

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 [± 0.005] 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 the application of LPS (Low Profile System) Connectors using the design features of SMT (Surface Mount Technology) Printed Circuit (PC) Board Connectors and IDC (Insulation Displacement Contact) Connectors.

The SMT connectors have contacts with row-to-row spacing on 1.27 mm [.050 in.] or 2.00 mm [.079 in.] centers. These SMT Connectors are available in 2 to 40 positions based on receptacle selection. For other positions which may be available, contact the Product Information Center phone number listed at the bottom of this page. SMT Connectors are available in Ultra Low Profile (for top entry only) or standard Low Profile for bottom or top entry.

The IDC Pin Header Connectors are available in two contact lengths for use with 2 position receptacles; 1.98 mm [.078 in.] for the standard Low Profile receptacle top or bottom entry, and 2.54 mm [1.00 in.] for the Ultra Low Profile Receptacle top entry only. The receptacles and headers (excluding the IDC headers) are designed to be placed on the pc board by tape and reel for pick and placement using semi-automatic tooling. The IDC Connectors consist of a housing and two insulation displacement contacts. These connectors are designed to terminate 7-stranded 32 AWG wire with irradiated PVC insulation (UL 1571). The maximum insulation diameter is 0.56 mm [.022 in.]. The application to any other type of wire must first be tested and approved by Tyco Electronics. The wires are terminated using semi-automatic tooling. See Section 5, TOOLING.

When corresponding with Tyco Electronics Representatives, use the terminology provided in this specification to facilitate your inquiry for information. Basic terms and features are provided in Figures 1 and 2.

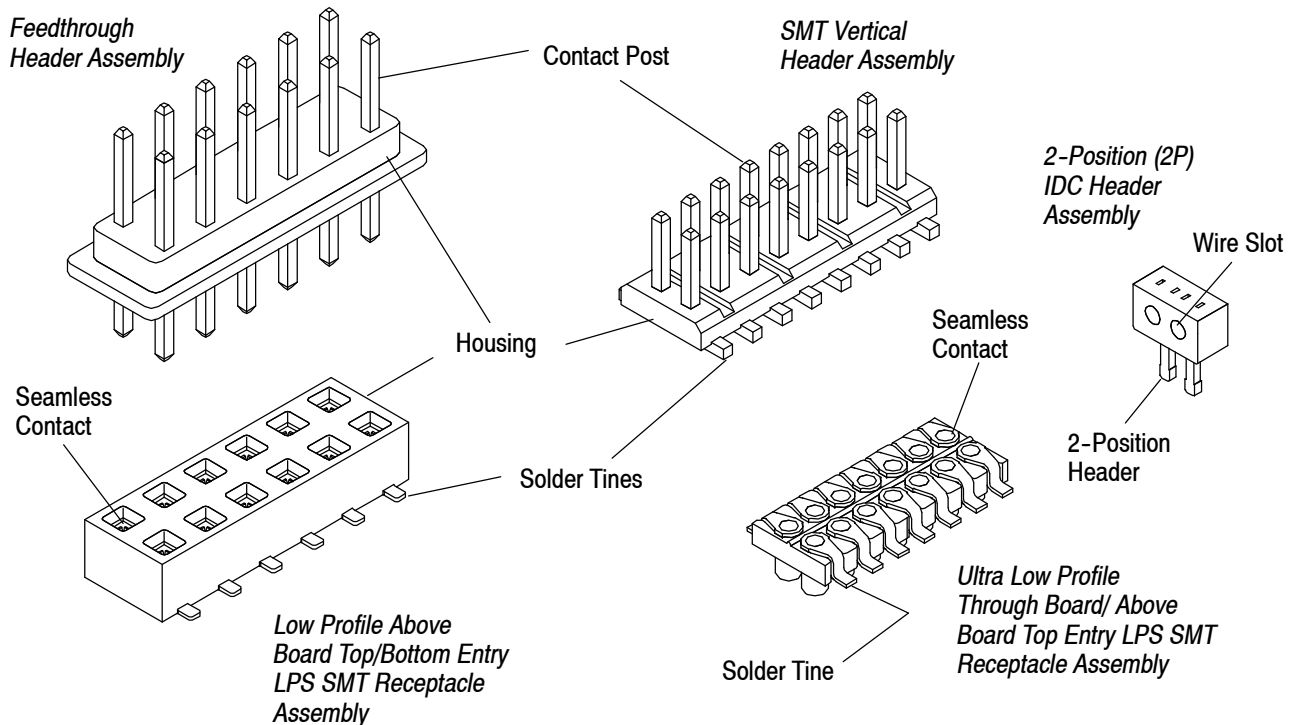


Figure 1

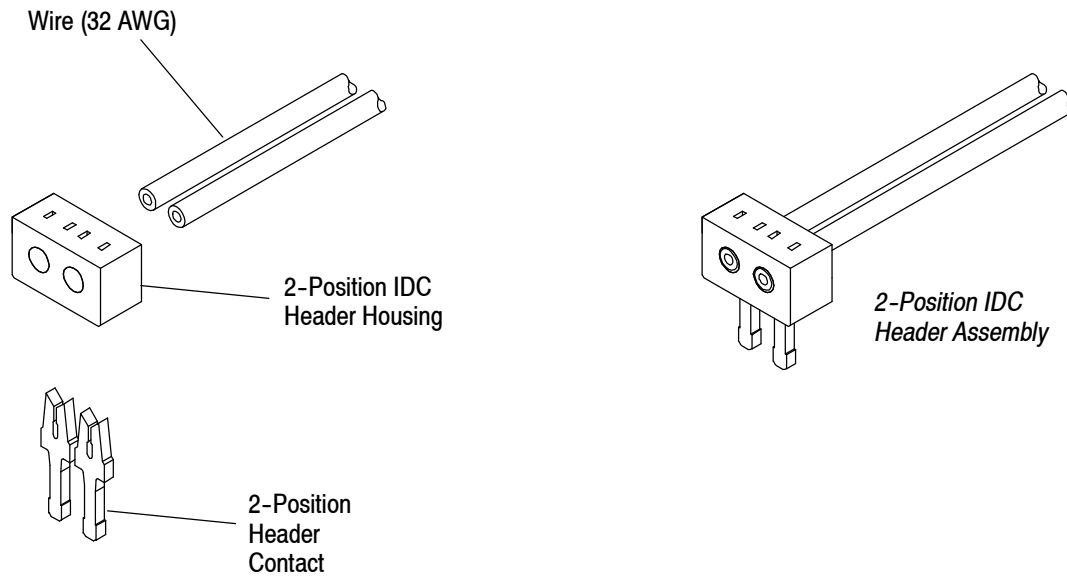


Figure 2

2. REFERENCE MATERIAL

2.1. Revision Summary

This paragraph is reserved for a revision summary covering the most recent additions and changes made to this specification.

- Updated document to corporate requirements
- New logo and format

2.2. Customer Assistance

Reference Part Number 560642 and Product Code 3110 are representative numbers of LPS (Low Profile System) 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 Tyco Electronics Representative or, after purchase, by calling the Tooling Assistance Center or Product Information number at the bottom of page 1.

2.3. Drawings

Customer Drawings for specific products are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any other technical documentation supplied by Tyco Electronics.

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

A. Product Specifications

Product Specification 108-1451 covers test and performance requirements for the LPS (Low Profile System) Connectors.

B. Test Specification

Test Specification 501-264 covers suggested test and evaluation methods.

C. Workmanship Specification

Workmanship Specification 101-21 provides solder joint requirements approved by Development Engineering Managers Organization subcommittee for Surface Mount Technology.

D. Commercial Specification

IPC specification AJ-820 8.1.5 provides solder joint requirements approved by The Institute for Interconnecting and Packaging Electronic Circuits (IPC).

2.6. Instruction Material

Customer Manual 409-5857 provides information on setup and operation, as well as maintenance and repair, of 2P Header Bench Assembly Machine 122276-1 and 122276-2.

3. REQUIREMENTS

3.1. Material

With the exception of the unfilled clear nylon IDC header housings, the SMT receptacle housings are made of glass-filled, high-temperature thermoplastic. The IDC contacts are phosphor bronze, nickel underplated, with gold plated contact mating posts. The wire displacement area of the contact is tin-lead plated. The receptacle contacts in the pre-assembled SMT connectors are beryllium copper, nickel, palladium nickel underplated, with gold flash.

3.2. Storage

Connectors are packaged and shipped in various trays, reels, and tube containers. To prevent damage to the housings and contacts, the connectors should remain in the container until ready for installation. Also, to prevent possible storage contamination and ensure maximum solderability for the connectors, the connectors should be used on a first in, first out basis.

3.3. Printed Circuit Boards for SMT Connectors

A. Tolerance

At the time of connector placement, the coplanarity of the pad pattern must be held to 0.05 mm [.002 in.] maximum. We recommend a solder mask to minimize solder bridging between pads. The mask must not exceed the height of the pad by more than 0.05 mm [.002 in.].



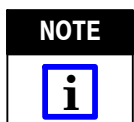
Since the connector housings may rest on top of the solder mask, an excessively high mask will allow too much space between the solder tin and pad for a good solder joint. A solder joint under these conditions would be weak, and would not provide long term performance for the connector.

B. Material

The pc board material shall be glass epoxy and should be 0.43 [.017] minimum thick to insure proper performance of through-board receptacle. Consult the Product Information number listed at the bottom of page 1 for suitability of other materials, or other board thicknesses. A solder mask is recommended when soldering SMT connectors. Those most suitable are Liquid Photo Imageable and Dry Film.

C. PC Board Layout

Recommended pc board patterns are provided in Figures 3 through 9.



All pc board dimensions are ± 0.03 mm [.001 in.] unless otherwise specified.

PC BOARD LAYOUT FOR 1.27 [.050] ULTRA LOW PROFILE SMT RECEPTACLE INTO BOARD TOP ENTRY CONNECTORS

POS.	"B"	"C"	POS.	"B"	"C"
4	1	1.27 [.050]	20	9	11.43 [.450]
10	4	5.08 [.200]	22	10	12.70 [.500]
12	5	6.35 [.250]	24	11	13.97 [.550]
14	6	7.62 [.300]	30	14	17.78 [.700]
16	7	8.89 [.350]	40	19	24.13 [.950]
18	8	10.16 [.400]			

NOTE: Customers must establish their own datum reference dimensions.

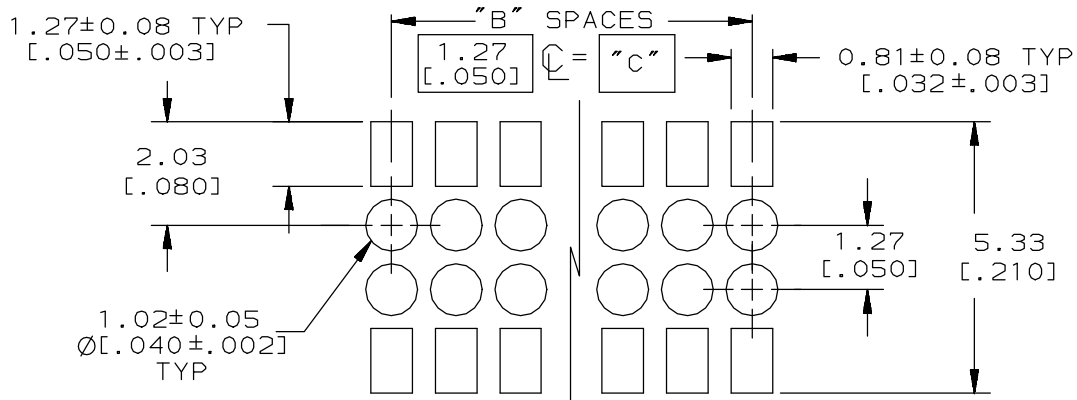


Figure 3

PC BOARD LAYOUT FOR 1.27 [.050] STANDARD LOW PROFILE SMT RECEPTACLE ABOVE BOARD TOP/BOTTOM ENTRY CONNECTORS

POS.	"B"	"C"	POS.	"B"	"C"
2	0	N/A	20	9	11.43 [.450]
4	1	1.27 [.050]	22	10	12.70 [.500]
10	4	5.08 [.200]	24	11	13.97 [.550]
12	5	6.35 [.250]	26	12	15.24 [.600]
14	6	7.62 [.300]	28	13	16.51 [.650]
16	7	8.89 [.350]	30	14	17.78 [.700]
18	8	10.16 [.400]	50	24	24.13 [.950]

NOTE: Customers must establish their own datum reference dimensions.

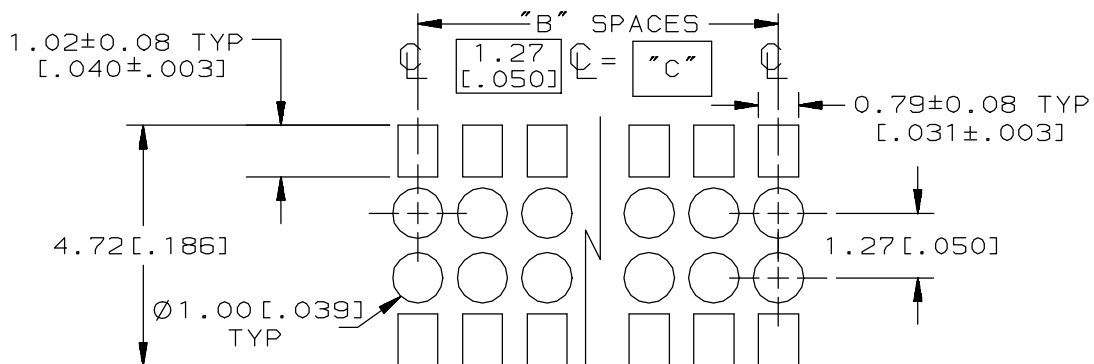


Figure 4

PC BOARD LAYOUT FOR 2.00 [.079] ULTRA LOW PROFILE SMT RECEPTACLE INTO BOARD TOP ENTRY CONNECTORS

POS.	"B"	"C"	POS.	"B"	"C"
4	1	2.00 [.079]	18	8	16.00 [.630]
12	5	10.00 [.394]	20	9	18.00 [.709]
14	6	12.00 [.472]	24	11	22.00 [.866]
16	7	14.00 [.551]			

NOTE: Customers must establish their own datum reference dimensions.

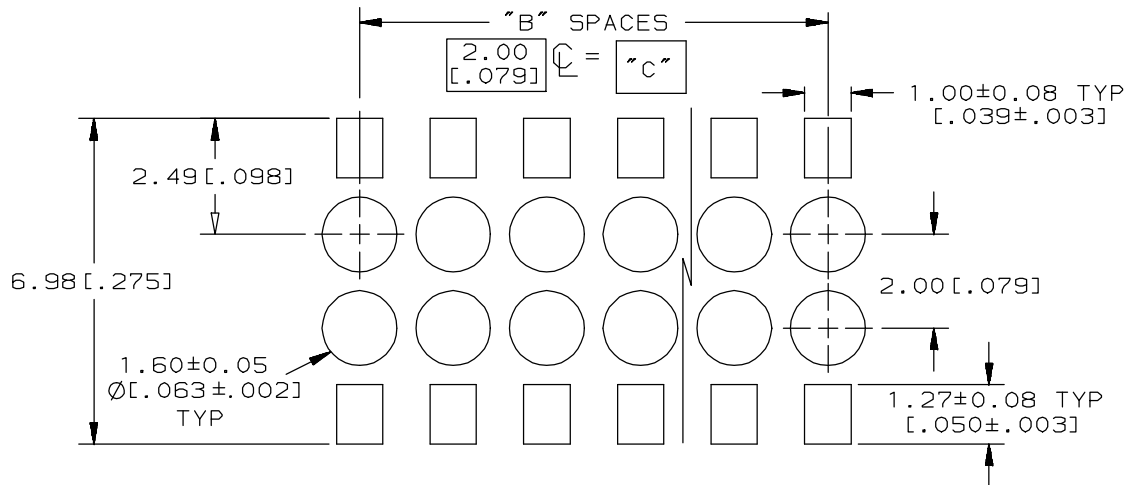


Figure 5

PC BOARD LAYOUT FOR 2.00 [.079] STANDARD LOW PROFILE SMT RECEPTACLE ABOVE BOARD TOP/BOTTOM ENTRY CONNECTORS

POS.	"B"	"C"	POS.	"B"	"C"
4	1	2.00 [.079]	18	8	16.00 [.630]
12	5	10.00 [.394]	20	9	18.00 [.709]
14	6	12.00 [.472]	24	11	22.00 [.866]
16	7	14.00 [.551]	28	13	24.00 [.945]

NOTE: Customers must establish their own datum reference dimensions.

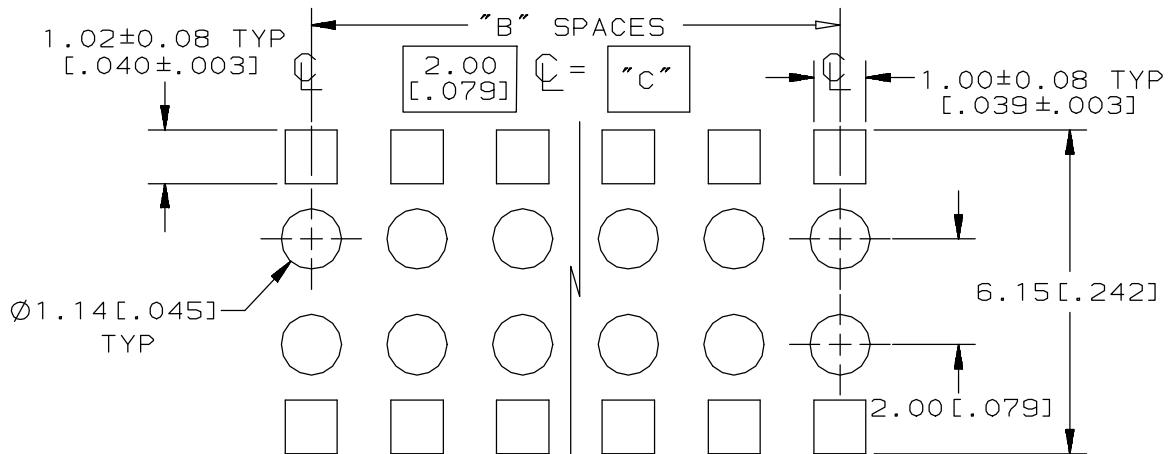


Figure 6

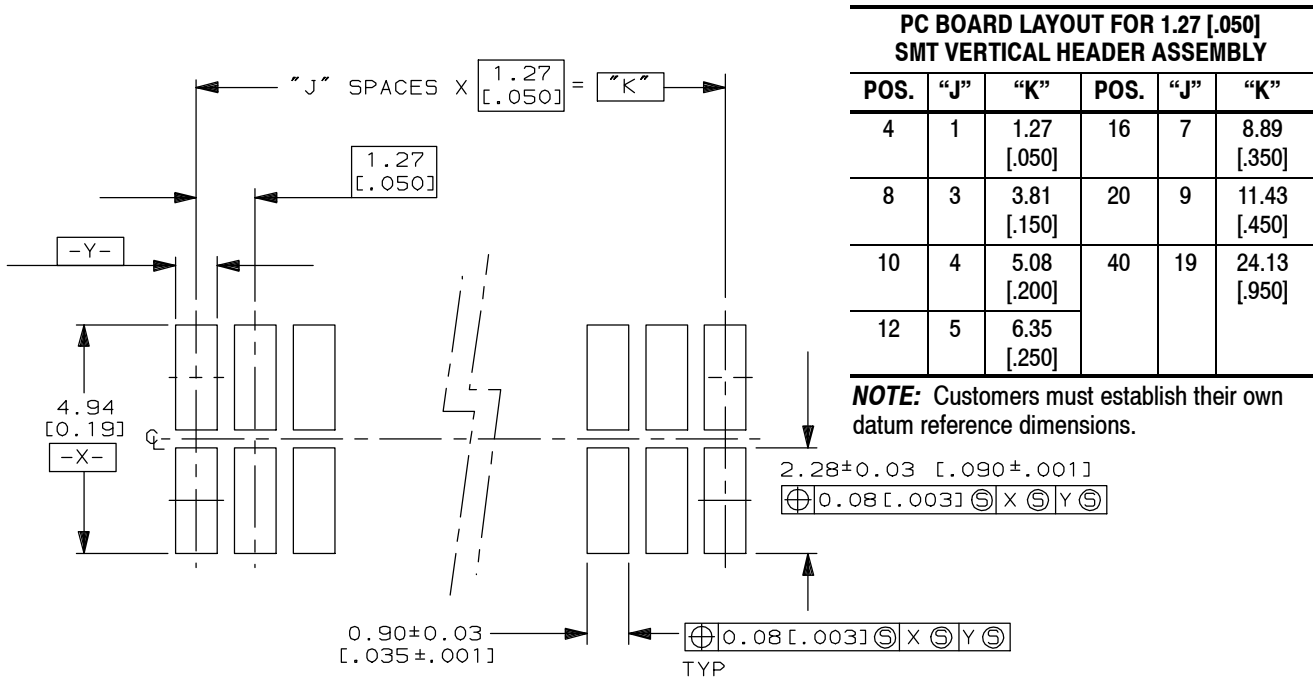
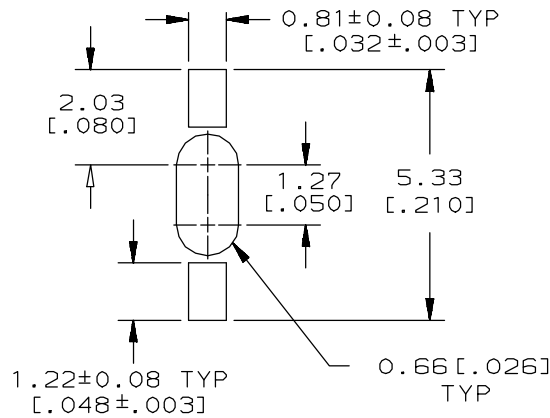


Figure 7

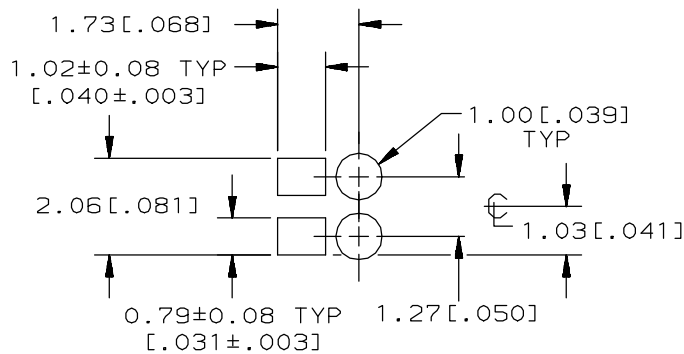
**2 POSITION
1.27 [.050]
ULTRA LOW PROFILE
SMT RECEPTACLE
INTO BOARD TOP ENTRY
PC BOARD LAYOUT**



NOTE: Customers must establish their own datum reference dimensions.

Figure 8

**2 POSITION
1.27 [.050]
STANDARD LOW PROFILE
SMT RECEPTACLE
ABOVE BOARD
TOP/BOTTOM ENTRY
PC BOARD LAYOUT**



NOTE: Customers must establish their own datum reference dimensions.

Figure 9

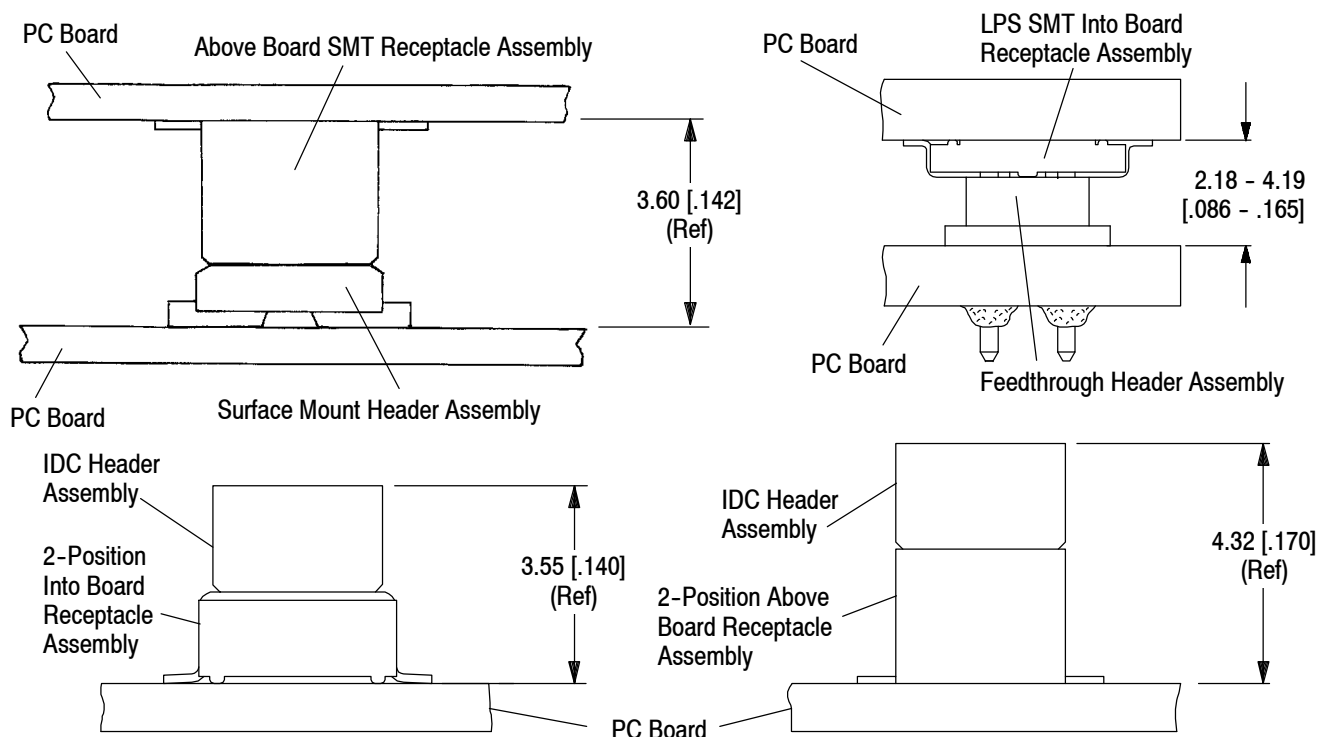


Figure 10

3.4. Spacing

Board-to-board stacking dimensions for the header configurations are provided in Figure 10.

3.5. Processing

The pc board pads must be solderable in accordance with Test Specification 109-11-1.

A. Typical Solder Paste Characteristics

1. Alloy type shall be either 63 Sn/37 Pb or 60 Sn/40 Pb.
2. Flux shall be RMA type.
3. Solids by weight shall be 85% minimum.
4. Mesh designation -200 to +325 (74 to 44 square micron openings, respectively).
5. Minimum viscosity of screen print shall be 5×10^5 cp (centipoise).
6. Minimum viscosity of stencil print shall be 7.5×10^5 cp (centipoise).

B. Solder Volume

Solder volume can be obtained by multiplying (stencil thickness X "A" dimension X "B" dimension). See Figure 11.

NOTE

Solder volume may vary depending on solder paste composition.



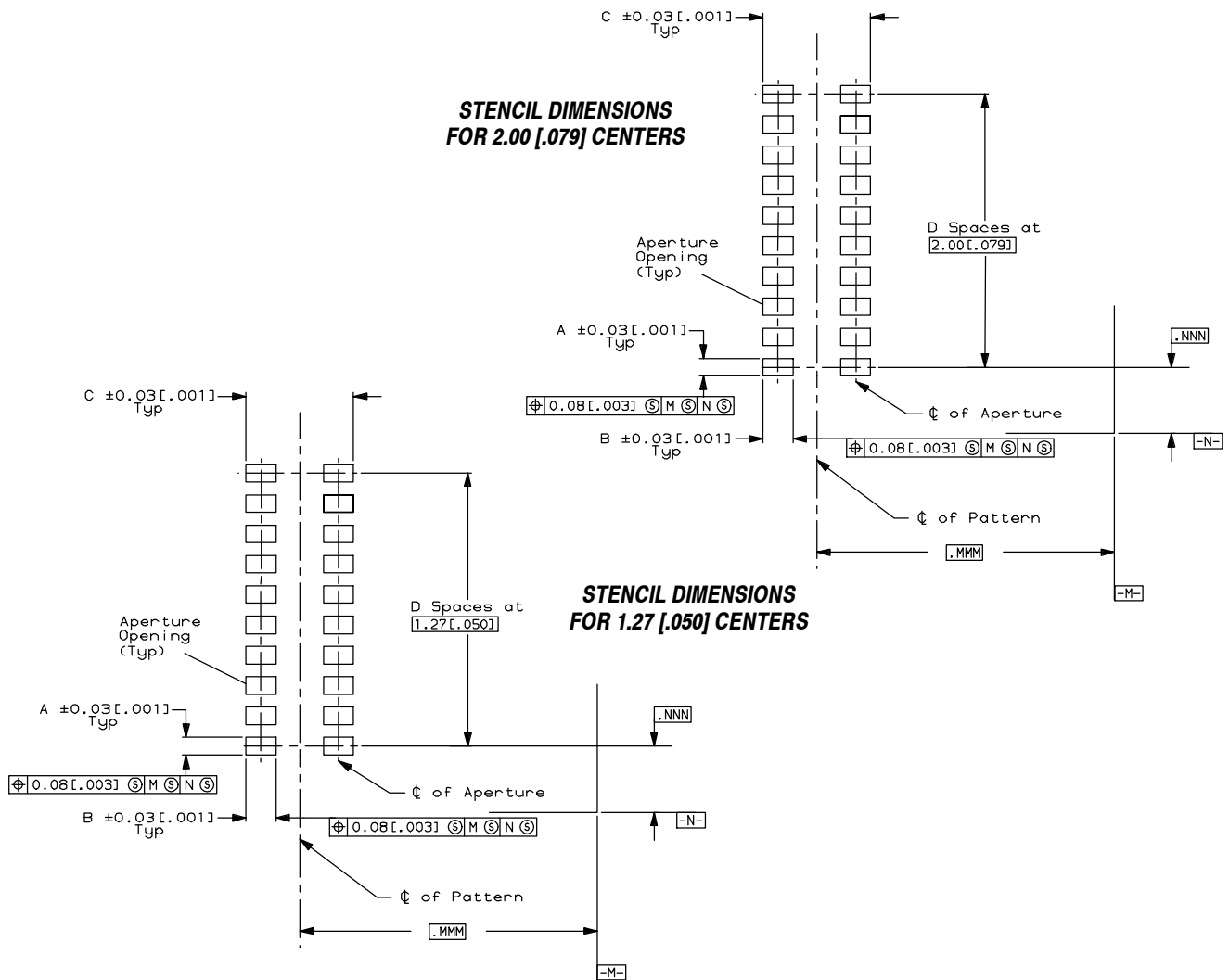
C. Stencil

Stencil aperture will be determined by the thickness of the stencil being used. Generally, the thinner stencils will have a larger aperture to maintain a given volume of solder paste. Solder deposition should be within the pad area of the solder tines. Typical aperture openings are provided in Figure 11.

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.



RECEPTACLE TYPE	NOMINAL PAD SIZE	STENCIL THICKNESS	PAD APERTURE DIMENSIONS		PATTERN DIMENSIONS	
			"A" WIDTH	"B" LENGTH	"C" WIDTH	"D" SPACES
STENCIL DIMENSIONS FOR 2.00 [.079] CENTERS						
INTO BOARD	1.00 x 1.27 [.039 x .050]	0.15 [.006]	0.64 [.025]	0.76 [.030]	6.48 [.255]	4-28
		0.20 [.008]	0.56 [.022]	0.64 [.025]		
ABOVE BOARD	1.00 x 1.02 [.039 x .040]	0.15 [.006]	0.28 [.011]	0.30 [.012]	5.33 [.210]	
		0.20 [.008]	0.25 [.010]	0.25 [.010]		
STENCIL DIMENSIONS FOR 1.27 [.050] CENTERS						
INTO BOARD	0.81 x 1.22 [.032 x .048] (2 Position Only)	0.15 [.006]	0.64 [.025]	0.76 [.030]	4.83 [.190]	2
		0.20 [.008]	0.56 [.022]	0.64 [.025]		
	0.81 x 1.27 [.032 x .050]	0.15 [.006]	0.64 [.025]	0.76 [.030]	4.83 [.190]	4-40
		0.20 [.008]	0.56 [.022]	0.64 [.025]		
ABOVE BOARD	0.79 x 1.02 [.031 x .040]	0.15 [.006]	0.38 [.015]	0.41 [.016]	4.52 [.178]	2-50
		0.20 [.008]	0.30 [.012]	0.38 [.015]		
	0.89 x 2.29 [.035 x .090] (SMT Header)	0.15 [.006]	0.81 [.032]	1.90 [.075]	4.47 [.176]	4-40
		0.20 [.008]	0.81 [.032]	1.42 [.056]		

Figure 11

D. Solder Screen

Generally, we do not recommend screen application of solder paste because of the limited volume of paste that can be deposited. If a screen application is required, we recommend removal of all screen from the solder tine and hold-down pad areas. Consult your supplier for compatibility of screen and paste, and for application techniques.

E. 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. Additionally, there should be solder mask covering any traces in the area of the hold-down solder deposit. Liquid photo imageable or dry film solder masks are recommended.

F. Connector Placement

Placement of the headers on the pc board is straightforward. To avoid damage, the connectors are to be used directly from the shipping package into the feeder device and picked up with the tool as described in the instructions packaged with the tool. The tool is used to position and seat connectors to minimize the possibilities of damage that could result from improper handling.

NOTE



Optimally, the connector solder tines should be aligned on the pc board pads. However, mis-registration is permissible for certain performance classifications as specified in IPC-S-815. See Figure 12.

CAUTION



Connectors should be handled only by the ends. DO NOT touch the solder tines, as moisture from the hands will contaminate the soldering process.

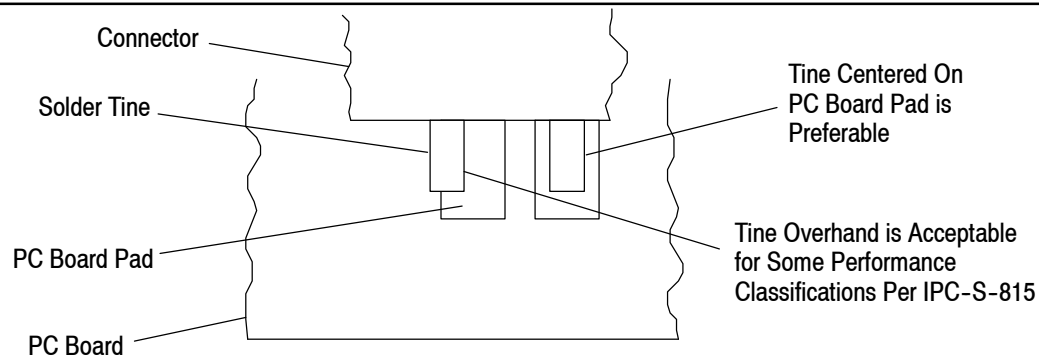


Figure 12

G. Solder

1. Techniques

It is recommended that the connector be soldered using vapor phase (VPR), double sided non-focused infrared (IR), or equivalent soldering technique. We qualify connectors using a Corpane Batch Vapor Phase (Model VVP 10 BU) and Vitronics IR (Model SMD 718) equipment.

2. Connector Capacity

The connectors will withstand temperatures of 215°C [419°F] for a maximum of three minutes. Higher temperatures can be withstood for short periods of time as indicated in Figure 13 for the IR reflow.

3. Reflow Parameters

For reference purposes only, see recommendations provided in Figure 13, for typical reflow parameters. Due to the many variables involved with the reflow process (ie, component density, orientation, etc), we recommend that the user conduct trial runs under actual manufacturing conditions to ensure product and process compatibility.

VPR: Primary vapor temperature 215°C [419°F]
 Preheat time 30 seconds (in secondary vapor)
 Dwell time 60 seconds (in primary vapor)
 Cool down time 30 seconds (in secondary vapor)

IR: Conveyor speed 635 [25], or 381 [15] per minute for bigger boards

PREHEAT 350°C [662°F]	ZONE 1	ZONE 2	ZONE 3
Top Heater	240°C [464°F]	260°C [500°F]	265°C [509°F]
Bottom Heater	240°C [464°F]	260°C [500°F]	265°C [509°F]

Figure 13

H. Cleaning

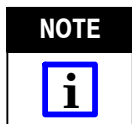
Removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder paste and flux for recommended cleaning solvents. The following is a listing of common cleaning solvents that will not affect the header connectors. The connectors will be unaffected by any of these solvents for 5 minutes at 105°C [221°F]. See Figure 14.

CLEANER		TIME (Minutes)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
ALPHA 2110	Aqueous	1	132	270
BIOACT EC-7	Solvent	5	100	212
CARBITOL	Solvent	1	Room Ambience	
Isopropyl Alcohol	Solvent	5	100	212
KESTER 5778	Aqueous	5	100	212
KESTER 5779	Aqueous	5	100	212
LONCO 520	Aqueous	5	100	212
LONCO 530	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

Figure 14



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, Tyco Electronics 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.



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

I. Checking Installed Connector

All solder joints should conform to those specified in Workmanship Specification 101-21. The housing must seat on the pc board to within the tolerance of 0.10 mm [.004 in.]. See Figure 15.

3.6. Inspecting Terminated IDC Connectors

External and internal inspections can be made on terminated connectors. All terminated connectors can be inspected externally. Internal inspections should be made during setup and periodically to assure be sure the connectors are being properly applied. Connectors used for internal inspection must be discarded after inspection. See Figure 16.

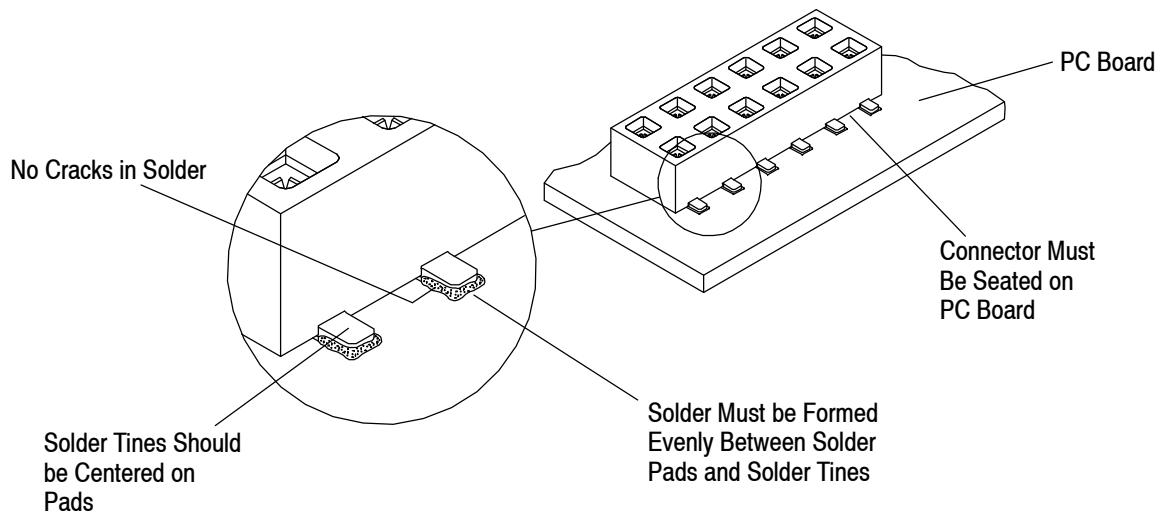


Figure 15

A. External

1. Check the terminated connector for electrical continuity.
2. The wire must protrude through the contact.
3. The burr must be no longer than the dimensions shown.

B. Internal

1. Check that each wire is inserted to the dimensional requirements shown.
2. Make sure that all contacts have penetrated the housing and that none are bent or deformed.
3. Make sure the conductors and contacts are placed in accordance with the requirements shown.

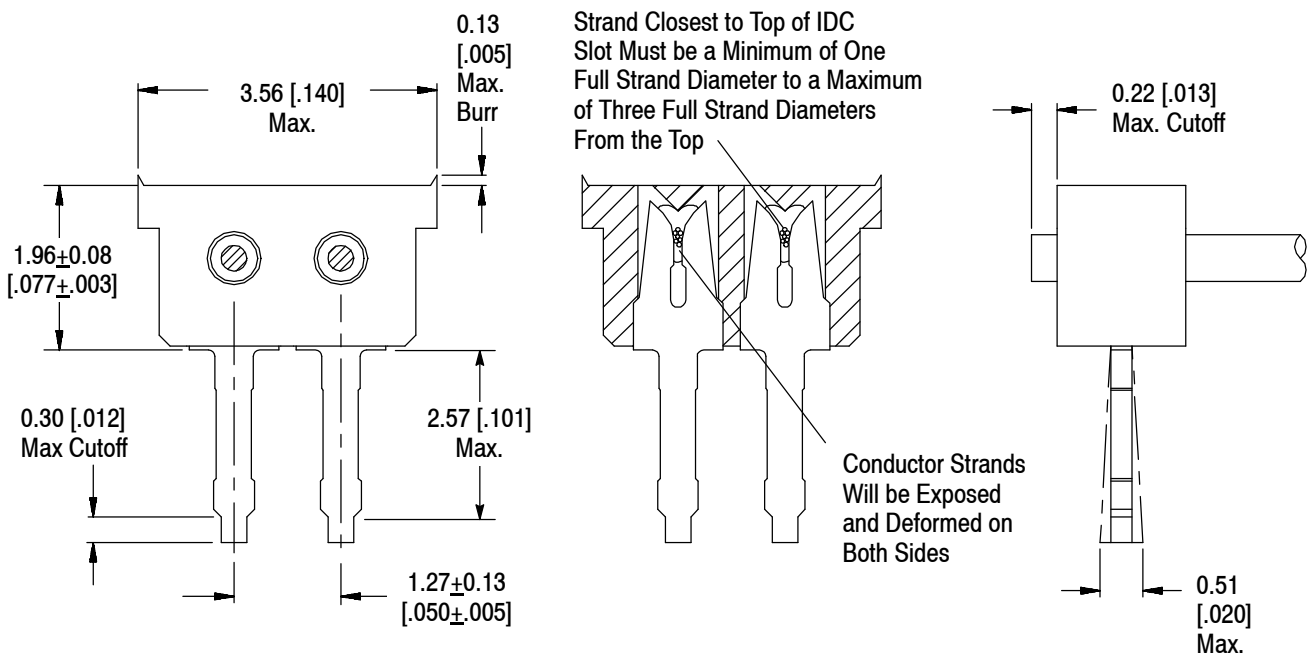


Figure 16

3.7. Mating and Unmating



The use of uneven or off-angle forces during mating and unmating of the connectors could cause over-stress and damage to the contacts and/or housings. Do not use the "peel-back" method of unmating one end and pulling it until the other end is unmated. Also, do NOT use a severe side-to-side rocking motion to unmate connectors.

Miniaturization is a design feature of these connectors and the systems in which they are used. Component density, connector location, and pc board size may make it difficult to hold one connector in place while extracting the other. The recommended method is to construct a tool for your system design that will produce a straight-away separation of the connectors.

4. QUALIFICATIONS

The LPS (Low Profile System) Connectors are not required to be agency approved.

5. TOOLING

IDC contacts can be terminated to wire using semi-automatic crimping tools. Recommended tooling is shown in Figure 17.

The 2P Header Bench Assembly is a semi-automatic machine used to assemble headers consisting of a header housing, a pair of contacts, and a pair of wires. This machine is designed to be placed on a work bench for operation.

*2P Header Bench
Assembly Machine 122276-[]
(Customer Manual 409-5857)*

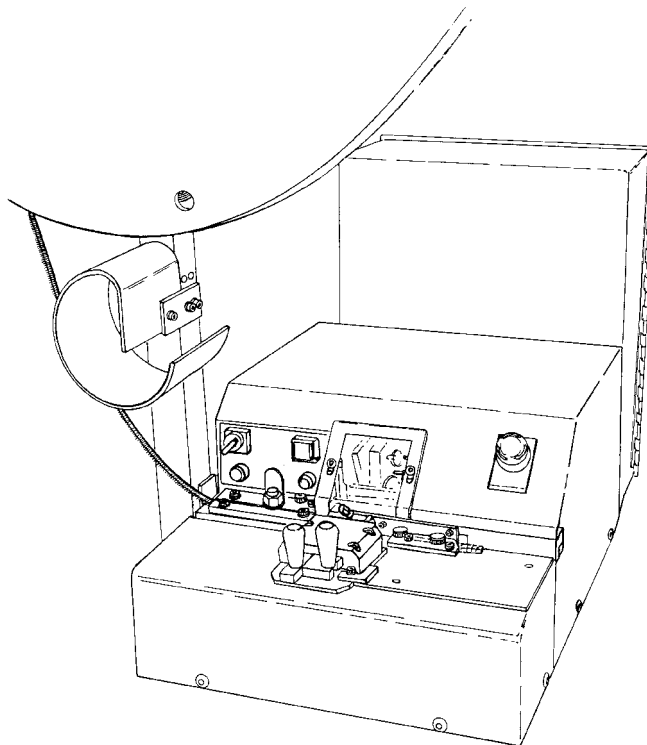


Figure 17

6. VISUAL AID

Figure 18 shows a typical application of the LPS 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.

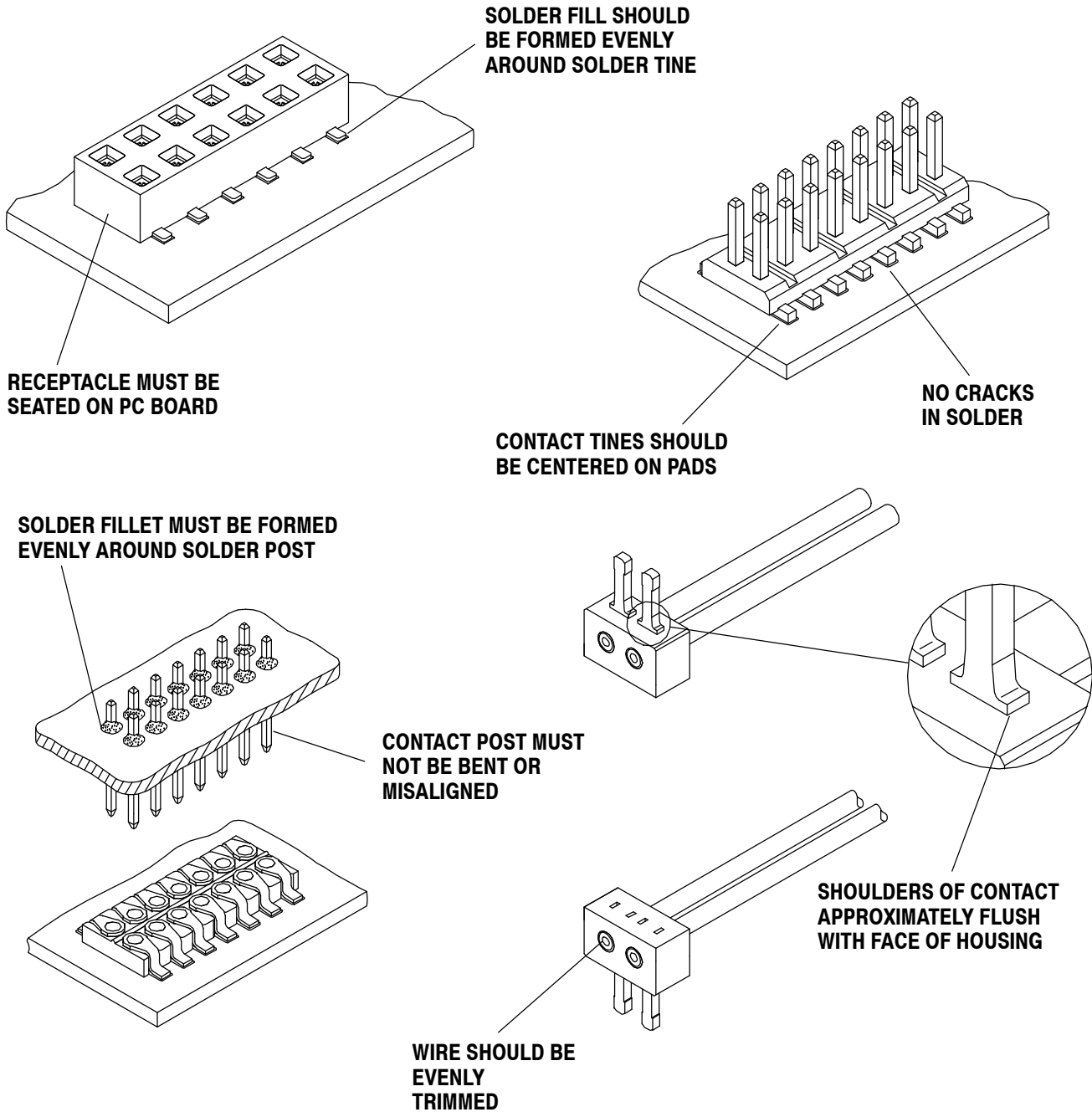


FIGURE 18. VISUAL AID