

### 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  $\pm 0.13$  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 CHAMP 0.8 mm Cable and PC Board Connectors. These connectors are available in shielded, cable mounted and right-angle pc board plugs and receptacles. Refer to Figure 1.

The cable mounted plug connectors are designed for discrete round wire applications. These connectors are available in sizes 36, 50, and 68 positions. A typical cable connector consists of a plastic housing with pre-installed insulation displacement contacts (IDC), front metal shell, and two termination covers. The cable connectors are used with backshell kits. A typical backshell kit contains two hermaphroditic metal backshells, two hermaphroditic plastic backshell covers, and either two spring latches or two jackscrews. These connectors will mate with compatible pc board receptacle connectors.

The right-angle pc board connectors are designed in true surface mount, true through-hole, and hybrid surface mount/through-hole configurations. These connectors are also available with vertical mount and straddle mount design with true surface mount lead configurations. All versions are surface mount soldering compatible.

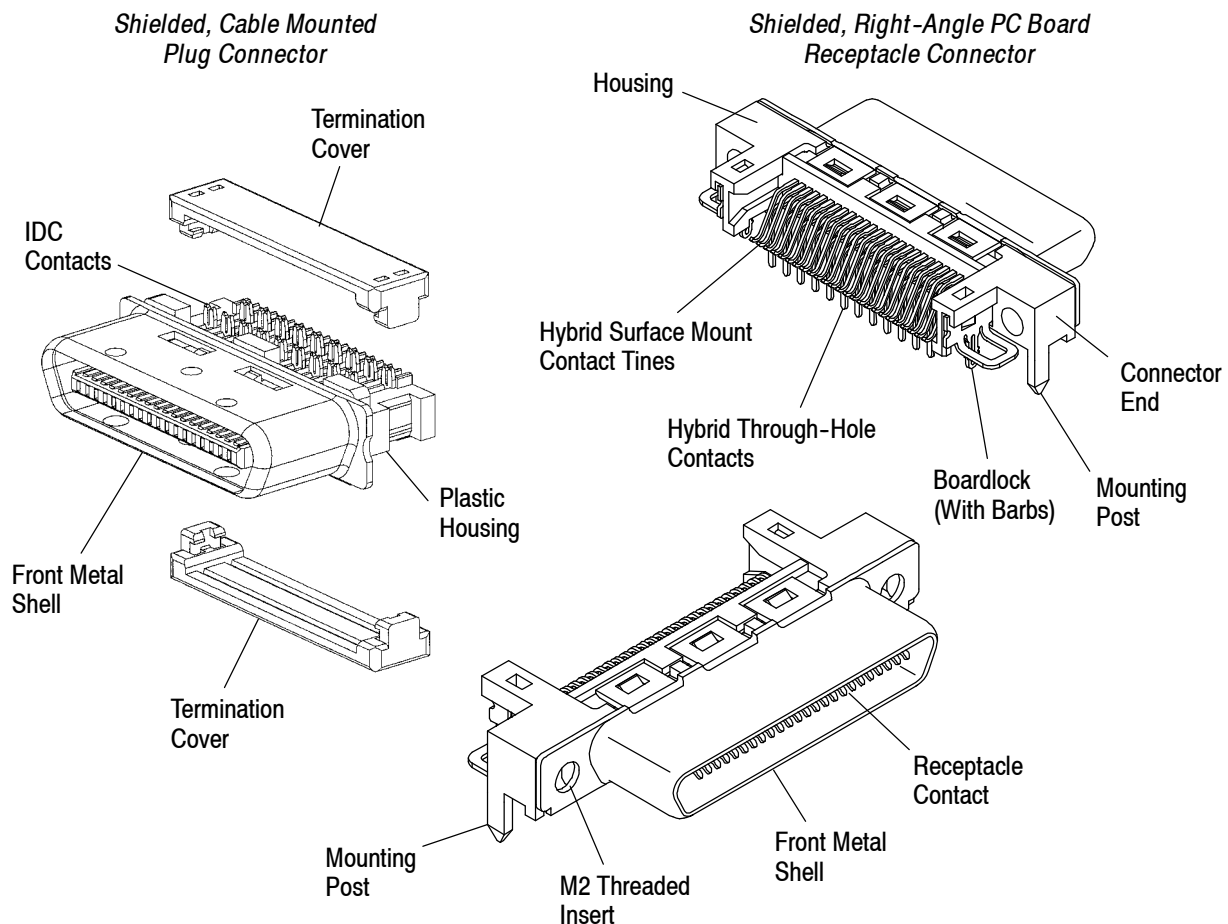


Figure 1 (cont'd)



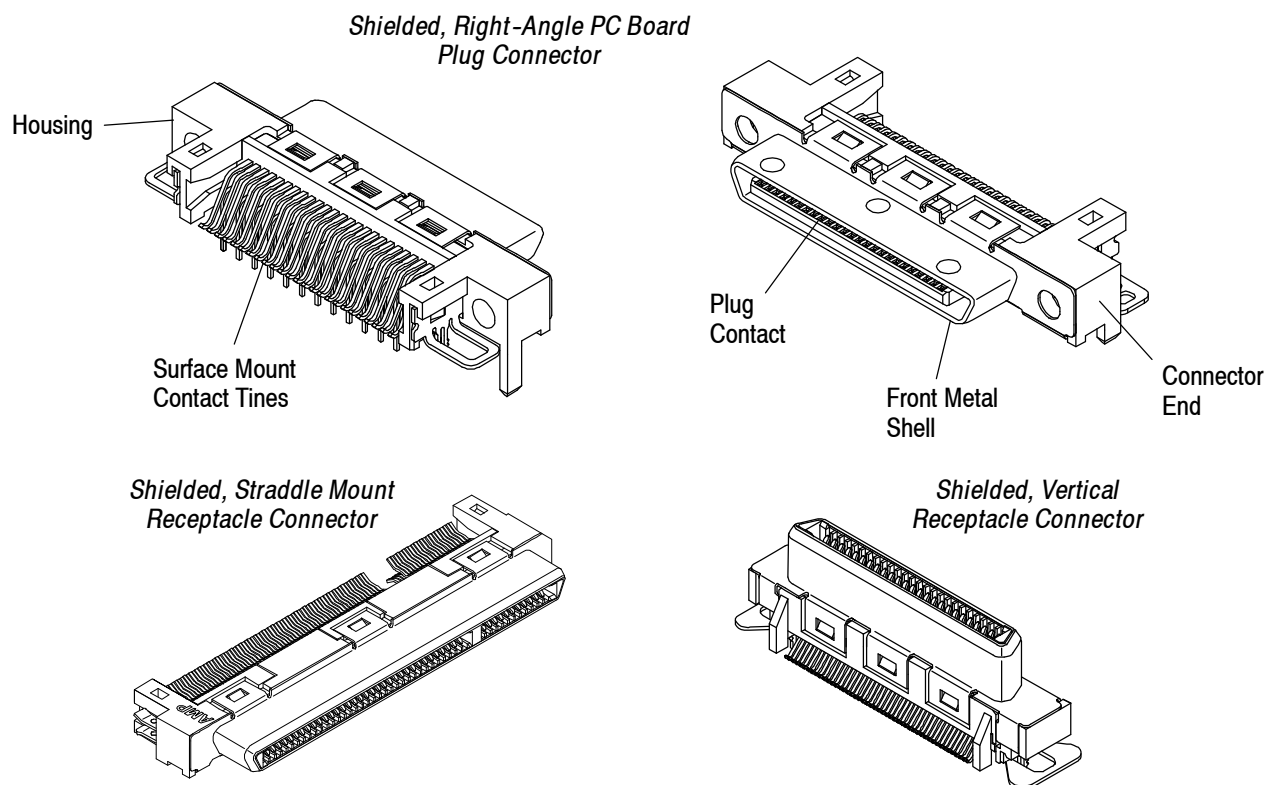


Figure 1 (end)

These connectors are available in sizes 36, 50, 68 and 90 (docking applications only) positions. Typical pc board connectors consist of a plastic housing with pre-installed contacts, front metal shell, boardlocks, M2 threaded inserts, and hardware for cable-to-board applications (screwlock or latch post). Placement of pc board connectors can be done by hand or robotic equipment. These connectors mate with compatible pc board plug connectors or cable mounted plug connectors.

When corresponding with TE Connectivity Personnel, use the terminology provided on this specification to help facilitate your inquiry for information. Basic terms and features of components are provided in Figure 1.

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

This paragraph is reserved for a revision summary of changes and additions made to this specification which include the following:

- Updated document to corporate requirements
- New logo

### 2.2. Customer Assistance

Reference Base Part Numbers 5787131 (plug kit), 5787254 (receptacle), and Product Codes 2185 and 2195 are representative numbers of CHAMP 0.8 mm Cable and PC Board 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 the Tooling Assistance Center or the Product Information Center number at the bottom of page 1.

### 2.3. Customer 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 technical documentation supplied by TE.



## 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. Specifications

Product Specification 108-1471 provides product performance requirements and test information. Workmanship Specification 101-21 and IPC-S-815 provide solder joint requirements.

## 2.6. Instructional Material

The following list includes available instruction sheets (408-series) that provide assembly procedures for product, operation, maintenance and repair of tooling; and customer manuals (409-series) that provides setup, operation, and maintenance of machines.

408-4017	Tooling Kit 768900-[ ]
408-4040	0.8 mm CHAMP Crimper Assemblies 122842-1 and 122842-2
408-4264	Mass Termination Tooling Assembly 543580-1
408-7777	Manual Arbor Frame Assembly 91085-2
409-5791	CHAMPOMATOR* 2.5 Terminating Machine Control Module 852423-[ ]
409-5839	CHAMPOMATOR 2.5 Bench Terminating Machine 762734-3

## 3. REQUIREMENTS

### 3.1. Storage

#### A. Ultraviolet Light

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

#### B. Shelf Life

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

#### C. 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

### 3.2. Special Characteristics

The connectors feature plated shells which provide continuity for electromagnetic compatibility (EMC) applications. When mated with corresponding metal shell connectors, shielding and grounding continuity are achieved.

### 3.3. Polarization

These connectors are polarized by the keystone configuration designed in the mating face. If using identical connectors in close proximity to each other, TE recommends the use of some visible means (marker, sticker, etc.) to prevent mismatching.

### 3.4. Circuit Identification

These cable mounted plug and receptacle connectors are marked to indicate the Circuit 1 position only. Plug connectors are numbered from left to right, top row first when the connector is viewed from the front (looking at the mating face). Receptacle connectors are numbered as a mirror image of plug connectors. See Figure 2.



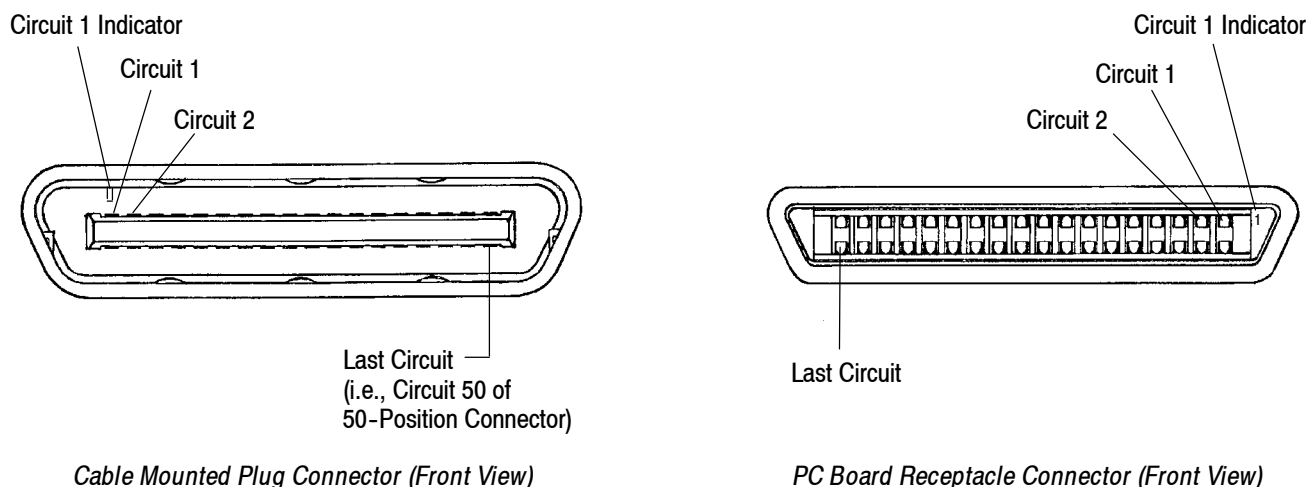


Figure 2

### 3.5. Cable Selection and Preparation

Cable used with these connectors should be size 30 AWG with solid or 7–38 stranded conductors with an insulation diameter range of 0.56 mm to 0.64 mm. Connector size, cable diameter range, and strip length are shown in Figure 3.



*Do not nick, scrape, or cut the conductors, conductor insulation (or wire), or cable braid when removing cable insulation. Aluminum shield (if used) must be removed from the strain relief crimp area. All discrete wire and cable must be approved by TE Engineering. Do not strip insulation from conductors.*

Position Sizes	Cable Dia. Range $\pm 0.38$
36	7.49
50	8.38
68	9.27

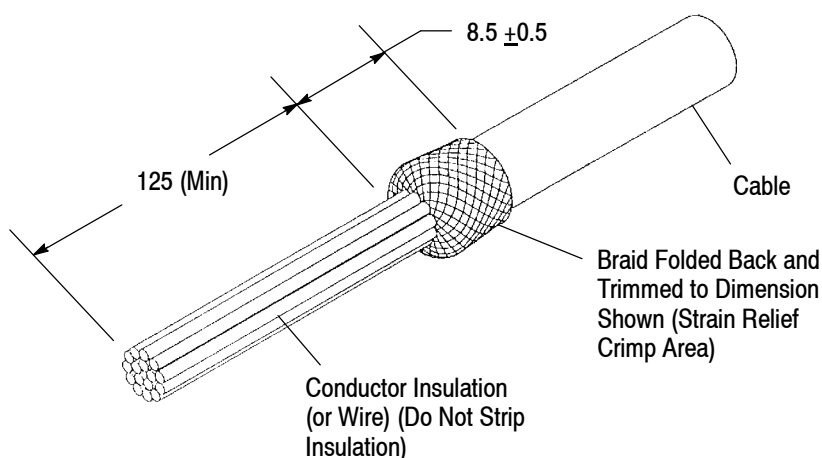


Figure 3

### 3.6. Cable Mounted Plug Connector

A typical cable mounted plug connector consists of a plastic housing with pre-installed insulation displacement contacts, front metal shell, and two termination covers. Immediately after the cable termination, the wires should be inspected, and the termination covers and backshell kits installed to provide protection and prevent strain on the terminated wire.

Care must be taken when installing the termination covers to avoid breaking the latches. A recommended method is to engage the latches of both covers at one end of the connector, and using the thumb and forefinger, sweep across the termination covers until the latches engage at the other end of the connector. Both termination covers must be installed to provide support for the backshell, even though all contacts may not be terminated (e.g., selective loading). The backshell kits provide the means of securing the cable connector to the pc board connector.



### 3.7. Wire Termination for Cable Plug Connector

Prepared wire shall be located and terminated according to the procedures included with the applicable tooling instructions. See Section 5, TOOLING for details on tooling options and instructions for using them.



*Reasonable care should be taken by tooling operators to provide undamaged wire terminations. An improper termination in any of the insulation displacement contacts will be reason to discard the entire connector. Contacts are designed for one-time termination, and cannot be replaced, repaired, or re-used.*

### 3.8. Termination Inspection

All terminated connectors can be inspected externally without damage to the connector. Internal inspection of the termination characteristics will require the selection of a sample connector that must be discarded after the inspection is completed.

#### A. External Inspection

The cable braid must be folded back over the cable jacket and trimmed; and the cable must be located a distance from the front of the termination covers at the dimension shown in Figure 4.

Only one wire may be inserted into each insulation displacement contact. Each wire end must extend beyond the contact as shown in Figure 4.

The locking latches of the termination cover must engage the latch recess in the housing.

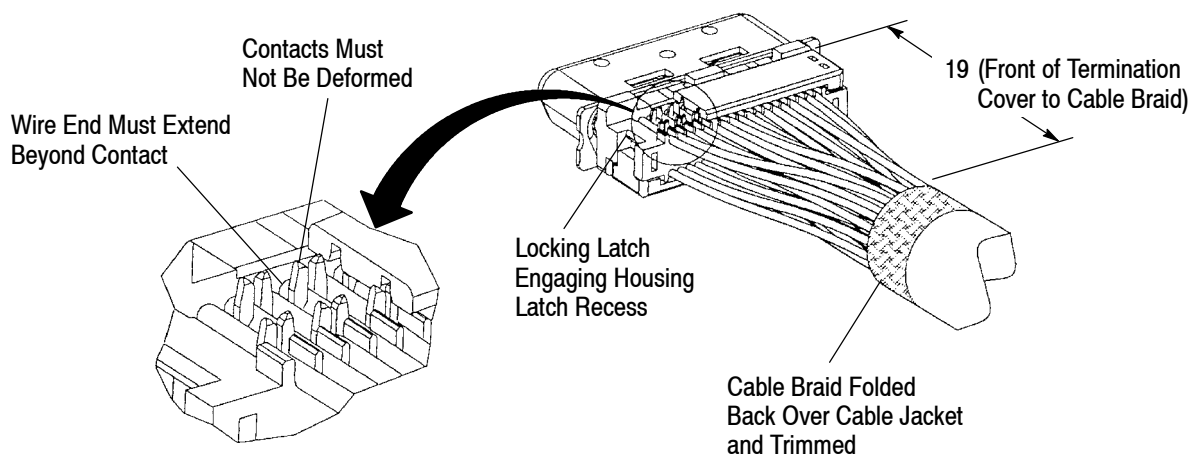
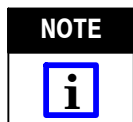


Figure 4

#### B. Internal Inspection (See Figure 5)



*Use a sample connector for the internal inspection and discard it after the inspection is complete.*

The contact beams of each contact must be straight and must not fold over or be damaged in any way. If the contact beams are spread apart enough to allow the wire to move freely, the entire connector must be replaced.

All wire must be below the transition point in the termination slot with the center of the wire located at the approximate center. Slight variation above and below the centerline is acceptable. Wire strands should be stacked with a minimum of three strands deformed. Insulation of the wire must be displaced on both sides of the termination slot with the top and bottom of the insulation remaining intact. Some slight tool markings caused by the termination tool are permissible. Conductor strands may be slightly visible on either side of the termination slot but no strands may be severed.



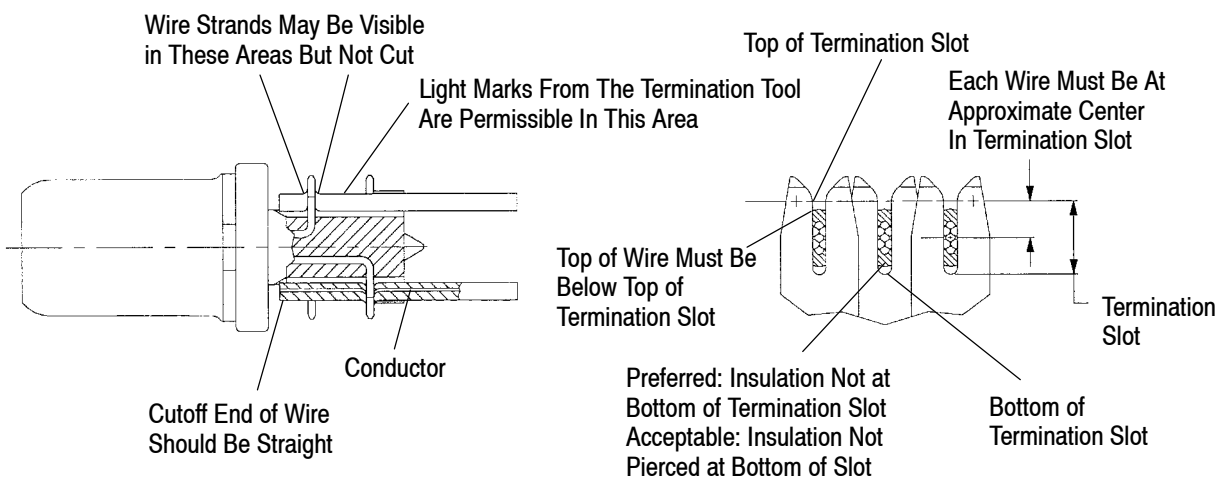


Figure 5

### 3.9. Hardware for Cable Mounted Connectors

Backshell kits are available for spring latch or jackscrew applications for connector sizes 36, 50, and 68 positions. Typical backshell kits contain two hermaphroditic metal backshells, two hermaphroditic plastic backshell covers, and either two spring latches or two jackscrews. See Figure 6.

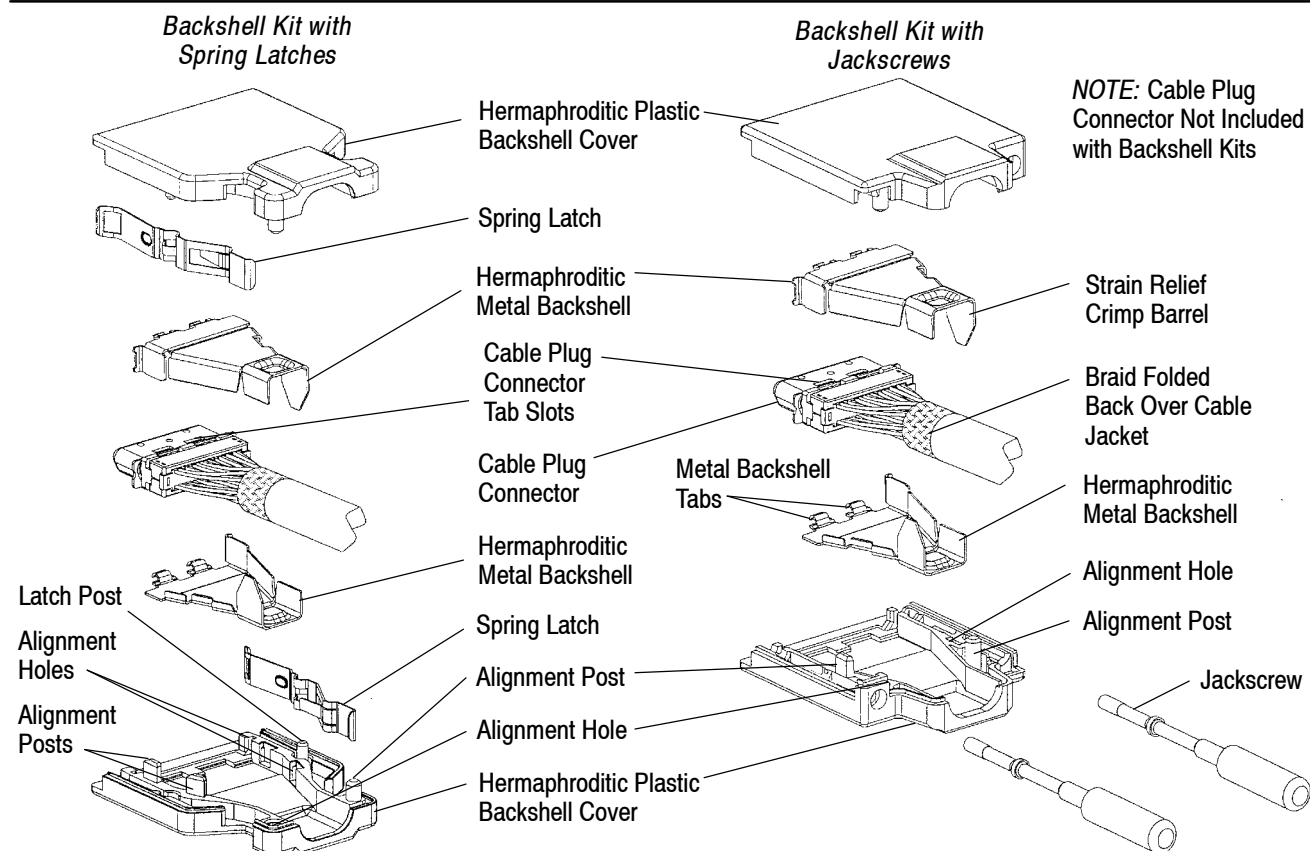


Figure 6

### 3.10. Backshell Assembly and Inspection



The connector must be properly terminated and the backshell kit must be installed as specified in the following.



The hermaphroditic metal backshells and assembly techniques are identical for both the spring latch and the jackscrew kits.

### A. Hermaphroditic Metal Backshell Assembly

The cable jacket (with the braid folded back) must be located in the strain relief crimp barrel and, before crimping, must extend beyond the strain relief crimp barrel at the dimension shown in Figure 7. There should be slack in the wires to prevent stress at the point of termination. The hermaphroditic metal backshell tabs must be inserted into the plug connector tab slots. Care must be taken to avoid pinching wires when rotating the backshells to the closed position.

The strain relief crimp barrel must be crimped according to the directions shipped with the arbor frame assembly and crimper assembly. After crimping, tool marks are permissible on the strain relief crimp barrel. Crimp height dimensions according to connector size are shown in Figure 7.

#### NOTE



The backshell strain relief crimp barrel will accommodate cable diameters as previously specified with up to 80% braid coverage and 1 to 1½ wraps of copper tape (optional). If the cable has a higher coverage or if additional metal tape or foil is required to build up cable diameter, contact Product Information number located on the bottom of page 1.

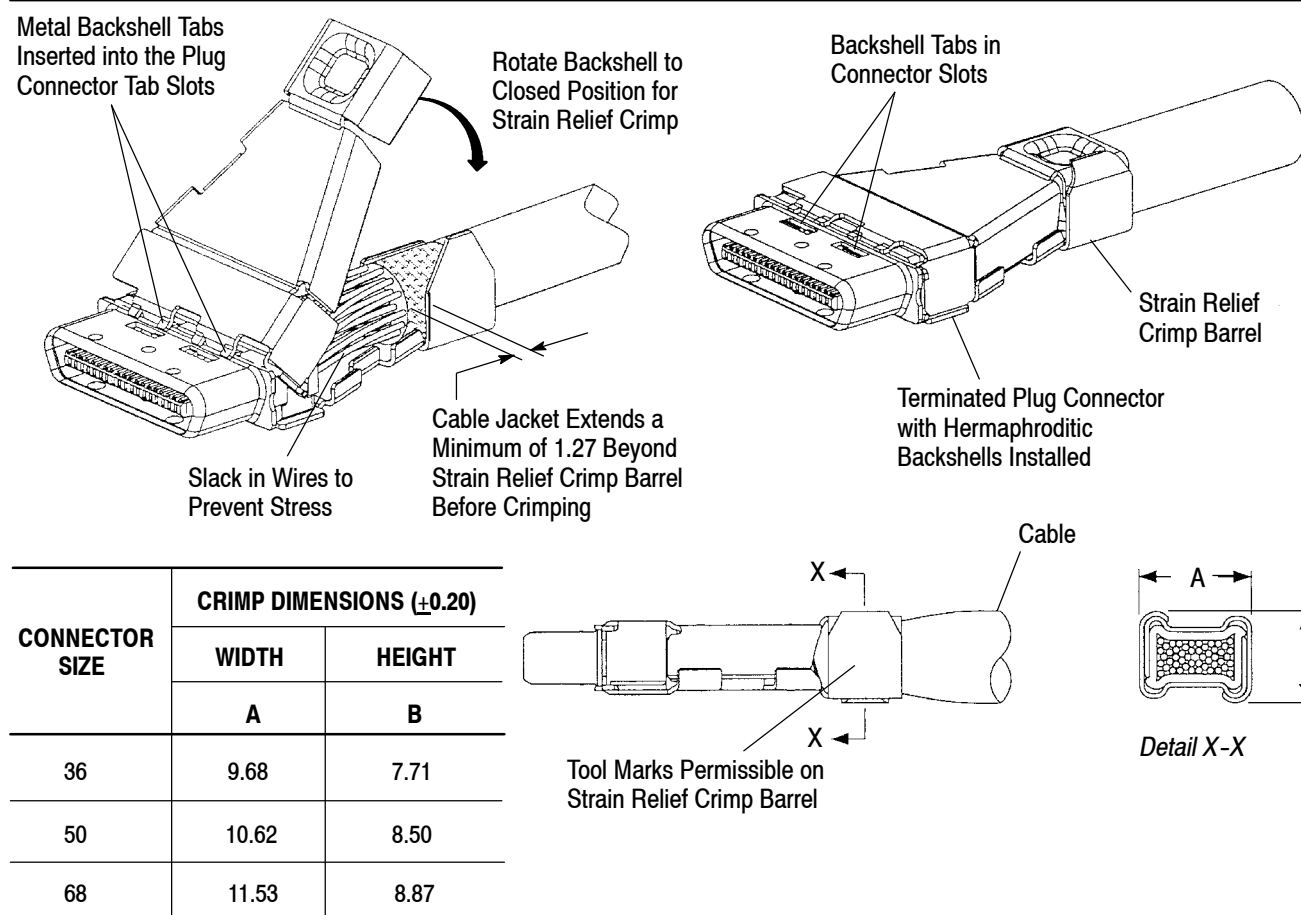


Figure 7

### B. Spring Latch and Hermaphroditic Plastic Backshell Cover Assembly

Insert the terminated cable plug connector assembly into the hermaphroditic plastic backshell cover. Then install the spring latch over the latch post in the backshell cover. Install the spring latch over the latch post in the mating backshell cover. See Figure 8.

Align the alignment holes and posts of the top hermaphroditic plastic backshell cover with the alignment holes and posts of the bottom backshell cover and push together until the covers are bottomed on each other within the dimension shown in Figure 8.



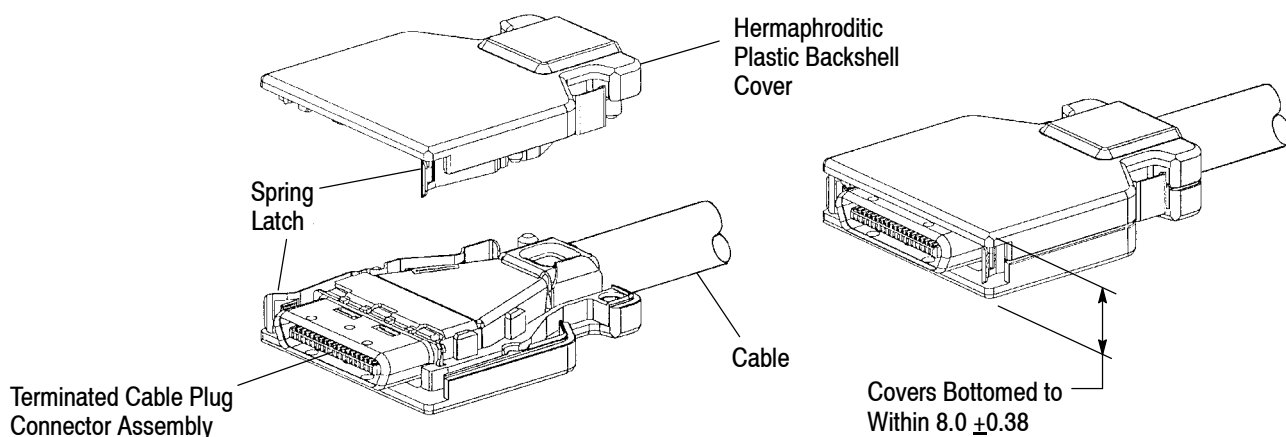


Figure 8

### C. Jackscrew and Hermaphroditic Plastic Backshell Cover Assembly

Insert the terminated cable plug connector assembly into the hermaphroditic plastic backshell cover. Align the alignment holes and posts of the top and bottom backshell covers and push together until the covers are bottomed on each other and within the dimension shown in Figure 9.

Insert the jackscrews into the jackscrew insertion holes on the hermaphroditic plastic backshell covers and push forward until the jackscrew shoulder touches insertion hole as shown in Figure 9. If necessary, the jackscrews can be assembled into the backshell covers prior to assembly.

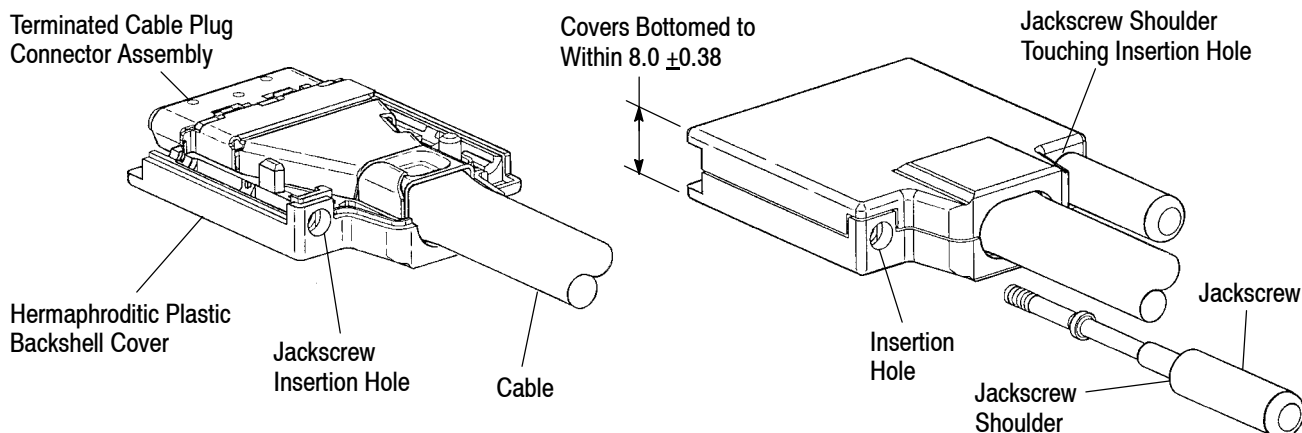


Figure 9

## 3.11. PC Board

### A. PC Board Thickness

The connectors are designed for 1.6  $\pm$ 0.15 mm thick pc boards with the exception of the straddle mount design, which requires a 1.0  $\pm$ 0.13 mm thick pc board.

### B. Material

PC board material should be glass epoxy (FR-4, G-10). Contact Product Information at the number located on the bottom of page 1 for suitability of other pc board materials. The solder mask materials recommended as most suitable are Liquid Photo Imageable and Dry Film.

### C. Tolerance

The maximum allowable bow of the pc board shall be 0.08 mm over the length of the connector. At the time of connector placement, the coplanarity of the pad pattern must be held to 0.03 mm (maximum). A solder mask is recommended to minimize solder bridging between the pads. The mask must not exceed the height of the pad by more than 0.05 mm, otherwise a poor solder joint will result.



### 3.12. PC Board Layout

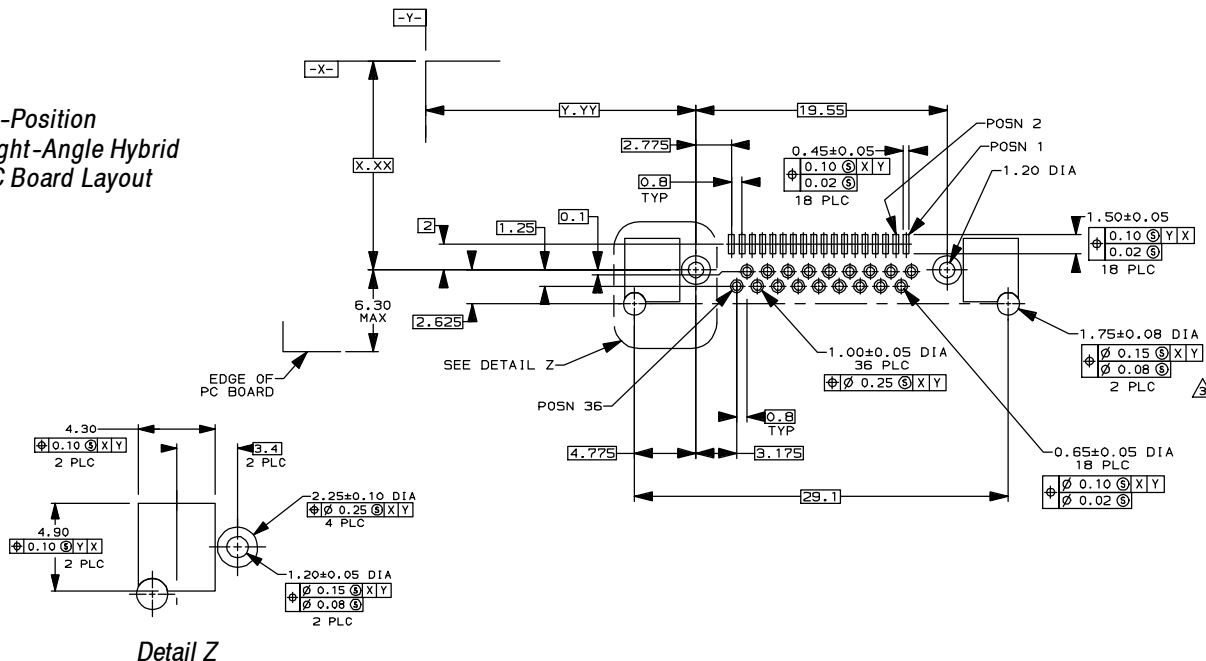
The contact pads and mounting holes must be precisely located to ensure proper alignment and optimum performance of the connector. Board layouts for 36-position right-angle hybrid, 50-position right-angle hybrid, and through-hole mount, 68-position right-angle through-hole mount, and 90-position surface and straddle and mount connectors are shown in Figure 10.

#### NOTE



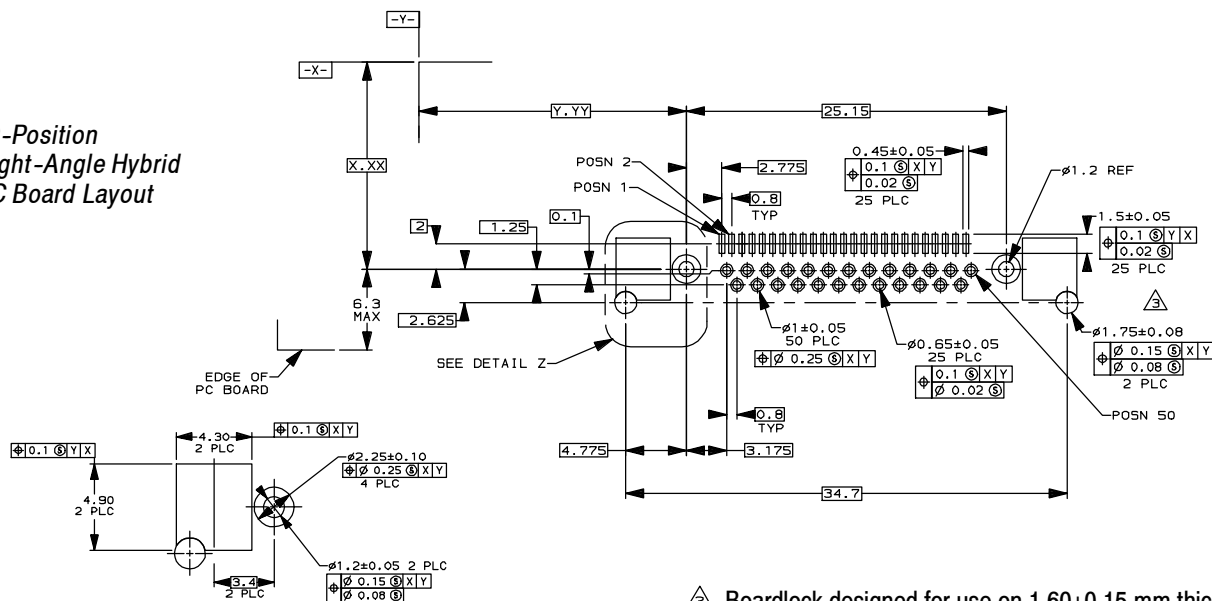
The "X" and "Y" symbols on the pc board layouts represent customer established datums. They are the origin for the basic dimension (XXX and YYY datum), the point from which ALL hole positions must be located. All layouts depict the top (component) side (unless otherwise noted) of the pc boards.

#### 36-Position Right-Angle Hybrid PC Board Layout



Detail Z

#### 50-Position Right-Angle Hybrid PC Board Layout



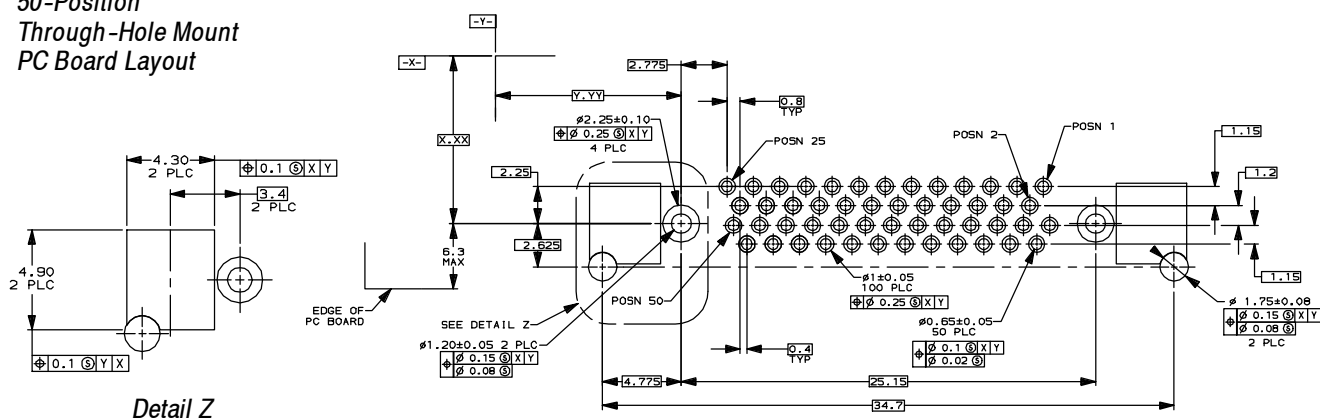
Detail Z

Boardlock designed for use on 1.60±0.15 mm thick pc board with plated through mounting holes.

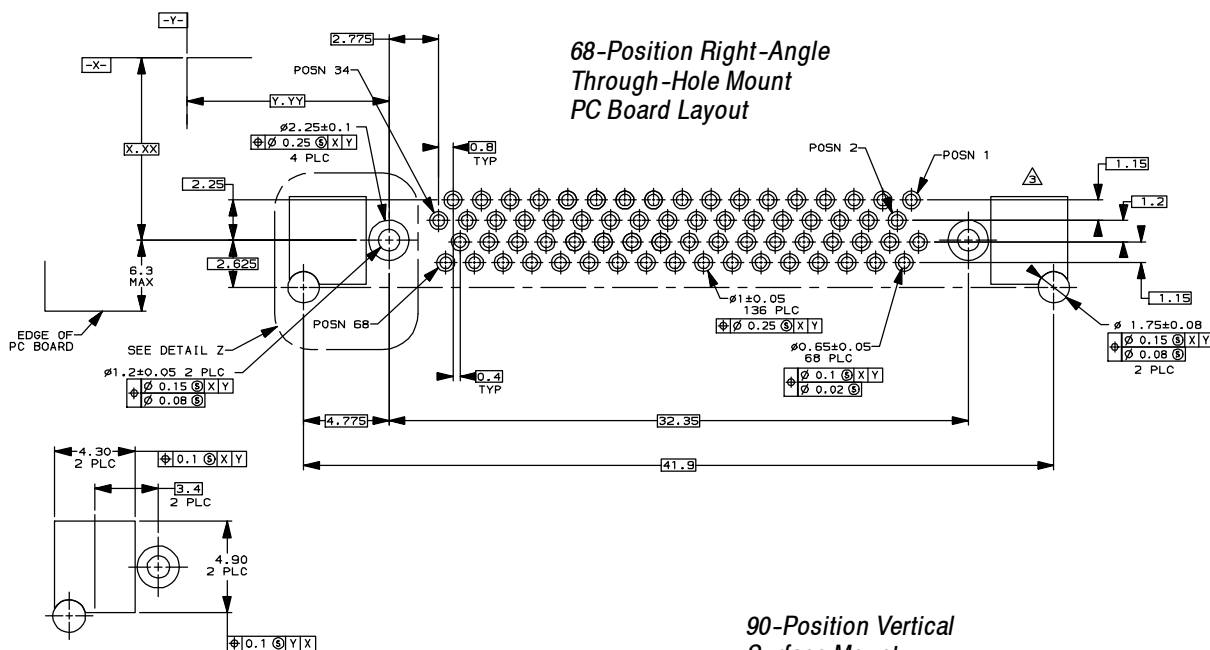
Figure 10 (cont'd)



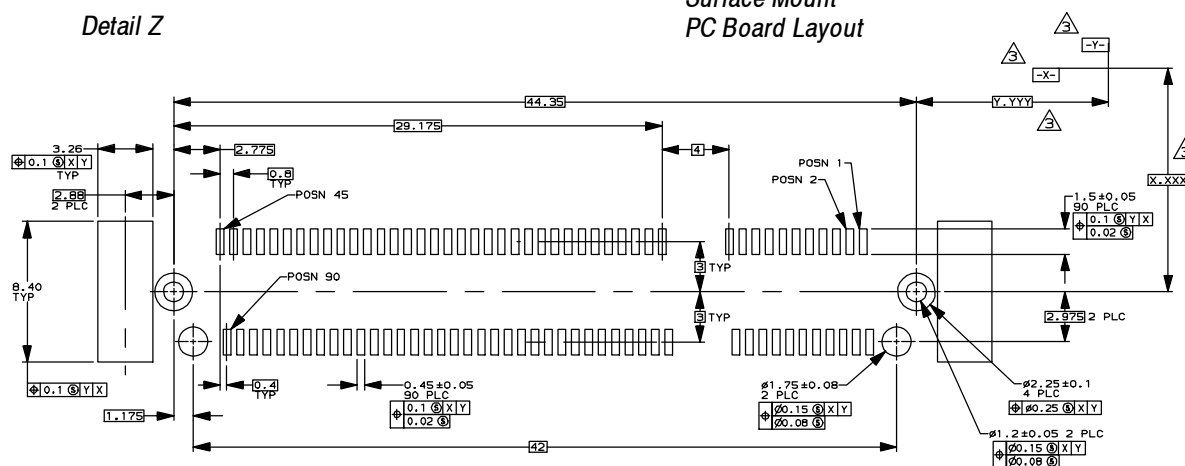
**50-Position  
Through-Hole Mount  
PC Board Layout**



### 68-Position Right-Angle Through-Hole Mount PC Board Layout



### 90-Position Vertical Surface Mount PC Board Layout




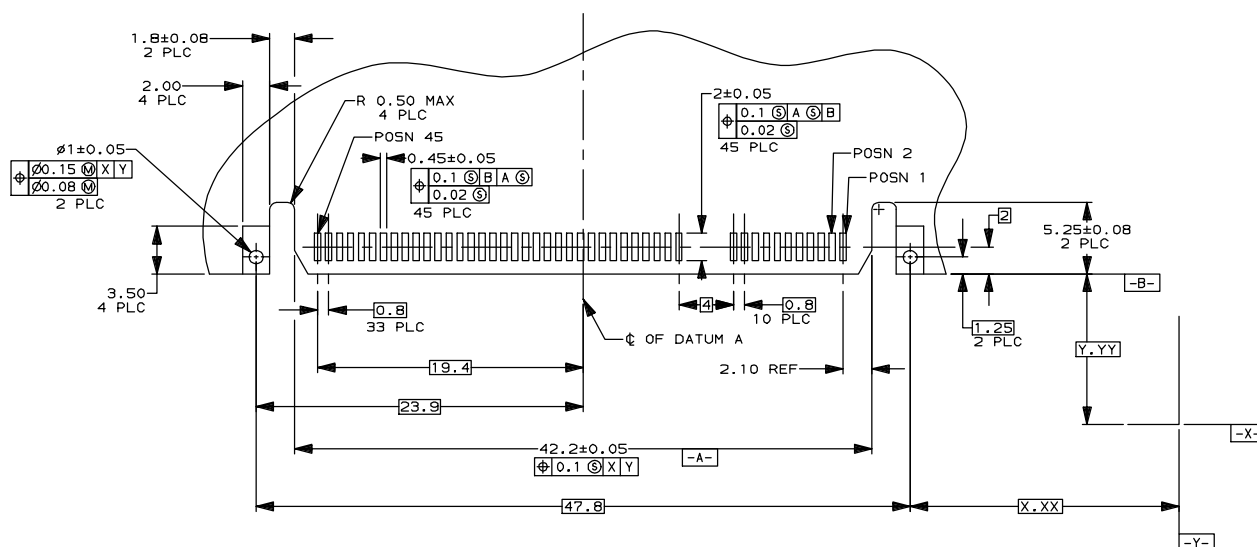
 Boardlock designed for use on 1.60±0.15 mm thick pc board with plated through mounting holes.

Figure 10 (cont'd)



**90-Position Straddle Mount  
Surface Mount (Top)  
PC Board Layout**



**90-Position Straddle Mount  
Surface Mount (Bottom)  
PC Board Layout**

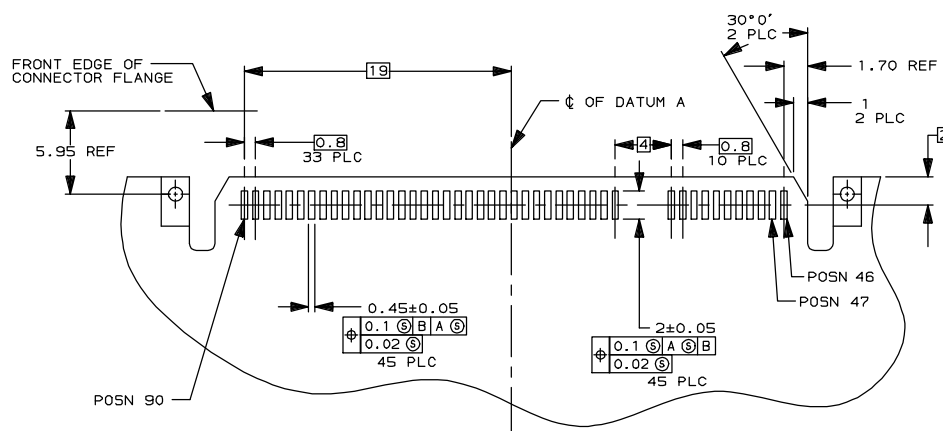


Figure 10 (end)

### 3.13. PC Board Holes

The holes in the pc board for the solder tines must be drilled and plated through to precise dimensions. See Figure 11.



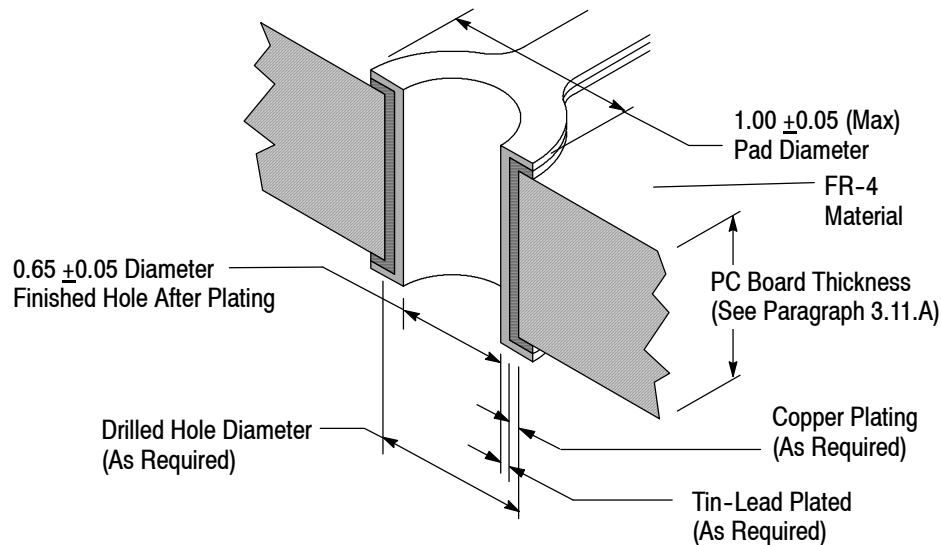


Figure 11

### 3.14. Panel Mounting

Panel mounting provides additional support for the solder joints during mating and unmating of the pc board connectors and ensures EMC performance. The connectors must be mounted to the rear of the panel only. The recommended panel thickness is  $1.12 \pm 0.08$  mm. For mating pc board connector to cable connector applications, the latch post or screwlocks are used to secure the pc board connector to the panel. For panel cutout dimensions, see Figure 12.

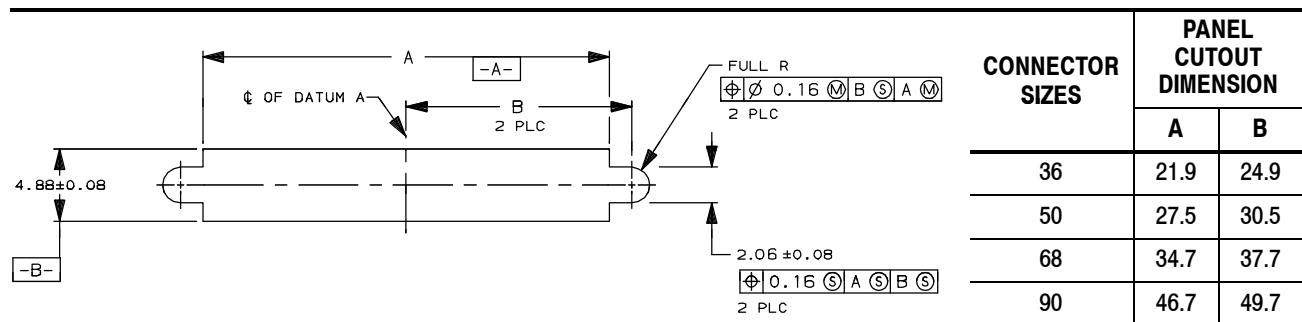


Figure 12

### 3.15. Connector Placement



*Always grip the connector housing by the ends to prevent contamination and distortion to the contact solder tines.*

#### A. Manual Placement

Manual placement of the connectors on the pc board can be done with relative ease by picking them up by the ends and inserting them into the pc board holes. The holes are designed to ensure alignment of the contact solder tines and boardlocks with the pc board pads and holes.

#### B. Robotic Placement

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. See Section 5, TOOLING.



### 3.16. Soldering

## NOTE



*The following contains soldering information for pc board circuit pads, as well as information on soldering through-hole contact tines.*

PC board pads shall be adaptable for soldering as defined in Specification 109-11-1. 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. Recommended Solder Paste Characteristics

- Alloy type: either 63% Sn / 37% Pb or 60% Sn / 40% Pb
- Flux: RMA type
- Solids by weight: 85% minimum
- Mesh particle size: -200 to +325 designation
- Minimum viscosity of screen print:  $5 \times 10^5$  cps
- Minimum viscosity of solder paste for stencil print:  $7.5 \times 10^5$  cps

### B. Paste Volume

## NOTE



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

- Contact surface mount solder time: 0.142 mm<sup>3</sup> per contact
- Contact through-hole time: 0.283 mm<sup>3</sup> per contact
- Hold-down flange: 3.66 mm<sup>3</sup> per flange
- Boardlock: 9.13 mm<sup>3</sup> per boardlock

### C. Stencil

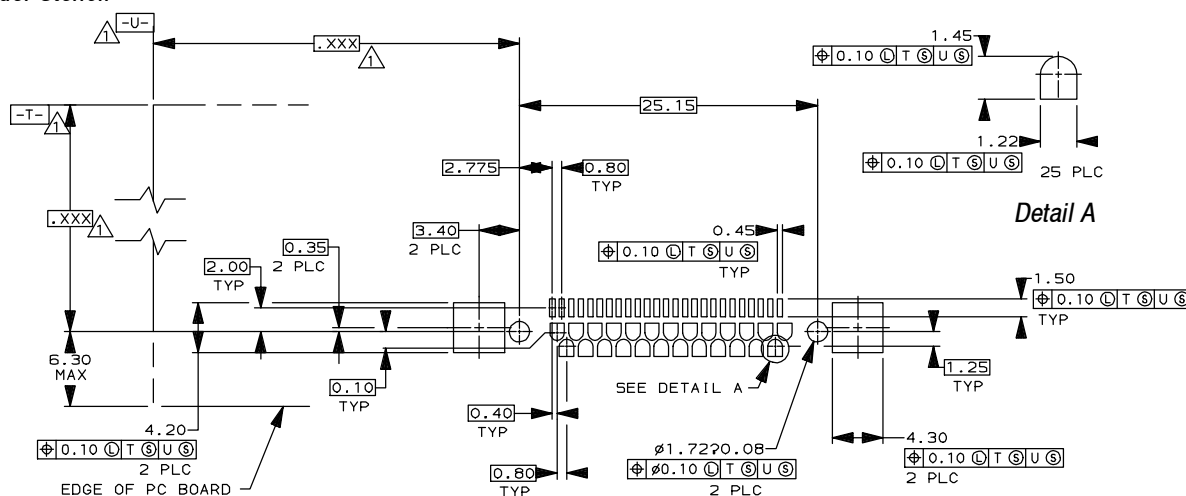
Stencil apertures will be determined by the thickness of the stencil being used. Generally, the thinner stencils will have a larger aperture to maintain a given volume of solder paste. The recommended 0.2 mm-thick solder stencils for representative pc board connectors are shown in Figure 13.

## 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 13.*

### 50-Position Right-Angle Hybrid Solder Stencil

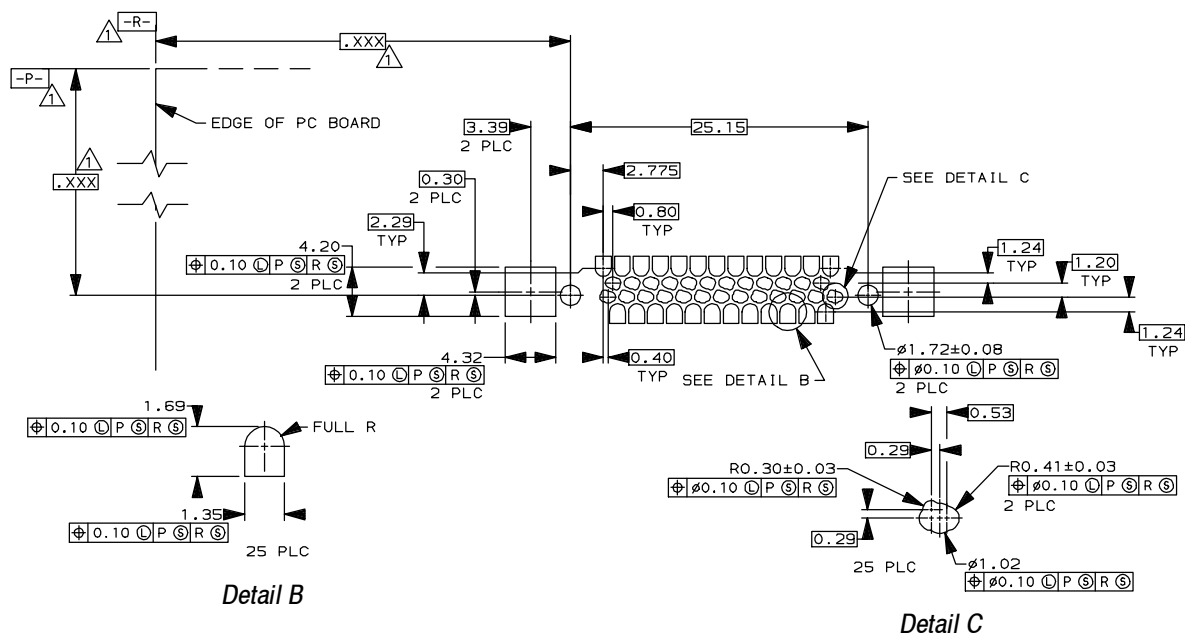


 Datums and basic dimensions established by customer.

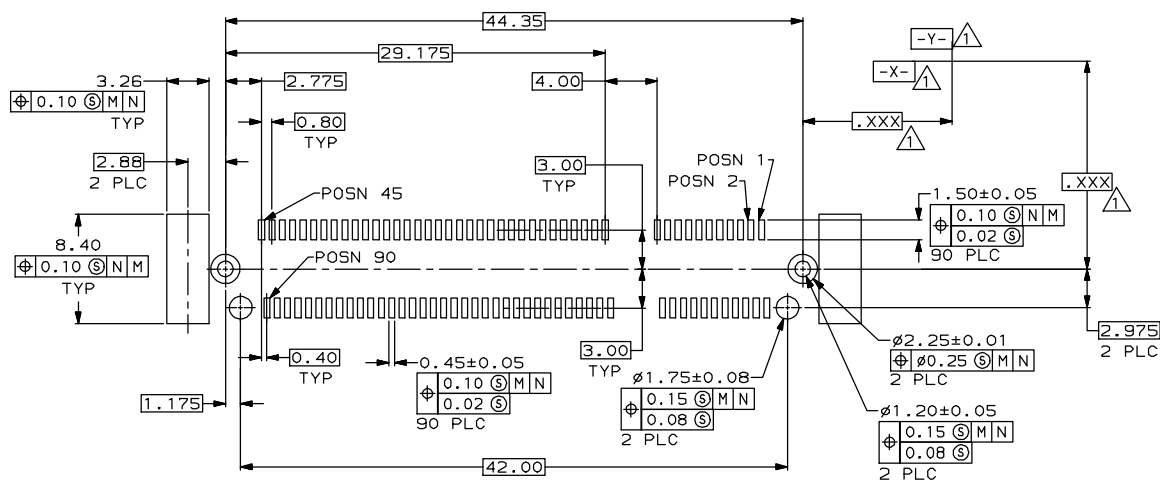
Figure 13 (cont'd)



### 50-Position Right-Angle Through-Hole Mount Solder Stencil



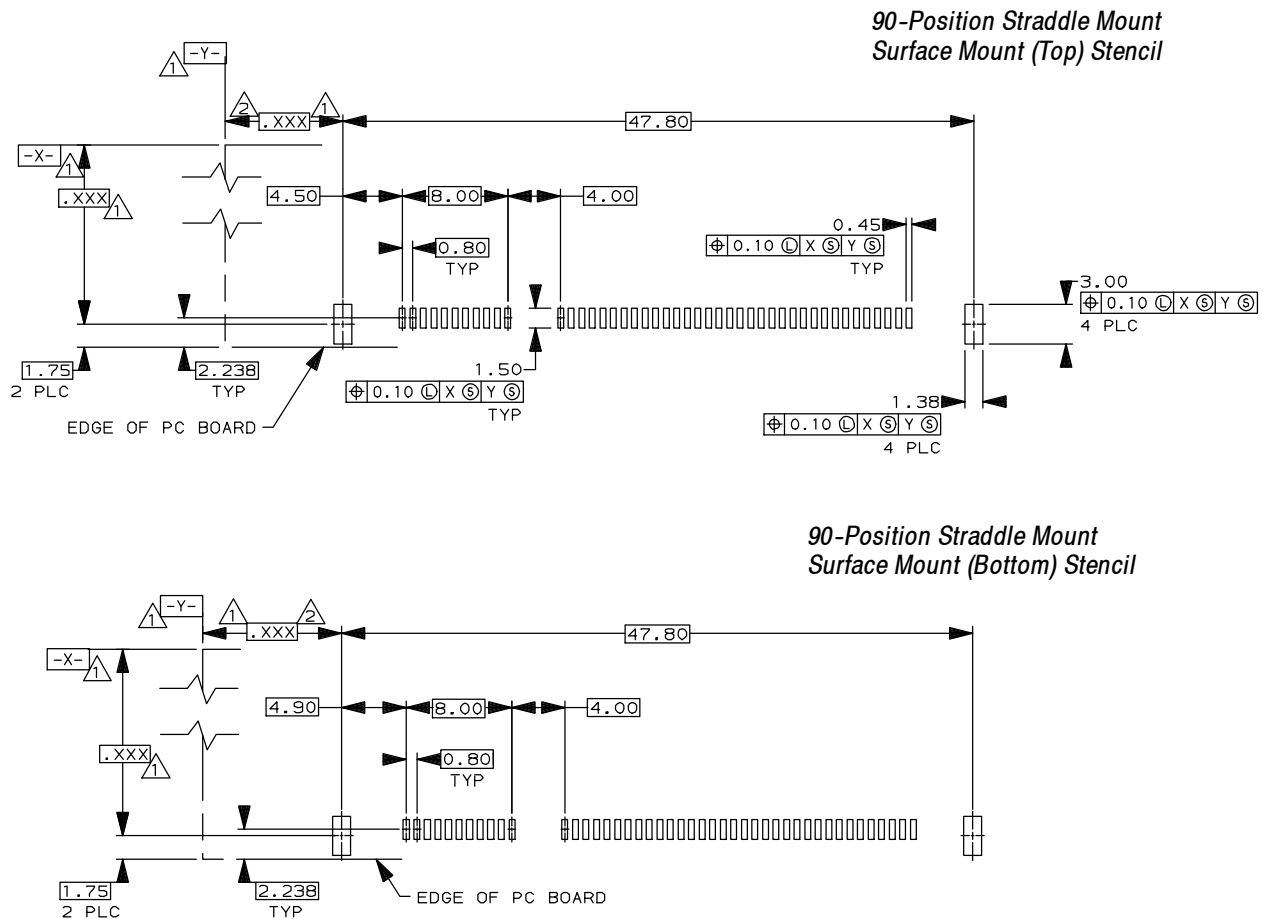
### 90-Position Vertical Surface Mount Solder Stencil



**①** Datums and basic dimensions established by customer.

Figure 13 (cont'd)





- ① Datums and basic dimensions established by customer.
- ② Boardlock designed for use on 1.00-1.75 mm thick pc board with plated through mounting holes.

Figure 13 (end)

## D. Solder Screen

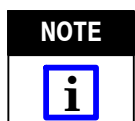
TE does not recommend screen application of solder paste because of the limited volume of paste that can be deposited. However, if a screen application is required, TE recommends removal of all screen from the solder line and hold-down pad areas. Consult your supplier for compatibility of screen and paste, and for application techniques.

## E. 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 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, 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.



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	Room Ambient	
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

Figure 14

### F. Drying



Excessive temperatures may cause housing and plating degradation.

Temperatures to which the connectors are subject should not exceed 220°C [492°F] for more than 3 minutes. Peak temperatures exceeding 220°C [492°F] for a short duration are acceptable.

### G. Solder Joint Inspection

All solder joints should comply with TE Workmanship Specification 101-21. For typical fillets for surface mount time requirements, refer to Figure 15.

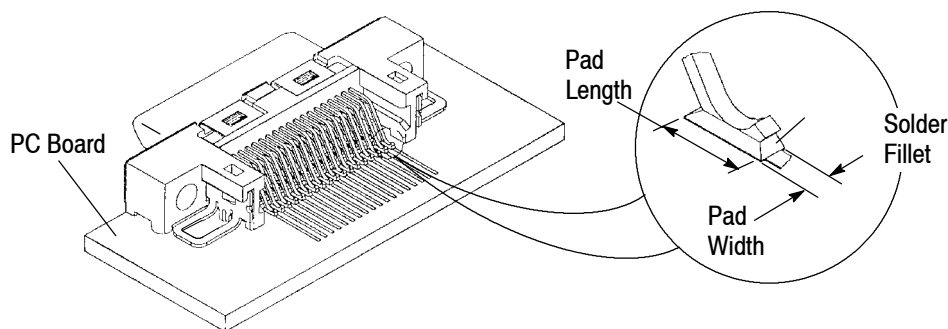


Figure 15

### 3.17. Hardware for PC Board Connectors (See Figure 16)

These connectors are supplied with pre-installed contacts, front metal shell, boardlocks, and M2 x 0.4 – 6H threaded inserts. Mounting hardware for cable to board applications (latch post or screwlocks) is available separately.

#### A. Boardlocks

Boardlocks have gripping shoulders that engage the pc board. The boardlocks lock into position when the connector is installed. Boardlocks also feature solder flanges for soldering to pc board pads.

#### B. Threaded Inserts

Pre-installed, M2 x 0.4 – 6H inserts provide a means of mounting a pc board connector to a panel.

#### C. Latch Posts

Latch posts are used to secure pc board connectors to a panel and provide the engagement feature for the spring latch in the cable connector for pc board applications.

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## D. Screwlocks

Screwlocks are available with M2 x 0.4 – 6H internal threads and M2 x 0.4 – 6G external threads. They are used to secure pc board connectors to a panel and provide the mating threaded socket for the jackscrew in cable to pc board applications.



The maximum recommended tightening torque for latch posts and screw locks is 0.45 N•m.

### Right-Angle PC Board Receptacle Connector

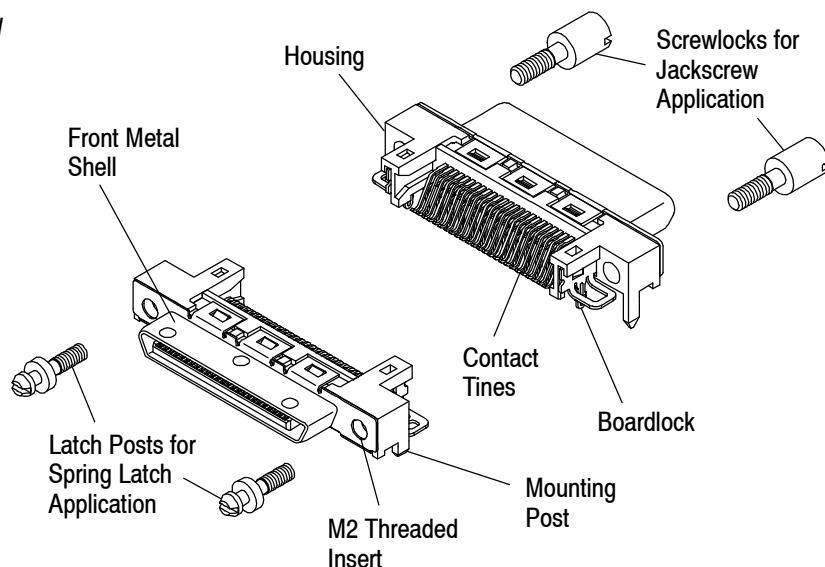


Figure 16

## 3.18. Seating and Retention Force

The force to seat the connector in a 1.6 mm thick pc board should not exceed 39 N. The barbed boardlocks provide a minimum of 2.5 N retention force per connector in a 1.6 mm thick pc board. The connector housing must be bottomed on the pc board to within the dimension shown in Figure 17.

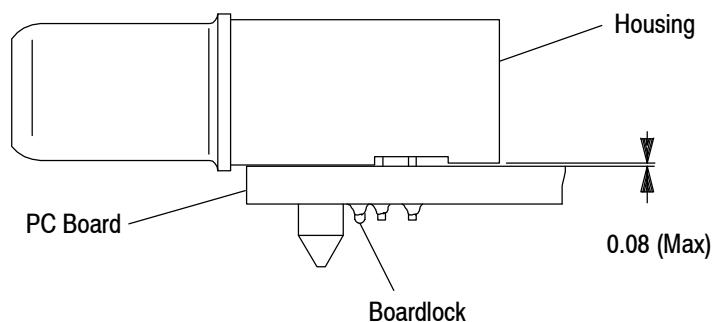


Figure 17

## 3.19. Mating Dimensions

### A. PC Board Receptacle Connector to PC Board Plug Connector

The mating dimension must be considered when determining panel thickness and screw type to be used to secure the connector to the panel. To ensure full mating of connectors, use the mating dimension shown in Figure 18.



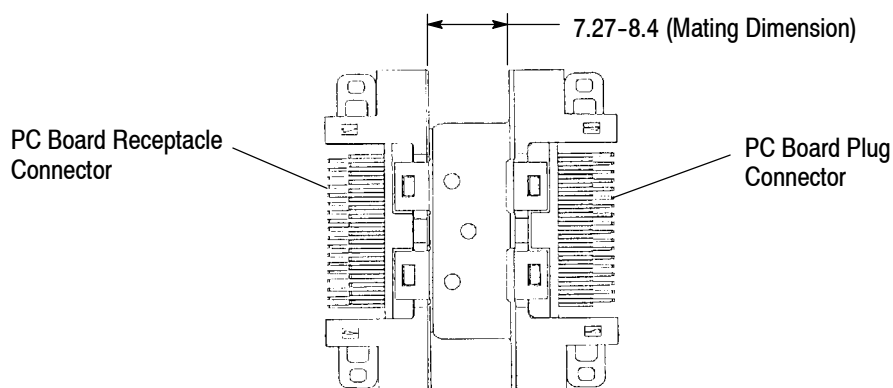


Figure 18

### B. PC Board Receptacle Connector to Cable Plug Connector with Spring Latch Hardware

There must be no obstruction between the plastic backshell cover and the receptacle flange (except specified panel) which would prevent the spring latch from engaging the latch post. To ensure proper mating, the latch posts must be located as shown in Figure 19.

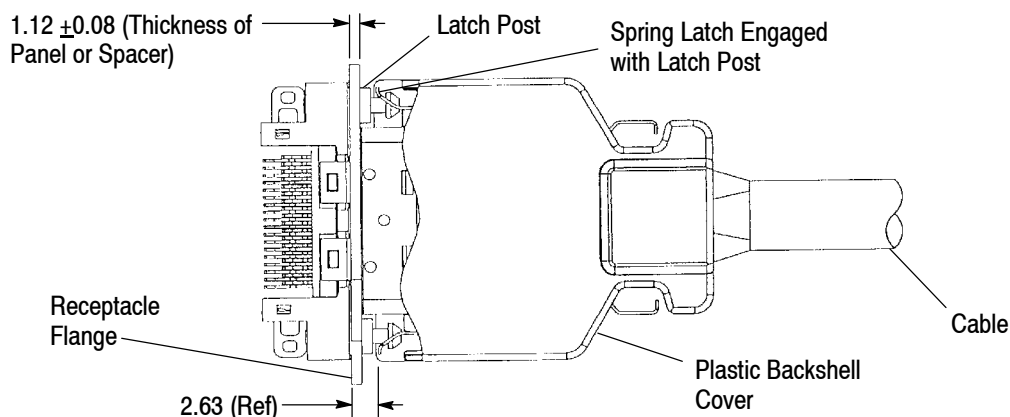


Figure 19

### C. PC Board Receptacle Connector to Cable Plug Connector with Jackscrew Hardware

There must be no obstruction between the plastic backshell cover and the receptacle flange (except specified panel) which would prevent the jackscrew from engaging the latch post. To ensure proper mating, screwlocks must be located as shown in Figure 20.

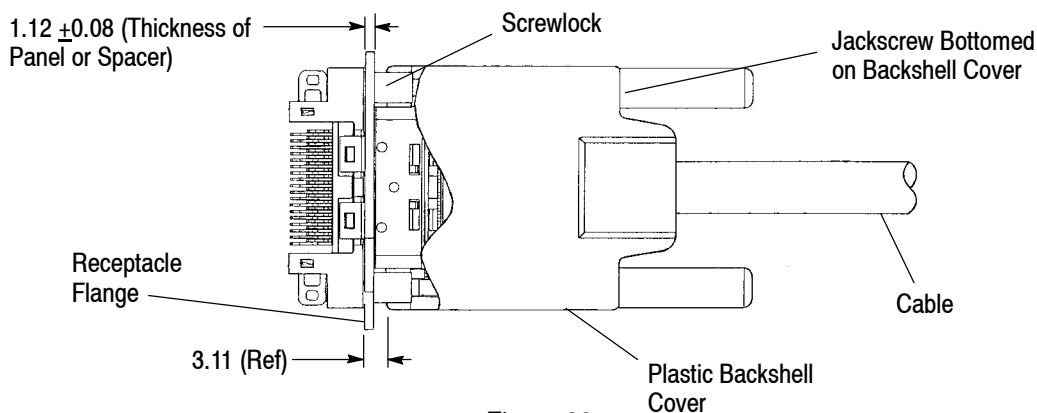


Figure 20



### 3.20. Repair and Replacement

If the connector or any of the contacts become damaged, the connector must be replaced. The connector may be removed from the pc board by normal desoldering methods and replaced with a new connector.

## 4. QUALIFICATION

CHAMP 0.8 mm Connectors are Recognized by Underwriters Laboratories Inc. (UL) in File E28476 and Certified to CSA International in File LR7189.

## 5. TOOLING (See Figure 21)

### 5.1. Crimp Tooling

CHAMP 0.8 mm IDC contacts can be terminated using CHAMPOMATOR semi-automatic machines. The arbor frame assembly is used to crimp metal backshell assemblies onto CHAMP connectors.

### 5.2. PC Board Support

A pc board support should be used to prevent damage to the components during the placement of a connector on the board. The support should have flat surfaces with holes or a channel wide enough and deep enough to receive the solder tines and hold-down during installation of the connector on the board.

### 5.3. Robotic Equipment

Robotic equipment must have a true position accuracy tolerance of 0.13 mm to properly locate the connectors for insertion. This includes gripper and fixture tolerances, as well as equipment repeatability. If used, the robotic equipment must use the connector datum surfaces detailed on the Customer Drawing to ensure reliable connector placement.

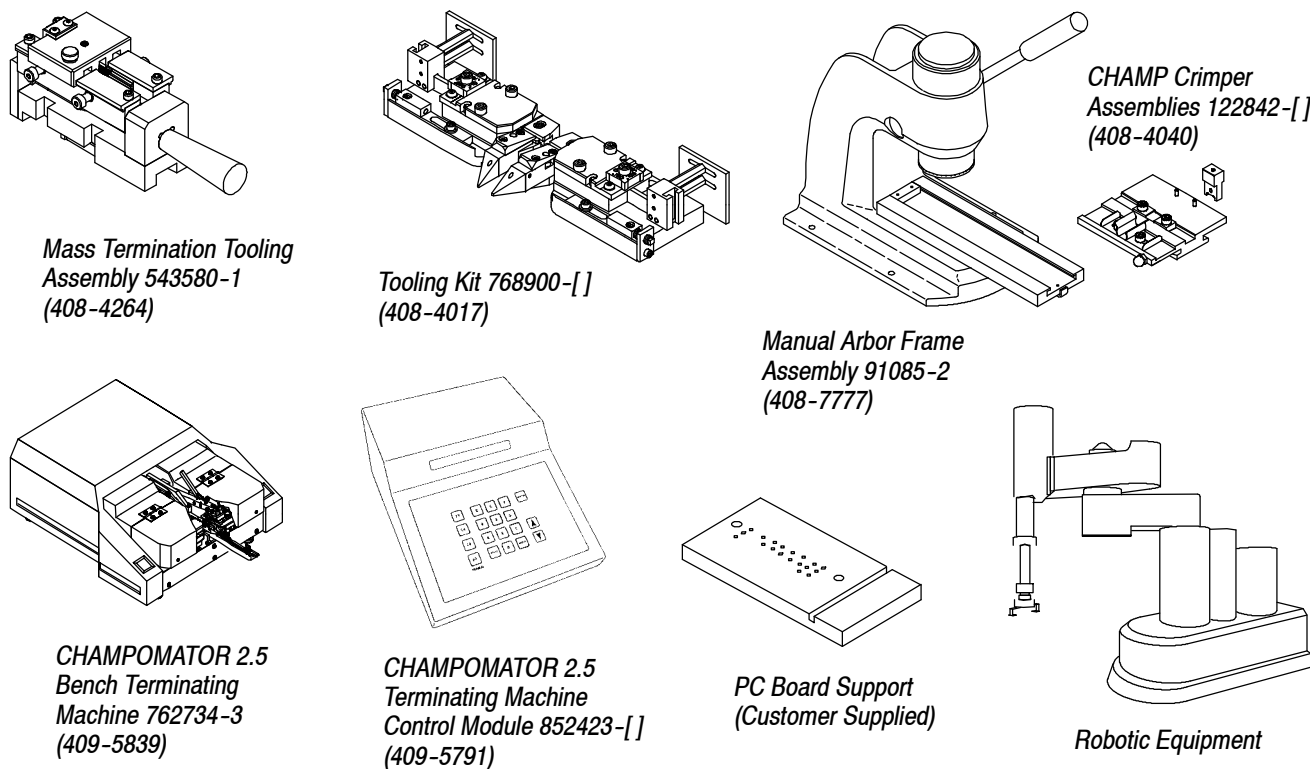


Figure 21



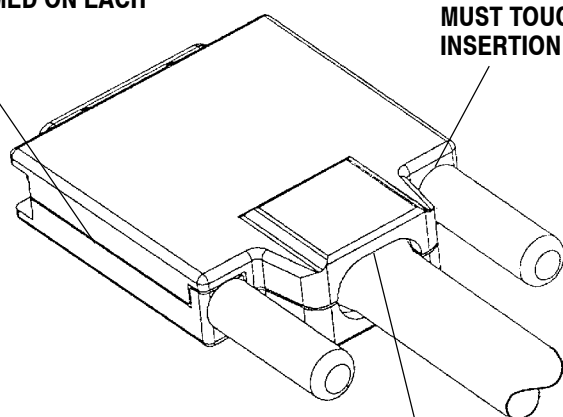
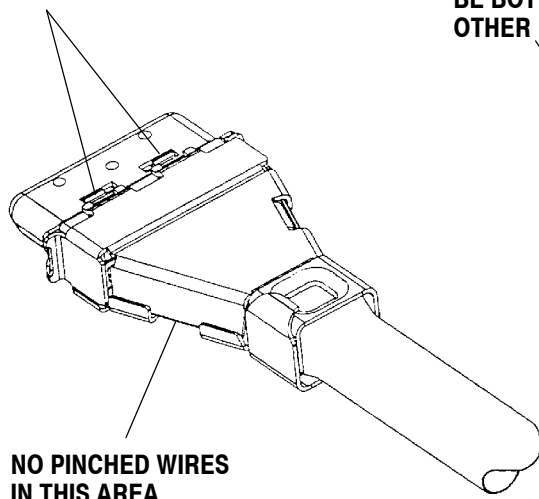
## 6. VISUAL AID

Figure 22 shows a typical application of a CHAMP 0.8 mm Cable and PC Board Connector. 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.

**HERMAPHRODITIC METAL BACKSHELL  
TABS MUST BE FULLY ENGAGED  
IN CONNECTOR SLOTS**

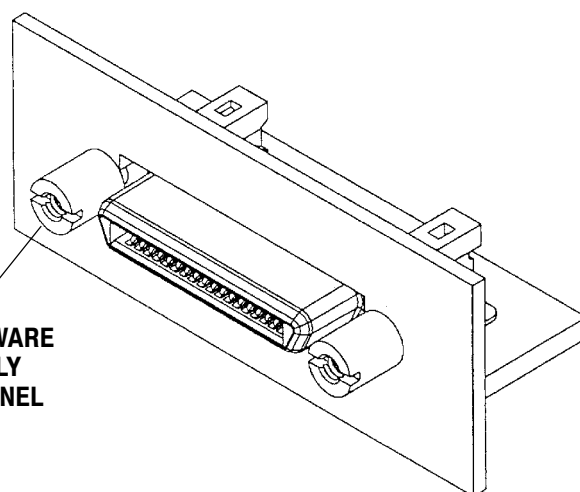
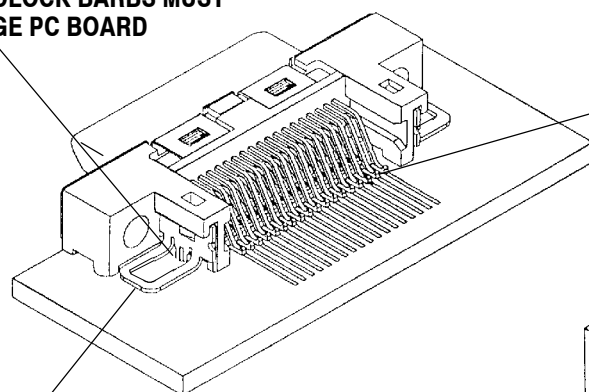
**HERMAPHRODITIC PLASTIC  
BACKSHELL COVERS MUST  
BE BOTTOMED ON EACH  
OTHER**

**JACKSCREW  
SHOULDER  
MUST TOUCH  
INSERTION HOLE**



**BOARDLOCK BARBS MUST  
ENGAGE PC BOARD**

**ALL SOLDER FILLETS  
MUST BE EVENLY  
FORMED**



**FIGURE 22. VISUAL AID**