

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 [$\pm .005$] 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 SMT end cap connector assembly and cover onto each end of a light emitting diode (LED) light tube. The connector assembly and cover are used to interface the string of the printed circuit (pc) board with a standard G13 bipin socket to retrofit into fixtures designed for T8 or T12 fluorescent light tubes. Two connector assemblies and two covers are required for one light tube.

The connector assembly has two solder type contacts and two pins. The body features locating posts for proper placement of the connector on the pc board and a chamfer for ease in installation of the cover onto the connector. The cover features latches that “snap” onto the pocket and the cavities of the connector to prevent disengagement, an alignment feature to ensure proper alignment with the light tube, and anti-rotation lugs.

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.

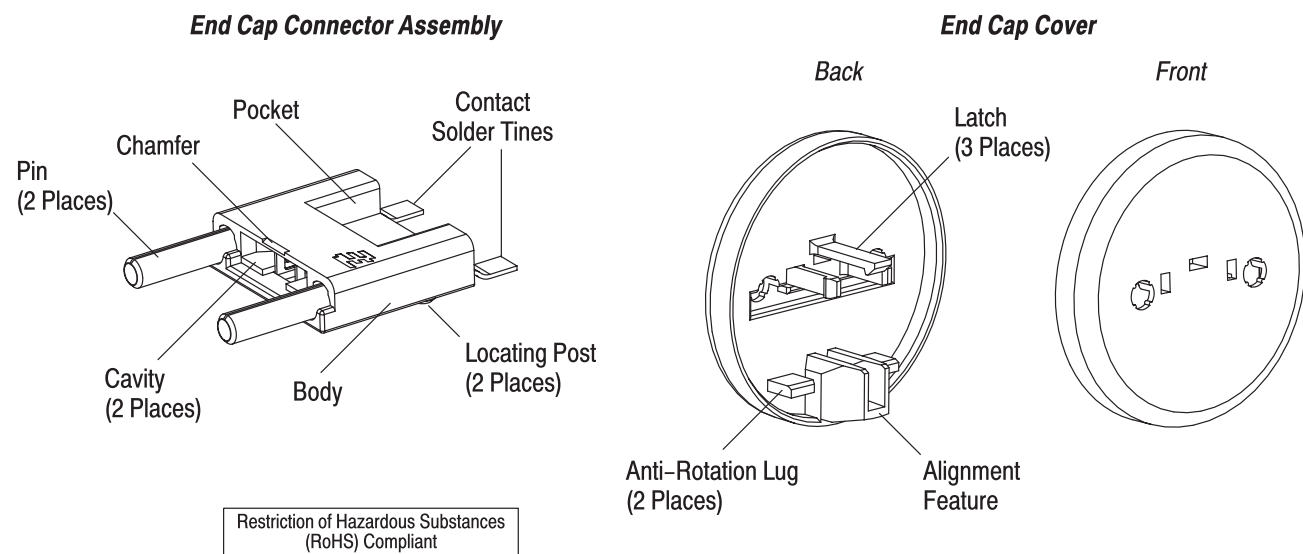


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

- Initial release of application specification

2.2. Customer Assistance

Reference Product Base Part Numbers 2106150 (connector assembly) and 2106153 (connector cover) and Product Code L012 are representative of SMT end cap connector assembly and cover. 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 this page.

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 this page.

2.4. Specifications

Design Objective (status at time of publication) 108-2393 provides expected product performance and test information.

2.5. Standards and Publications

Standards and publications developed by the Institute for Electronic Industries Alliance (EIA) and Interconnecting and Packaging Electronic Circuits (IPC). Documents available which pertain to this product are:

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"

IPC-S-815, "General Requirements for Soldering Electronic Interconnections"

2.6. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions or tooling setup and operation procedures. There are no documents available that pertain to these products.

2.7. Manuals

Manuals (402-series) can be used as a guide to soldering. These manuals provide information on various flux types and characteristics with the commercial designation, flux removal procedures, and a guide for information on soldering problems. Documents available which pertain to this product are:

402-40 Solderability and Soldering

3. REQUIREMENTS

3.1. Safety

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

3.2. Limitations

The connector assembly is designed to operate in a temperature range of -40° to 120°C [-40° to 248°F].

3.3. Storage

A. Ultraviolet Light

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

B. Shelf Life

Product should remain in the shipping containers until ready for use to prevent deformation. Product should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

C. Reeled Products

When using tape-mounted reeled product, care must be taken to prevent stretching, sagging, or other distortion that would prevent smooth feeding of the tape through automatic machine feed mechanisms. Store coil wound reels horizontally and traverse wound reels vertically.

D. Chemical Exposure

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

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

3.4. PC Board

A. Material and Thickness

The pc board material can be glass epoxy (FR-4 or G-10). PC boards with aluminum clad or flex circuits can be used. The minimum pc board thickness shall be 1.50 [.060].

B. Tolerance

Maximum allowable bow of the pc board shall be 0.10 [.004] over the length of the connector assembly.

C. Pads

The pc board circuit pads must be solderable in accordance with Test Specification 109-11.

D. Layout

The pc board layout must be designed using the dimensions provided on the customer drawing for the connector assembly. Recommended pc board layout is also shown in Figure 2.

It is important that the electrical pads (continuity to pins) and mechanical hold-down pads (no electrical function) are properly placed.

Recommended PC Board Layout

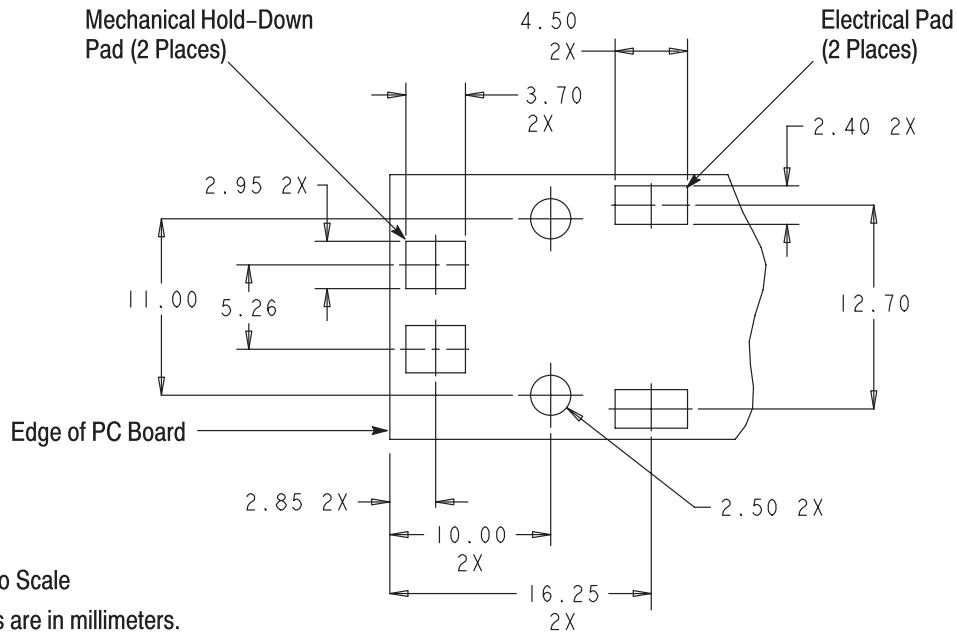


Figure 2

3.5. Connector Assembly Placement

A. Registration

The connector assembly is packaged per EIA 481. Automatic machine placement requires total equipment accuracy of 0.25 [.010] to locate the connector assembly for placement on the pc board. This includes gripper and fixture tolerances, as well as equipment repeatability.

The locating posts of the connector must align with the holes in the pc board. The edge (with the chamfer) of the connector body must align with the edge of the pc board. Refer to Figure 3.

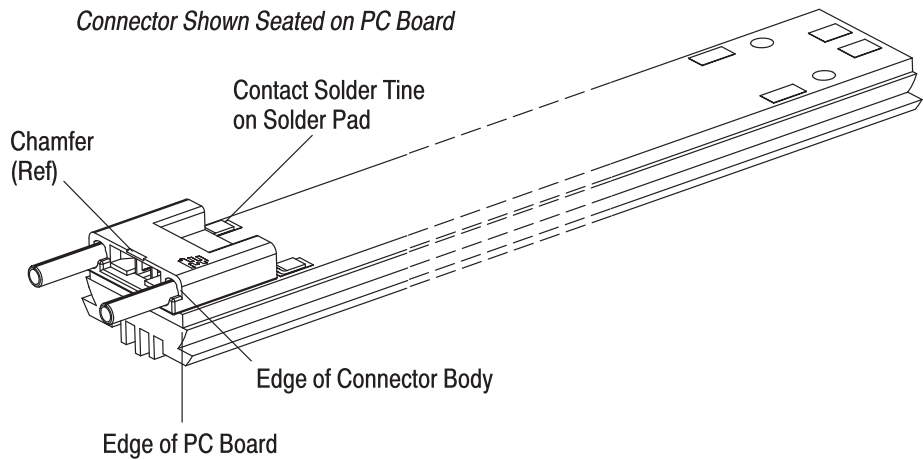


Figure 3

B. Position

Optimally, the contact solder tines should be centered on the pc board pads. However, slight misalignment is permissible as shown in Figure 4.

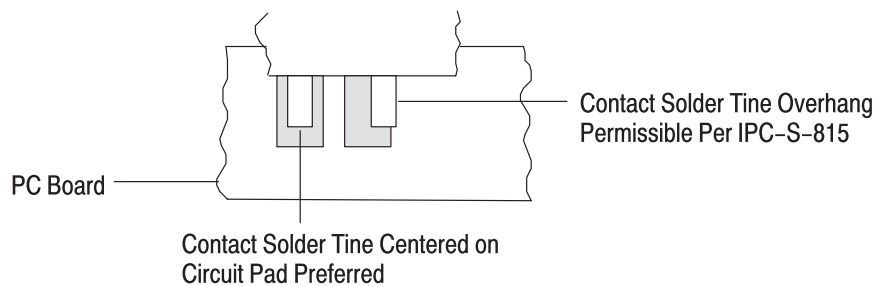


Figure 4

3.6. Soldering**A. Solder Paste Characteristics**

1. Alloy type shall be SAC 305, Sn 96.5/Ag 3.0/Cu 0.5.
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).

B. Solder Volume

Solder volume for the connector assembly must be 1.6 mm^3 [$.000098 \text{ in.}^3$] per contact solder tine (calculated per 90% solids content).

NOTE

Solder volume may vary depending on solder paste composition.

**C. Stencil**

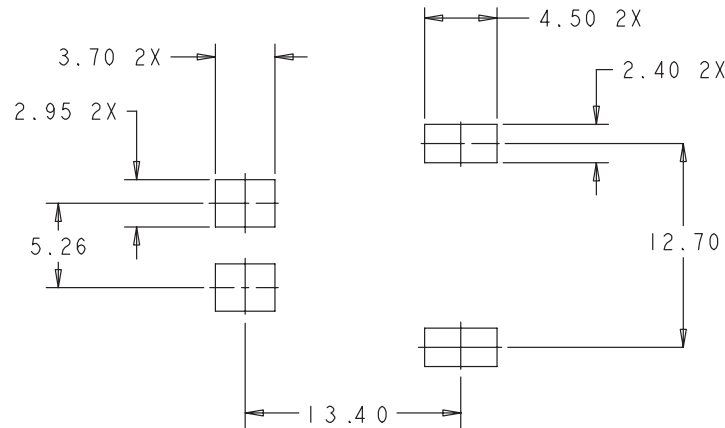
The stencil aperture is determined by the circuit pad size and stencil thickness. It may be any shape as long as it prevents solder bridging from one pad to another. Generally, the thinner stencil will need a larger aperture to maintain the given volume of solder paste. Typical stencil layout is shown in Figure 5.

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 bond.

Typical Stencil Layout

(Applies to Top of Connector Assembly)



Note: Not to Scale
Dimensions are in millimeters.

Figure 5

D. Solder Mask

Solder mask is recommended between all pads. If a trace is run between adjacent pads on the solder side of the pc board, a solder mask **MUST** be applied over the trace to prevent bridging and wicking of solder away from the contact solder tines. Liquid photo imageable or dry film solder masks are recommended. The mask must not exceed the height of the pad by more than 0.05 [.002].

CAUTION

Since the connector assembly may rest on top of the solder mask, an excessively high mask will allow too much space between the solder tine and pad for a good solder bond. A solder bond under these conditions would be weak and would not provide long-term performance for the connector assembly.

E. Process

This connector assembly can be soldered using vapor phase (VPR), non-focused infrared reflow (IR), or equivalent soldering technique. Due to many variables involved with the reflow process (i.e., component density, orientation, etc.), it is recommended that trial runs be conducted under actual manufacturing conditions to ensure product and process compatibility. Acceptable temperature and exposure time are given in Figure 6.

NOTE

Manual 402-40 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.

SOLDERING PROCESS	TEMPERATURE (Max)	TIME
VPR	215°C [419°F]	5 Minutes
IR	260°C [468°F]	10 Seconds

Figure 6

The lead-free reflow soldering profile is shown in Figure 7.

KESTER Lead-Free Reflow Soldering Profile
(Sn96.5/Ag3.0/Cu0.5 and Sn96.5/Ag3.5)

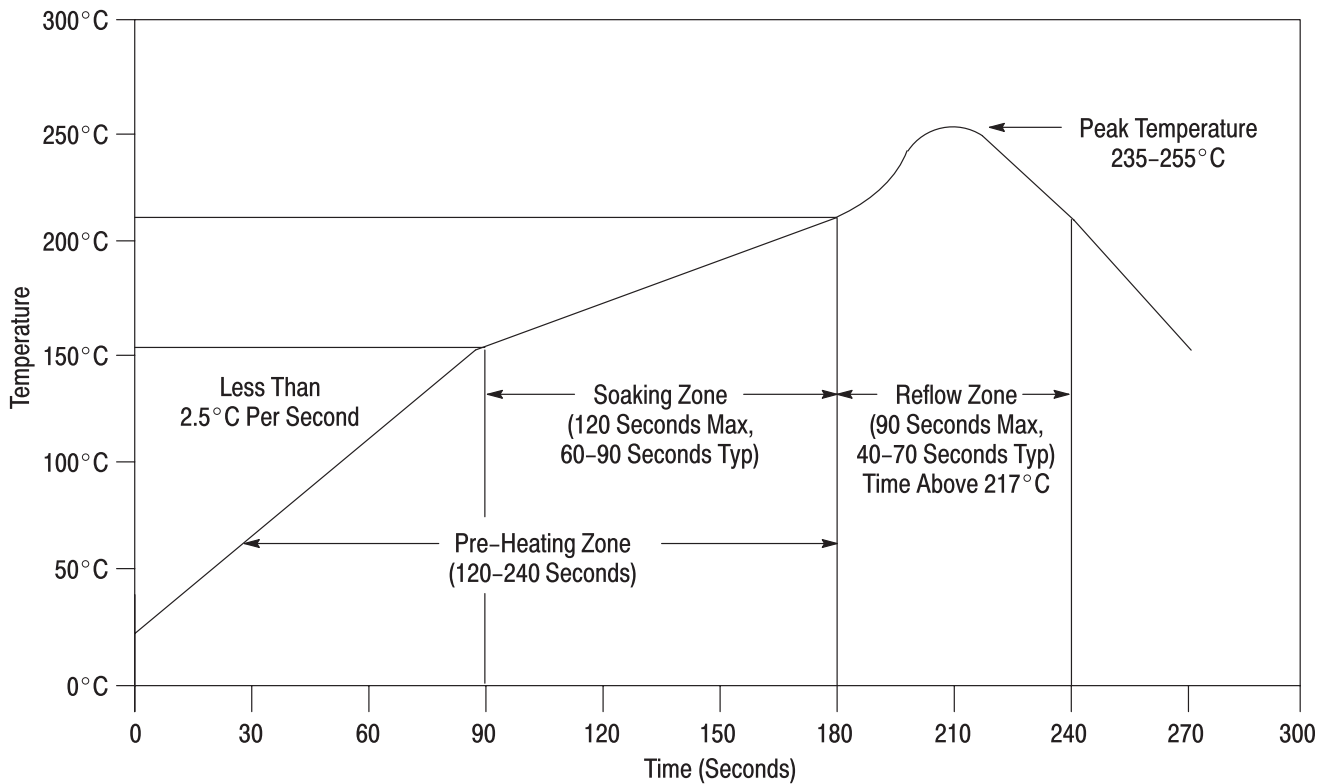


Figure 7

F. 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 that cleaning takes place with the pc board on its edge. Common cleaning solvents with times and temperatures that will not affect the connector assembly is specified 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 cleaning solvent that is not listed, contact PRODUCT INFORMATION at the number at the bottom of page 1.

G. Drying

When drying the cleaned assembly and pc board, temperature limitation must not be exceeded: 200°C [492°F] for more than 3 minutes. Excessive temperatures may cause product degradation.

3.7. Checking Installed Connector

All solder bonding should conform to those specified in Workmanship Specification 101-21 and all other requirements specified in this document. The installed connector must sit flat on the pc board. The solder must be bonded to each contact solder tine and the pc board.

Kester is a trademark of Kester, Inc.

CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)
NAME	TYPE		
ALPHA 2110	Aqueous	1	132°C [270°F]
BIOACT EC-7	Solvent	5	100°C [212°F]
Butyl CARBITOL	Solvent	1	Ambient Room
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]
Terpene Solvent	Solvent	5	100°C [212°F]

Figure 8

3.8. Cover Installation

The cover must be installed onto the connector so that:

- the holes of the cover align with the pins of the connector
- the top locking latch of the cover engages the pocket of the connector and the side locking latches engage the cavities of the connector (there should be an audible “click”)
- the alignment feature and anti-rotation lugs engage the ribs of the light tube heat sink extrusion

Refer to Figure 9.

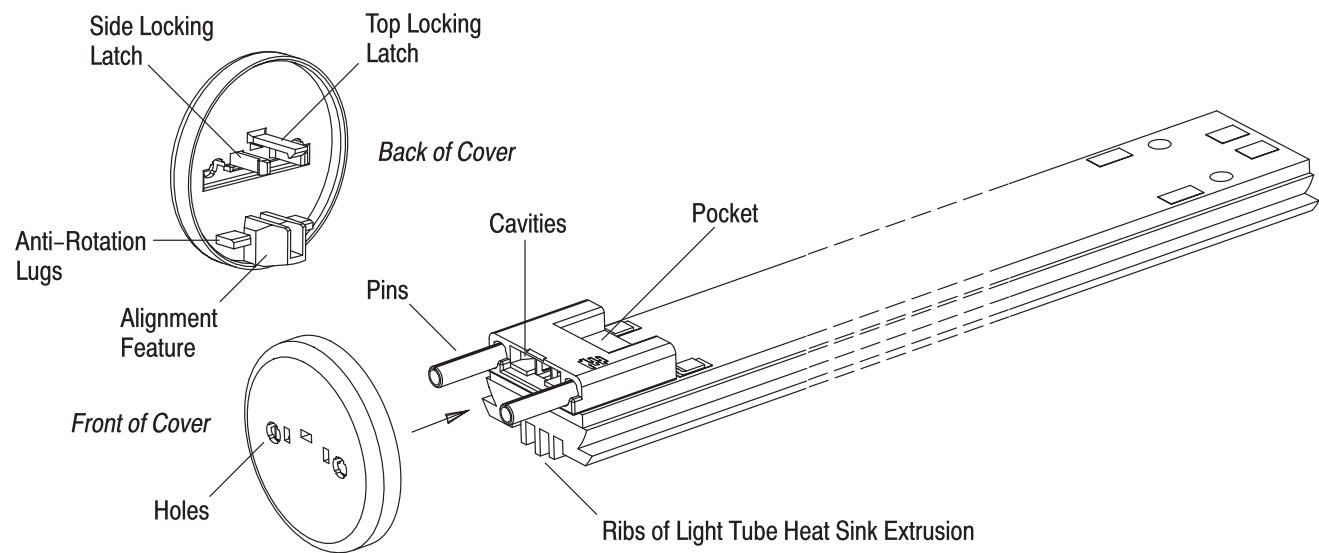


Figure 9

3.9. Repair

Damaged or defective connector assemblies or covers **MUST NOT** be used. The connector assembly may be removed from the pc board by standard de-soldering methods and replaced with a new one.

4. QUALIFICATION

No qualifying support for SMT end cap connector assembly and cover was defined at the time of publication of this document.

Alpha is a trademark of Fry's Metals, Inc.
Bioact is a trademark of Petroferm, Inc.

Kester is a trademark of Kester, Inc.
Carbitol and Loncoterger is a trademark of Union Carbide Corp.

5. TOOLING

An automatic machine is recommended for placement of the connector assembly on the pc board. The cover does not require any tooling for installation.

6. VISUAL AID

The illustration below shows a typical application of SMT end cap connector assembly and cover. 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.

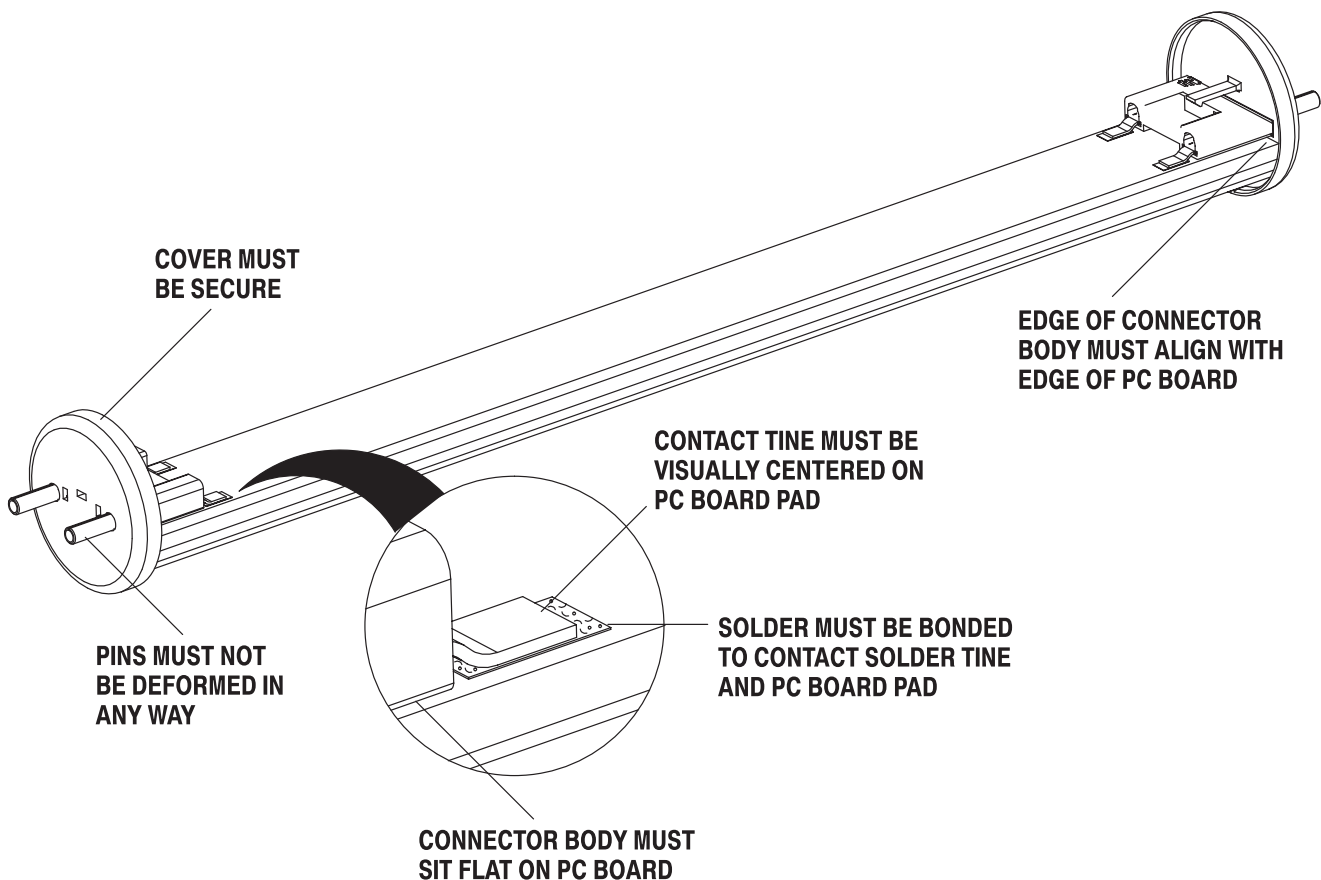


FIGURE 10. VISUAL AID