IDC SSL Connector

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 ±2°. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of IDC SSL Connectors for use on printed circuit (pc) board based LED strip lighting typically used for sign lighting. The connector accommodates 18, 20, 22, or 24 AWG solid and stranded copper wires.

The low profile housing with flat top surface allows for vacuum pick-and-place application. The connector is packaged in tape and reel packaging per EIA-481.

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.

NOTE

Two-Position shown, One-, Three-, and Four-Position also available.

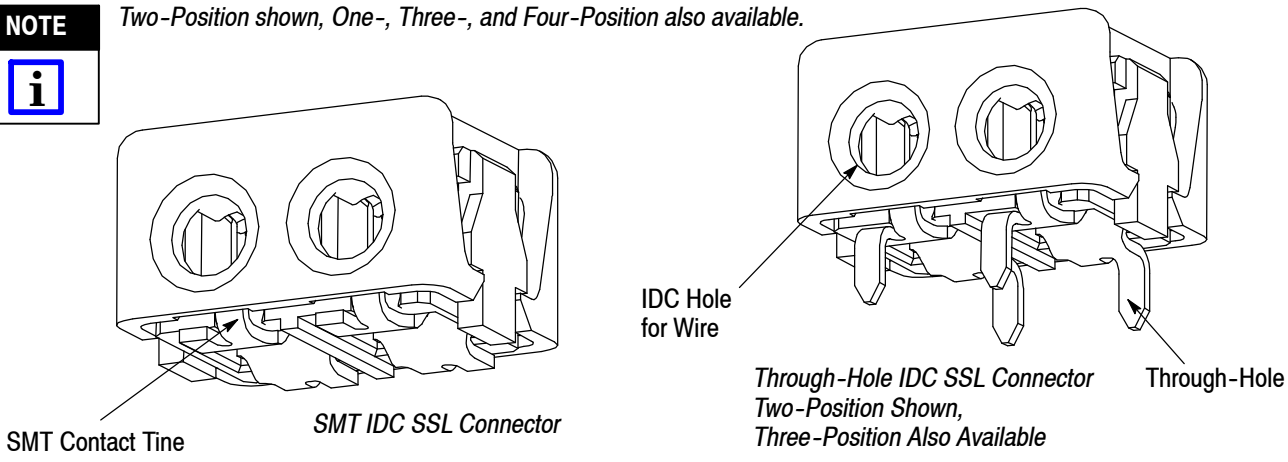


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

- Updated document to corporate requirements
- Added new information in Paragraph 5.3 and new artwork in Figure 18

2.2. Customer Assistance

Reference product base part numbers 2106003 and 2106431 (One thru Four Position SMT), 2106489 and 2106751 (Two- and Three-Position Through-Hole), and product code L012 are representative of the IDC SSL Connectors. 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 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 the Product Information number at the bottom of this page.

2.4. Manuals

Manual 402-40 is available from the service network. This manual provides information on various flux types and characteristics along with the commercial designation and flux removal procedures. A checklist is included in the manual as required for information on soldering problems.

2.5. Specifications

Design Objective 108-2404 provides expected product performance and test information for the IDC SSL Connector; and Design Objective 108-2404-2 provides expected product performance and test information for the Sealed IDC SSL Connector. Workmanship Specification 101-21 and Test Specification 109-11 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 -40° to 105°C [-40° to 221°F]

3.3. Material

The housing is made of UL 94V-0 rated thermoplastic. The contacts are made of phosphorous bronze, under-plated with nickel, and plated overall with tin.

3.4. Storage

A. Shelf Life

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

B. Chemical Exposure

Do not store connectors 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

3.5. Wire Selection and Preparation

These connectors will accept 18, 20, 22, and 24 AWG solid or stranded copper wire. The table in Figure 2 provides wire selection for the IDC SSL Connectors.

NOTE

Color indication markings for wire sizes are as follows: Yellow - 18 AWG; Blue - 20 AWG; Green - 22 AWG and Red - 24 AWG.

RECOMMENDED WIRE		
18 AWG	UL 1007-18	Solid
18 AWG	UL 1007-18 (16)	Stranded
20 AWG	UL 1007-20	Solid
20 AWG	UL 1007-20 (7)	Stranded
22 AWG	UL 1007-22	Solid
22 AWG	UL 1007-22 (7)	Stranded
24 AWG	UL 1007-24	Solid
24 AWG	UL 1007-24 (7)	Stranded

Figure 2

3.6. Wire Termination

After termination, wire shall meet the requirements specified in Figure 3.

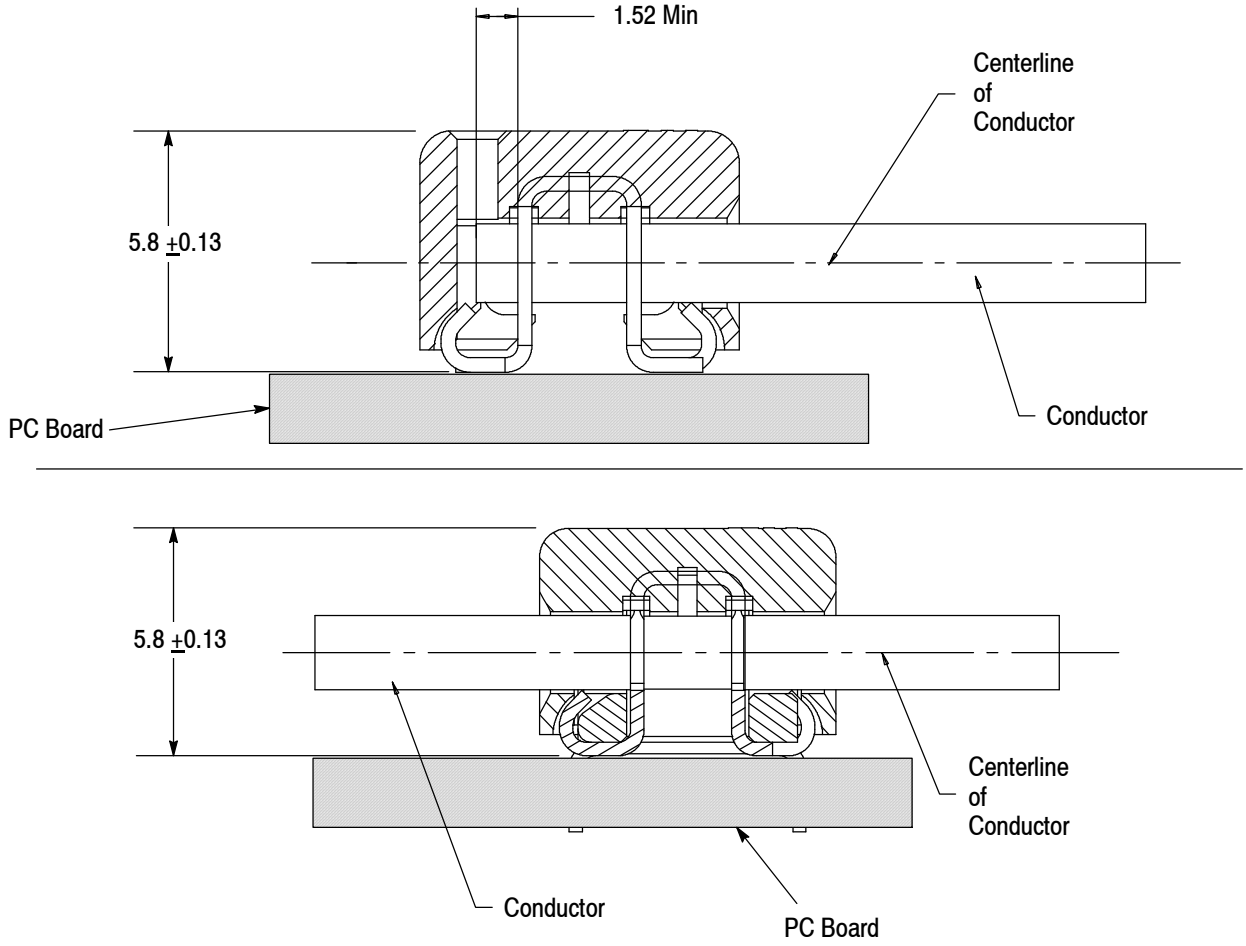


Figure 3

3.7. Contact Damage

There shall be no evidence of physical damage or distortion to any portion of the contact after wire termination.

3.8. Housing Damage

A. There shall be no cracks, breaks, or other visible damage to the housing due to wire termination.

B. Skiving of plastic on the inside wall of the housing cavity is permissible provided that conditions specified in Paragraph 3.8.A are met.

3.9. Broken Strands

There shall be no broken strands in the conductor after termination.

3.10. Exposed Conductor

Exposed conductors shall not exceed the limits specified in Figure 4 after termination.

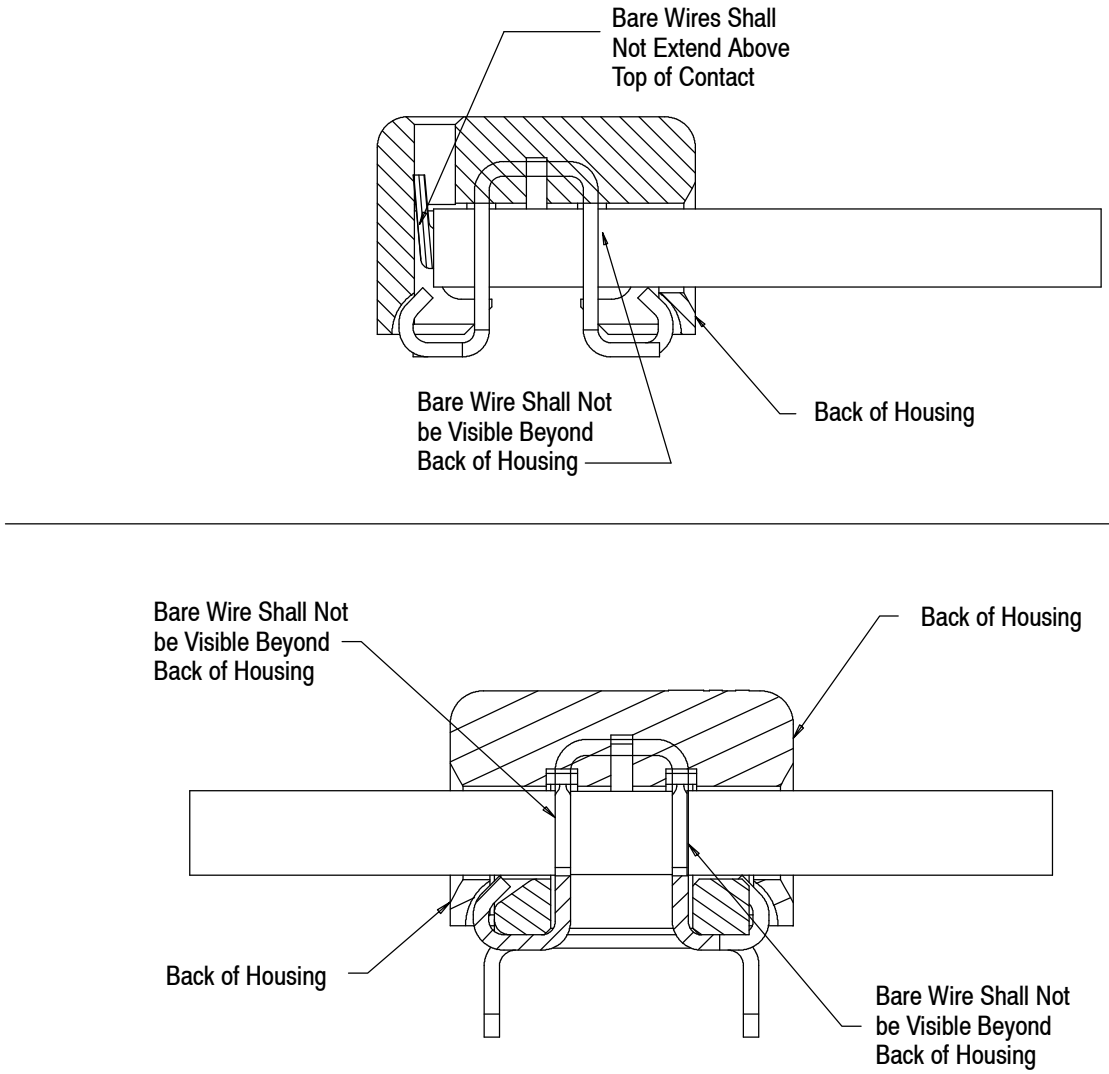


Figure 4

3.11. Conductor Insulation

Conductor insulation shall be contained within the confines of the insulation strain relief as shown in Figure 5.

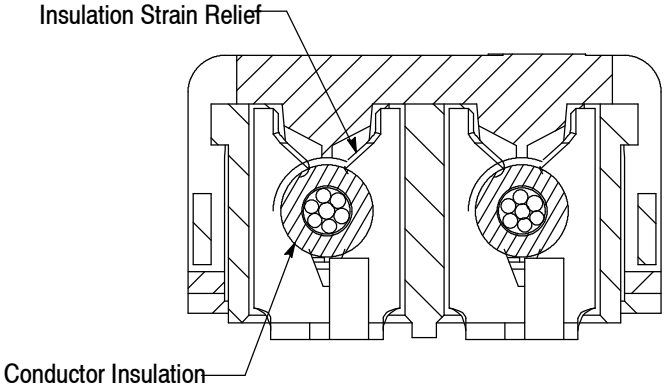


Figure 5

3.12. PC Board

A. Material and Thickness

Common pc board materials may be used such as glass epoxy (FR-4 or G-10), Aluminum-clad pc boards and flex circuits. The pc board thickness may vary to suit the end use thickness.

B. Tolerance

Maximum allowable bow of the pc board shall be 0.10 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.

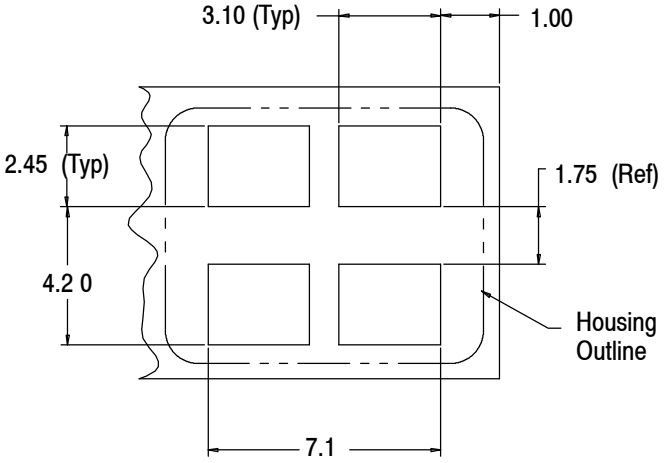
C. Pads

The pc board circuit pads must be solderable in accordance with Test Specification 109-11 (Test Method A, non-activated rosin flux).

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 6.

SMT PC Board Layout (Two-Position Shown)



Through-Hole PC Board Layout (Two-Position Shown)

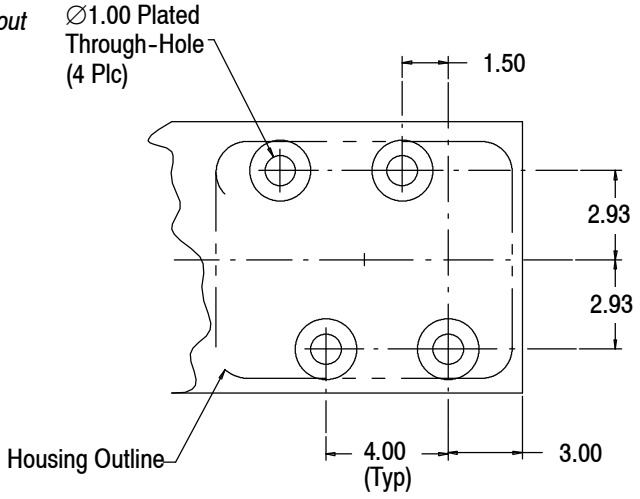
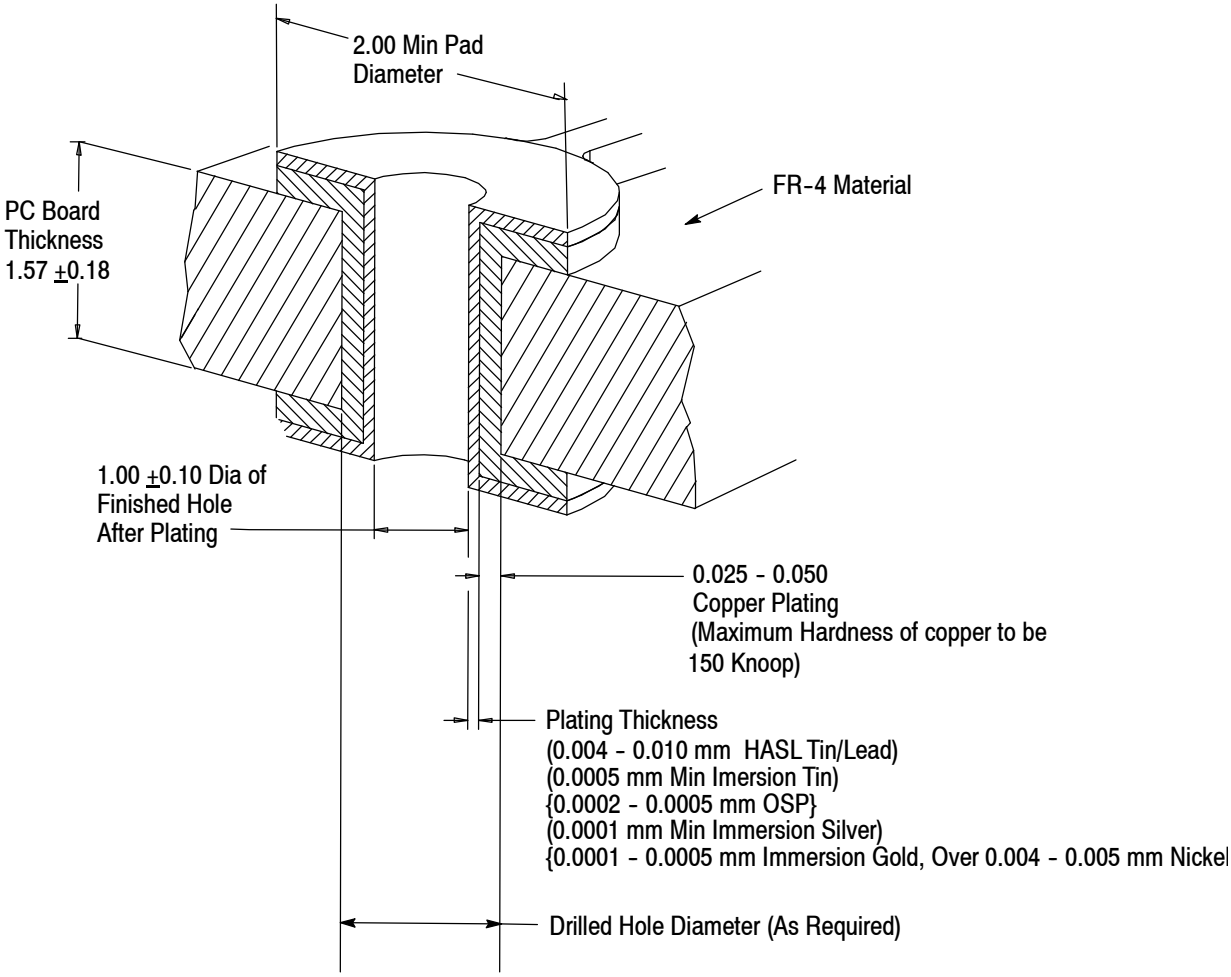


Figure 6

E. PC Board Hole Dimensions

The finished hole size for through-hole applications must meet the dimensional requirements provided in Figure 7.



NOTE: Other material and thickness of plating may be used on both RoHS compliance and connector vendor's agreement.

Figure 7

3.13. Spacing

The connector is able to be placed side-by-side on the pc board when the pad layout for the adjacent connectors are placed on 5.9 mm centers. See Figure 8.

CAUTION

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

NOTE

Two-position shown, one-position dimensions are the same.

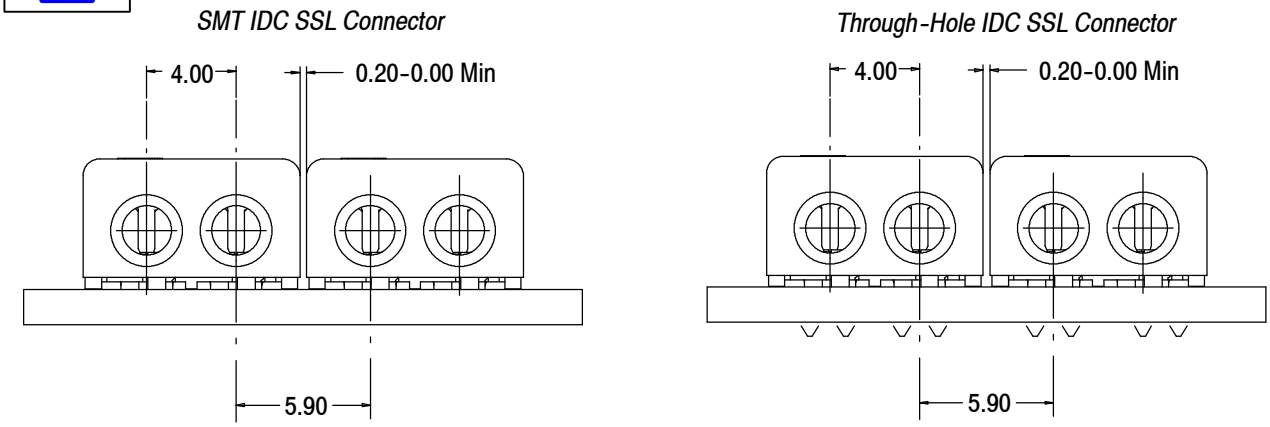


Figure 8

3.14. Connector Placement

A. SMT Connectors

This product is packaged in tape and reel packaging per EIA-481. Robotic/gripper placement requires total equipment accuracy of 0.13 mm to locate the connector for insertion. This includes gripper and fixture tolerances, as well as equipment repeatability. Insertion location will be programmed by a simple pantograph/template system or software package. Optimally, the contact solder tines should be centered on the pc board pads. However, slight misalignment is permissible for the performance classifications specified in Association of Connecting Electronics Industries (IPC)-S-815, “General Requirements for Soldering Electronic Interconnection.” See Figure 9.

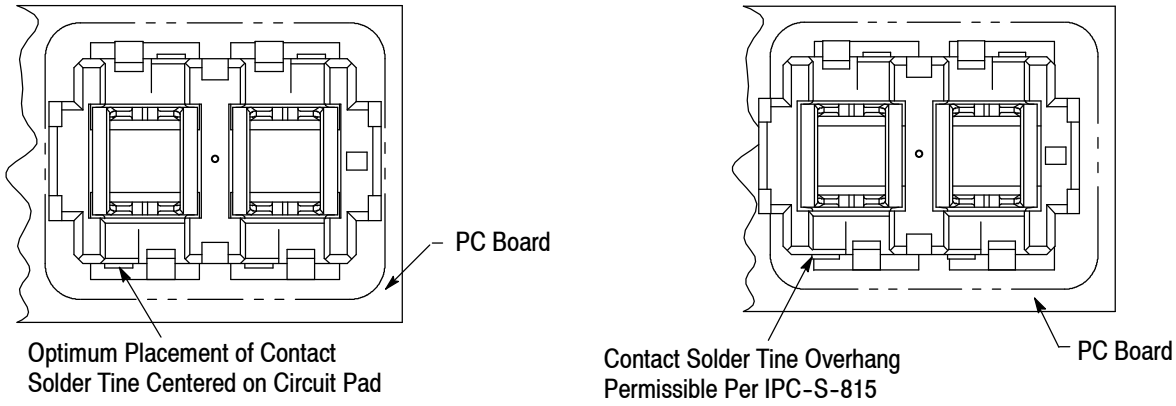


Figure 9

B. Through-Hole Connectors

When placing connectors on the pc board, the contacts must be aligned and started into the matching holes before seating the connector onto the pc board. After the connector is seated, the standoffs must be flush to the pc board. Refer to Figure 10.

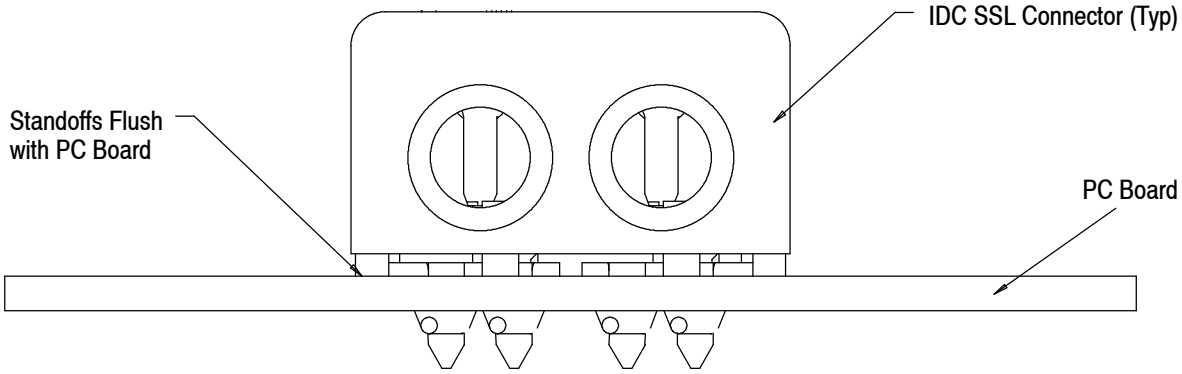


Figure 10

3.15. 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 101-21 and IPC-S-815.

A. 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 11.

FLUX TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			KESTER	ALPHA
Type RMA (Mildly Activated)	Mild	Noncorrosive	185/197	611

Figure 11

B. Connectors with SMT Contacts

1. Solderability

The pc board pads must be solderable in accordance with Test Specification 109-11 (Test Method A, non-activated rosin flux) and all other requirements for surface mount contacts specified in this document.

2. 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 5×10% cp (centipoise).
f. Minimum viscosity of stencil print shall be 7.5×10% cp (centipoise).

3. Solder Volume

NOTE

Solder paste volumes are required as follows (calculated per 90% solids content). Paste volume may vary depending on the composition.

Solder volume for each SMT IDC SSL Connector must be according to the following:

1.32 mm^3 per contact solder tine

KESTER and ALPHA are trademarks.

4. 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. See Figure 12.

NOTE

The stencil layouts illustrated apply to the top (connector) side (unless otherwise noted) of the pc board. For any other variations, refer to the pc board mounting configurations on the appropriate customer drawing to determine modifications necessary to the solder stencils in Figure 12.

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.

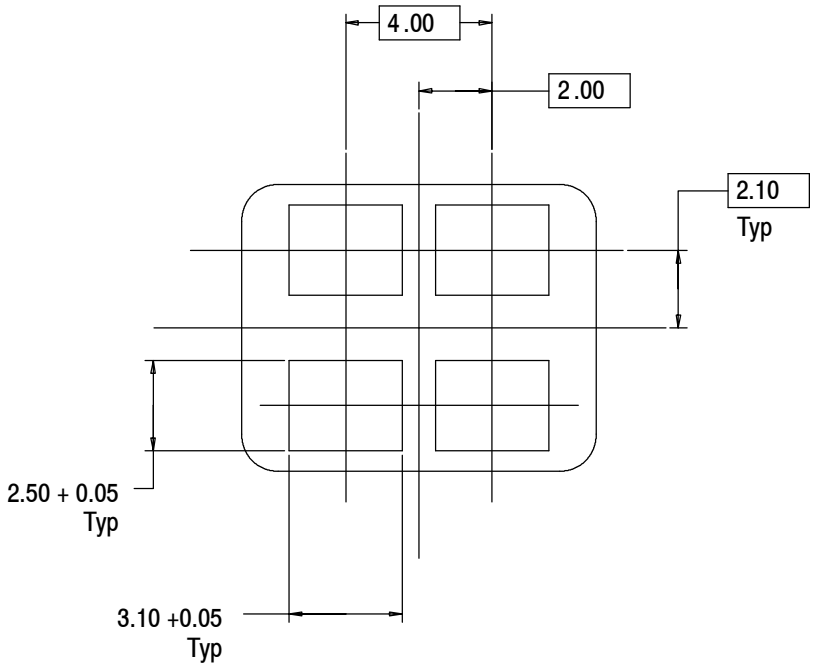


Figure 12

5. 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.

6. 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 13

The lead-free reflow profile is shown in Figure 14.

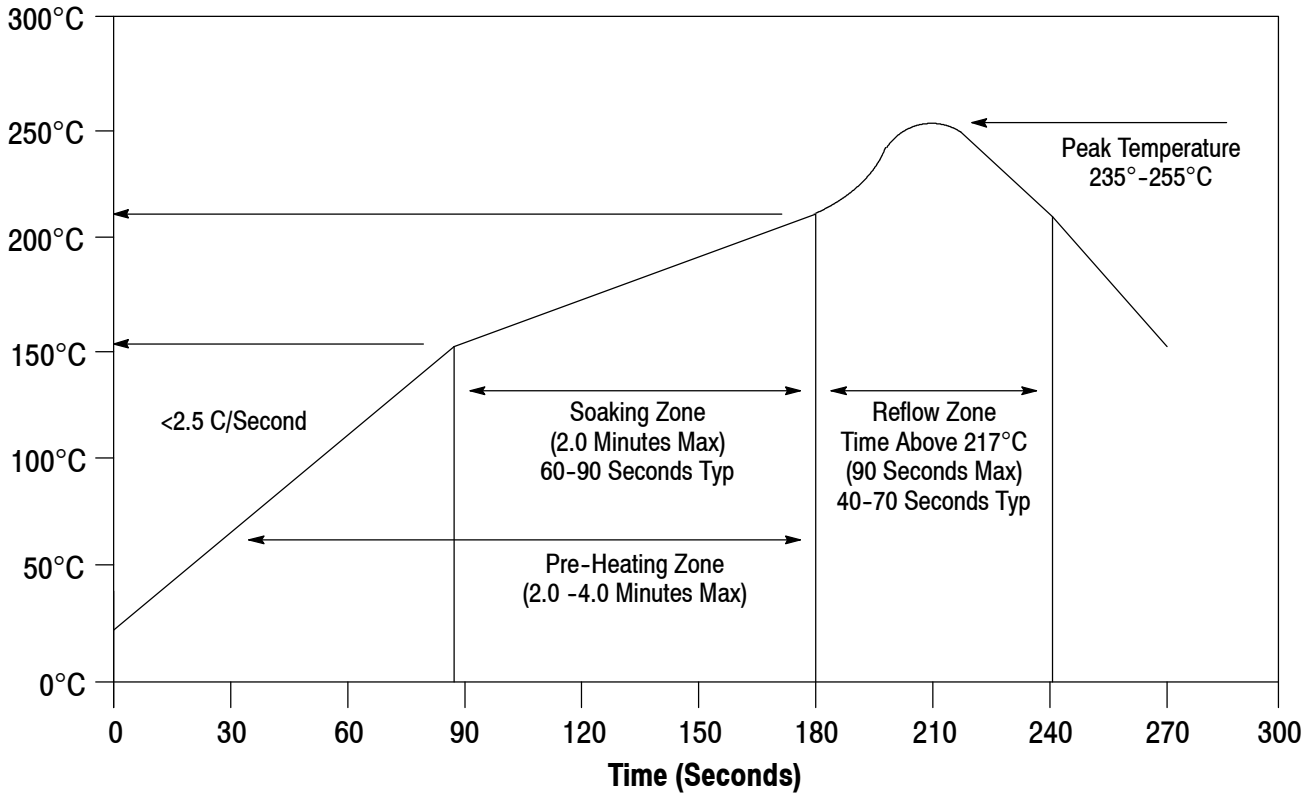


Figure 14

C. Connectors with Through-Hole Contacts

1. Solderability

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

2. Process

Connectors with through-hole contacts can be soldered using wave soldering or equivalent soldering techniques. It is recommended using lead-free or SN100C solder for these connectors. The temperature and exposure time shall be as specified in Figure 15.

SOLDERING PROCESS	TEMPERATURE (Max)	TIME (At Max Temperature)
Wave	260°C [500°F]	3 Seconds

Figure 15

D. 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 16.

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)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
Alpha 2110	Aqueous	1	132	270
Bioact EC-7	Solvent	5	100	212
Butyl Carbitol	Solvent	1	Ambient Room	
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
Terpene Solvent	Solvent	5	100	212

Alpha, Bioact, Carbitol, Kester, and Loncoterge are trademarks.

Figure 16

E. 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.

3.16. Checking Installed Connector

All solder joints should comply with TE Workmanship Specification 101-21. For typical fillets for surface mount and through-hole tine requirements, refer to Figure 17.

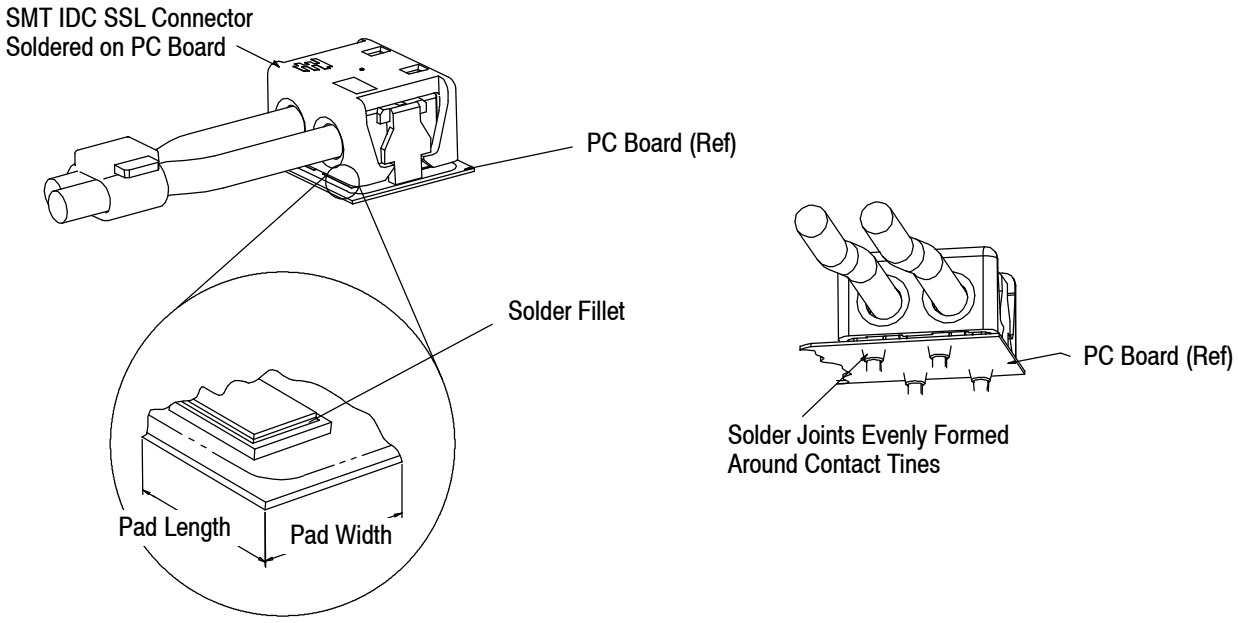


Figure 17

3.17. Replacement and Repair

The contacts and housings are not repairable. DO NOT use damaged or defective contacts or housings. DO NOT remove the wire and re-terminate contacts.

4. QUALIFICATIONS

IDC SSL Connectors are Component Recognized by Underwriters Laboratories Inc. (UL) in File E28476, Vol. 100, and have been Investigated to CSA International by UL.

5. TOOLING

5.1. Robotic Equipment

The robotic equipment must have a true position accuracy tolerance of 0.25 mm to properly locate the connectors. This includes gripper and fixture tolerances as well as equipment repeatability.

NOTE

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

5.2. PC Board Support

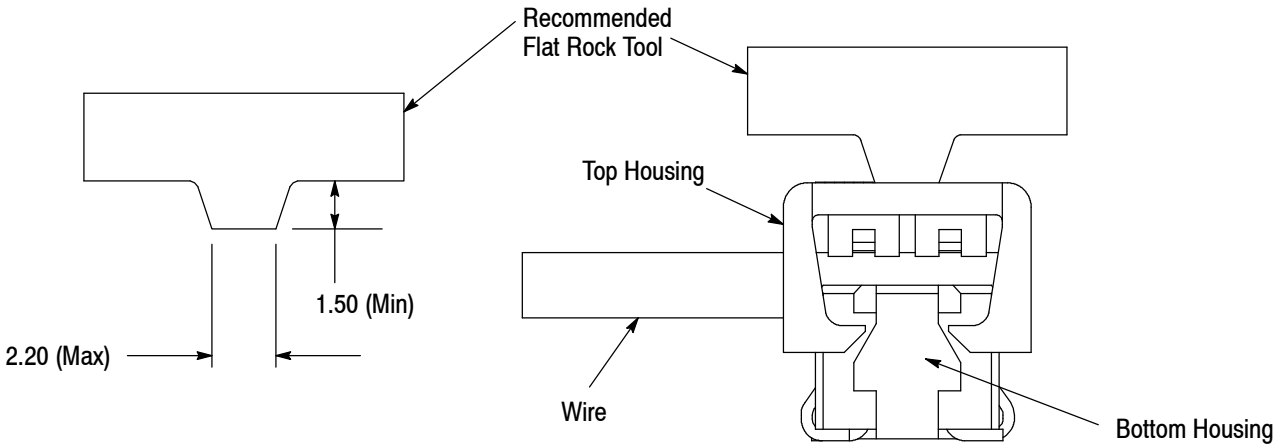
For automatic machine placement and wire termination, a pc board support must be used to prevent bowing of the pc board during the placement of connectors. It should have flat surfaces with holes or a channel large enough and deep enough to receive any protruding components. The pc board support must be customer made.

5.3. Wire Termination

The pc board should be supported on a flat surface. The termination force must be parallel to the pc board and applied on the top housing until it is fully seated in it's final stage. See Figure 18.

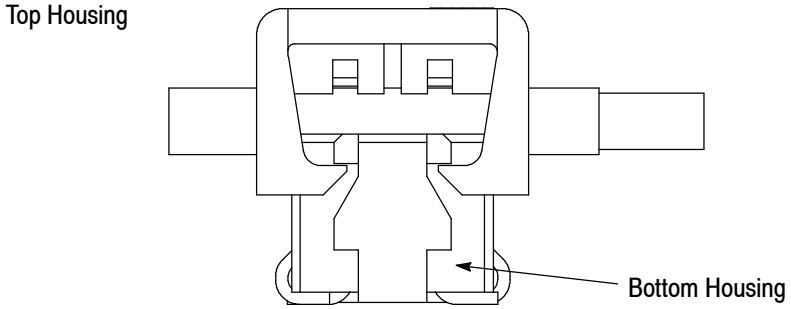
NOTE

The force required to terminate these connectors may not be applied by hand. The use of an Arbor Press is recommended for termination of these connectors. TE recommends a flat rock tool that concentrates the applied force to the center of the part, as shown in Figure 18.

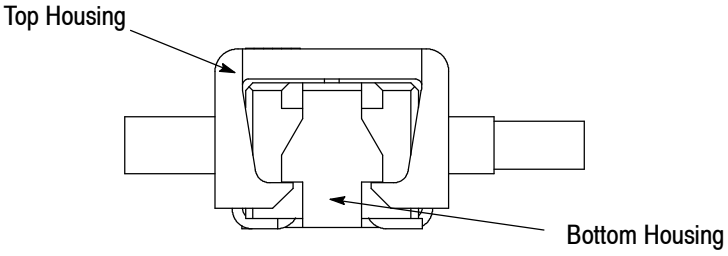


Initial - Pre-Stage
(Configuration of Connector Prior to Termination)

Wire Insertion Test



Initial-Pre Stage
(Configuration of Connector Prior to Termination)



Final-Terminated Position
(Configuration of Connector After Termination)

Figure 18

6. VISUAL AID

Figure 19 shows a typical application of IDC SSL Connectors. 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.

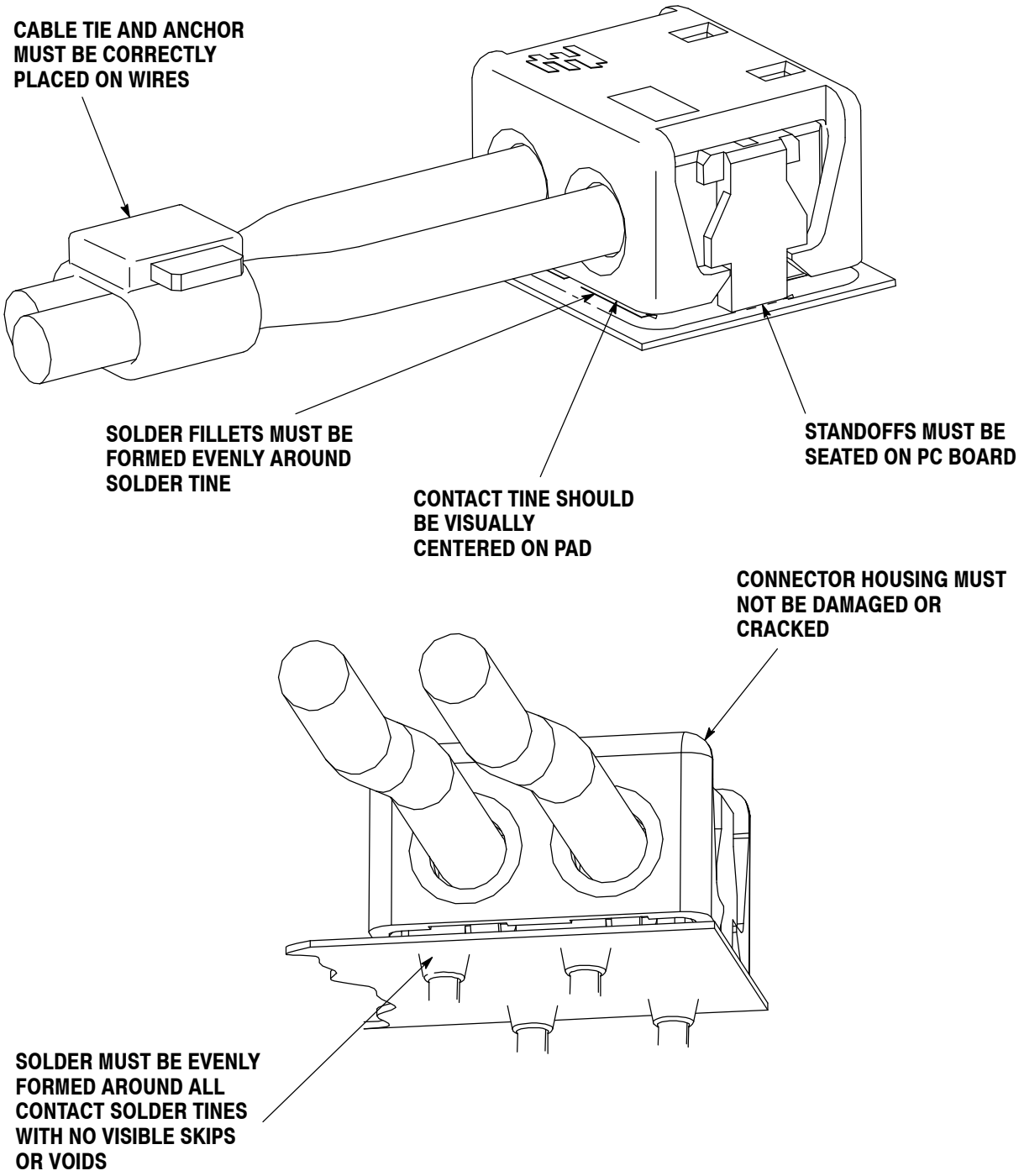


FIGURE 19. VISUAL AID