

**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 application of AMPMODU Mod II and Mod IV Printed Circuit (PC) Board Connectors for through hole and Surface Mount Technology (SMT). The connectors are available with double beam receptacle contacts designed to accept 0.64 mm square posts. There are connectors in 2 through 80 positions for top and bottom entry applications as well as pass through applications with 2.54 mm contact centerline spacing. All side entry connectors are available in 4 through 130 positions for double rows and 2 through 65 positions for single row. The double beam contact connectors are available with single and double rows of contacts. There are various solder lead configurations to meet a variety of system requirements.

There are surface mount connectors available with and without hold-downs. The hold-downs help position the connector on the pc board and hold it in place during soldering. Through hole connectors are available with and without retentive contact leads. The retentive contact leads help stabilize and hold the connector in place during soldering. Connectors without hold-down or retentive contact lead stabilizing features are available to accommodate alternate system requirements.

When corresponding with Tyco Electronics 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.

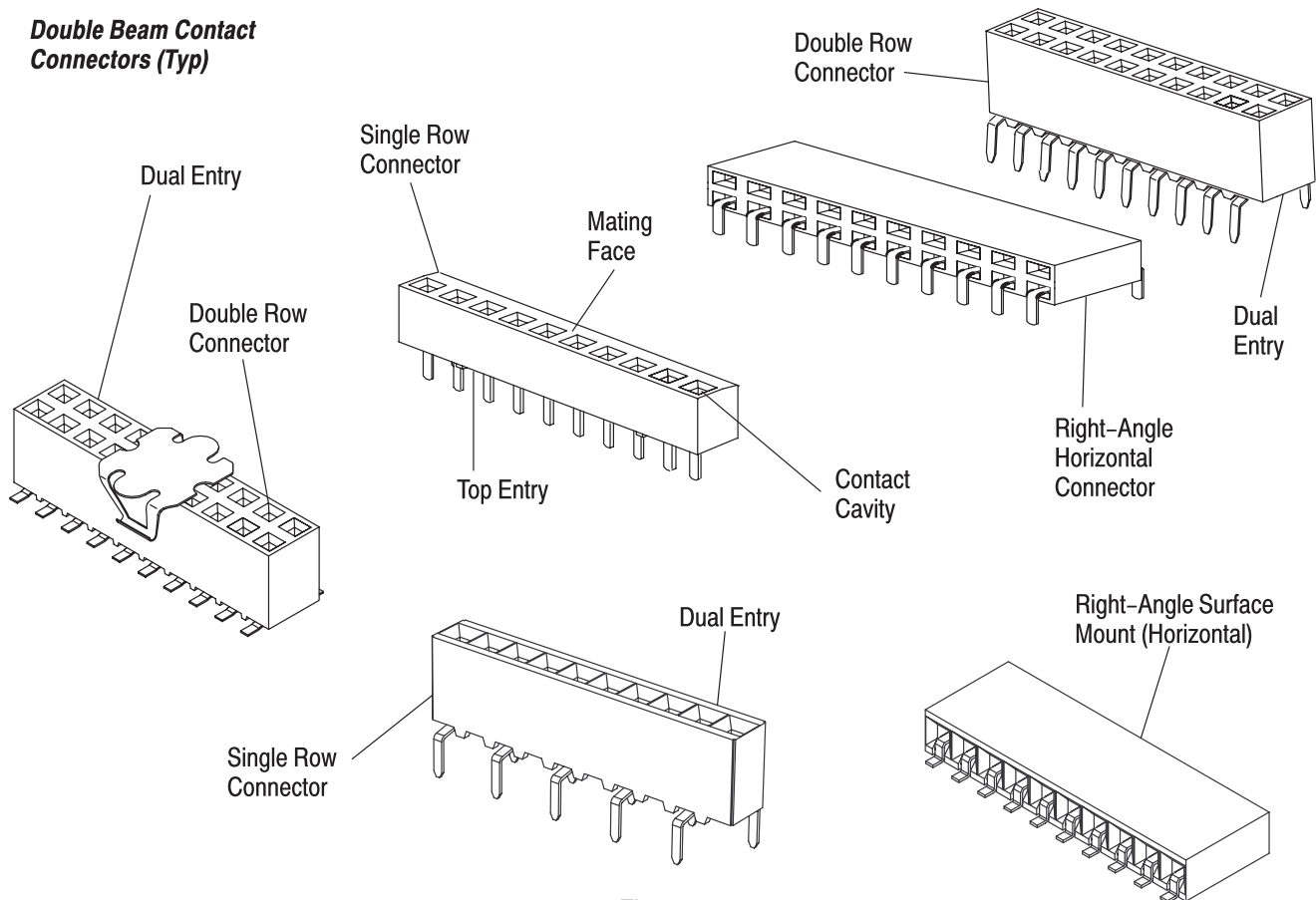


Figure 1

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

This paragraph is reserved for a revision summary of changes and additions made to this specification. The following changes have been made to this revision.

- Updated document to corporate requirements
- New format

### 2.2. Customer Assistance

Reference Part Number 534998 and Product Code 5008 are representative numbers of AMPMODU 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 information. Such information can be obtained through a local Tyco Electronics Representative or, after purchase, by calling the Tooling Assistance Center or the Product Information Center number at the bottom of page 1.

### 2.3. Drawings

Customer drawings for each connector 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 Tyco Electronics.

### 2.4. Manuals

Manual 402-40 is available upon request and can be used as a guide in soldering. 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 a guide for information on soldering problems.

### 2.5. Specifications

Product Specifications provide product performance requirements and test information. See Product Specifications 108-25022 and 108-25026 for double beam contacts.

## 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 of the contact solder leads or other damage to the connectors. The connectors should be used on a first in, first out basis to avoid storage contamination.

#### C. Chemical Exposure

Do not store connectors near any chemical listed below as they may cause stress, corrosion, cracks in the contacts.

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

### 3.2. Special Characteristics

AMPMODU PC Board Connectors with double beam contacts have an operating temperature range of  $-65^{\circ}\text{C}$  to  $105^{\circ}\text{C}$  [ $-85^{\circ}\text{F}$  to  $221^{\circ}\text{F}$ ], and the connectors consist of a black polyester housing and phosphor bronze contacts with one of two types of plating. The contact plating may be overall nickel with gold on the mating surface and matte tin on the solder leads, or it may be overall nickel and matte tin plated.

The housing contact cavities on the mating face of the connectors have a tapered lead-in to facilitate mating with contact posts. Through hole connectors are available as: (1) top entry with pinched solder leads; (2) dual entry with in-line and extended outrigger solder leads; and (3) right-angle horizontal connectors. Vertical surface mount connectors are also available. See Figure 2.

**THROUGH HOLE CONNECTOR CONFIGURATIONS**

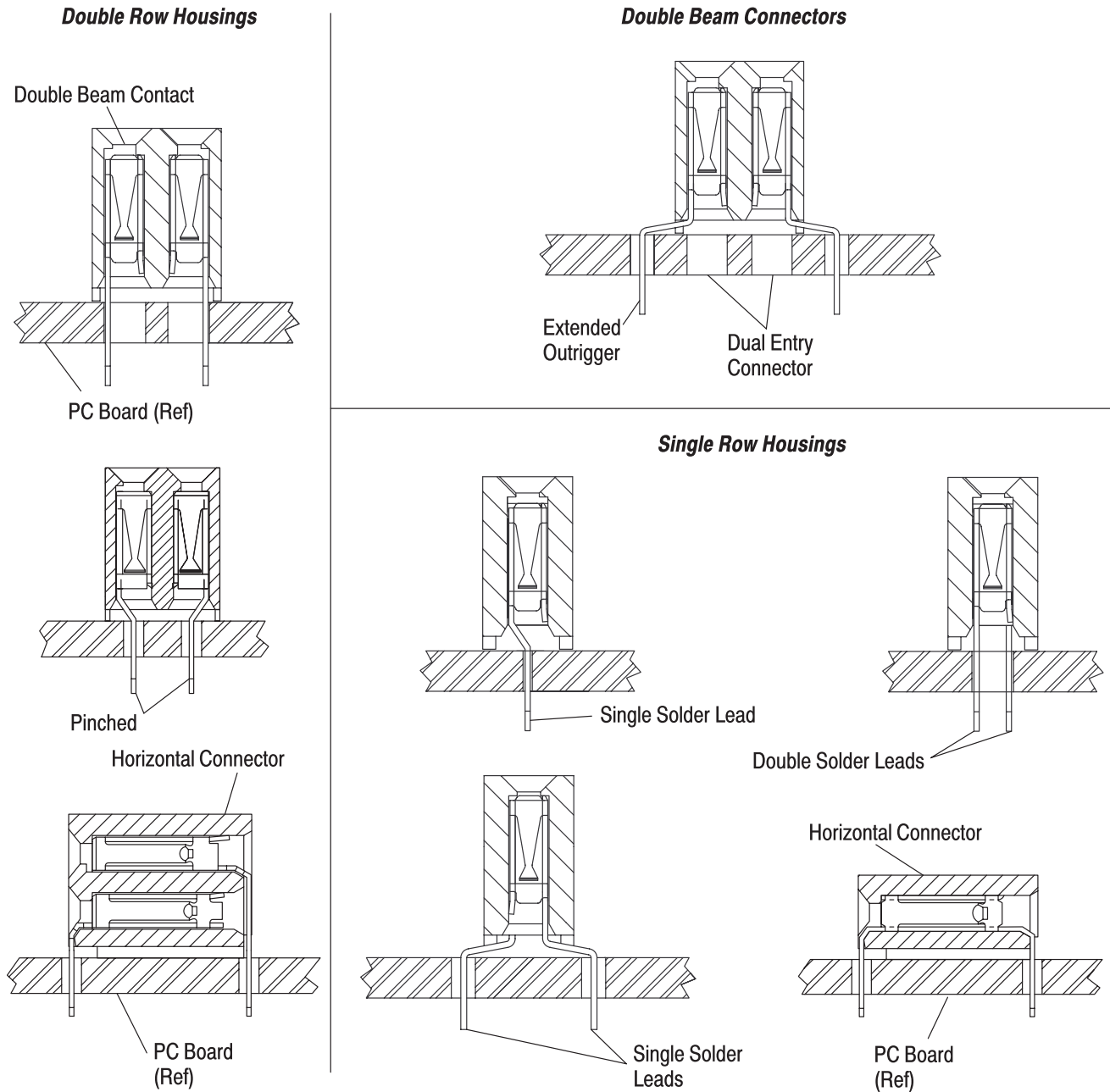


Figure 2

**3.3. Printed Circuit Boards**

**A. Material and Thickness**

The pc board material shall be glass epoxy (IPC 4101/26/83 or equivalent). The connectors are designed to accommodate a pc board thickness range of 1.40 mm to 2.40 mm. Call the Product Information number listed at the bottom of page 1 for suitability of other board materials or other board thickness applications not specified on this specification.

**B. Tolerance**

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

**C. Layout for Surface Mount Connectors**



Connectors with hold-downs can be used with pc boards with 1.02 mm minimum thickness.

All surface mount connectors can be used for top or bottom entry applications. When a top mounted application is to be used, no post entry holes will be required in the pc board. A stencil is recommended for soldering of the connector to the circuit lands. We recommend liquid photo imageable and dry film for the solder mask material. The layouts for the circuit lands and solder mask are provided in Figure 3.

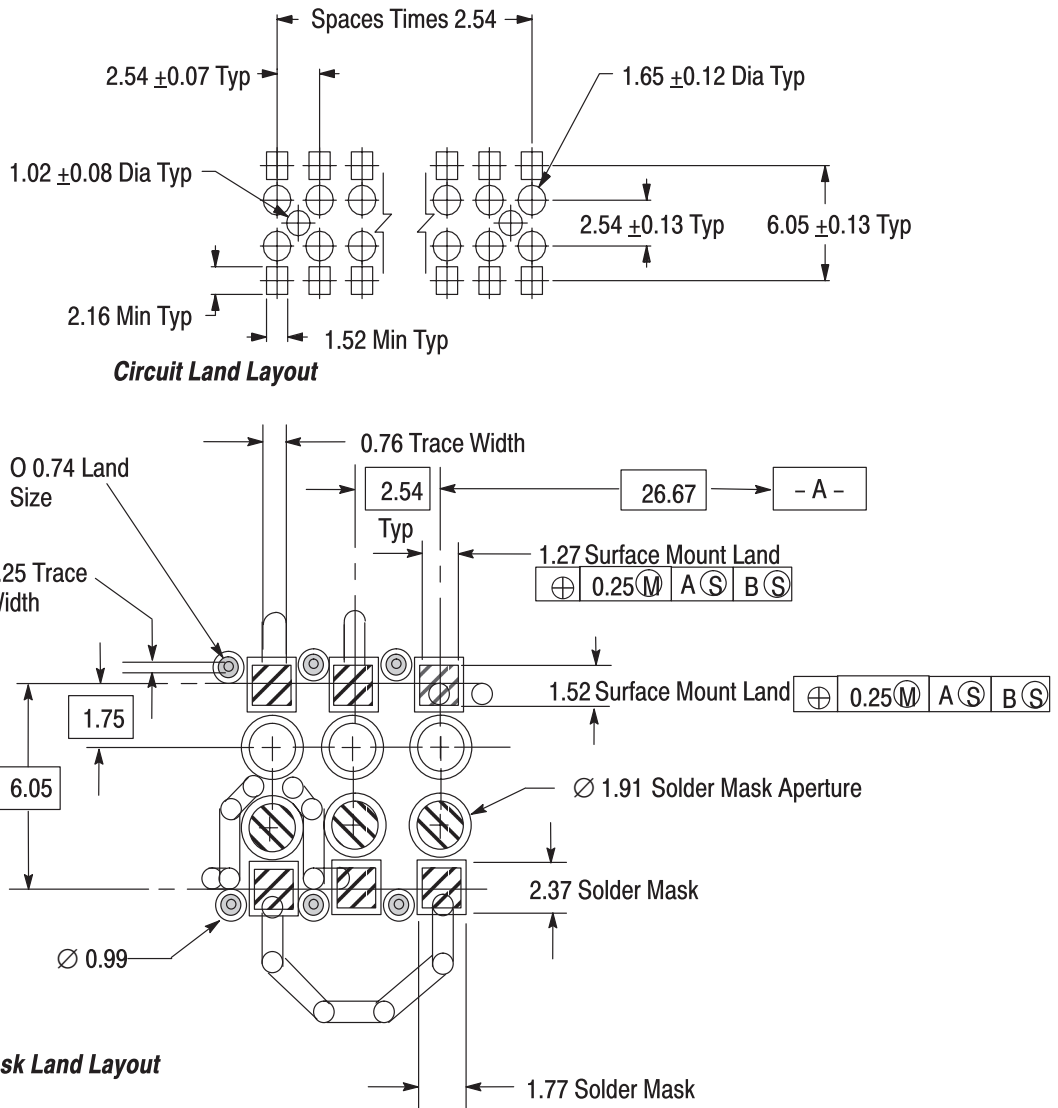


Figure 3

**D. Layout for Through Hole Top Entry Applications**

Top entry connectors with and without retention contact solder leads have the same centerline and hole diameter requirement. They use the identical pc board layout as indicated in Figure 4.

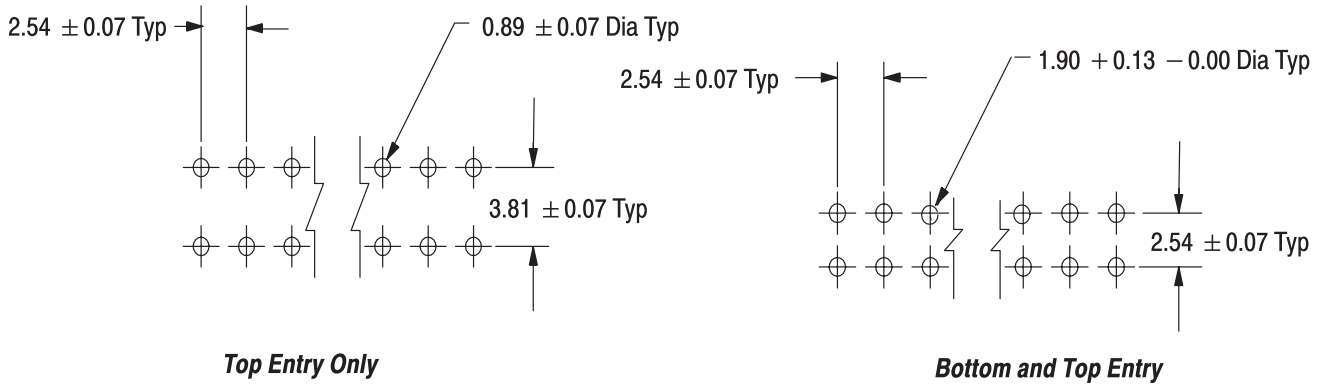


Figure 4

**E. Layout for Bottom Entry Applications**

Since these connectors have been designed for bottom entry applications, they have either in-line or extended contact solder leads. The holes through which the mating posts enter are identical in size; however, two additional rows of holes are required for the extended outrigger contact solder leads. See the layout dimensions in Figure 5.

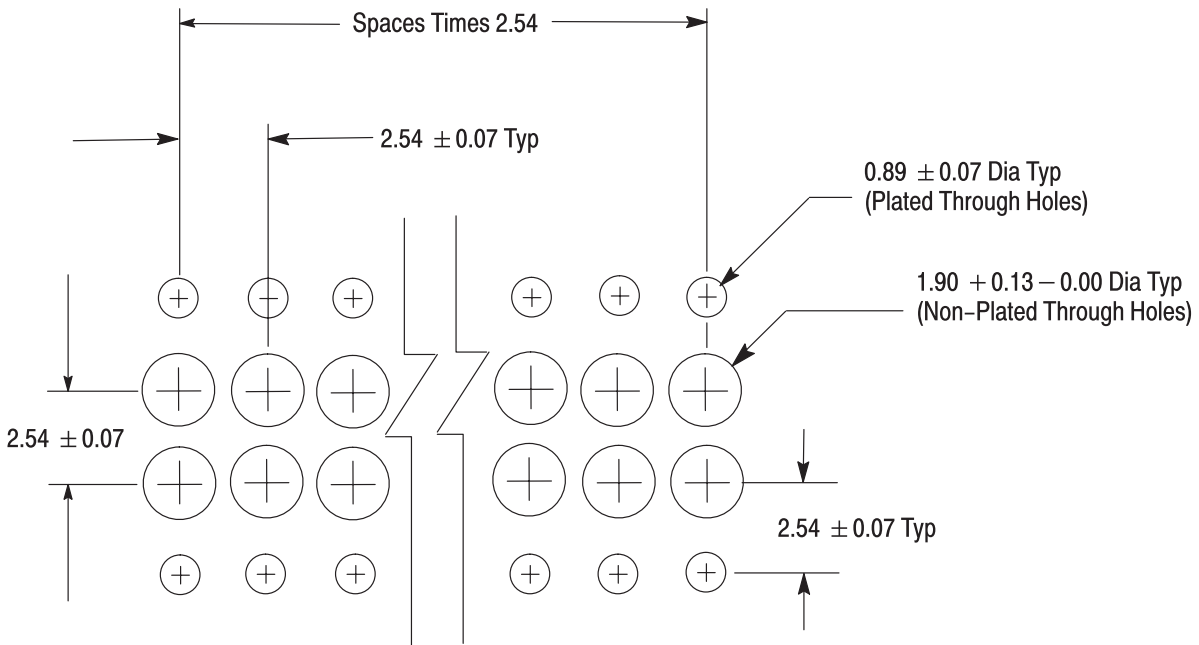


Figure 5

**F. Layout for Right-Angle Horizontal Connectors**

Right-angle connectors are designed to be mounted near the edge of a pc board to engage the mating contact posts without interference. The distance from the edge of the pc board and the hole layout dimensions are provided in Figure 6.

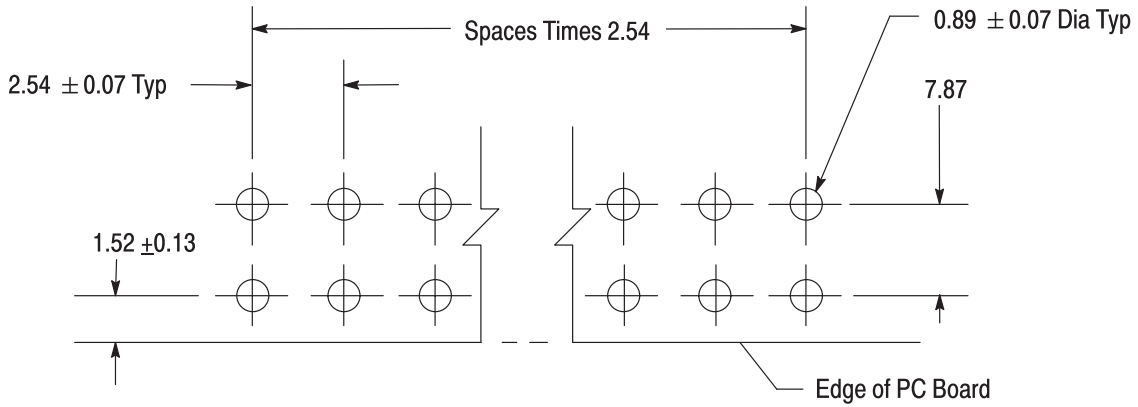


Figure 6

**G. Through Hole Preparation**

The holes in the pc board must be precisely located to ensure proper placement and optimum performance of the connector, and must be prepared to the requirements provided in Figure 7.

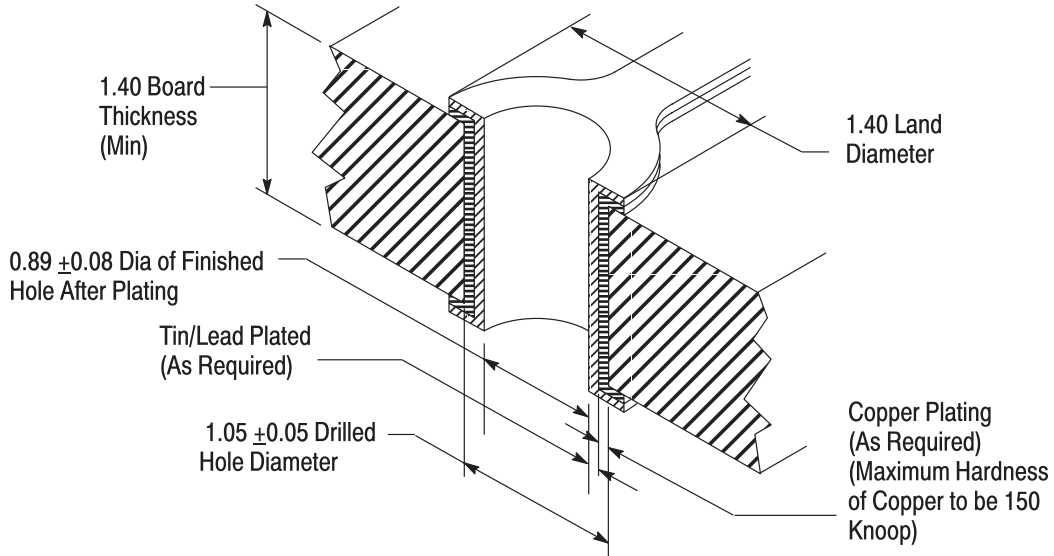


Figure 7

**3.4. Connector Placement**



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

Connector placement may be done either manually or with robotic equipment. The robotic equipment must be adjusted to feed, pick up, and place the connectors on the pc board with an accuracy of 0.25 mm.

**A. Through Hole Connectors**

When placing through hole connector on the pc board, make sure the contact solder leads are aligned and started into the matching holes before seating the housing on the pc board. To help hold through hole, top entry, single beam connectors on the pc board prior to soldering, we recommend bending the contact solder leads outward (away from center) to hold the connector in place during soldering. The solder leads must be bottomed on the pc board as shown in Figure 8. Product may also be ordered with retentive solder leads.



When clinching contact solder leads, make sure the housing remains seated on the pc board and the connector housing and pc board are supported. Also, do not apply in-line pressure on the contact leads as this could cause the contacts to dislodge from their seat in the housing.

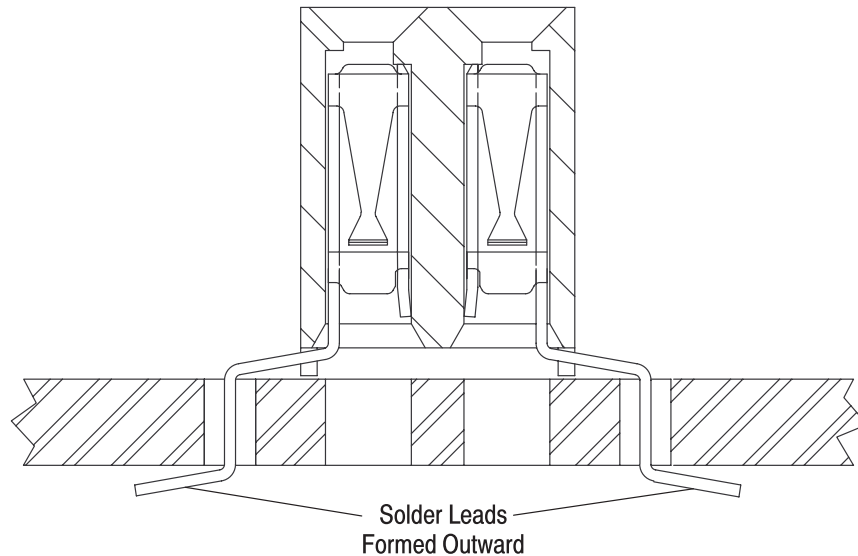


Figure 8

**B. Surface Mount Connectors**

On connectors so equipped the hold-down feature is a press fit design to hold the connector on the pc board. All connector housings must be seated on the pc board to ensure proper placement. Also, solder leads must penetrate the solder flux and be aligned within the limits shown in Figure 9.



Optimally, the connector solder leads should be aligned on the pc board lands. However, misregistration is permissible for certain performance classifications as specified in J-STD-001 as indicated below.

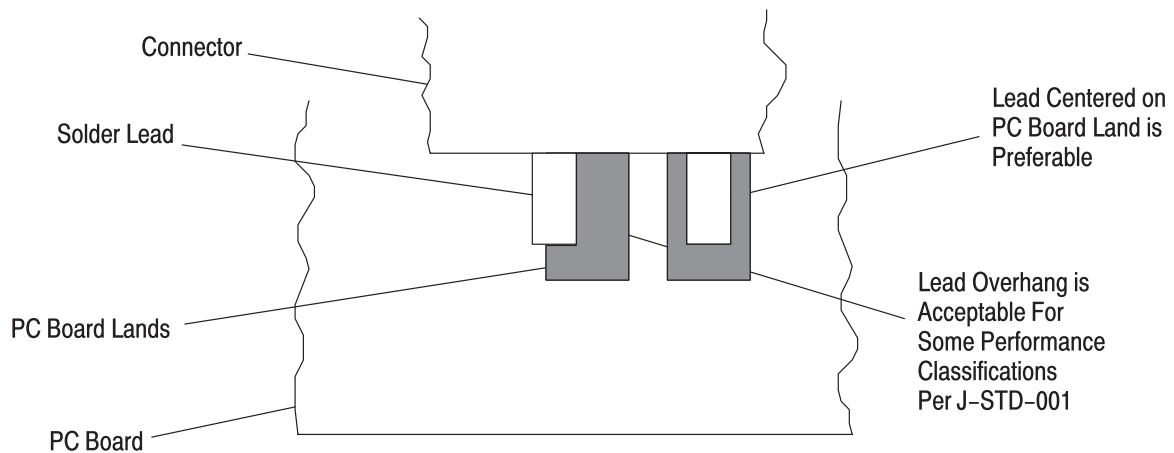


Figure 9

**3.5. Mechanical Support**

**A. Hold-Down**

We recommend that a hold-down be used to keep the connectors in place until the soldering is completed. Tyco Electronics does not manufacture or market hold-downs for general sale.

## B. PC Board Support

The system design must provide support for the pc boards to minimize stress on the solder leads. This process is of special concern for surface mount connectors.

### 3.6. Surface Mount Connector Preparations

The pc board lands must be solderable in accordance with Test Specification 109–11.

#### A. Typical Solder Paste Characteristics

1. Alloy type shall be 99.8 Sn lead-free.
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 x 10% cp (centipoise).
6. Minimum viscosity of stencil print shall be 7.5 x 10% cp (centipoise).

#### B. Solder Volume

Solder volume for each connector shall be 0.18 mm<sup>3</sup> per contact solder lead.

#### NOTE

*Solder volume may vary depending on solder paste composition.*



#### C. Solder Paste Thickness

Solder paste thickness for the solder leads shall be 0.20 mm.

#### D. 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 land area of the contact solder leads.

#### 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 leads, 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 lands. If a trace is run between adjacent lands 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 leads. 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 (reference Figure 3).

### 3.7. Through Hole Connectors Preparations

Three items are essential when wave soldering through hole connectors: (1) preventing solder bridging across solder leads, (2) preventing wicking of flux/solder into receptacle contacts, and (3) removing flux from the contact after soldering.

#### A. Bridging

Solder bridging across solder leads can be prevented by interrupting copper land between leads by etching, plugging, tapping, or masking area between solder leads. Typical configurations are shown in Figure 10.





Etching is not recommended if reduction of copper would be detrimental to current carrying capability of the circuit land.

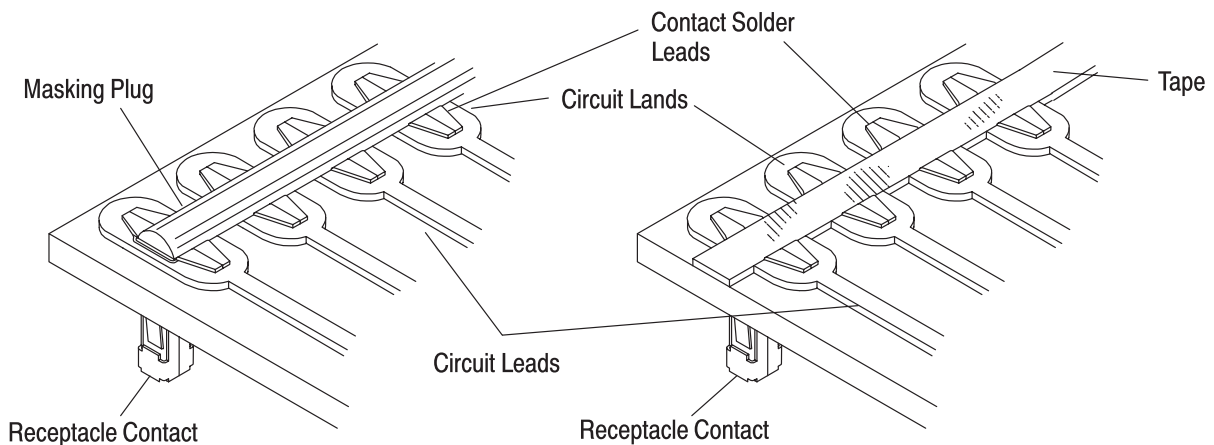


Figure 10

### B. Wicking

Flux that is splashed or driven by heat into the receptacle could cause open or intermittent circuits and can be prevented by using any one of the following: (1) masking plugs, (2) liquid solder mask, and (3) tape. Tyco Electronics has obtained favorable test results using the products and manufacturers listed below:

- Liquid Solder Mask No.110, or equivalent (Alphametals Inc., Santa Ana, CA )
- Masking Tape No. 213 or equivalent (3M Company, Minneapolis, MN )

Our test results have produced the following recommendations.

#### 1. Masking Plug

The masking plug must be inserted between the solder leads and firmly seated on the pc board. After soldering, the plug must be pulled out. If no damage is apparent, the masking plug may be used again.

#### 2. Liquid Solder Mask

The liquid solder mask must be applied with a brush between the contact solder leads on the bottom side of the pc board. It is water soluble and can easily be removed with clean water.

#### 3. Tape

The width of the tape must be comparable to the space between the contact solder leads after the contact solder leads are clinched in place. Mod II contacts will require a 3.18 mm [1/8 in.] wide strip of tape and the Mod IV contacts will require a 1.59 mm [1/16 in.] wide strip of tape. The tape must be firmly applied to the bottom of the pc board between the contact solder leads. It *must not* be re-used after it is removed.

### C. Flux Removal

If application requirements and equipment permit, fluxing and soldering can be done without the special precautions for bridging and wicking of solder. Flux and flux residue must be removed to prevent the possibility of intermittent and open circuits. We recommend using any of the cleaners listed in Figure 13 and a clean air supply with pressure suitable for components you are soldering with (see section 3.9, B).

## 3.8. Soldering Technique

### A. Soldering Equipment

It is recommended that the connectors be soldered using vapor phase reflow (VPR), double sided Batch Vapor Phase (Model VVP 10 BU) and Vitronics‡ (Model SMD 718) equipment, non-focused infrared (IR), or equivalent soldering technique. Tyco Electronics has had success using Corpane† equipment.

† Manufactured by Corpane Industries Incorporated, Louisville, KY

‡ Manufactured by Vitronics Corporation, Newburyport, MA

**B. 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 11 for the IR reflow.

SOLDERING PROCESS	TEMPERATURE		TIME (At Max Temp)
	CELSIUS	FAHRENHEIT	
WAVE SOLDERING	260●	500●	5 Seconds
VAPOR PHASE SOLDERING	215	419	5 Minutes
INFRARED REFLOW SOLDERING	230	446	5 Minutes

● Wave Temperature

Figure 11

**C. Reflow Parameters**

Due to many variables involved with the reflow process (eg, component density, orientation, etc), it is recommended that the user conduct trial runs under actual manufacturing conditions to ensure product and process compatibility. Recommended reflow parameters are provided in Figure 12. For additional suggestions, contact one of the phone numbers provided at the bottom of page 1.

- 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 mm, or 381 mm per minute for bigger boards

PREHEAT 350°C [662°F]	ZONE 1	ZONE 2	ZONE 3
SURFACE-MOUNT	240°C [464°F]	260°C [500°F]	265°C [509°F]
THROUGH-HOLE	240°C [464°F]	260°C [500°F]	265°C [509°F]

Figure 12

**3.9. Cleaning**

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Figure 13 provides a list of common cleaning solvents that will not affect the connectors for the times and temperatures provided without any adverse effects on the connector.



Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer.



If you have a particular solvent that is not listed, contact Tyco Electronics through one of the telephone numbers at the bottom of page 1.

**A. Through Hole Connectors**

Flux and flux residue can be removed from through hole contacts by directing a narrow stream of solvent through the receptacle followed by a burst of pressurized, clean air.



Compressed air used for cleaning must be reduced to less than 207 kPa [30 psi], and effective chip guarding and personal protective equipment(including eye protection) must be used.

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

■ Product of Fry's Metals, Inc.    ◆ Product of Petroferm, Inc.    ● Product of Union Carbide Corp.    ❖ Product of Litton Systems, Inc.

Figure 13

**B. Drying**



Excessive temperatures may cause housing degradation.

Connectors can withstand a temperature of -65 to 100°C [-85 to 212°F]. Values may vary with different automatic cleaning equipment (see equipment manufacturer's recommendations).

**3.10. Checking Installed Connector**

All solder joints should conform to those specified in Workmanship Specification 101-21 and all other requirements specified on this document. The housing must seat on the pc board to within the tolerance shown in Figure 14.

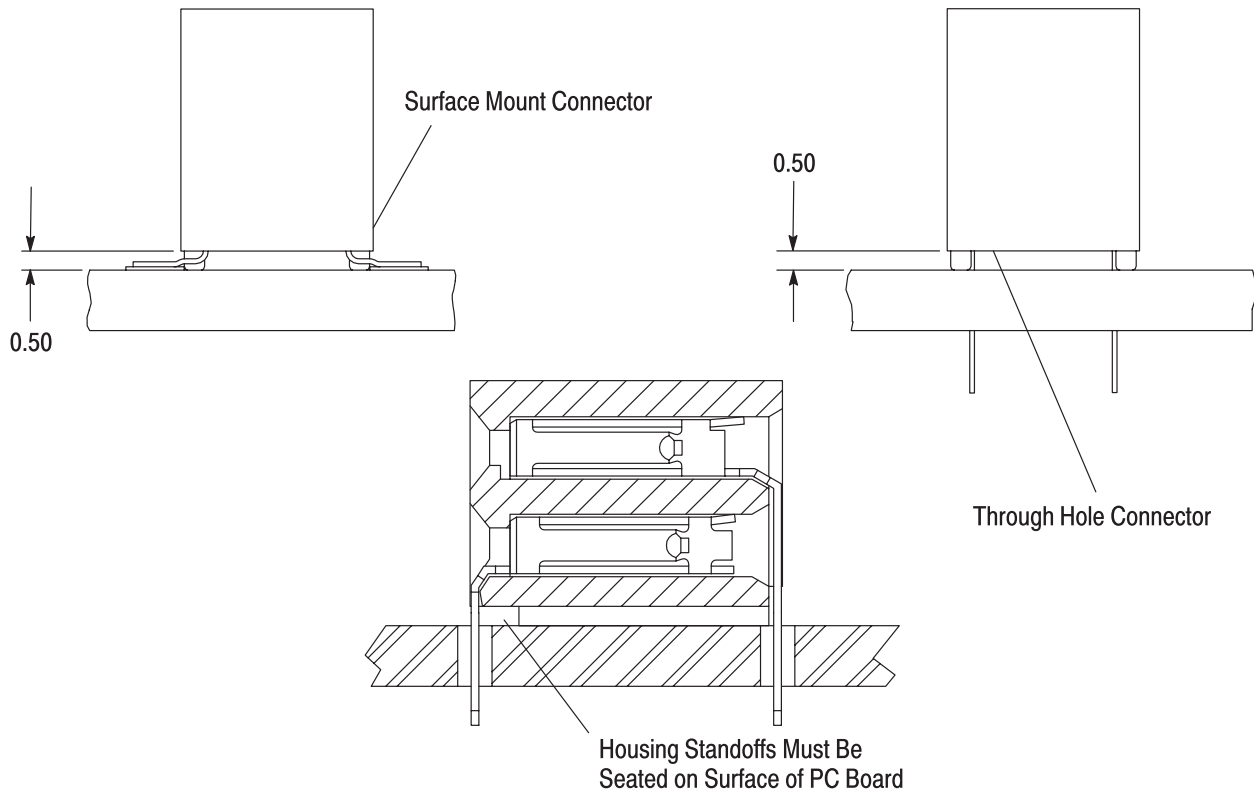


Figure 14

**3.11. Keying**

The connectors can be keyed with keying plug 86286-1 to prevent inadvertent mating of similar connectors in the same area. The mating assembly of a keyed connector must have the mating post removed. The keying plug must be inserted with the small end in the cavity. See Figure 15.

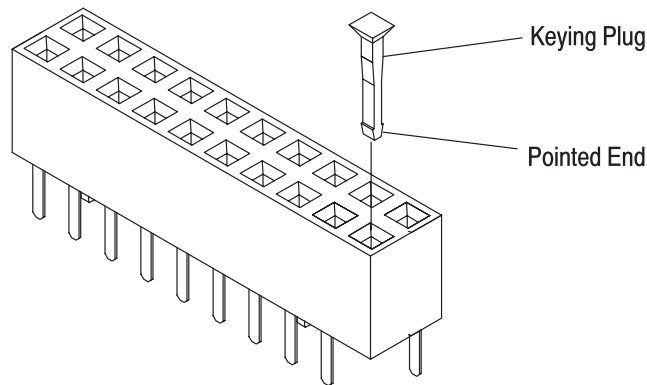


Figure 15

**3.12. Repair**

All connectors will require the desoldering of all contact solder leads, removing and discarding the damaged connector, and replacing it with a new one.

**4. QUALIFICATION**

The AMPMODU PC Board Connectors are Recognized by Underwriters' Laboratories, Inc. (UL) in File E28476, and Certified to CSA International in File LR7189.

**5. TOOLING**

No special tooling is required when handling connectors for manual placement; however, it is recommended that a support plate be used for through hole applications for both manual and robotic equipment placement to prevent deformation of the solder leads. See Figure 16.

**5.1. PC Board Support**

A pc board support should be used to prevent bowing of the pc board during the placement of a connector on the board and to allow the contact solder leads to go through the pc board without deforming the lead.

**5.2. Robotic Equipment**

The robotic equipment must have a true position accuracy tolerance of 0.25 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.

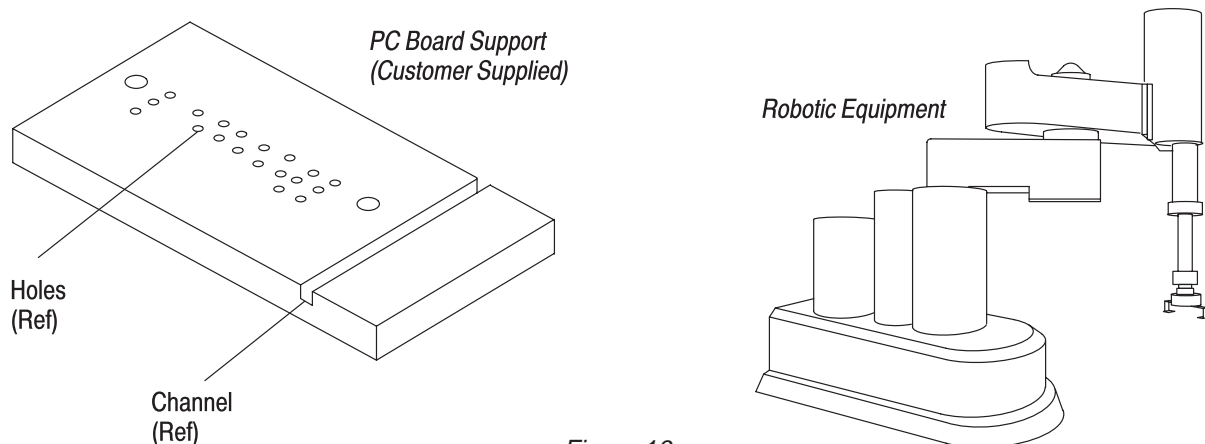
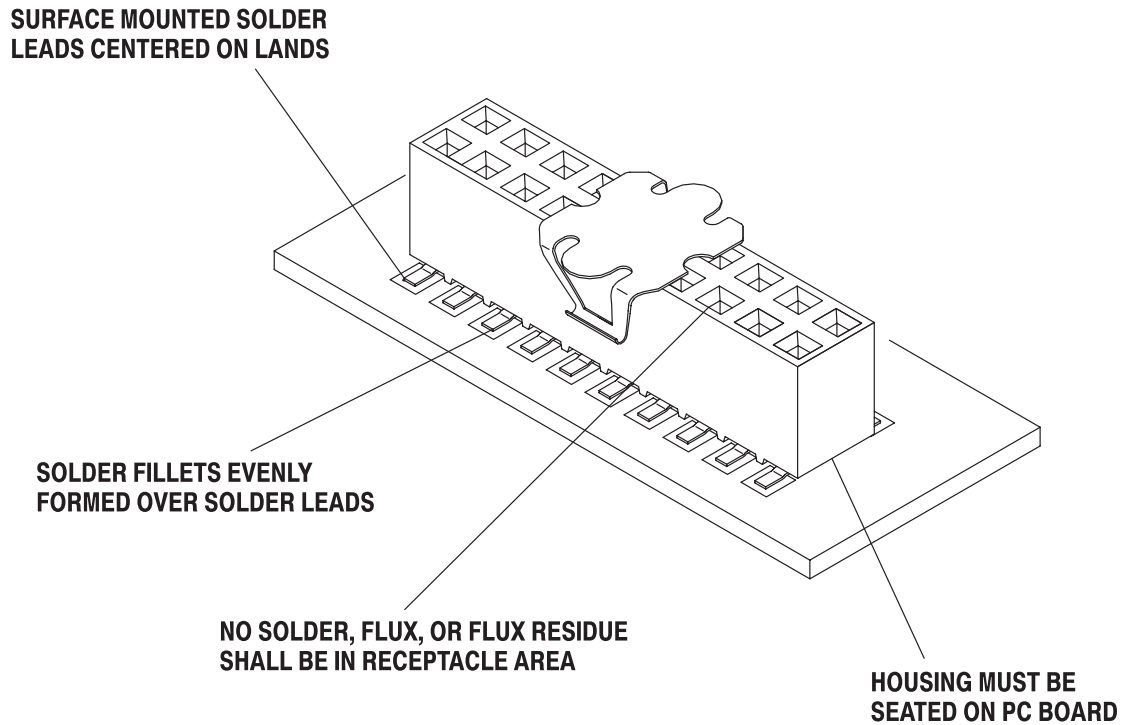


Figure 16

**6. VISUAL AID**

Figure 17 shows a typical application of an AMPMODU 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.



**FIGURE 17. VISUAL AID**