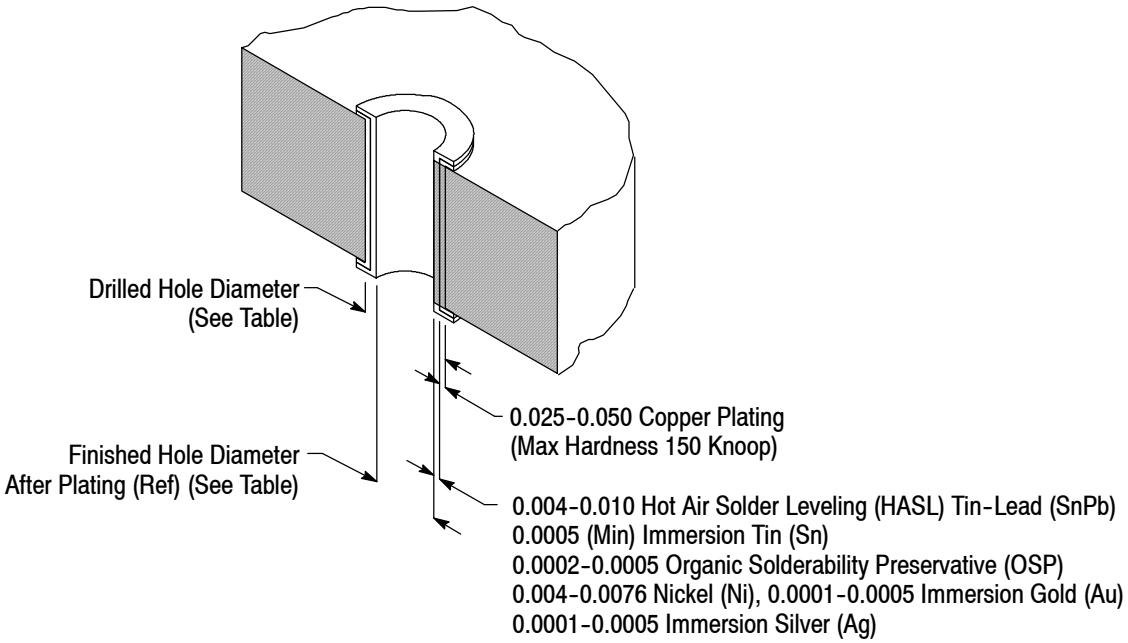
C. Circuit Pads

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

D. Hole Dimension

The holes for the connector alignment posts and cage assembly compliant pin contacts must be drilled and plated through to prevent stubbing during placement. Holes for the EMI suppression pins must be drilled and can be used with or without plating. Recommended drilled hole diameter, plating type and thickness, and finished hole size are provided in Figure 3.

Recommended Hole Dimensions and Plating
For Cage Assembly Compliant Pin Contacts



HOLE (See Customer Drawing for Hole Designation; Also Shown in Figure 4—*Sample* PC Board Layout)	DIAMETER	
	DRILLED HOLE	FINISHED HOLE (After Plating)
A	1.15±0.02	1.05 (Ref)
B	1.05±0.02	0.95 (Ref)
C	0.95±0.02	0.85 (Ref)

Figure 3

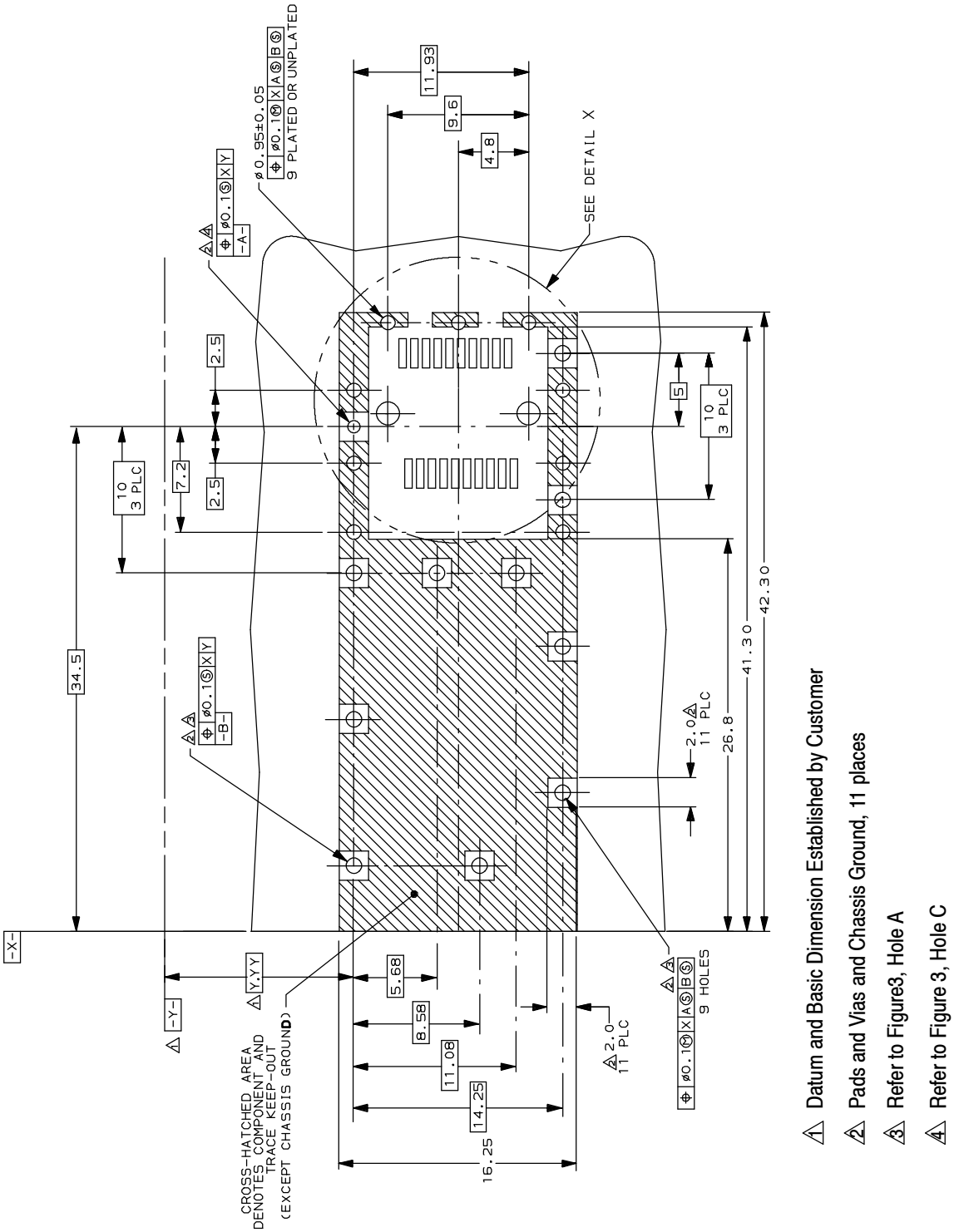
E. Layout

The host pc board holes and circuit pads must be precisely located to ensure proper placement and optimum performance of the connector and cage assembly. The layout must be designed using the dimensions provided on the customer drawing for the specific connector and cage assembly. A sample layout is provided in Figure 4.

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

Sample Recommended PC Board Layout
(Connector and Cage Assembly)

NOTE: For a Specific PC Board Layout, Refer to the Customer Drawing for the Specific Connector and Cage Assembly



1. Datum and Basic Dimension Established by Customer
2. Pads and Vias and Chassis Ground, 11 places
3. Refer to Figure3, Hole A
4. Refer to Figure 3, Hole C

Figure 4 (Cont'd)

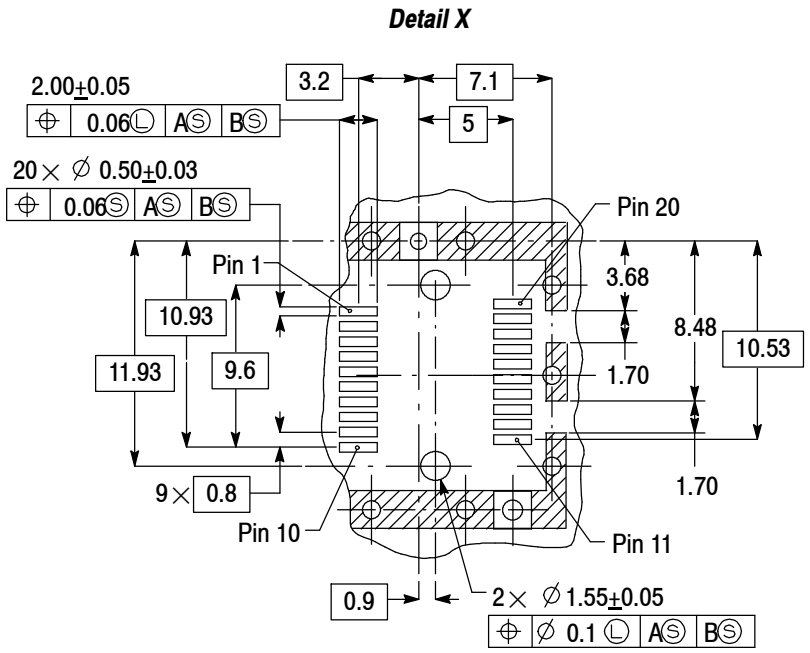


Figure 4 (End)

3.7. Solder Paste Characteristics

1. Alloy type shall be:

   Tin-lead solder—63 Sn/37 Pb, 60 Sn/40 Pb, or 62 Sn/36 Pb/2 Ag

   Lead-free solder—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 5×10% cp (centipoise).
6. Minimum viscosity of stencil print shall be 7.5×10% 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):

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

Solder volume for each connector must be 0.15 mm^3 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 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. The stencil layout must be designed using the dimensions provided on the customer drawing for the specific connector.

3.11. Solder Mask

When soldering, a 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.

The connector must be soldered to the host pc board BEFORE seating the cage assembly; otherwise, 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 connector contact solder tines should be centered on the host pc board circuit pads. However, slight misalignment is permissible as shown in Figure 5.

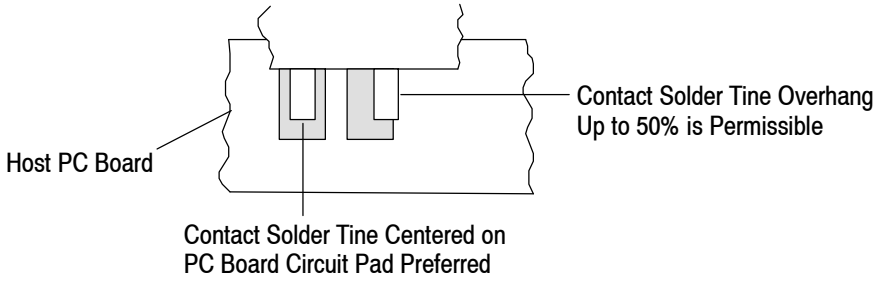


Figure 5

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.

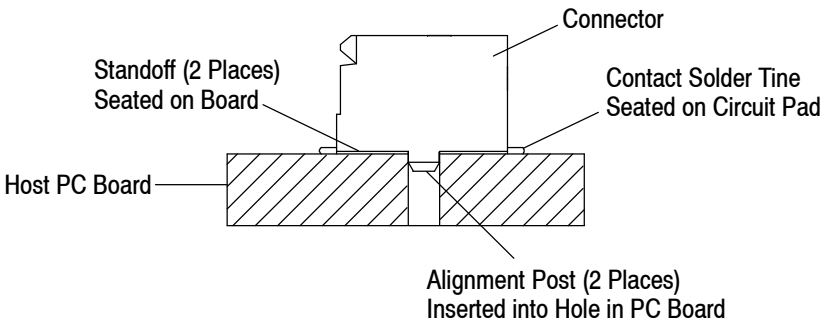


Figure 6

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 liquidus state will hold the connector on the board.

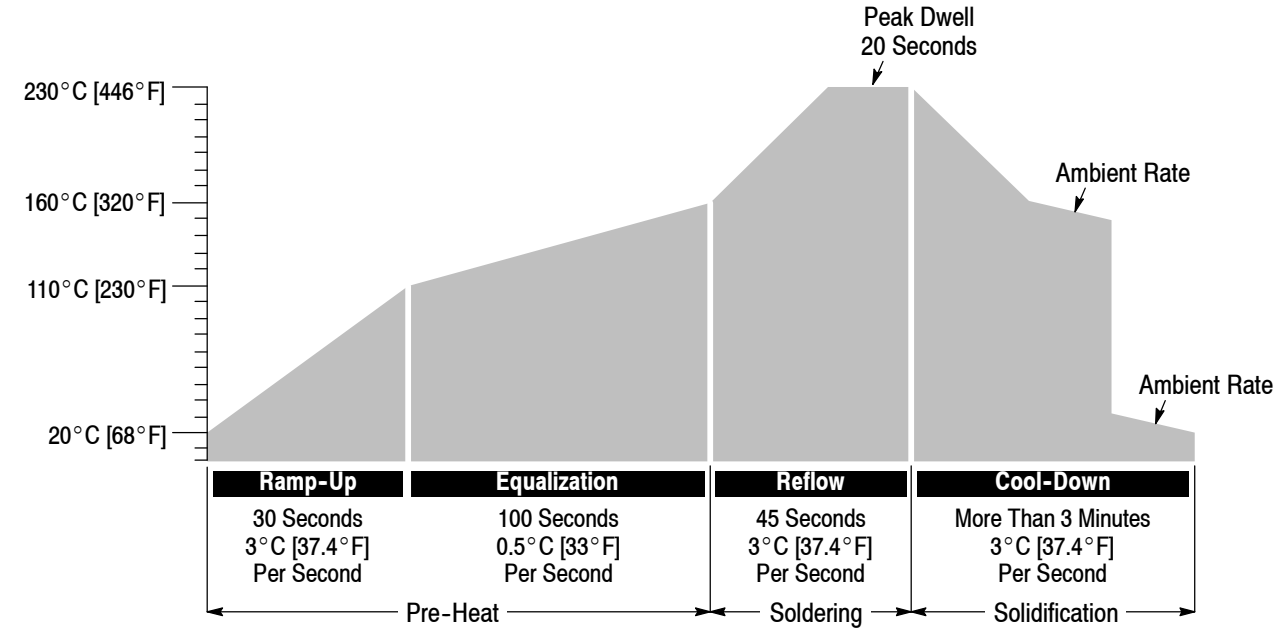
Reflow temperature and time may vary depending on the size of the host pc board and placement of other components. The reflow temperature and approximate time to which the connector can be subjected is specified in Figure 7.

CAUTION

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.

Reflow Soldering Process Cycle

Tin-Lead Solder
(Maximum 230°C [446°F] for 20 Seconds)



Lead-Free Solder
(Maximum 260°C [500°F] for 20 Seconds)

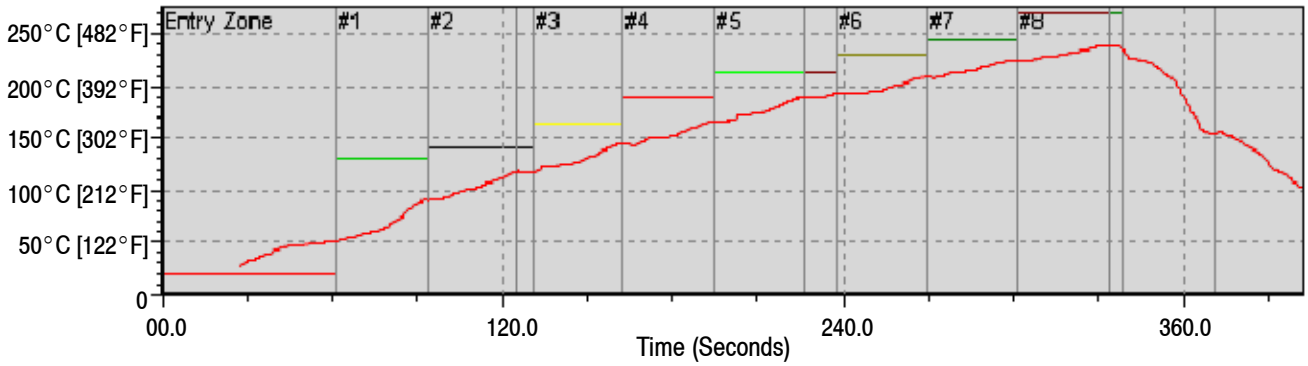


Figure 7

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 the affect the connector for the time and temperature specified are listed in Figure 8.

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. Both are carcinogenic (cancer-causing).

NOTE

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

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	5	100°C [212°F]
KESTER 5779	Aqueous	5	100°C [212°F]
LONCOTERGE 520	Aqueous	5	100°C [212°F]
LONCOTERGE 530	Aqueous	5	100°C [212°F]

Figure 8

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.

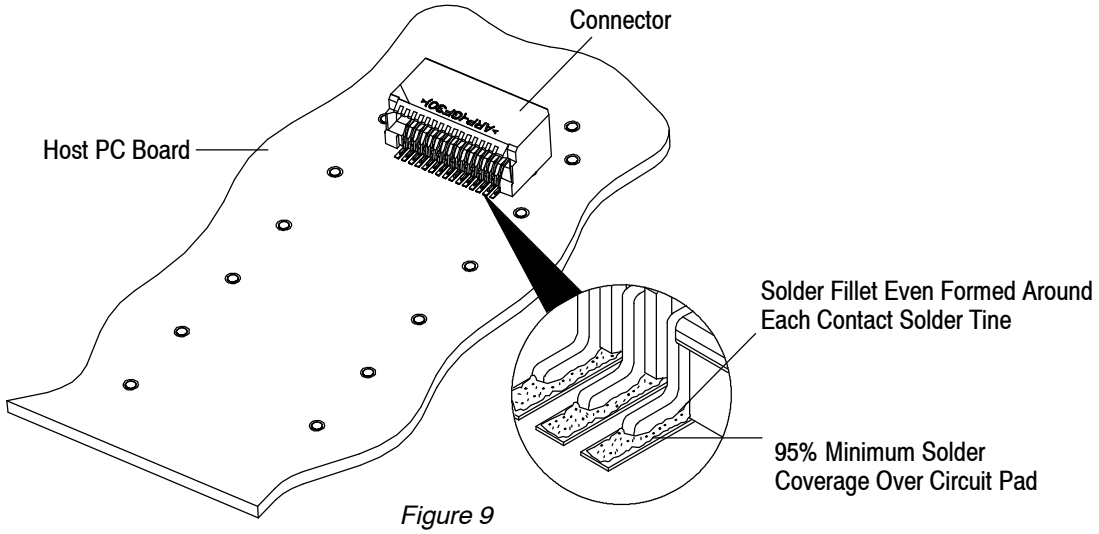


Figure 9

ALPHA, KESTER, and LONCOTERGE are trademarks.

3.15. Cage Assembly Placement

NOTE

The connector must be soldered to the host pc board BEFORE seating the cage assembly.

A. Registration

The compliant pin contacts and EMI suppression pins must be aligned with matching holes in the host pc board, then inserted into the pc board simultaneously to prevent twisting or bending of these parts.

B. Seating

The force used to seat the cage assembly must be applied evenly to prevent deformation or other damage to the compliant pin contacts. Apply only that force necessary to seat the shoulders of the compliant pins onto the host pc board to the dimension shown in Figure 10.

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.

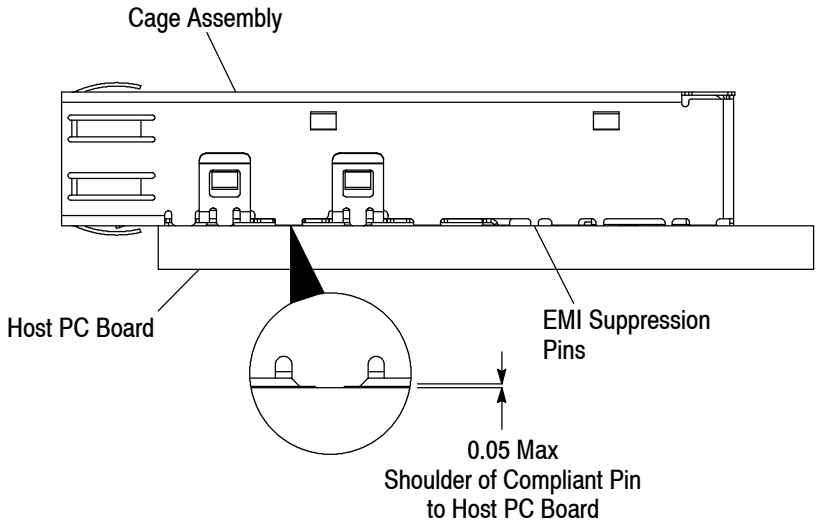


Figure 10

3.16. Heat Sink and Clip

NOTE

The heat sink and clip must be installed onto the cage assembly AFTER placement of the cage assembly onto the host pc board and BEFORE installation of the cage assembly into the bezel.

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 11):

- 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 attachment latches of the cage assembly

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

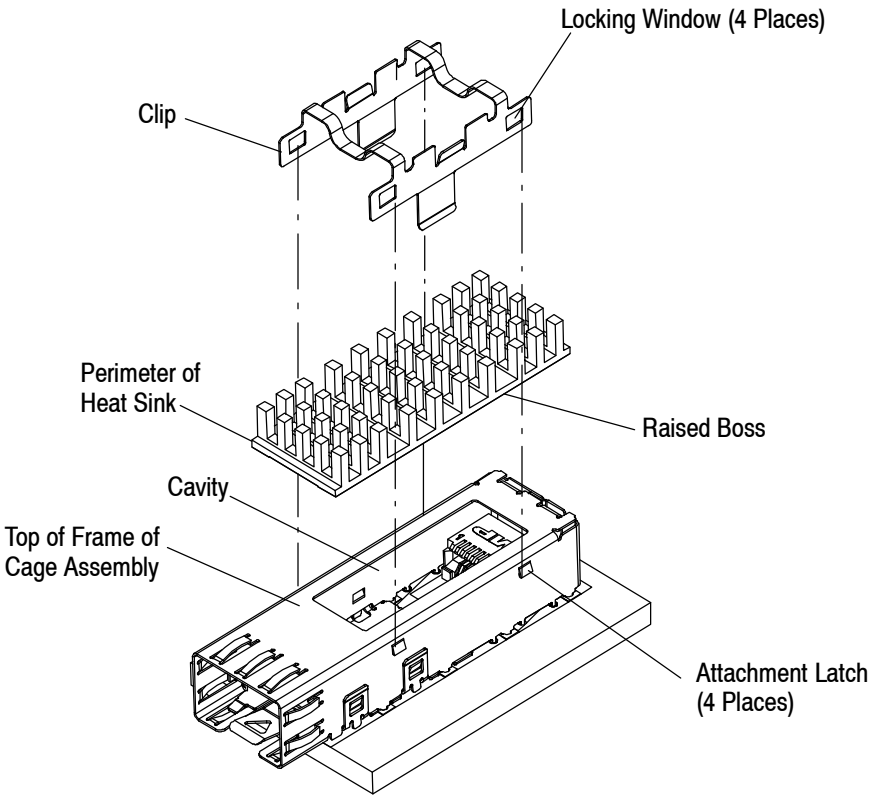


Figure 11

3.17. Bezel

A. Thickness

The bezel thickness range shall be 0.8 through 2.6 mm.

B. Cutout

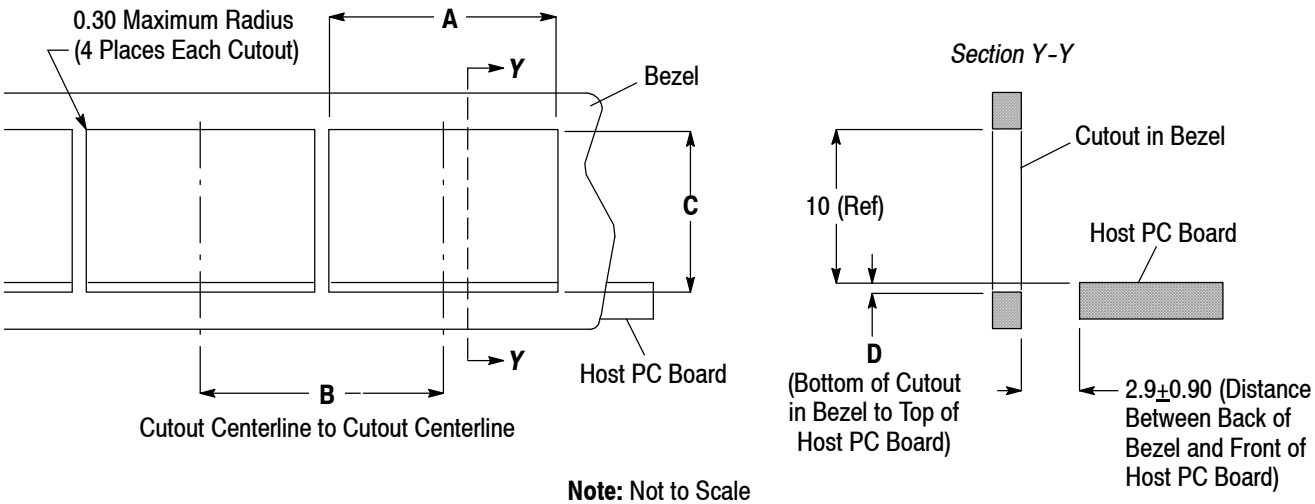
The bezel must provide a cutout that allows proper mounting of the cage assembly. The cage assembly EMI suppression springs must be compressed by the bezel in order to provide an electrical ground between the cage assembly and bezel for EMI suppression. Care must be used to avoid interference between 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 12.

3.18. Installing Cage Assembly onto Bezel

The cage assembly (with host pc board) must be installed onto the bezel so that the port of the cage assembly is centered over the cutout of the bezel. The bezel and host pc board must be positioned in relation to each other to avoid interference with the function of the cage assembly transceiver locking latch and to ensure proper function of the EMI suppression springs. This relationship must conform to the dimensions given in Figure 12.

Recommended Bezel Cutout (Minimum Pitch) and Host PC Board and Bezel Position

Bezel Thickness: 0.8-2.6



Note: Not to Scale

DIMENSION ±0.10			
A	**B**	**C**	**D**
15.25	16.25	10.40	0.40

Figure 12

3.19. Checking Installed Cage Assembly

After installation, the cage assembly EMI suppression springs must be compressed by the bezel. A slight bow in the cage assembly is permitted. The bezel must not interfere with the function of the transceiver locking latch. The bezel and host pc board must be positioned according to the dimensions shown in Figure 13.

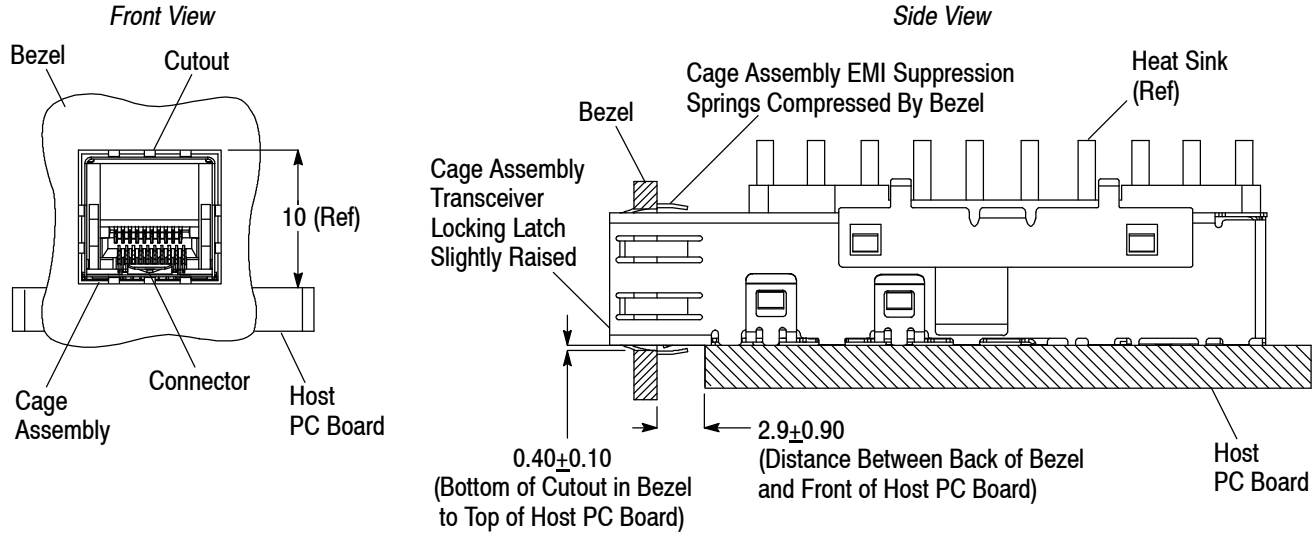


Figure 13

3.20. Dust Cover

The dust cover must be installed into the port of the cage assembly when the transceiver is not mated with the cage assembly.

3.21. Removal

A. Heat Sink

The cage assembly (and host pc board) must be removed from the bezel before the heat sink and clip can be removed from the cage assembly. The heat sink must be removed according to the following:

1. Insert the tip of the tool (such as a small screwdriver) behind either release aperture of the clip, and rotate the tool until the corresponding locking windows are released from the attachment latches of the cage assembly. Repeat this step for the remaining release aperture. Refer to Figure 14.

2. Lift the clip and heat sink from the cage assembly.

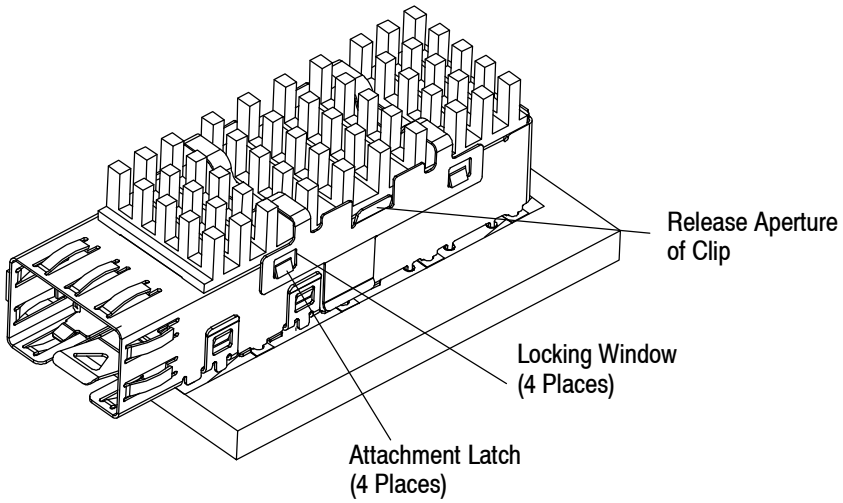


Figure 14

B. Cage Assembly

The heat sink must be removed from the cage assembly before removing the cage assembly from the host pc board. A flat metal bar (or similar object) can be inserted into the port of the cage assembly, but 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.

C. Connector

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.

3.22. Repair

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

4. QUALIFICATION

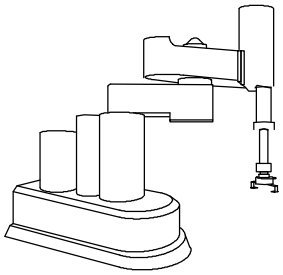
SFP DWDM connectors are Recognized by Underwriters Laboratories Inc. (UL) in File E28476.

5. TOOLING

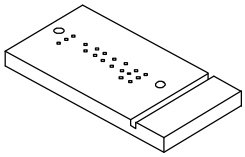
No tooling is required for placement of the cage assembly onto the host pc board.

No tooling is required for manual placement of the connector onto the host 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 15.

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 15.



Robotic Equipment



PC Board Support Fixture
(Application Specific,
Customer Supplied)

Feed Strip Carrier Dimensions for Connector

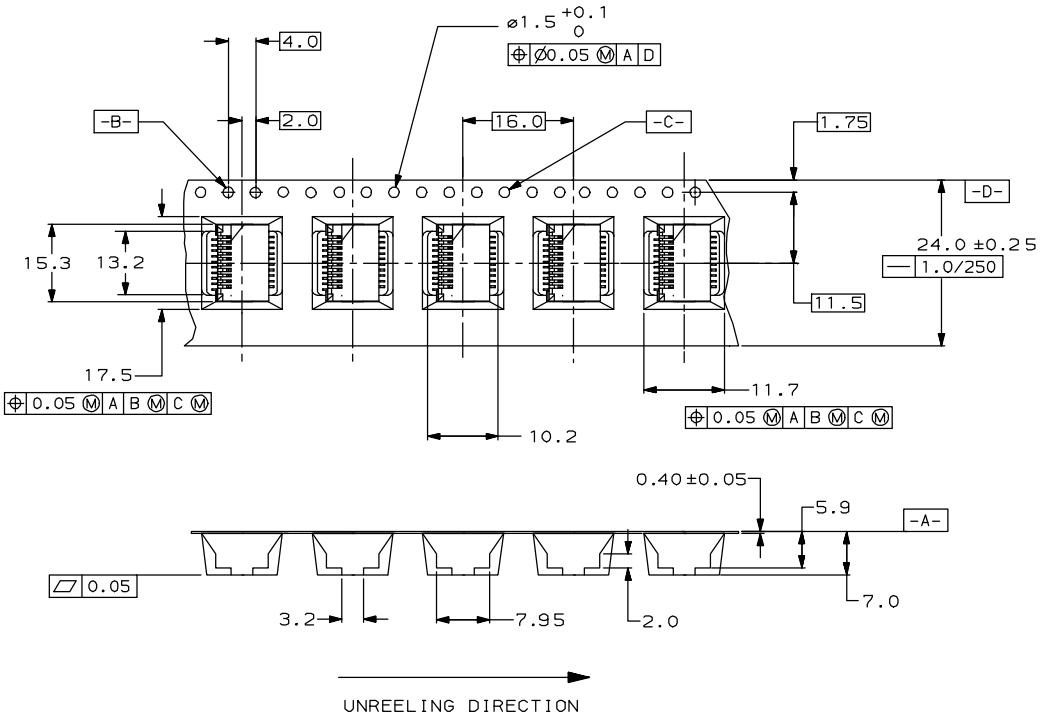


Figure 15

6. VISUAL AID

Figure 16 shows a typical application of SFP DWDM 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.

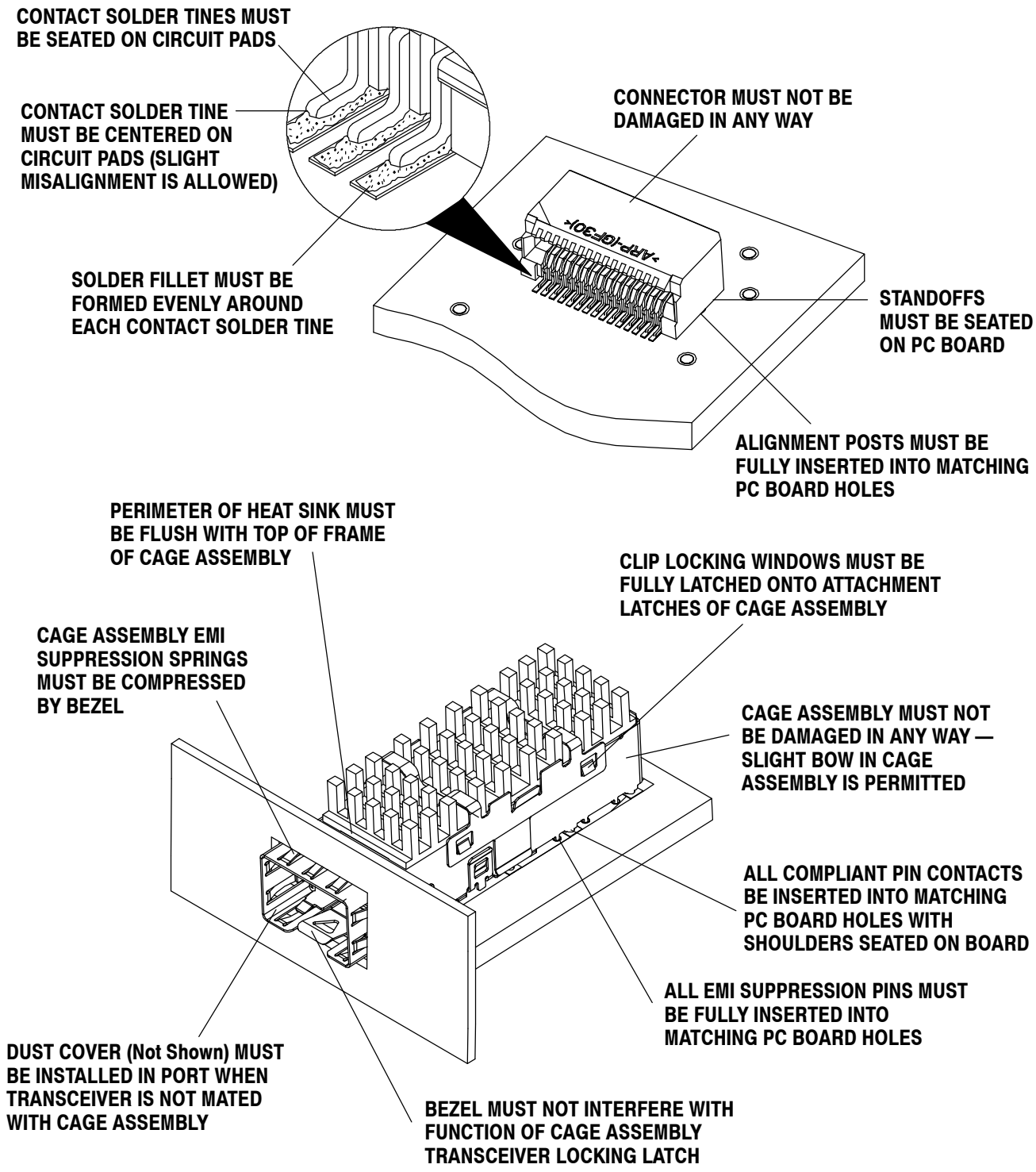


FIGURE 16. VISUAL AID