



**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  $\pm 0.13$  mm 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 TE Connectivity Economy Power (EP) Connectors which are designed for secondary power circuit applications. They consist of wire-to-pc board plug housings (for receptacle contacts), and mating post headers. Two contact centerline spacing is available: 3.96 mm [.156 in.] and 7.92 mm [.312 in.]. During mating, the positive locking lever on the outside of the plug housing engages the mating header housing to provide for greater retention. This helps maintain reliable connections, when other non-locking type connectors could vibrate apart. This same locking lever must be depressed to unmate the connectors. The locking mechanism is also located high enough to help avoid interference with printed circuit (pc) board clear plastic coating (potting), which is a common treatment for many home appliances.

Headers with a 3.96 mm [.156 in.] centerline is offered in 2 through 12 positions while the 7.92 mm [.312 in.] centerline is offered in 2 through 5 positions. Both versions are provided in bulk pack or in tubes for automatic machines. The slim, vertical, post headers are stackable end-to-end for greater flexibility when designing pc board configurations. The mating height of a low-profile plug and vertical header is 16.3 mm [.642 in.] above the pc board. Compact dimensions like these are well suited for most applications in confined spaces.

When corresponding with TE Personnel, use the terminology provided in this specification to facilitate inquiries for information. Basic terms and features of this product are provided in Figure 1.

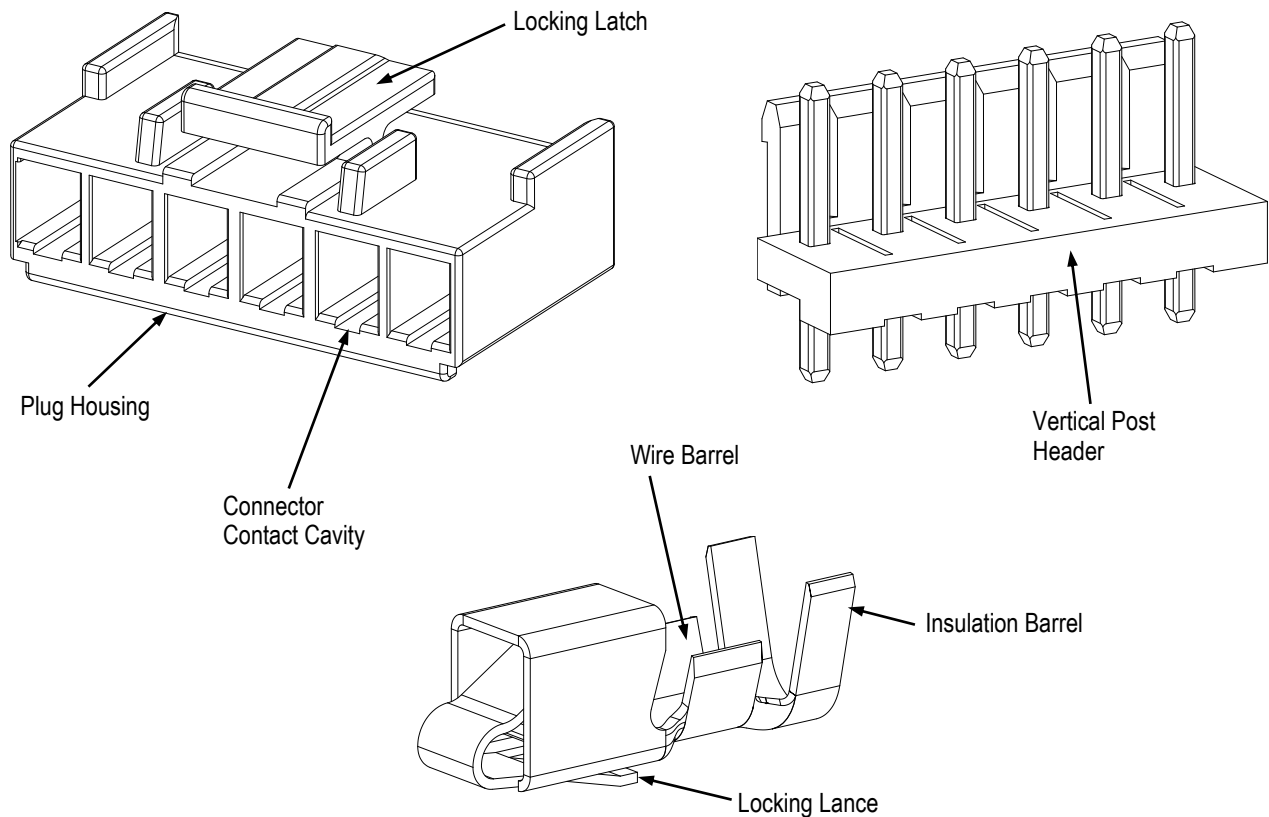


Figure 1

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## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

Initial release of application specification

### 2.2. Customer Assistance

Reference Product Base Part Numbers 1123721, 1123722, 1123723 and Product Codes D949, D950, and D951 are representative of the EP Connectors. Use of these numbers will identify the product line and help you to obtain product and tooling information. Such information can be obtained through a local TE Representative, by visiting our website at [www.te.com](http://www.te.com), or by calling PRODUCT INFORMATION or the TOOLING ASSISTANCE CENTER at the numbers at the bottom of page 1.

### 2.3. Drawings

Customer Drawings for product part numbers are available from the service network. If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, the information contained in the Customer Drawings takes priority.

### 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

Application Specification [114-5253](#) provides crimping information on the EP contacts. Product Specification [108-5609](#) provides product performance and test results.

### 2.6. Instructional Material

Instruction Sheets and Customer Manuals available that pertain to this product are:

<u>Document No.</u>	<u>Document Title</u>
<a href="#">408-8040</a>	Heavy Duty Miniature Quick-Change Applicators (Side-Feed Type)
<a href="#">408-10389</a>	Ocean Side-Feed Applicators
<a href="#">409-10027</a>	AMP 3K/40* CE Terminator 2161600-1 and AMP 5K/40* CE Terminating Machine 2161700-1
<a href="#">409-10045</a>	CAT-3000-( ) Terminating Machine Manual
<a href="#">409-10047</a>	AMP 3K* Terminating Machines 1725950 and AMP 5K* Terminating Machines 1725900
<a href="#">409-10049</a>	1.5T Terminating Machines 1725950 and 2.5T Terminating Machines 1725900
<a href="#">409-10050</a>	M-3000 Terminating Machines 1725950 and M-5000E Terminating Machines 1725900
<a href="#">409-10054</a>	Stripping Module 1490502-( ), 1490500-( ), and 1725910-( )
<a href="#">409-10059</a>	CAT-3000-05 Series Stripping Module Manual
<a href="#">409-10100</a>	Crimp Quality Monitor II
<a href="#">409-10204</a>	AMP 3K/40 2161400-[ ] CE Terminating Machines and AMP 5K/40 216500-[ ] CE Terminating Machines
<a href="#">409-32021</a>	AMP 3K/40 CE Terminators (with Stripping Module) 2161600-[ ] and AMP 5K/40 CE Terminators (with Stripping Module) 2161700-[ ]
<a href="#">409-32034</a>	AMP 3K Terminating Machine 1725950-[ ] and AMP 5K Terminating Machine 1725900-[ ]
<a href="#">409-127000</a>	AMP 3K/40 CE Terminator 2161600-1 and AMP 5K/40 CE Terminating Machine 2161700-1
<a href="#">411-5899</a>	Economy Power (EP) Connector

### 3. REQUIREMENTS

#### 3.1. Safety

Do not stack product shipping containers so high that the containers buckle or deform.

#### 3.2. Storage

##### A. Ultraviolet Light

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

##### B. Shelf Life

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

##### C. Reeled Products

Store coil wound reels horizontally and traverse wound reels vertical.

##### D. Chemical Exposure

Do not store product near any chemical listed below as they may cause stress corrosion cracking in the material.

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

#### 3.3. Wire Selection, Preparation, and Crimp Termination Procedures

Information on EP Contact selection, wire size, wire preparation, and crimp termination procedures may be found in Application Specification [114-5253](#) and Instruction Sheet [411-5899](#).

#### 3.4. Assembly

##### A. Contact Insertion

The crimped contact must be aligned with the contact cavity from the back of the receptacle housing, and oriented so that the locking window is aligned with the receptacle housing locking ramp. The contact must be inserted straight into the receptacle housing until it bottoms and there is an audible and tactile “click”. The wire must be pulled back lightly to ensure retention of the contact in the receptacle housing. For proper receptacle housing mating, each contact locking latch must show in the window of its contact cavity. See Figure 2.



##### NOTE

*An insertion tool is not required to inset contacts into the receptacle housings.*

##### B. Contact Extraction



##### CAUTION

*To avoid damage to the contact and/or receptacle housing, the proper extraction procedure must be used.*

Contacts can be removed from the receptacle housing using a commercially-available precision tweezer with a tip width of 0.38 mm and tip thickness of 0.25 mm (approximately). Common listings of this type of tweezer are Pattern 6, Type 6, 6-SA, or MM, Pattern MM or MM SA, or MM Boley style. The proper extraction procedure is covered in Instruction Sheet 408-10116.

#### 3.5. Wire Bend Radius

TE Engineering recommends that individual wires should be dressed to a bend radius of at least ten times the wire diameter. Likewise, wire bundles should be dressed to a bend radius of at least ten times the diameter of the bundle. If cables are used, the ratio for the cables is the same ratio for the wires.

### 3.6. Header Assemblies

The pc board vertical header assemblies are supplied with pre-installed contacts that have vertical solder tines. They are designed to mate with connectors that have precision formed, crimp-type contacts inserted into 2 through 5 and 2 through 11 position housings. The header assemblies are soldered to the pc board.

### 3.7. Connector Spacing

Care must be used to avoid interference between adjacent connectors and other components. The minimum allowable distance between header assemblies to ensure proper mating is provided in Figure 2.

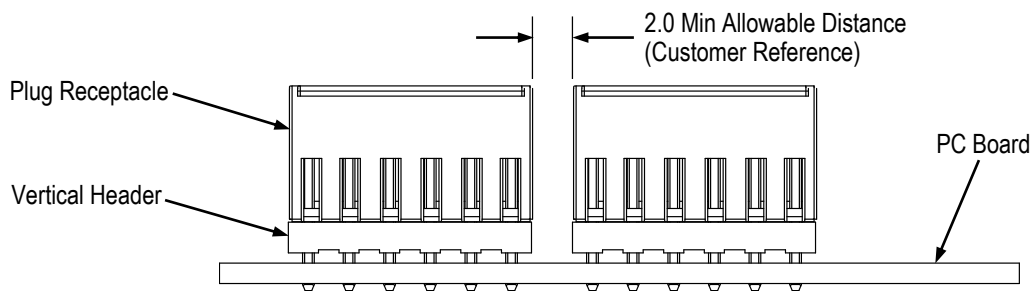


Figure 2

### 3.8. PC Board

#### A. Material and Thickness

1. Board material will be glass epoxy (FR-4, G-10).
2. Board thickness shall be 1.78 mm max.



**NOTE**

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

#### B. Tolerance

Maximum allowable bow of the pc board shall be 0.03 mm over the length of the header assembly.

#### C. PC Board Layout

The contact holes in the pc board must be precisely located to ensure proper placement and optimum performance of the header assembly. Design of the pc board using the dimensions provided in Figure 3. The layout shows the top (component) side of the pc board.

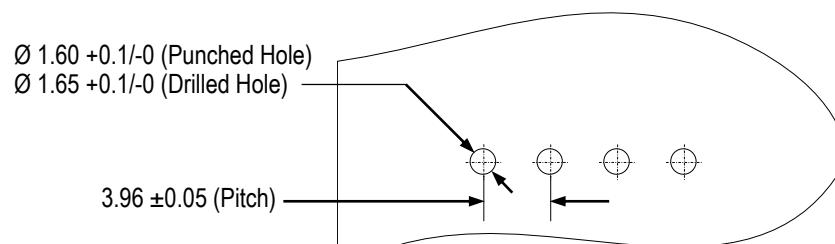


Figure 3

### 3.9. PC Board Solder Tine Holes

The holes in the pc board for the solder tines must be drilled and plated through to specific dimensions. See Figure 4.

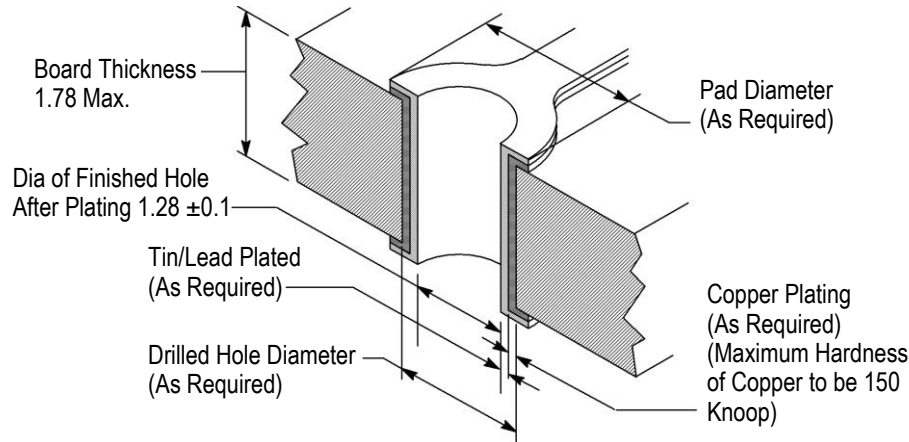


Figure 4

### 3.10. PC Board Header Assembly Placement



**CAUTION**

The header assemblies should only be handled by the housing to prevent deformation or other damage to the solder tines.

#### A. Manual Placement

Align the header assembly solder tines with the appropriate holes in the pc board. Start all solder tines into the pc board, then press on the header until it seats on the pc board.

#### B. Robotic Placement

The robotic equipment must be adjusted to feed, pick up, and place the headers on the pc board with an accuracy of 0.25 mm. For information on robotic equipment, see Section 5, TOOLING.

### 3.11. 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. Call the Product Information phone number at the bottom of page 1 for consideration of other types of flux. Some fluxes that are compatible with these header assemblies are provided in Figure 5

TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			ALPHA	KESTER
RMA (Mildly Activated)	Mild	Noncorrosive	611	186

Figure 5

#### B. Soldering Guidelines

Economy Power header assemblies can be soldered using a variety of soldering techniques. The temperatures and exposure time shall be within the ranges specified in Figure 6. We recommend using SN60 or SN62 solder for these header assemblies.



**NOTE**

Manual 402-40 provides some guidelines for establishing soldering practices. Refer to Paragraph 2.4, Manuals.

SOLDERING PROCESS	TEMPERATURE	TIME (At Max Temperature)
Wave	260°C [500°F] (Wave Temperature)	5 Seconds

Figure 6

ALPHA and KESTER are trademarks of their respective owners.

### 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 header assemblies for the time and temperature specified. See Figure 7.



**DANGER**

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 effect to the header assemblies; however TE does not recommend them because of the harmful occupational and environmental effects. Both are carcinogenic (cancer-causing) and Trichloroethylene is harmful to the earth's ozone layer.



**NOTE**

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

CLEANER		TIME (Minutes)	TEMPERATURE (Max)
NAME	TYPE		
ALPHA 2110	Aqueous	1	132°C [270°F]
BIOACT EC-7	Solvent	5	100°C [212°F]
Butyl CARBITOL	Solvent	1	Ambient Room
Isopropyl Alcohol	Solvent	5	100°C [212°F]
KESTER 5778	Aqueous		
KESTER 5779	Aqueous		
LONCOTERGE 520	Aqueous		
LONCOTERGE 530	Aqueous		
Terpene	Solvent		

Figure 7

### D. Drying

When drying cleaned assemblies and printed circuit boards, make certain that temperature limitations are not exceeded: 105°C [221°F] max for a period of 5 minutes for standard temperature products. Excessive temperatures may cause header assembly degradation. Values may vary with different types of automatic cleaning equipment. See the equipment manufacturers' recommendations.

### E. Checking Installed Header Assemblies



**NOTE**

All solder joints should conform to the requirements specified in this document and those specified in Test Specification 109-11 for through hole mount connectors. The maximum post-solder bow is ±0.25 mm.

The header assembly must be seated on the pc board to the dimensions shown in Figure 8. Solder must be evenly distributed and not cracked.

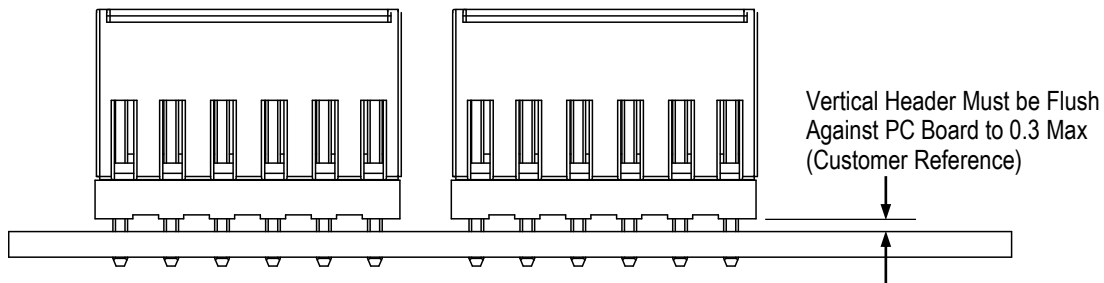


Figure 8

ALPHA, BIOACT, CARBITOL, LONCOTERGE, and KESTER are trademarks of their respective owners.

### 3.12. Polarization

The configuration of the contact cavity assures polarization for the mating connectors.

### 3.13. Mating Connectors

To ensure a proper circuit connection, the receptacle connector latch must fully engage the header assembly locking ramp.

The receptacle has an integral locking latch that should be fully seated and latched to the header assembly locking tab after mating. The locking latch ensures positive mating of connectors. The distance between mating connectors must be considered when determining location of connectors to ensure full mating. The mated dimension of the receptacle housing to the pin header is provided in Figure 9.

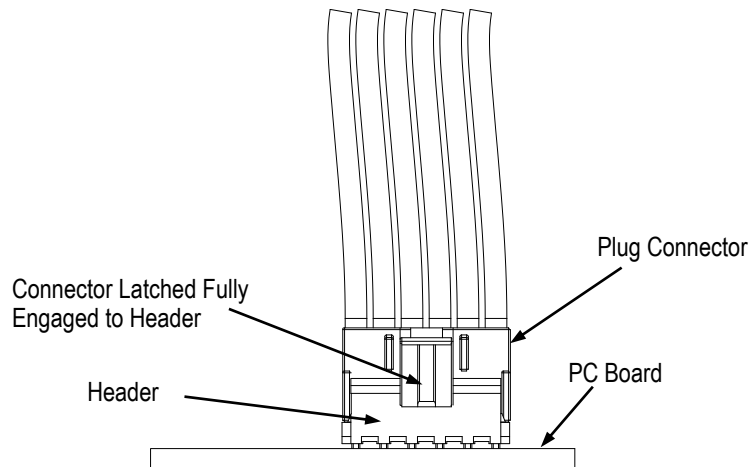


Figure 9



**CAUTION**

Receptacles will mate only with the appropriate pin headers; the receptacle and pin header must have the identical number of circuit positions and rows.

### 3.14. Unmating of Connectors

To unmate the plug connector from the header assembly, push on the locking latch with your thumb and pull straight up from the header assembly. See Figure 10.

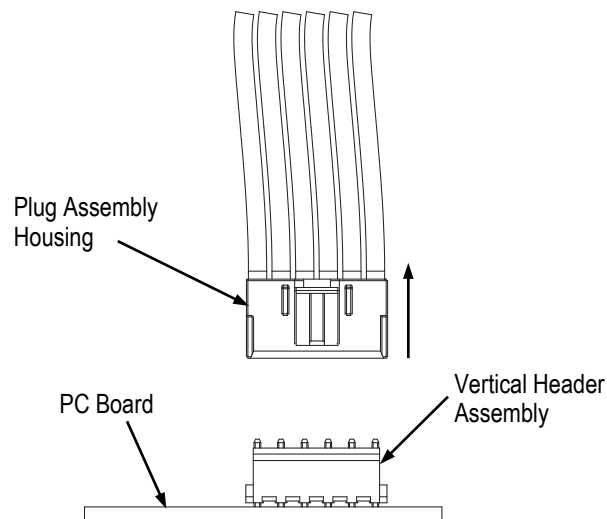


Figure 10

### 3.15. Repair/Removal

#### A. Plug Housing

**CAUTION**

*Damaged contacts must be removed, discarded, and replaced. Contacts are not to be reterminated.*

Use a small screwdriver or small pin to remove the individual contacts from the plug housing. See Figure 11. The contacts can be released by pressing down on the contact locking latch and gently pulling the wire out of the back of the plug housing.

Contacts can then be replaced provided there is sufficient slack, after re-stripping the wire, to insert the new contact into the plug housing.

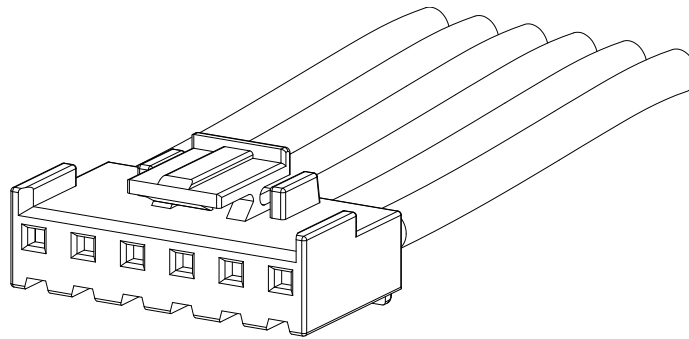


Figure 11

#### B. Header Assembly

Damaged header assemblies will require standard de-soldering of all contact solder tines and removal of the header from the pc board. Individual solder type contacts cannot be replaced.

## 4. QUALIFICATION

Economy Power (EP) Headers, Housings, and Receptacles are Component Recognized in UL-1977 and Certified in CSA International C22.2 No. 182.3 by Underwriters Laboratories Inc. (UL) in file E28476.

## 5. TOOLING

Tooling part numbers and instructional material packaged with the tooling are given in Figure 12. Refer to Paragraph 2.6 for links to instructional material.

**NOTE**

*TE Tool Engineers have designed machines for a variety of application requirements. For assistance in setting up prototype and production line equipment, contact Tool Engineering through your local TE Representative or call the Tooling Assistance Center number at the bottom of page 1.*

### 5.1. Applicators

Applicators are designed for the full wire size range of strip-fed, precision formed contacts, and provide for high volume, heavy duty production requirements. The applicators can be used in bench or floor model power units.

**NOTE**

*Each applicator is shipped with a metal identification tag attached. DO NOT remove this tag or disregard the information on it. Also, a packet of associated paperwork is included in each applicator shipment. This information should be read before using the applicator; then it should be stored in a clean, dry area near the applicator for future reference. Some changes may have to be made to the applicators to run in all related power units. Contact the Tooling Assistance Center number at the bottom of page 1 for specific changes.*



## 5.2. Power Units

A power unit is an automatic or semi-automatic device used to assist in the application of a product. Power unit includes the power source used to supply the force or power to an applicator.



**NOTE**

*Modified designs and additional tooling concepts may be available to meet other application requirements. Machines have been designed for a variety of application requirements. For assistance in setting up prototype and production line equipment, call the Tooling Assistance Center at the number at the bottom of page 1.*

## 5.3. PC Board Supports

A customer supplied pc board support must be used to prevent bowing of the pc board during insertion of the headers. It should have a flat surface with holes or a channel large enough to receive the solder tines during installation.

## 5.4. Extraction Tools

No specific extraction tooling is needed. A small screwdriver or pin may be used for contact extraction from the plug housings.

## 5.5. Robotic Equipment

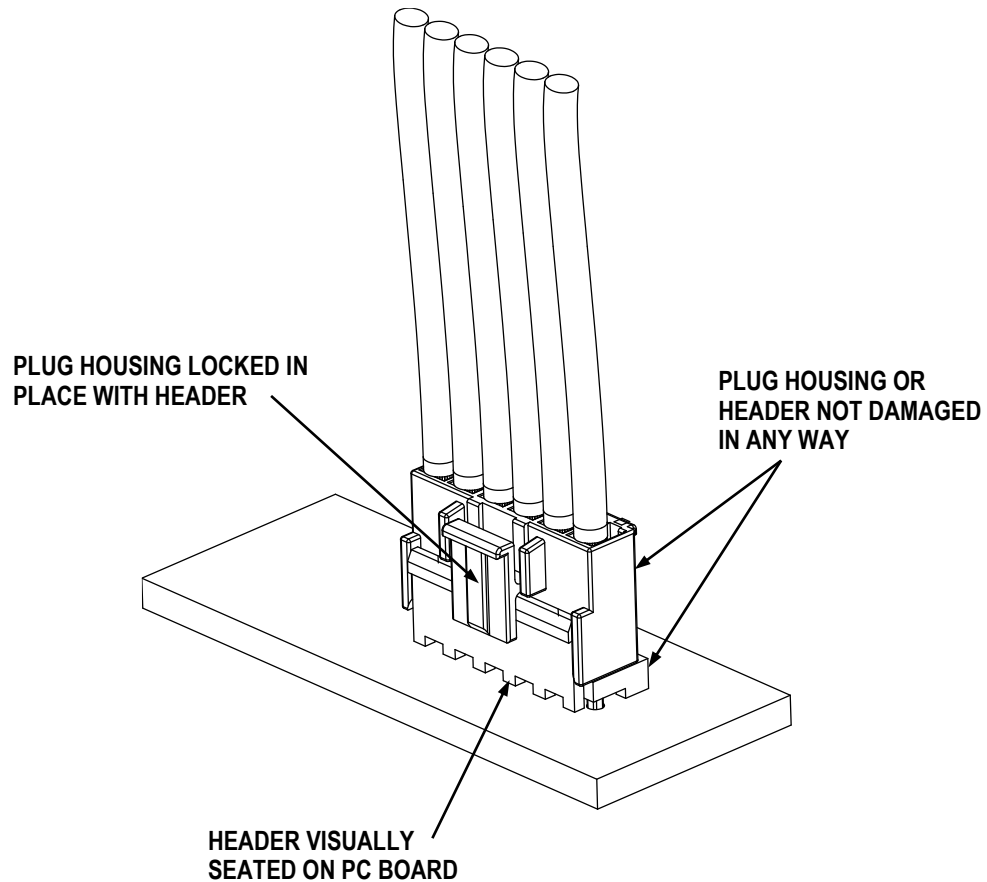
For automatic machine placement, a pc board support must be used to prevent bowing of the pc board during the placement of header assemblies on the pc board. It should have flat surfaces with holes or a channel large enough and deep enough to receive the solder tines. The robotic equipment must have a true position accuracy tolerance to properly locate the solder tines. This includes gripper and fixture tolerances as well as equipment repeatability.

APPLICATOR (DOCUMENT)	POWER UNIT	POWER UNIT DOCUMENT
1385286-3 (408-8040) or 2151113-[ ] (408-10389)	1725700-[ ]	409-10045
	1725900-[ ]	409-10047 409-10049 409-10050 409-32034
	1725910-[ ]	409-10027 409-10054 409-10059
	1725950-[ ]	409-10047 409-10049 409-10050 409-32034
	2014000-[ ]	---
	2161400-[ ]	409-10100 409-10204
	2161500-[ ]	409-10204
	2161600-[ ]	409-10204 409-32021 409-127000
	2161700-[ ]	409-10204 409-32021

Figure 12

## 6. VISUAL AID

The illustration below shows a typical application of this product. This illustration should be used by production personnel to ensure a correctly applied product. Applications which do not appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.



**FIGURE 13. VISUAL AID**