



Inverted Through Board Surface Mount Technology (SMT) Connector Assembly

Application Specification
114-13245
24 JUL 17 Rev G



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 mm 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 Inverted Through Board SMT Connector Assembly used for routing of discreet wire.

The connector features a housing, SMT contacts with complimentary post contacts, and two board locks. The connector is available in 2 through 6 position sizes, and has in--row contact centerline spacings of 1.50 mm.

The board locks stabilize the connector when placed on the pc board.

The connector interfaces with mini CT connectors from the bottom of the pc board. The connector is supplied in tape--and--reel form for hand or robotic equipment placement.

When corresponding with Tyco Electronics 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.

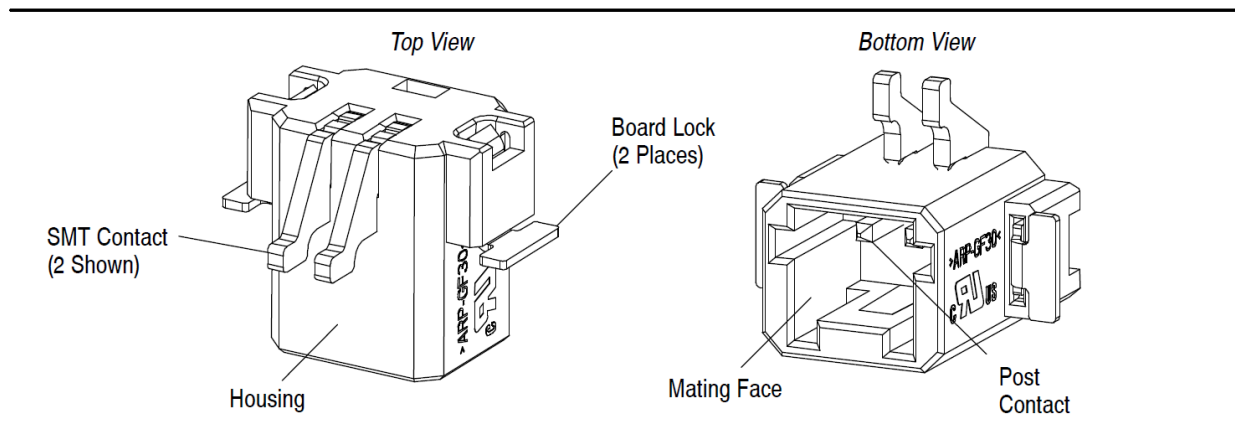


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

- ◆ Revised document to comply with Corporate requirements
- ◆ Revised recommended printed circuit board layout in Figure 2
- ◆ Paragraph 3.5 revised to recommend support of headers when mated to mini CT connectors

Reference Product Base Part Number 2106091 and Product Code L012 are representative of Inverted Through Board SMT Connector 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, by visiting our website at www.te.com, or by calling PRODUCT INFORMATION or the TOOLING ASSISTANCE CENTER at the numbers at the bottom of page 1.

2.2. 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.

2.3. 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.

2.4. Specifications

Product Specification [108-2376](#) provides product performance and test information for the Inverted Through Board SMT Connector Assembly. Connector Workmanship Specification IPC-A-610 provides solderability requirements and evaluation methods.

3. REQUIREMENTS

3.1. Safety

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

3.2. Limitations

The connectors are designed to operate in a temperature range of -30° to 105°C [-22° to 221°F].

3.3. Material

The connector housing is made of LCP (liquid crystal polymer) thermoplastic. The contacts are made of copper alloy plated with tin over nickel. The board locks are made of brass plated with tin over nickel.

3.4. Storage

A. Ultraviolet Light

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

B. 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.

C. 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

D. Reeled Products

Care must be taken to prevent stretching, sagging, or other distortion that would prevent smooth feeding of the tape and reel through automatic machine feed mechanisms. Store coil wound reels horizontally and traverse wound reels vertically.

3.5. PC Board

A. Material and Thickness

The pc board material shall be Glass epoxy (FR-4 or G-10) or Insulated Metal Substrate (IMS). There is no requirement for the thickness of the pc boards.



NOTE

It would be advisable to support the top side of the Inverted Through Board SMT Connectors when mating to the mini CT connectors when possible to reduce the chance of mating forces peeling the connectors off the pc boards.

B. Tolerance

The maximum allowable bow of the pc board shall be 0.03 mm over the length of the connector.



CAUTION

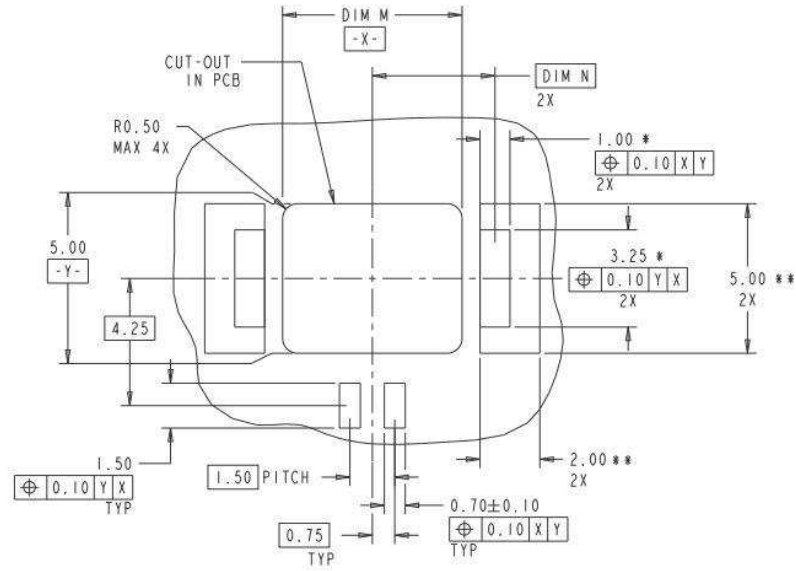
Since the connector housings may rest on top of the solder mask, an excessively high mask will allow too much space between the solder tine and pad for a good solder joint. A solder joint under these conditions would be weak, and would not provide long-term performance for the connector.

C. Pads

The pc board circuit pads must be solderable in accordance with IPC/EIA-J-STD-003 and Test Specification [TEC 109-11](#).

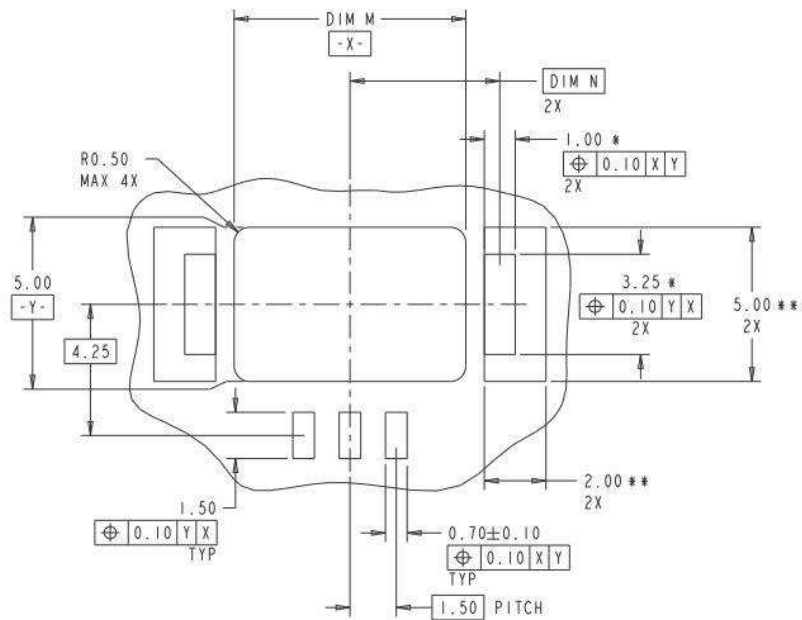
D. Layout

The pc board layout must be designed using the dimensions provided on the customer drawing for the specific connector. The recommended pc board layout is shown in Figure 2. This layout is for the solder mask and applies to the Inverted Through Board Connector. The copper layer of the LED pc board should be etched only enough to create the circuit to the connector leads and provide minimum creep and clearance distances between traces (minimum etching). Maximizing the copper pads used to mount the Inverted Through Board Connector will improve the connector's ability to resist peeling off the circuit board when mated to the mini CT Connector.



RECOMMENDED PCB LAYOUT
EVEN NUMBER POSITIONS SHOWN
SCALE 10:1

* DIMENSION SHOWN IS RECOMMENDED SOLDER MASK OPENING.
** DIMENSION SHOWN IS RECOMMENDED COPPER PAD SIZE.



RECOMMENDED PCB LAYOUT
ODD NUMBER POSITIONS SHOWN
SCALE 10:1

* DIMENSION SHOWN IS RECOMMENDED SOLDER MASK OPENING.
** DIMENSION SHOWN IS RECOMMENDED COPPER PAD SIZE.

Figure 2

3.6. Flux Selection

Contacts must be fluxed prior to soldering with a mildly active, rosin base flux. Selection of the flux will depend on the type of pc board and other components mounted on the board. Additionally, the flux must be compatible with the wave solder line, manufacturing, health, and safety requirements. Flux that is compatible with the connectors is provided in Figure 12.

FLUX TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			ALPHA	KESTER
RMA	Mild	Noncorrosive	611	186

Figure 3

3.7. Soldering

Observe guidelines and procedures when soldering contacts. Solder, clean, and dry all leads to contacts according to the following:

- ▶ The connectors should be soldered using vapor phase reflow (VPR), double-sided, non-focused infrared (IR), forced air convection, or equivalent soldering techniques.
- ▶ All solder joints should conform to the Workmanship Specification IPC-A-610 and IPC J-STD-001.

A. Solderability

The pc board pads must be solderable in accordance with IPC/EIA J-STD-003 and all other requirements for SMT contacts specified in this document.

B. Solder Paste Characteristics

- a. Alloy type shall be SAC 305; Sn 96.5/Ag 3.0/Cu 0.5.
- b. Flux incorporated in the paste shall be rosin, mildly active (RMA) type.
- c. Paste will be at least 80% solids by volume.
- d. Mesh designation -200 to +325 (74 to 44 square micron openings, respectively).
- e. Minimum viscosity of screen print shall be 5x10% cp (centipoise).
- f. Minimum viscosity of stencil print shall be 7.5x10% cp (centipoise).

C. Solder Volume



NOTE

Solder paste volumes are required as follows (calculated per 50% solids content). Paste volume may vary depending on the composition.

Solder is required to be 0.33 mm³ per contact solder tine and 0.75 mm³ per board lock (calculated per 50% solid content).

D. Screen or (Stencil)

The stencil aperture shall be 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. TE recommends the use of a minimum of 0.13 mm thick stencil.



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.



CAUTION

If a hold-down aperture is required other than that specified, the design must ensure that the connector housing will not sit on the solder deposit.

E. Solder Mask

Solder mask is recommended between all pads when soldering connectors with surface mount contacts to minimize solder bridging between pads. The mask must not exceed the height of the pad by more than 0.05 mm. 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. Those most suitable are Liquid Photo Imageable and Dry Film.



CAUTION

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

F. Process

Connectors with surface mount contacts should be soldered using vapor phase (VPR), double-sided, non-focused infrared reflow (IR) or equivalent soldering techniques. 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. These connectors will withstand the temperature and exposure time specified in Figure 13.

SOLDERING PROCESS	TEMPERATURE (Max)	TIME (At Max Temperature)
IR	220°C [428°F]	3 Minutes

Figure 4

The lead-free reflow profile is shown in Figure 5

Kester Lead-Free Reflow Profile Alloys: Sn96.5/Ag3.0/Cu0.5 and Sn96.5/Ag3.5

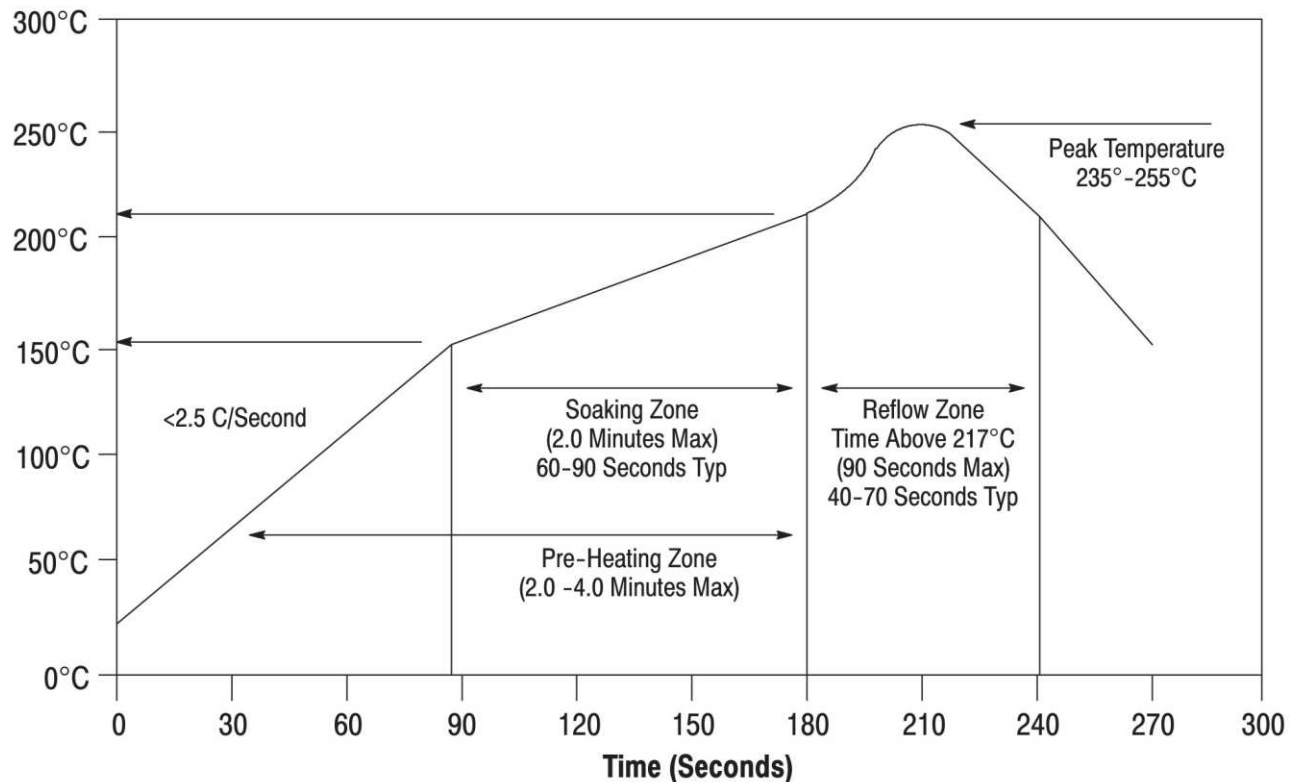


Figure 5

G. Cleaning

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Common cleaning solvents that will not affect the connectors or assemblies for the times and temperatures provided without any adverse effects on the connector assembly are listed in Figure 15.



DANGER

Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Trichloroethylene and Methylene Chloride can be used with no harmful affect to the connectors; however, TE does not recommend them because of the harmful occupational and environmental effects. Both are carcinogenic (cancer-causing) and Trichloroethylene is harmful to the earth's ozone layer.



NOTE

If you have a particular solvent that is not listed, contact TE Tooling Assistance Center or Product Information at the number on the bottom of page 1.

CLEANER		TIME (Minutes)	TEMPERATURE (Max)
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		
KESTER 5779	Aqueous		
LONCOTERGE 520	Aqueous		
LONCOTERGE 530	Aqueous		
Terpene	Solvent		

Figure 1

H. Drying



CAUTION

Excessive temperatures may cause housing and plating degradation.

When drying cleaned assemblies and pc boards, temperatures to which the connectors are subject should not exceed 220°C [492°F] for more than 3 minutes.

3.8. Checking Installed Connector

All solder joints should conform to those specified in Workmanship Specification 101-21, IPC-A-610, and all other requirements specified in this document.



CAUTION

Connectors or pc boards should not be tested by the insertion of probes of any type into the contact wire openings. This will result in damage to the contacts. Poke-in contacts are designed for a single wire insertion, of the gage and type listed in Paragraph 3.5.

3.9. Repair and Replacement



CAUTION

The contacts and housings are not repairable. DO NOT use damaged or defective contacts or housings.

4. QUALIFICATION

Inverted Through Board Connectors are Recognized Compliant to Underwriters Laboratories Inc. (UL) and CSA International requirements as Listed in UL File Number E28476.

5. TOOLING

For automatic machine placement, a pc board support must be used to prevent bowing of the pc board during the placement of connectors on the board. It should have flat surfaces with a cutout large enough and deep enough to receive the connector housing. The robotic equipment must have a true position accuracy tolerance of 0.25 mm to properly locate the connector. This includes gripper and fixture tolerances as well as equipment repeatability. It must use the datum surfaces detailed on the customer drawing to ensure reliable placement.



NOTE

Automatic machine placement is recommended for connectors instead of manual placement with surface mount contacts.

6. CONNECTOR PLACEMENT

A. Position

Optimally, the solder tines should be centered on the pads; however, slight misalignment is permissible as long as the entire length of the solder tine is on the pad. Refer to Figure 6.

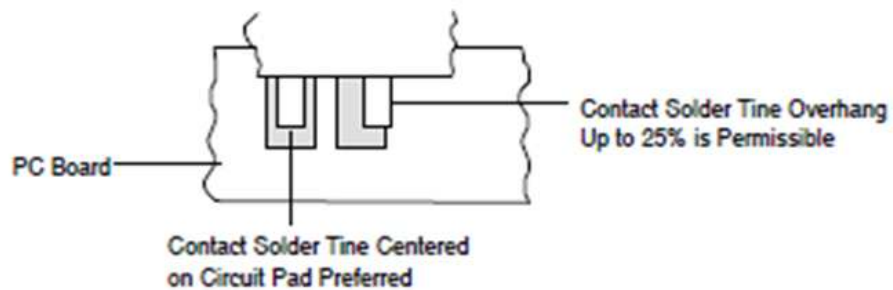


Figure 6

B. Seating Force

It is imperative that the contact solder tines and board locks are sufficiently pressed into the solder paste.

7. CHECKING INSTALLED CONNECTOR

All solder joints should conform to those specified in Workmanship Specification 101--21 and all other requirements specified in this document.

The board lock must be seated on the pc board not exceeding the dimension shown in Figure 7.

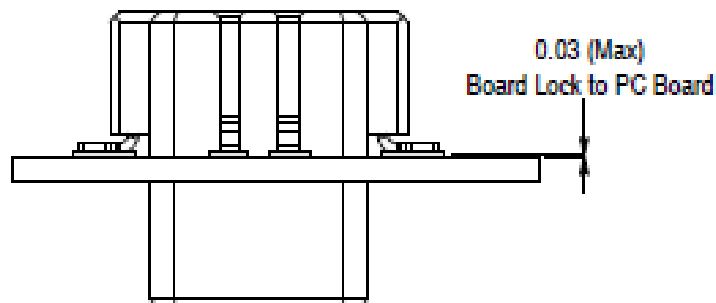


Figure 7

8. RETENTION FORCE

Retention force is 1.0 kgf per contact solder tine and 1.85 kgf per boardlock.

9. VISUAL AID

Figure 8 shows a typical application of an Inverted Through Board SMT Connector 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.

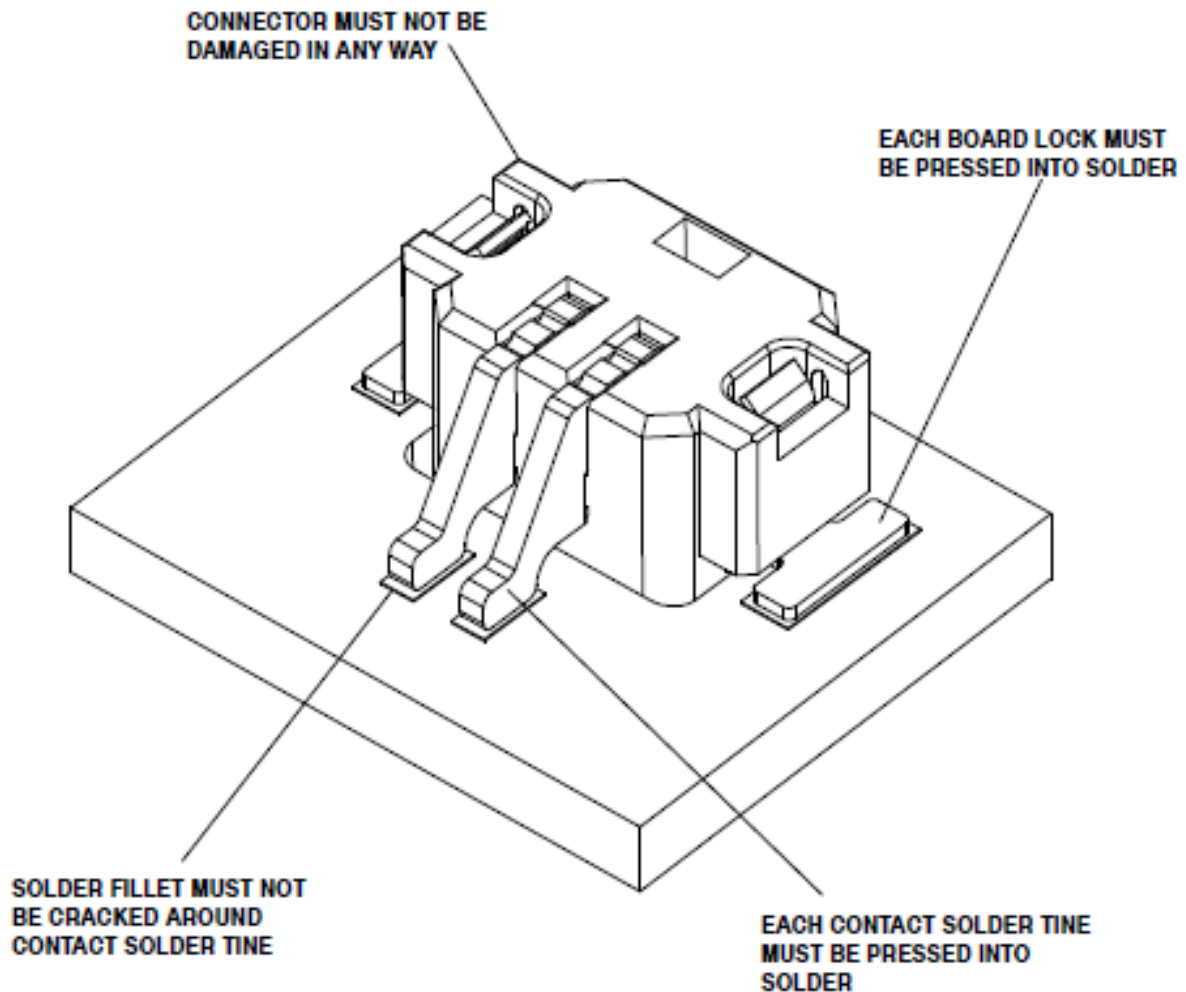


FIGURE 8. VISUAL AID