

**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  $\pm 0.13$  [ $\pm .005$ ] 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 application of AMPLIMITE Right-Angle Front Metal Shell Series 318, 478, and 590 plug and receptacle connectors. The series designator is the dimension from the front of the mounting flange to the center of the first row of contacts. The connectors are available without mounting hardware, with 4–40 threaded inserts, screwlocks, or boardlocks. They can be placed on the printed circuit (pc) board by hand or robotic equipment or may be panel mounted if necessary.

The connectors are available in 9, 15, 25, and 37 positions, and will mate with AMPLIMITE HDE, HDF, or HDP plastic or metal shell connectors. Each connector is marked with position numbers on the mating faces for circuit identification. The connector plugs contain pin contacts and the receptacles contain socket contacts. These pre-installed right-angle contacts have precision formed solder tines.

Figure 1 provides connector features and terms used throughout this specification. Use these terms when corresponding with Tyco Electronic Representatives to facilitate assistance.

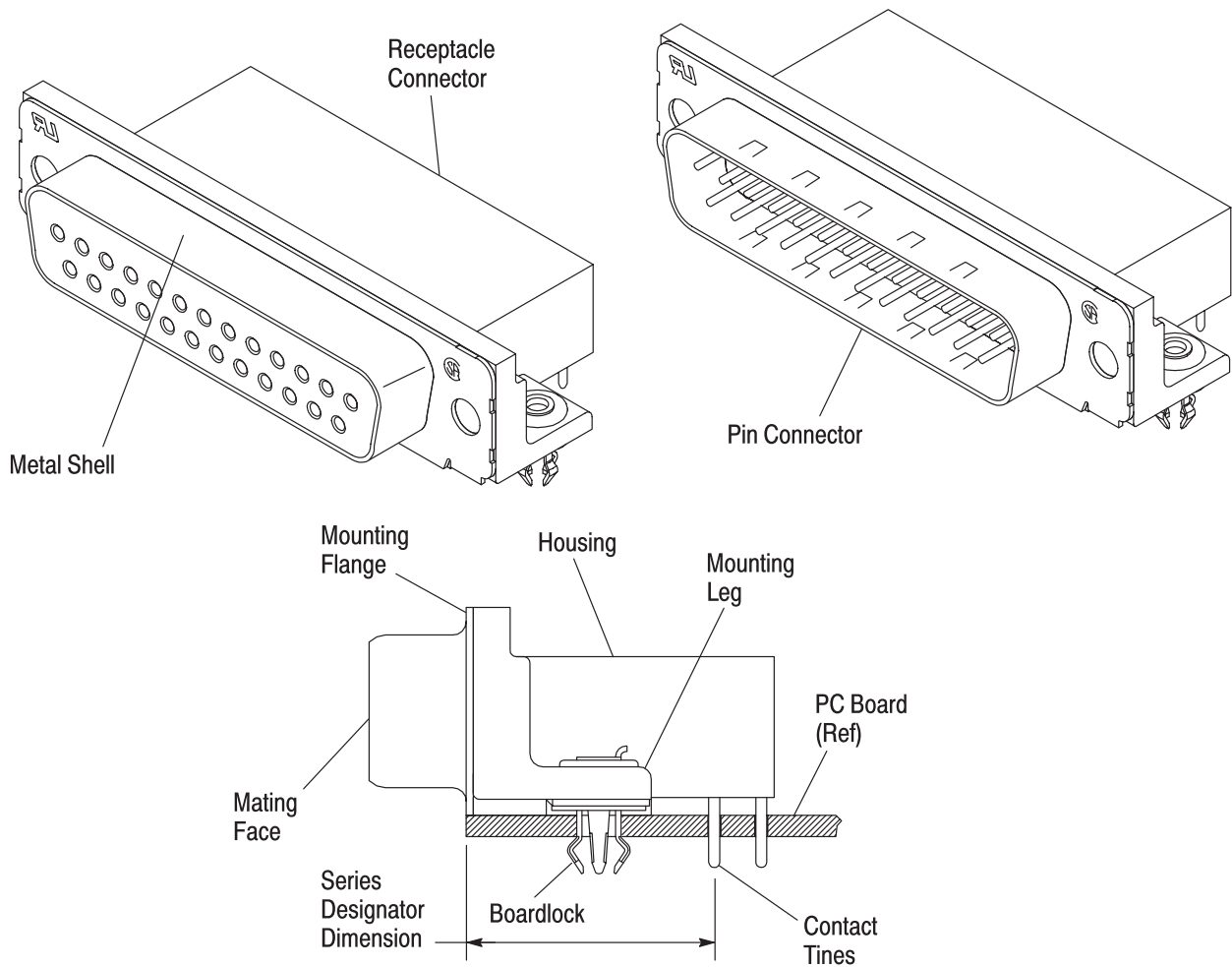


Figure 1

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

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

- Updated specification to corporate requirements
- New format and logo

### 2.2. Customer Assistance

Reference Part Number 747844 and Product Code 7318 are representative numbers of AMPLIMITE Right-Angle Front Metal Shell 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 the Product Information Center number at the bottom of page 1.

### 2.3. Drawings

Customer Drawings for each product part number 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 Corporation.

### 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 Specification 108-40025 covers test and performance requirements.

## 3. REQUIREMENTS

### 3.1. Storage

#### NOTE



*Due to the design of the connector, some corrosion may occur on the metal shell near the crimp tabs and on the ends of the shell. This condition does not affect the aesthetics, form, fit, or function of the connector or adjacent components and is considered to be acceptable by Tyco Electronics.*

#### A. Ultraviolet Light

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

#### B. Shelf Life

The connectors should remain in the shipping containers until ready for use to prevent damage. The products 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 chemicals listed below, as they may cause stress corrosion cracking in the components.

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

#### NOTE



*Where the above environmental conditions exist, phosphor-bronze contacts are recommended instead of brass if available.*

### 3.2. Connector Shell Size

The AMPLIMITE Metal Shell Connectors shell sizes conform to industry standard sizes. A composite of comparable plug configurations is provided in Figure 2.

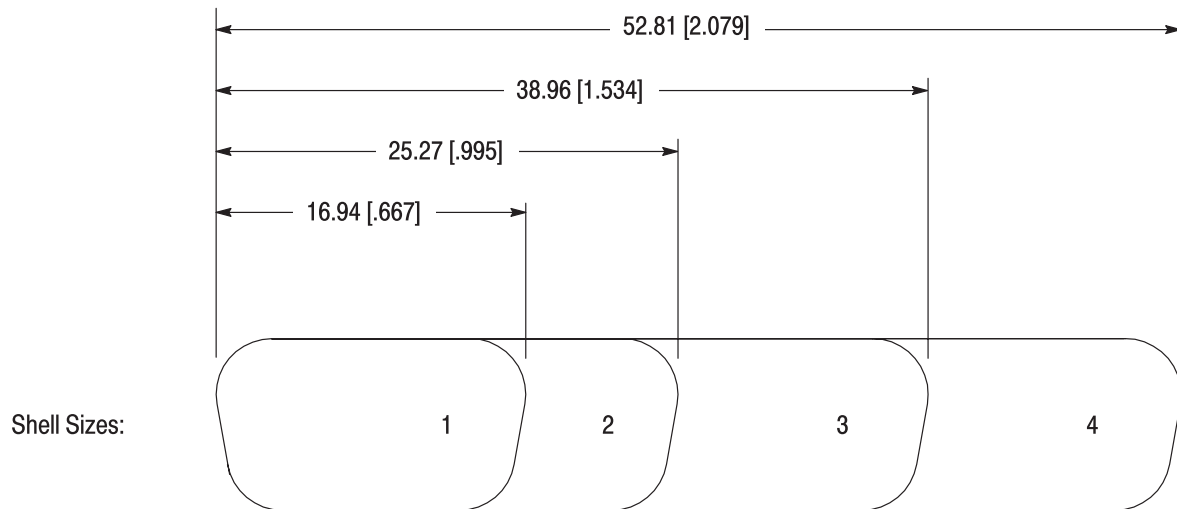


Figure 2

### 3.3. Mounting Panel Cutout

Panel mounting is optional for AMPLIMITE Right-Angle Front Metal Shell Connectors. For pc board receptacles, it will provide additional support for the solder joints during mating and unmating of connectors. PC board receptacles can ONLY be rear mounted. Either front or rear mounting is acceptable for the cable connector. The connector mounting flanges may have 4–40 internal threads that will accept screwlocks or panel mounting hardware. Hardware attached to the connector flange shall be tightened to 0.45 N•m (4 in.-lb) maximum. See Figure 3 for panel cutout dimensions.

Screwlocks are designed to secure a connector to a panel 1.58 mm [.062 in.] thick. They can be used with thinner panels; however, washers are recommended to make up the thickness difference and provide a bottoming surface for the mating connector flange. Screwlocks should be tightened to a torque of 0.45 N•m (4 in.-lb) maximum. The 4–40 internal threads in the screwlocks will accept commercially available screws and jackscrews.

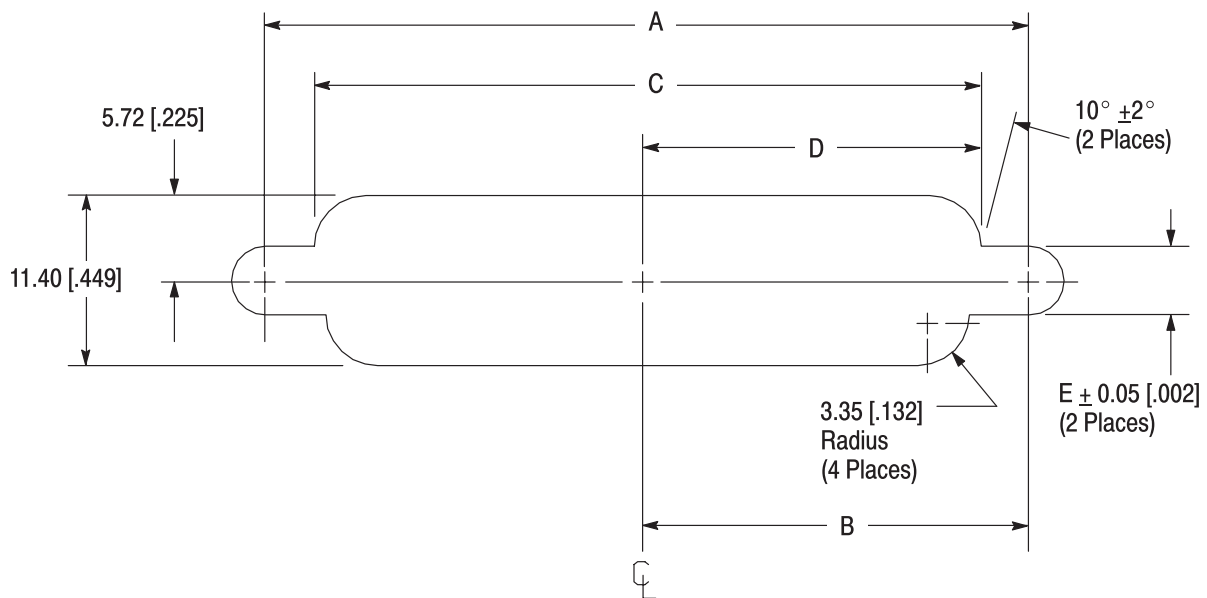


Figure 3 (cont'd)

NUMBER OF CONTACT POSITIONS	DIMENSIONS					
	A	B	C	D	E	
					W/SCREWLOCKS	W/O SCREWLOCKS
9	24.99 [.984]	12.50 [.492]	20.47 [.806]	10.24 [.403]	4.83 [.190]	3.05 [.120]
15	33.32 [1.312]	16.66 [.656]	28.80 [1.134]	14.40 [.567]		
25	47.04 [1.852]	23.52 [.926]	42.52 [1.674]	21.26 [.837]		
37	63.50 [2.500]	31.75 [1.250]	59.08 [2.326]	29.54 [1.163]		

Figure 3 (end)

**3.4. Mating Dimension**

The dimension in Figure 4 is needed to ensure full mating of connectors. This dimension must be considered when determining location and panel considerations when mounting connectors.

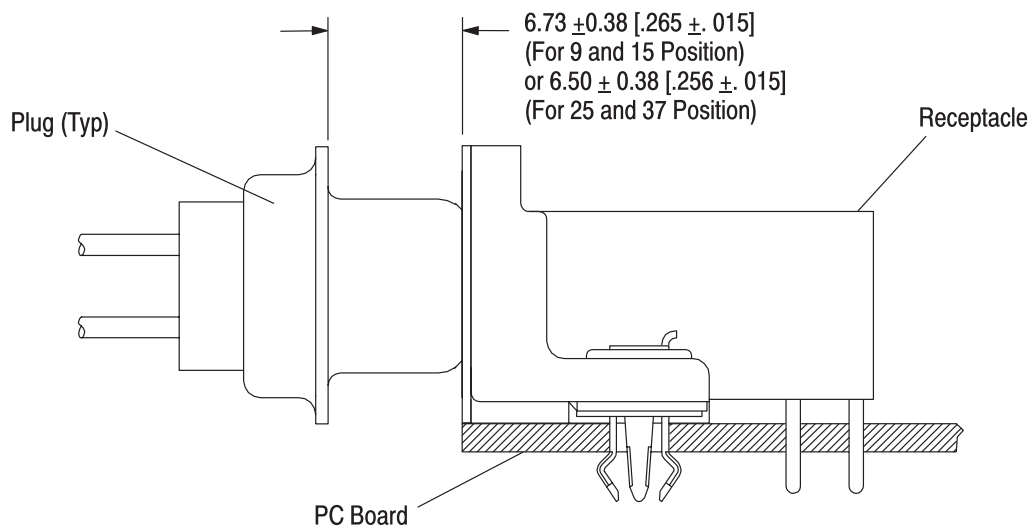


Figure 4

**3.5. Connector Spacing**

Care must be used to avoid interference between adjacent connectors and/or other components. The dimension is dependent on variable hardware used and the clearance required for mating connectors. The information provided in Figure 5 is to ensure proper mating for manual placement of connectors.

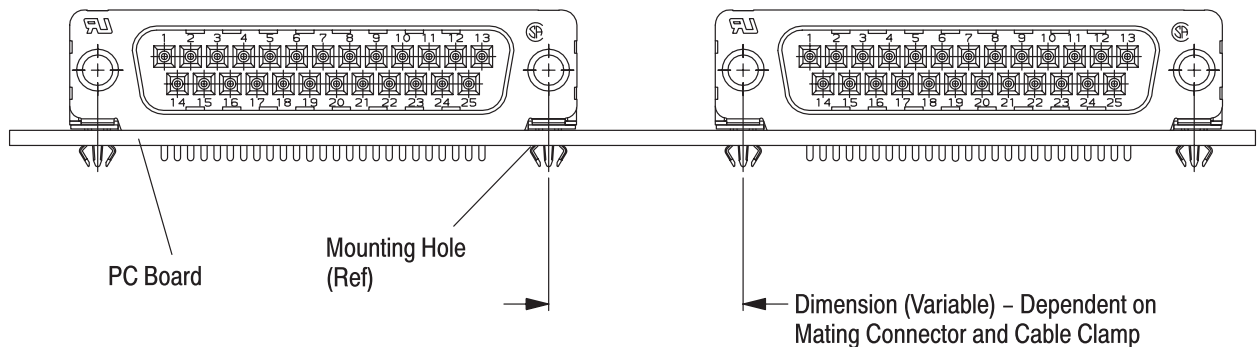


Figure 5

3.6. PC Boards

A. Material and Thickness

1. Board material will be glass epoxy (FR-4, G-10).
2. Board thickness shall be 2.36 mm [.093 in.] for standard AMPLIMITE Right-Angle Front Metal Shell Connectors or 1.57 mm [.062 in.] for connectors with boardlocks.

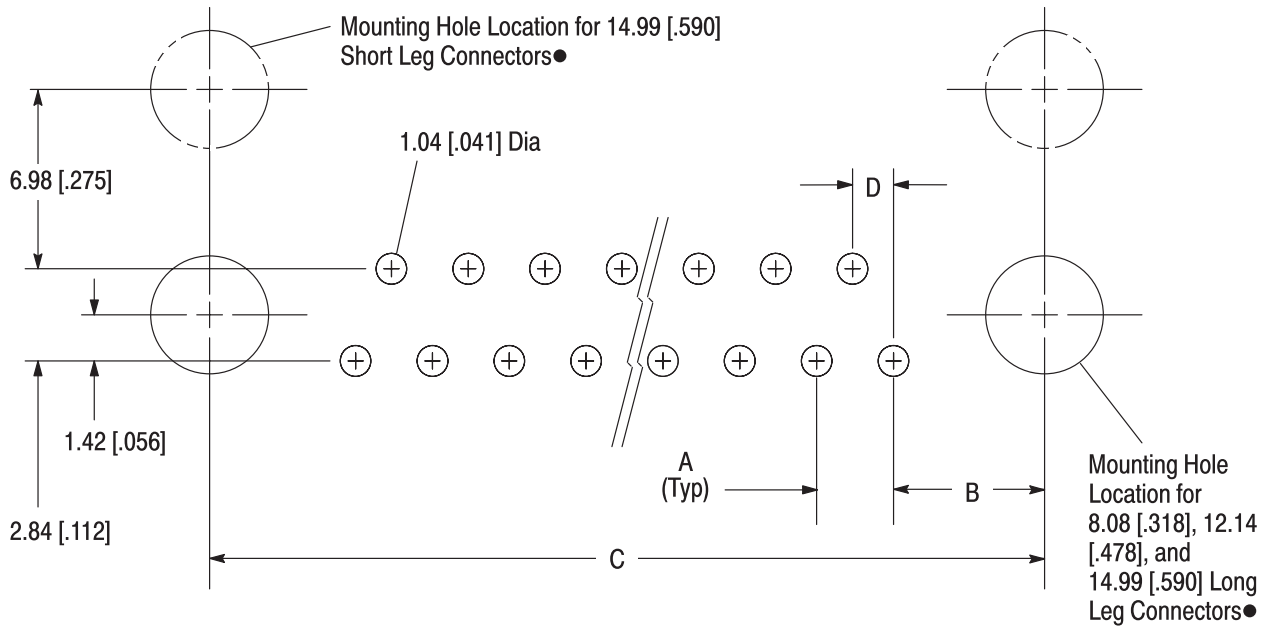
Contact the Product Information Center or the Tooling Assistance Center number listed at the bottom of page 1 for suitability of other board materials or thicknesses.

B. Tolerance

Maximum allowable bow of the pc board shall be 0.03 mm [.001 in.] over the length of the connector.

C. PC Board Layout

The mounting and contact holes in the pc board must be precisely located to ensure proper placement and optimum performance of the connector. The connectors can be placed on the pc board manually or by machine. The following dimensions must be observed when preparing a pc board for AMPLIMITE Right-Angle Front Metal Shell Connectors. Design the pc board using the dimensions provided in Figure 6 for manual placement and Figure 7 for robotic placement. Both figure layouts show the connector mating face of the pc board.



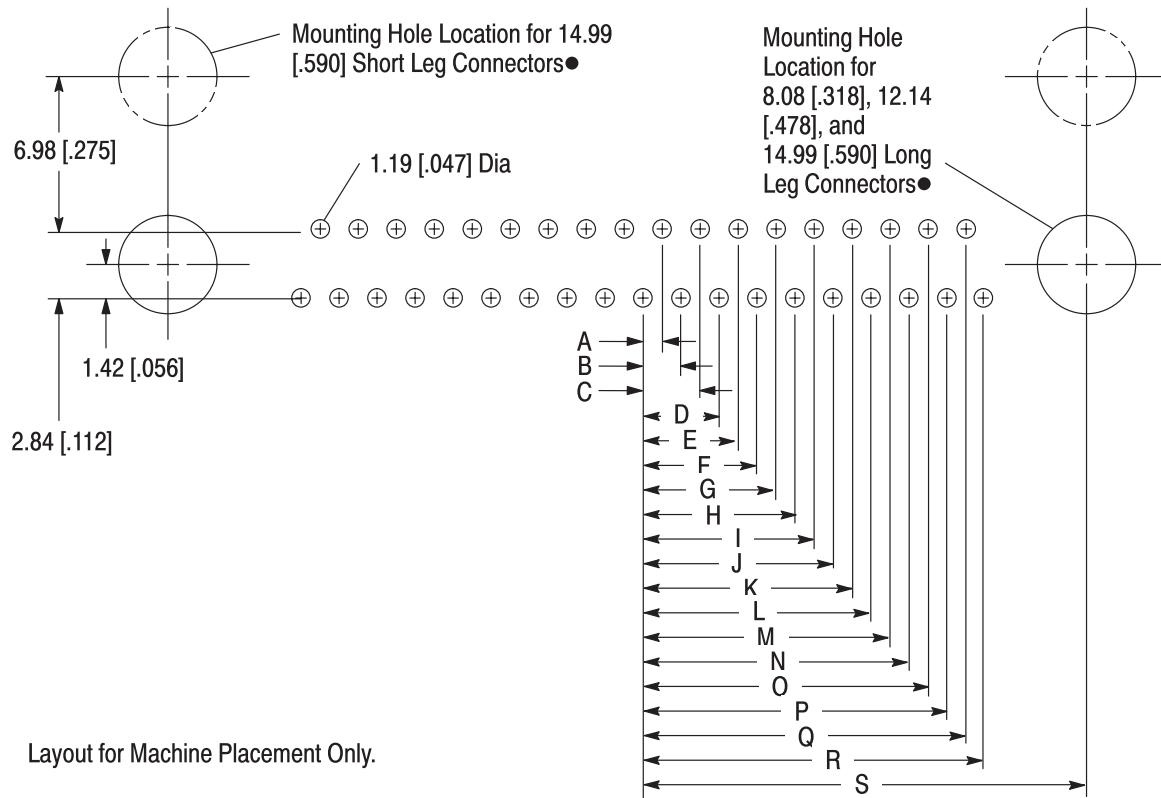
NOTE: Layout for Manual Placement Only.

NUMBER OF CONTACTS	DIMENSIONS			
	A†	B	C	D
9	2.74 [.108]	7.01 [.276]	24.99 [.984]	1.37 [.054]
15	2.74 [.108]	7.06 [.278]	33.32 [1.312]	1.37 [.054]
25	2.76 [.10867]	6.96 [.274]	47.04 [1.852]	1.379 [.05433]
37	2.76 [.10867]	6.91 [.272]	63.50 [2.500]	1.379 [.05433]

†This dimension is a noncumulative tolerance.

●Use 3.18 ±0.08 mm [.125 ±.003 in.] for connectors with boardlocks and 3.05 mm [.120 in.] for connectors with 3.18 mm [.125 in.] diameter holes.

Figure 6



**NOTE:** Layout for Machine Placement Only.

**NOTE:** All dimensions for this layout have a tolerance of  $\pm 0.05$  [ $\pm 0.002$ ] unless otherwise stated.

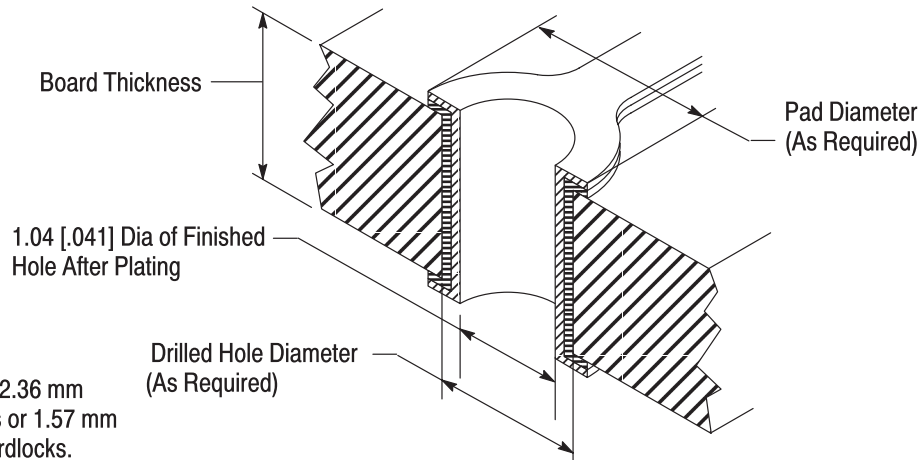
CONN POSN	DIMENSIONS									
	A	B	C	D	E	F	G	H	I	J
9	1.37 [.054]	2.74 [.108]	4.11 [.162]	5.49 [.216]	---	---	---	---	---	---
15	1.37 [.054]	2.74 [.108]	4.11 [.162]	5.49 [.216]	6.86 [.270]	8.23 [.324]	9.60 [.378]	---	---	---
25	1.40 [.055]	2.77 [.109]	4.14 [.163]	5.54 [.218]	6.91 [.272]	8.28 [.326]	9.68 [.381]	11.05 [.435]	12.42 [.489]	13.82 [.544]
37	1.40 [.055]	2.77 [.109]	4.14 [.163]	5.54 [.218]	6.91 [.272]	8.28 [.326]	9.68 [.381]	11.05 [.435]	12.42 [.489]	13.82 [.544]
CONN POSN	DIMENSIONS									
	K	L	M	N	O	P	Q	R	S	
9	---	---	---	---	---	---	---	---	12.50 [.492]	
15	---	---	---	---	---	---	---	---	16.66 [.656]	
25	15.19 [.598]	16.56 [.652]	---	---	---	---	---	---	23.52 [.926]	
37	15.19 [.598]	16.56 [.652]	17.96 [.707]	19.33 [.761]	20.70 [.815]	22.10 [.870]	23.47 [.924]	24.84 [.978]	31.75 [1.250]	

● Use 3.18  $\pm 0.08$  mm [.125  $\pm 0.003$  in.] for connectors with boardlocks and 3.05 mm [.120 in.] for connectors with 3.18 mm [.125 in.] diameter holes.

Figure 7

### 3.7. PC Board Contact Tine Holes

These connectors may be used with or without plated through holes. If plated, the drilled hole size plating types and plating thickness are dependent on your application requirements. The finished hole size must be as stated to provide unrestricted insertion and ensure adequate application of solder to the tines. See Figure 8.



**NOTE:** Board thickness shall be 2.36 mm [.093 in.] for standard connectors or 1.57 mm [.062 in.] for connectors with boardlocks.

Figure 8

### 3.8. Limitations

Use the Product Specification referenced in Paragraph 2.5 for test procedures regarding these connectors.

### 3.9. Polarizing and Keying

The keystone configuration of each connector mating face prohibits the accidental inversion of mating connectors. To further reduce the possibility of incorrect installation of mating plug connectors, a keying plug may be placed in the receptacle connector. See Figure 9.

**NOTE**

*If a keying plug is used, the pin cavity in the mating plug connector must be empty.*

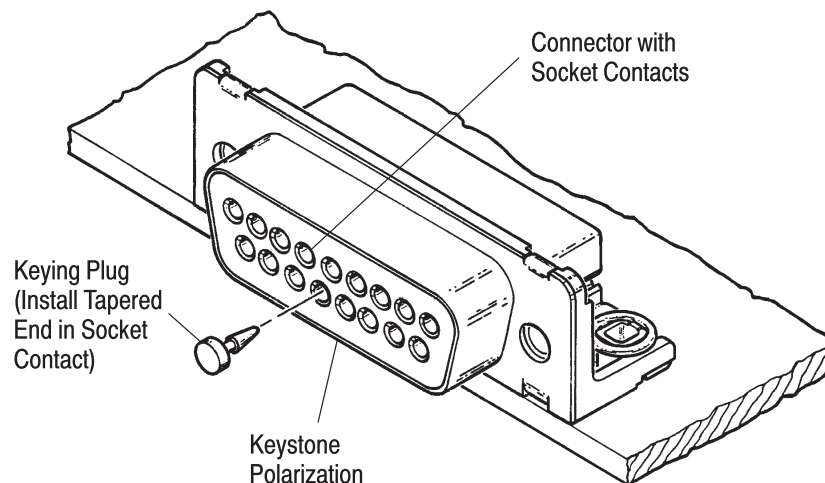


Figure 9

### 3.10. Hardware for PC Board Connectors

These connectors have been designed to be used with standard hardware. They will accept other types of commercially available mating hardware. If you are designing a connector for a system with some other type of hardware, contact the Product Information number on page 1 for design assistance. See Figure 10.

### A. Standard Products

The connector may be affixed to the pc board by using commercially available hardware such as screws, washers and nuts; rivets or similar devices. These connectors must not be secured using incompatible, dissimilar metals without appropriate interface treatment.

### B. Boardlocks

Boardlocks have gripping shoulders that pass through the pc board at the same time the contact tines are inserted through the board. They lock into position when the housing is seated on the board. The initial insertion and extraction forces are: 62 N [14 pounds] maximum for insertion and 13 N [3 pounds] minimum for extraction.

## 3.11. Ancillary Items

### A. Screwlocks

Removable or nonremovable screwlocks provide a means of securing mating connectors with commercially available 4-40 threaded hardware. The torque limit is 0.23 N•m [2 in-lb] applied from the mating face side. The maximum pushout force is 89 N [20 lb-force] applied from the mating face side.

### B. Inserts

Connectors with nonremovable 4-40 threaded inserts in the mounting flange allow the connector to be mounted to a panel with commercially available 4-40 hardware. The torque limit is .45 N•m [4 inch-pounds] applied from the mating face side. The maximum pushout force is 89 N [20 pounds], applied from the mating face side.

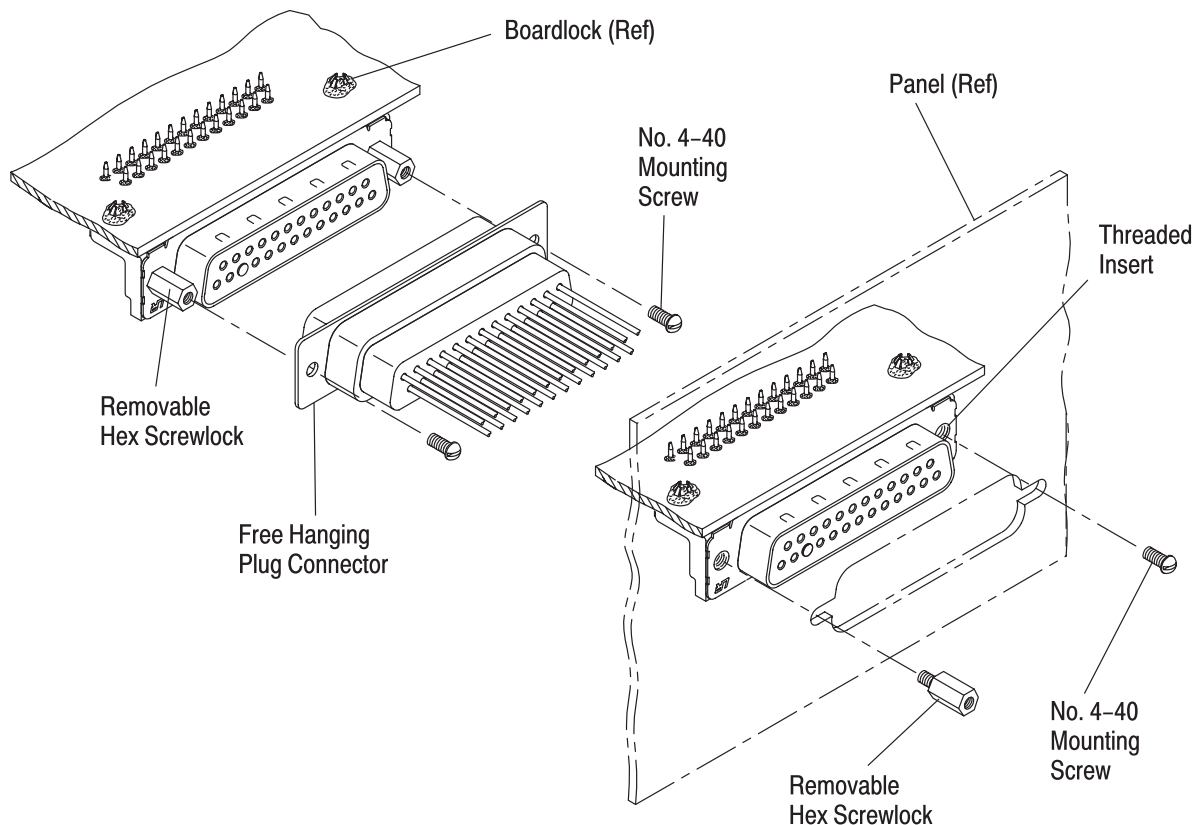


Figure 10

## 3.12. Shielding

These connectors feature tin-plated steel shells which provide continuity for EMC (Electromagnetic Compatibility) applications. When mated with corresponding metal shell connectors, shielding and grounding continuity are achieved. Use of boardlocks provides electrical continuity to any ground path on the pc board inclusive of hardware mounting holes.



**3.13. Connector Placement**



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

Determine which hole in the pc board is to receive the number one contact tine, then orient the connector so the number one solder tine is aligned with the hole. Start all solder tines into the board; then, when the boardlocks starts to engage the board, press the connector until it seats on the pc board.

After the connector is snapped into the pc board, the boardlocks are soldered with the connector solder tines during the soldering process.

**3.14. Soldering**

**A. Flux Selection**

Contact solder tines 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. Some fluxes that are compatible with these connectors are provided in Figure 11.

FLUX TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			KESTER <sup>⊞</sup>	ALPHA <sup>■</sup>
Type RMA (Mildly Activated)	Mild	Noncorrosive	186	611

⊞ Product of Kester Solder Co.    ■ Product of Alphametals Inc.

Figure 11

**B. Soldering Guidelines**

AMPLIMITE Right-Angle Front Metal Shell Connectors can be soldered using wave or equivalent soldering techniques. Refer to Manual 402-40 for soldering guidelines. The temperatures and exposure time shall be within the ranges specified in Figure 12. We recommend using SN60 or SN62 solder for these connectors.

A connector that is compatible with typical surface mount soldering techniques is also available. It can withstand a maximum temperature of 225°C [437°F] for a period of 90 seconds.

SOLDERING PROCESS	TEMPERATURE		TIME (At Max Temp)
	CELSIUS	FAHRENHEIT	
WAVE SOLDERING	260 <sup>⊞</sup>	500 <sup>⊞</sup>	5 Seconds

⊞ Wave Temperature

Figure 12

**C. Cleaning**

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. The following is a listing of common cleaning solvents that will not affect the connectors for the time and temperature specified. See Figure 13.

Cleaners must be free of dissolved flux and other contaminants. We recommend cleaning with the pc board on its edge. If using an aqueous cleaner, we recommend standard equipment such as a soak-tank or an automatic in-line machine.



Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Refer to the manufacturer’s Material Safety Data Sheet (MSDS) for characteristics and handling of cleaners. 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.

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

**D. Drying**

When drying cleaned assemblies and printed circuit boards, make certain that temperature limitations are not exceeded: -55° to 105°C [-67° to 221°F]. Excessive temperatures may cause housing degradation.

**3.15. Checking Installed Connector**

The AMPLIMITE Right-Angle Front Metal Shell Connector must be seated on the pc board to the dimensions shown in Figure 14.

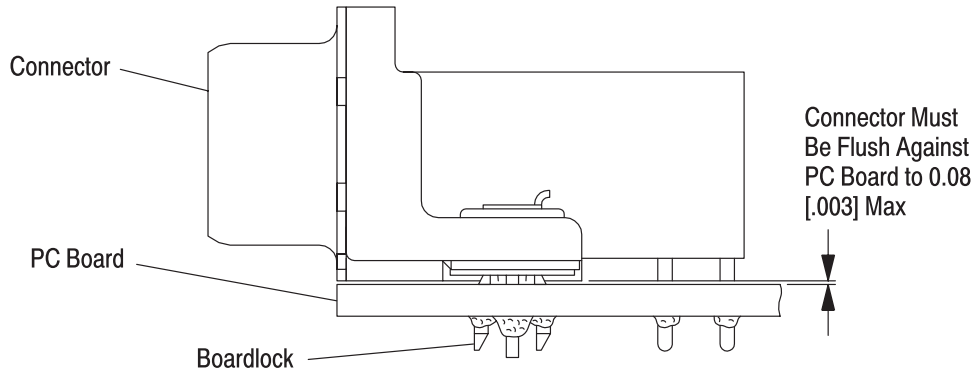


Figure 14

**3.16. Repair/Removal**

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



*When repairing or replacing AMPLIMITE Right-Angle Front Metal Shell Connectors, be careful not to damage other pc board components during the desoldering process.*

**4. QUALIFICATIONS**

AMPLIMITE Right-Angle Front Metal Shell Connectors are Recognized by Underwriters Laboratories Inc. (UL) in File Number E-28476 and Certified by CSA International in File Number LR-16455.

**5. TOOLING**

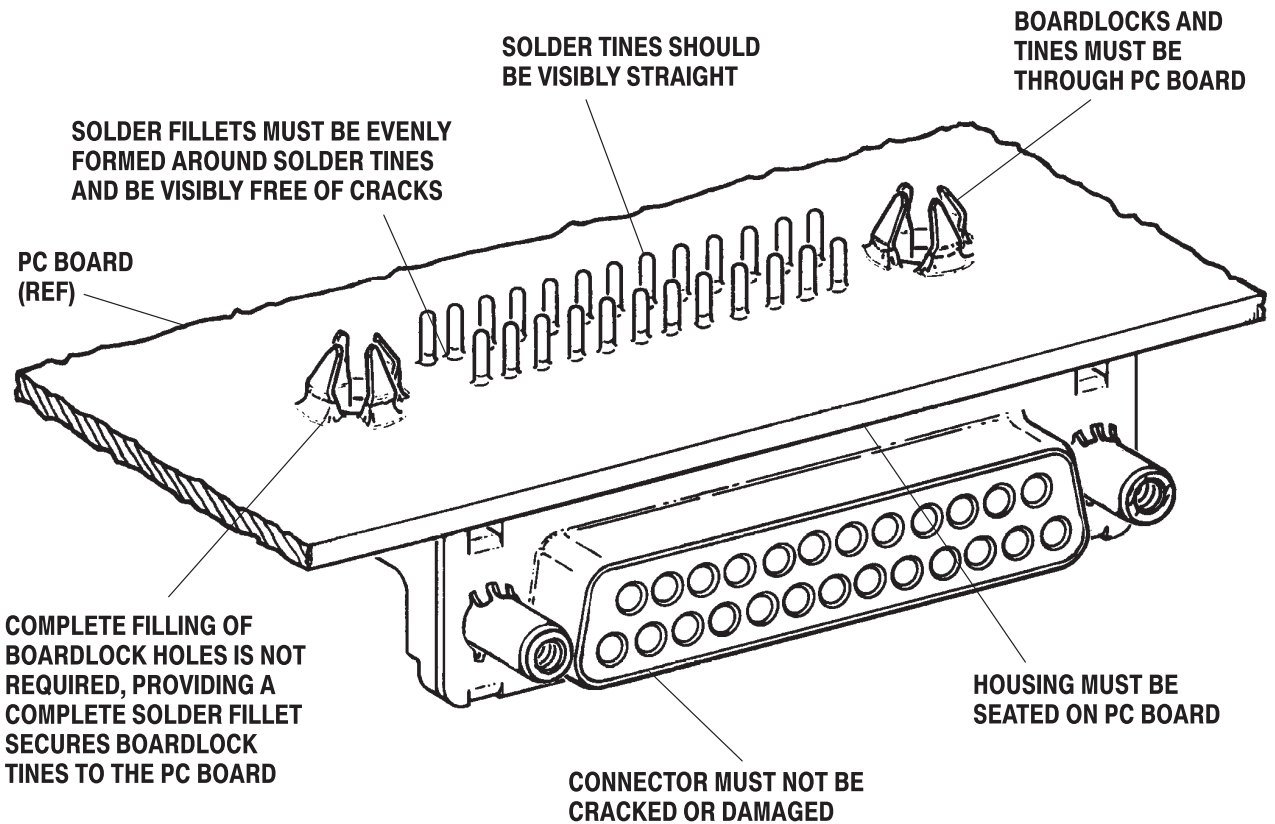
No special tooling is required for the hand placement of AMPLIMITE Connectors on a pc board.

6. VISUAL AID

Figure 15 shows a typical application of AMPLIMITE Right-Angle Front Metal Shell 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.

**NOTE**

*A typical installation will employ boardlocks, screwlocks, or other suitable hardware such as screws and nuts.*



**FIGURE 15. VISUAL AID**