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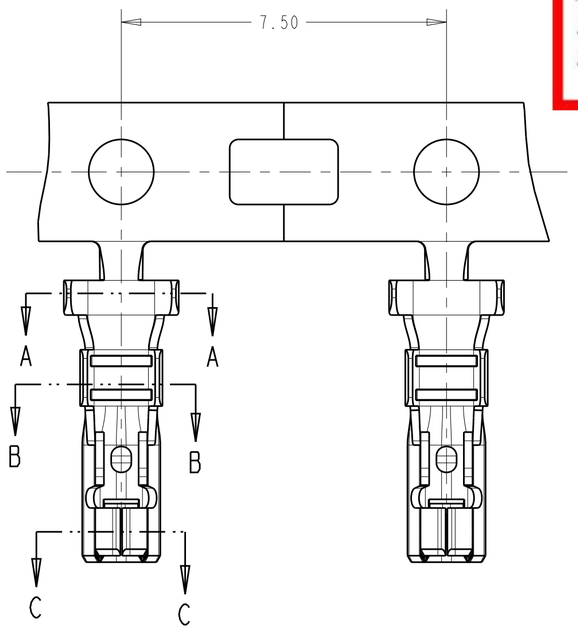
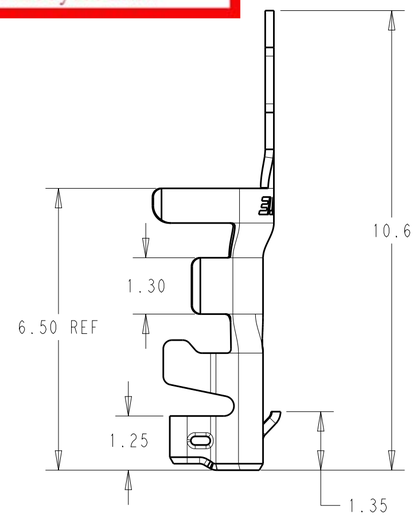
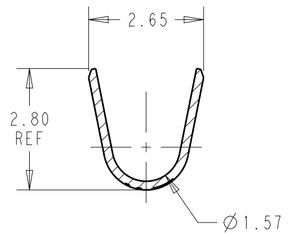
REVISIONS

P	LTR	DESCRIPTION	DATE	DWN	APVD
	B	REVISED PER ECR-19-013267	08JAN2020	WH	DZ

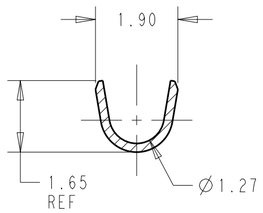




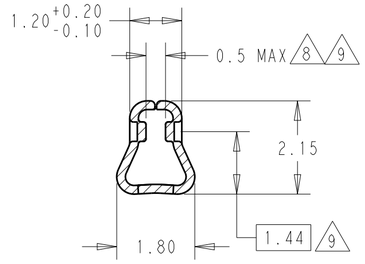
1. MATERIAL: PHOSPHOR BRONZE.
2. FINISH: PRE-TIN.
3. DESIGNED FOR USE IN HOUSINGS [ ]-1969442-[[OR [ ]-1744417-[ ].
4. CONTACTS COATED WITH ANTI-FRETTING LUBRICANT.
5. CONTACT IS RoHS COMPLIANT.
6. WIRE RANGE: 0.13~0.36mm2 [26-22 AWG] STRANDED.
7. INSULATION RANGE: 1.30~1.91
8. AFTER CRIMP DIMENSION
9. MEASURE LOCATION FOR 0.50mm MAX DIMENSION



SECTION A-A



SECTION B-B



SECTION C-C

2232905-1
PART NUMBER

THIS DRAWING IS A CONTROLLED DOCUMENT.

DIMENSIONS: mm

TOLERANCES UNLESS OTHERWISE SPECIFIED:
0 PLC ±-
1 PLC ±0.4
2 PLC ±0.30
3 PLC ±-
4 PLC ±-
ANGLES ±1°

MATERIAL 1 -
FINISH 2 -

DWN OTTO CHEN 25JUN2015
CHK DANIEL. Z 26JUN2015
APVD DANIEL. Z 26JUN2015
PRODUCT SPEC 108-2418
APPLICATION SPEC 114-13315
WEIGHT -

TE Connectivity

NAME LOW INSERTION FORCE CONTACT EP 2.5, RECEPTACLE

SIZE	CAGE CODE	DRAWING NO	RESTRICTED TO
A2	00779	C-2232905	-

Customer Drawing | SCALE N/A | SHEET 1 OF 1 | REV B

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 ±0.13 mm and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of EP 2.5 contacts; plug and receptacle housings; and vertical and right-angle headers used in the wire-to-wire and wire-to-board interconnections.

The contact features an insulation barrel, wire barrel, and stabilizer barrel. The contact locking latch is designed to lock onto the housing locking ramp to ensure proper depth of the contact in the housing.

The plug and receptacle housing consist single or dual row housings and terminal position assurance (TPA). The housings and TPA are available in 2 through 40 positions (position: 2 to 15 single row wire-to-wire); (position: 2 to 20 single row wire-to-board), (position: 8 to 40 dual row wire-to-board). The housing features contacts cavities, a locking ramp for each contact cavity, and locking latch. After all contacts are inserted into the housing, the TPA is designed to ensure that the contacts are fully inserted, and prevent them from backing out. The locking latch secures the mating connector to the receptacle housing.

The vertical and right-angle headers are used to mate with the plug and receptacle housings for wire-to-board and panel mount connections.

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

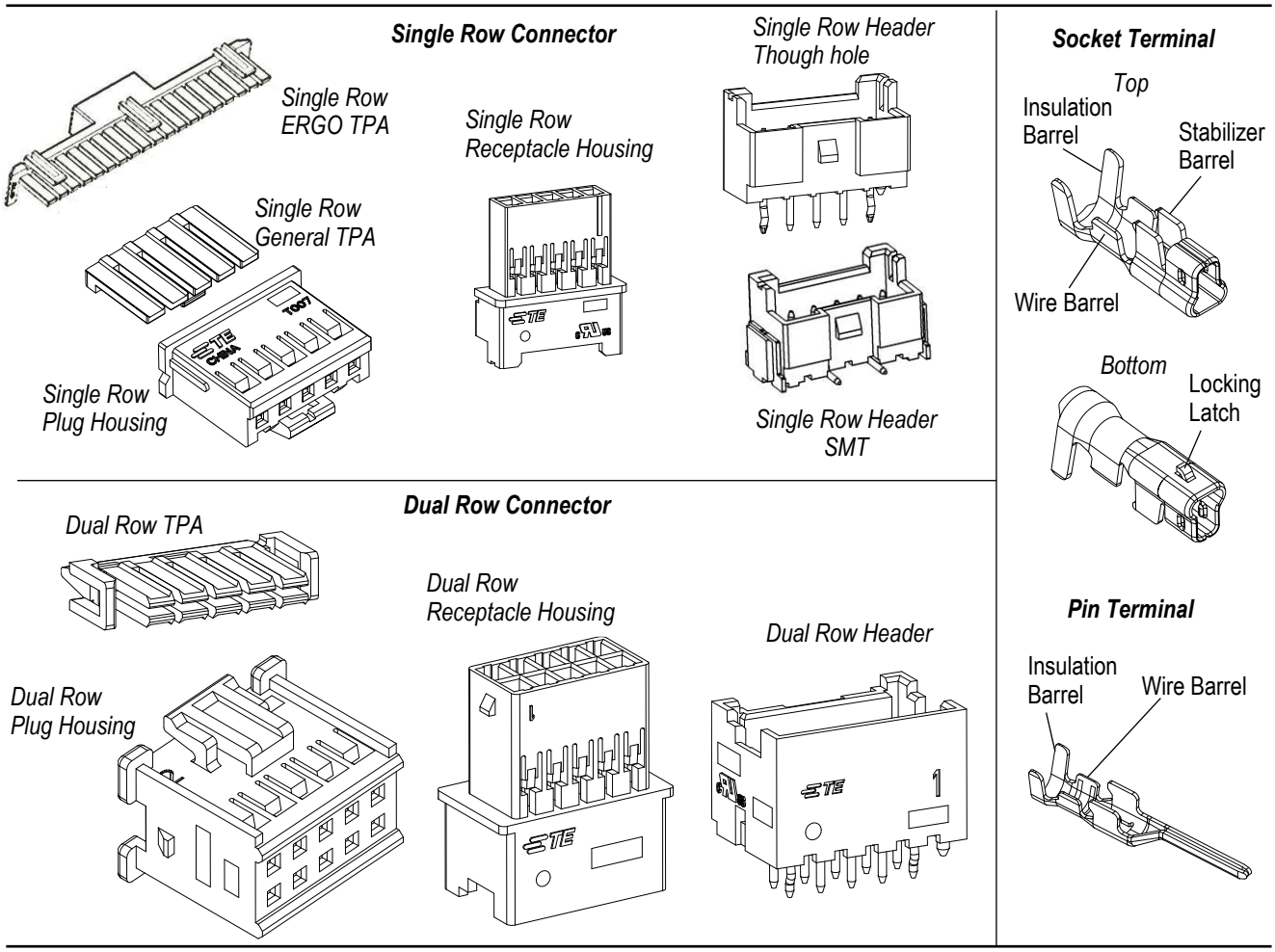


Figure 1

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2. REFERENCE MATERIAL

2.1. Revision Summary

- Updated Figure 1 to add SMT header type in page 1.
- Updated Figure 8 to add PCB Layout information of SMT header in page 10.
- Updated Figure 10 to add Manual Placement information of SMT header in page 13.
- Add IR reflow information of SMT header in Figure 12 of page14

2.2. Customer Assistance

Reference Product Base Part Numbers 2110989, 2238007, Product Code D950 (Socket and Pin Contacts); 1969443, 1969541, Product Code L014 (Single and Dual TPAs); 1969442, 1969540, Product Code L014 (Single and Dual Plug Housings); 1969588, 1969592, Product Code L014 (Single and Dual Receptacle Housings); 2132230, 1969543, Product Code L013 (Single and Dual Vertical Headers); represent some of Economy Power 2.5 components. 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, or by calling PRODUCT INFORMATION at the number at the bottom of Page 1.

2.3. Drawings

Customer drawings for product part numbers are available from www.te.com. 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

Product Specification 108-2418 provides product performance and test results.

2.6. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions or tooling setup and operation procedures and Customer Manuals (409-series) provide machine setup and operating procedures. Instructional material available that pertain to this product are:

Document No.	Document Title
408-3295	Preparing Reel of Contacts for Application Tooling
408-7424	Checking Terminal Crimp Height or Gaging Die Closure
408-8040	Heavy Duty Miniature Quick-Change Applicators (Side-Feed Type)
408-8053	Conversion Guide for Miniature Quick-Change Applicators
408-9816	Handling of Reeled Products
408-10389	Ocean Side-Feed Applicator
408-32041	EP 2.5 Wire-to-Wire and Wire-to-Board Connectors
408-32061	Extraction Tool 2161958-1 for EP 2.5 Contacts
408-32091	Mini Single Action Hand Tool (SAHT) 2217074-1
409-5842	AMP-O-LECTRIC* Model “G” Terminating Machines 354500-[ ]
409-5852	AMPOMATOR* CLS Model III-G Lead-Making Machines 122500-[ ]
409-5878	AMPOMATOR CLS IV+ Lead-Making Machines
409-5128	AMP-O-LECTRIC Model “K” Terminator Machines 565435-5 or 1-471273-2
409-5207	Model “T” Terminating Units 694620-[ ]
409-5289	Model “T” Terminating Unit 458000-4
409-10047	AMP 3K* Machines 1725950-[ ] and AMP 5K* Machines 1725900-[ ]
409-10099	AMP 3K/40* Machines 2119683-[ ] and AMP 5K/40* Machines 2119684-[ ]

3. REQUIREMENTS

3.1. Safety

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

3.2. Material

The housings are made of flame-retardant rated nylon (UL 94 V-0). The contacts are made of copper alloy.

3.3. 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. 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

D. Reeled Products

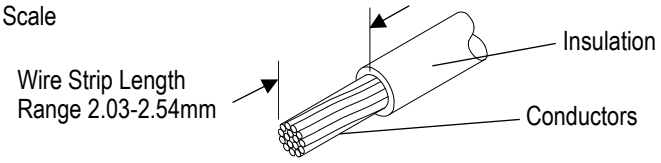
When using reeled contacts, store coil wound reels horizontally and traverse wound reels vertically.

3.4. Wire Selection and Preparation

The contacts accept stranded copper wire having sizes and insulation diameter given in Figure 2. The wire must be stripped within the dimensions given in Figure 2.

CAUTION
The wire conductors must not be nicked, cut, or scraped during the stripping operation.

NOTE: Not to Scale



WIRE	
SIZE (mm² [AWG])	INSUL DIA (mm)
0.13-0.36 [26-22]	1.30-1.91
0.20-0.56 [24-20]	

Figure 2

3.5. Crimp Requirements

Contacts must be terminated according to the instructions packaged with the tooling.

A. Bellmouth

The rear bellmouth shall be evident and be within the dimensions given in Figure 3.

B. Cutoff Tab and Burr

The cutoff tab and burr shall not exceed the dimension given in Figure 3.

C. Wire Barrel Flash

The wire barrel flash shall not exceed the dimension given in Figure 3.

D. Crimp Height

The crimp applied to the wire portion of the contact is the most compressed area and is most critical in ensuring optimum electrical and mechanical performance of the crimped contact. The wire barrel crimp height and width and insulation barrel crimp width must be within the dimensions provided in Figure 3.

NOTE
The effective crimp length depends on the crimping dies used and should not be measured for inspection purposes.

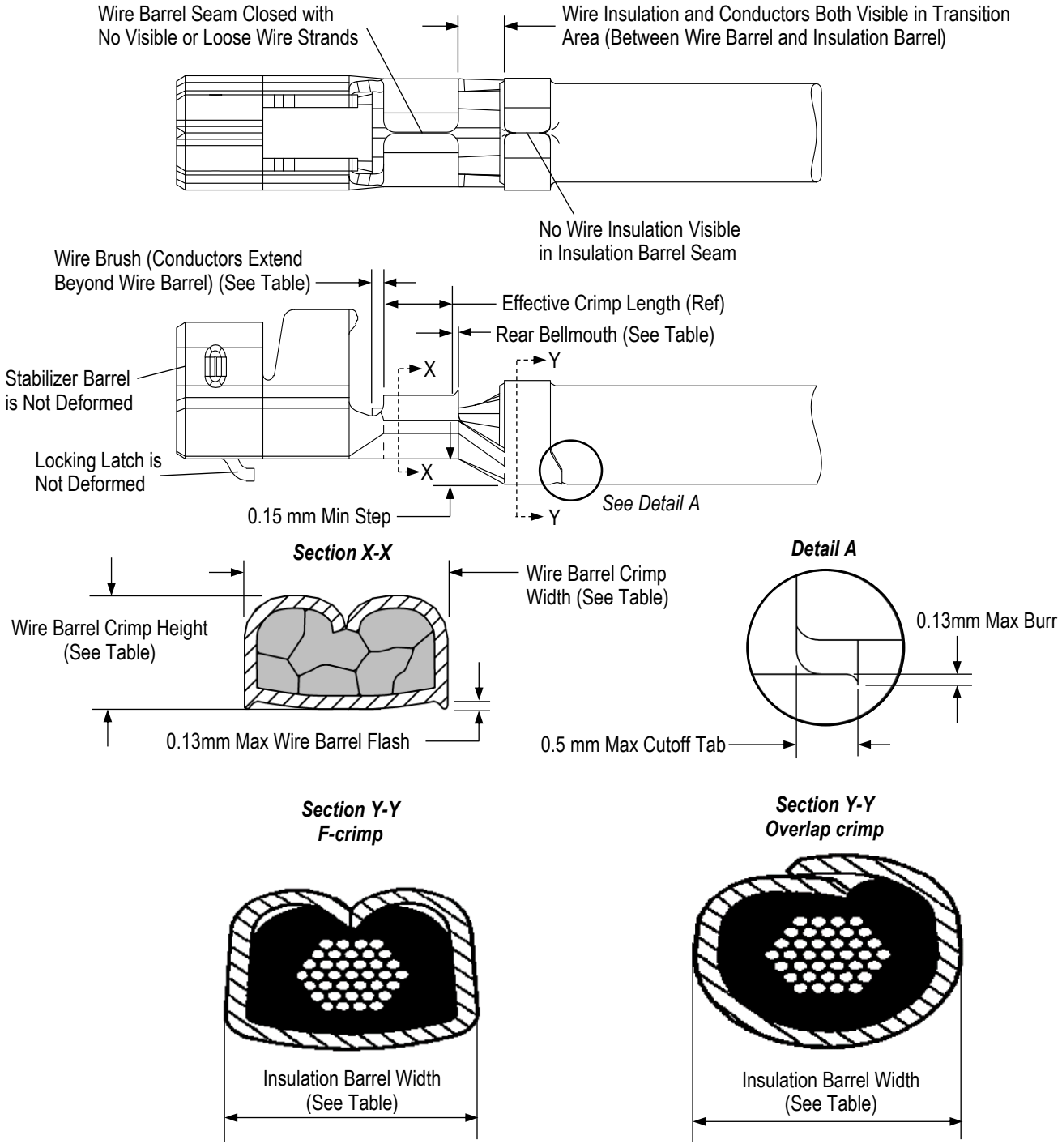


Figure 3 (cont'd)

WIRE SIZE		CONTACT							
		WIRE BARREL CRIMP		INSULATION BARREL CRIMP		WIRE BRUSH		REAR BELLMOUTH	
mm^2	AWG	HEIGHT (mm)	WIDTH (mm)	WIDTH (mm)	CRIMP CONFIGURATION	HAND TOOL (mm)	APPLICATOR (mm)	HAND TOOL (mm)	APPLICATOR (mm)
0.13-0.36	26	0.58±0.05	1.40	1.78	F crimp	0.7 Max	0.1-0.2	0.05-0.4	0.1-0.4
	24	0.64±0.05							
	22	0.71±0.05							
0.20-0.56	24	0.84±0.03	1.40	1.90 max	Overlap crimp				
	22	0.93±0.04							
	20	1.07±0.05							

Figure 3 (end)

E. Effective Crimp Length

Effective crimp length shall be defined as that portion of the wire barrel, excluding the rear bellmouth, fully formed by the crimping tool. Refer to Figure 3.

F. Wire Location

The wire insulation and conductors must be visible in the transition area between the wire barrel and insulation barrel. See Figure 3.

G. Wire Brush

The conductors may extend beyond the wire barrel within the dimensions given in Figure 3.

H. Wire Barrel Seam

The wire barrel seam must be closed with no evidence of loose wire strands visible in the seam.

I. Stabilizer Barrel

The stabilizer barrel must not be deformed.

J. Locking Latch

The locking latch must not be deformed.

K. Twist and Roll

There shall be no twist, roll, deformation, or other damage to the mating portion of the crimped contact that will prevent proper mating.

L. Straightness

The force applied during crimping may cause some bending between the crimped wire barrel and the mating portion of the contact. Such deformation is acceptable within the following limits:

The side-to-side bending of the contact may not exceed the limits provided in Figure 4.

The crimped contact, including cutoff tab and burr, shall not be bent above or below the datum line more than the amount given in Figure 4.

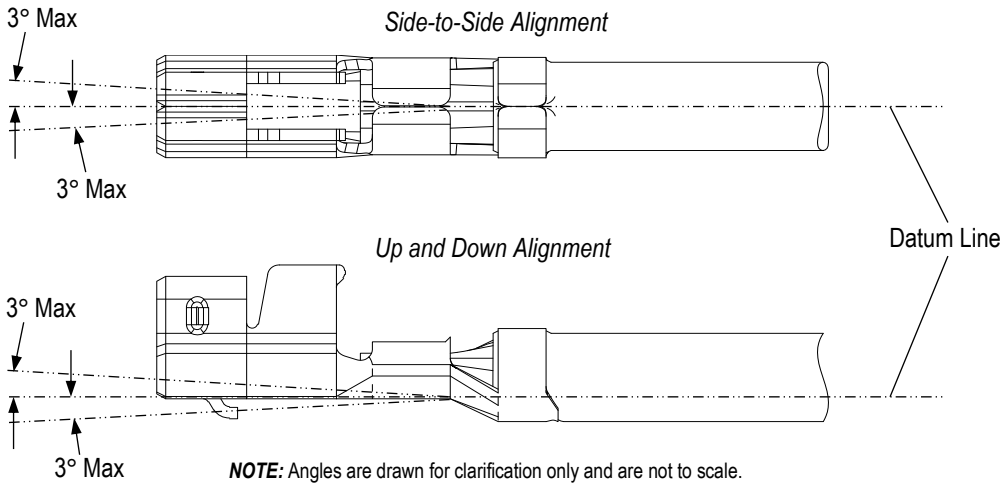


Figure 4

3.6. Assembly

A. Contact Insertion

The crimped contact must face the contact cavity from the wire end of the receptacle housing so that the locking latch is aligned with the receptacle housing locking ramp. The contact must be inserted into contact cavity until it bottoms. There should be audible and tactile “click”. The wire should be pulled back lightly to ensure retention of the crimped contact. For proper receptacle housing mating, each contact locking latch must show in the window of its contact cavity. See Figure 5.

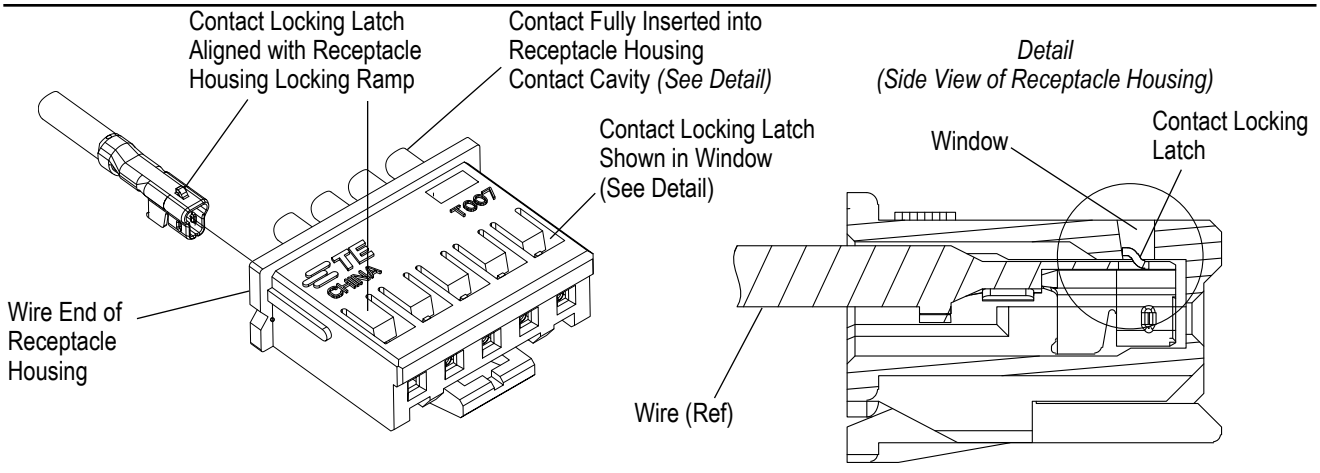


Figure 5

B. TPA Installation

After inserting all of the crimped contacts, the TPA must be inserted into the receptacle housing. The TPA must be oriented with the positions facing the wire end of the receptacle housing and the locking latch(es) aligned with the nub(s) of the receptacle housing. Then the TPA must be inserted so that the positions enter the receptacle housing contact cavities over the wires and the locking latch(es) engages the receptacle housing nub(s). There should be audible and tactile “click”. See Figure 6.

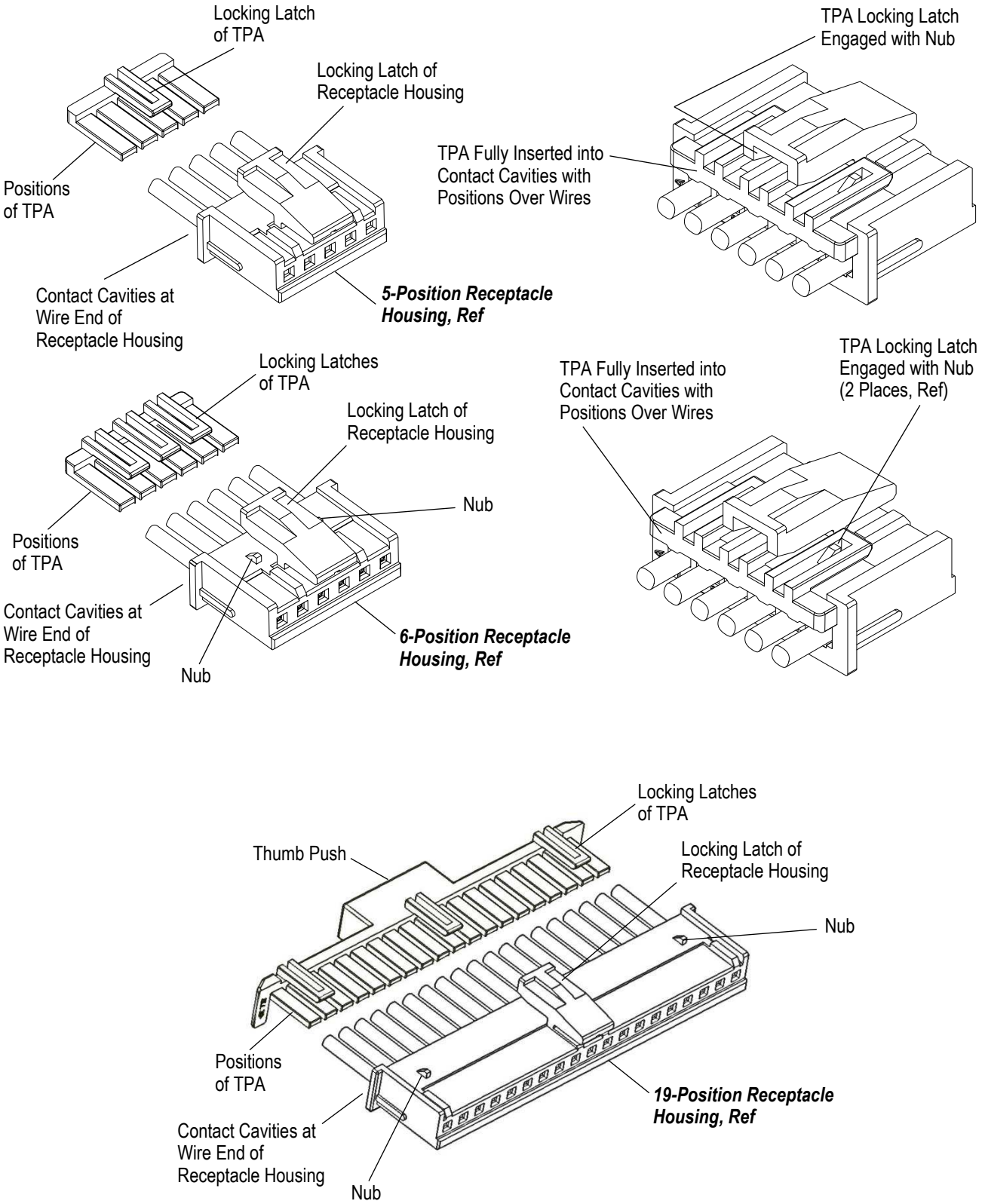


Figure 6 (cont'd)

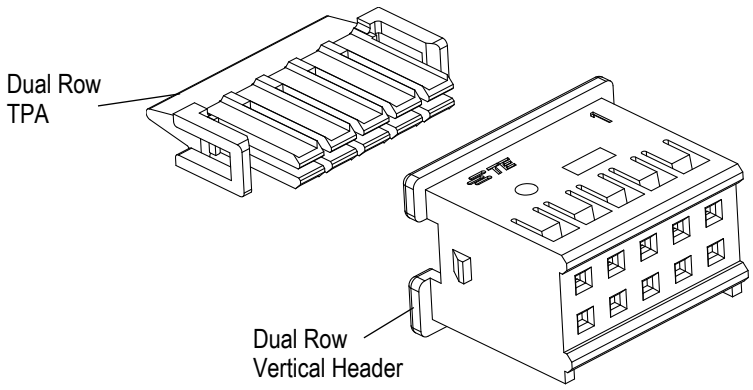


Figure 6 (end)

The TPA should be pulled back lightly to ensure retention.

The single row ERGO TPA includes a thumb push to allow for easier installation. Assemblers should utilize the thumb push to insert the TPA into the receptacle housing and engage the locking latch(es) with the receptacle housing nub(s). For the 15 through 20 position ERGO TPA, assemblers must ensure that the locking latches on the ends of the TPA are properly engaged with the receptacle housing nub(s). This should be done by pushing on both ends of the TPA directly above the locking latches of the TPA after it has been installed on the receptacle with the thumb push and performing a visual inspection to ensure proper latching.

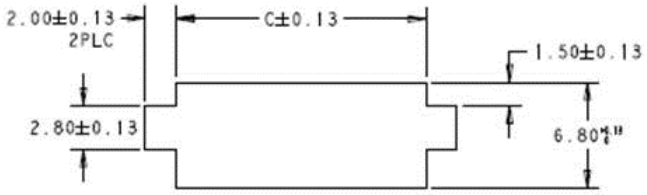
NOTE
TPAs with 5 positions or less have one locking latch and corresponding receptacle housings have one nub located under the receptacle housing locking latch. TPAs with more than 5 positions have more than one locking latch and corresponding receptacle housings have more than one nub, which are located on both sides of the receptacle housing locking latch. See Figure 6.

NOTE
Single row ERGO TPAs with 15 through 20 positions need to be checked for proper latching by following the instructions in Section 3.6.B.

3.7. Panel Cutout

EP 2.5 Wire-to-Wire Dual Row Connector panel cutouts shall be as indicated in Figure 7. No mounting hardware is required. The plug housings features flexible mounting tabs for insertion into the panel. Push the plug connector through the panel - in the same direction as the cutout was made – until it snaps into place.

Single Row Panel Mount Cutout Layout



Dual Row Panel Mount Cutout Layout

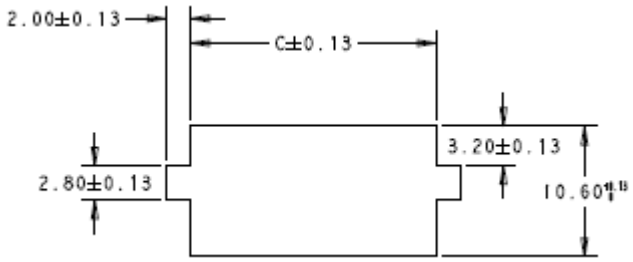


Figure 7

3.8. PC Board

A. Material and Thickness

1. Board material will be glass epoxy (FR-4, G-10).
2. Board thickness shall be 1.6 mm.

Contact the PRODUCT INFORMATION number at the bottom of Page 1 for suitability of other PC board materials or thicknesses.

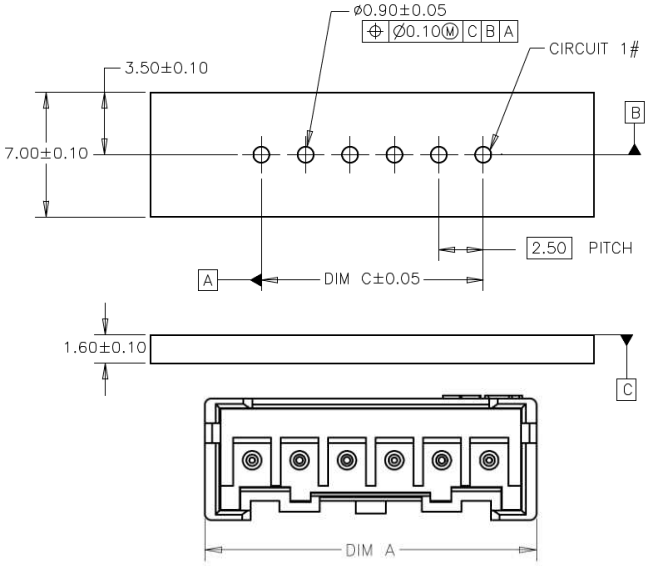
B. Tolerance

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

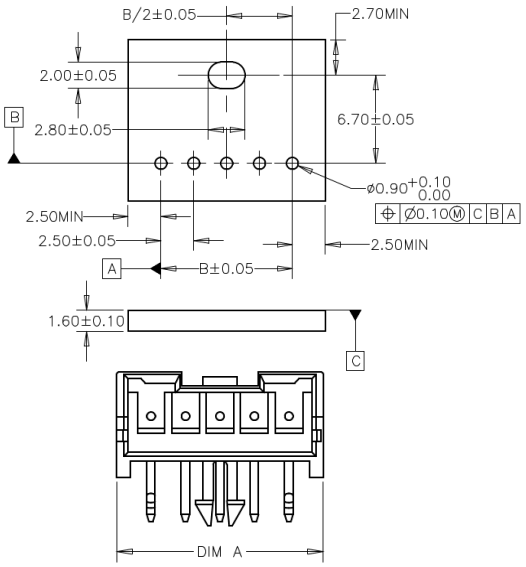
C. PC Board Layout

The mounting and contact holes in the PC board must be precisely located to ensure proper placement and optimum performance of the header assembly. Design the PC board using the dimensions provided in Figure 8. The layout shows the top (component) side of the board.

Vertical Header Assembly
(Through hole, Single Row)



Right-Angle Header Assembly
(Through hole, Single Row)



Vertical Header Assembly
(SMT type, Single Row)

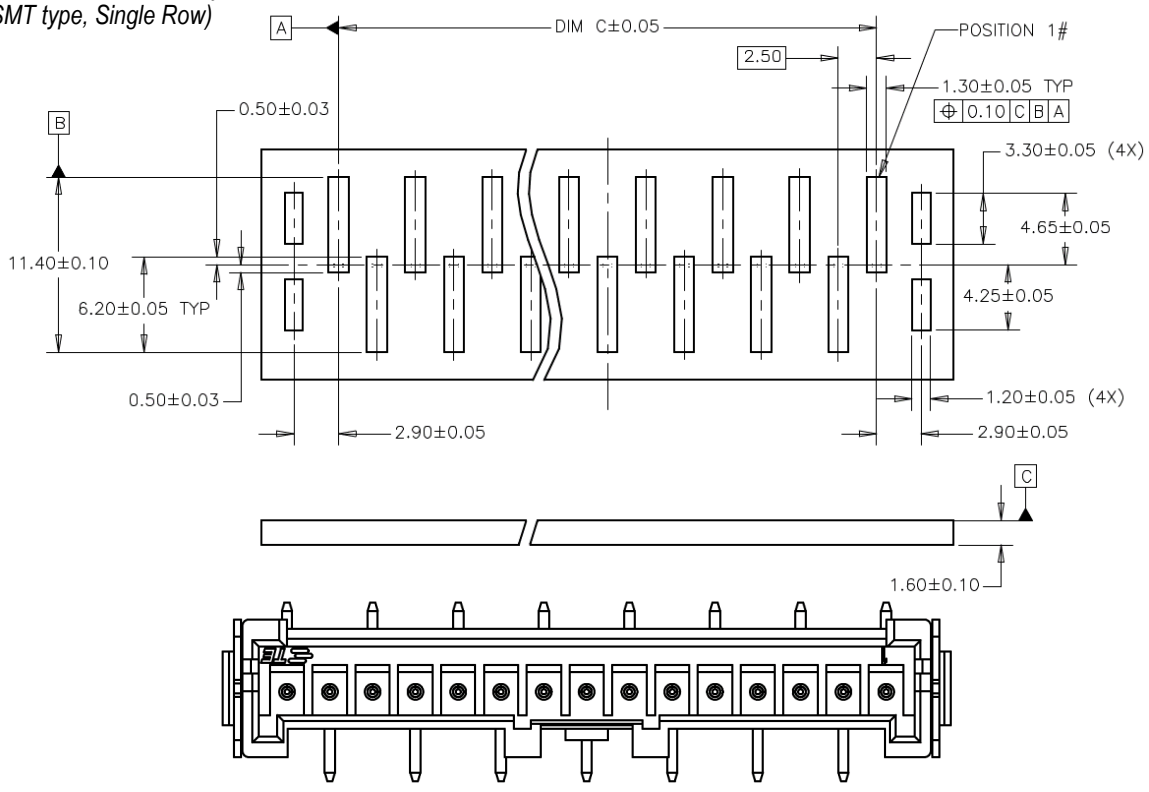
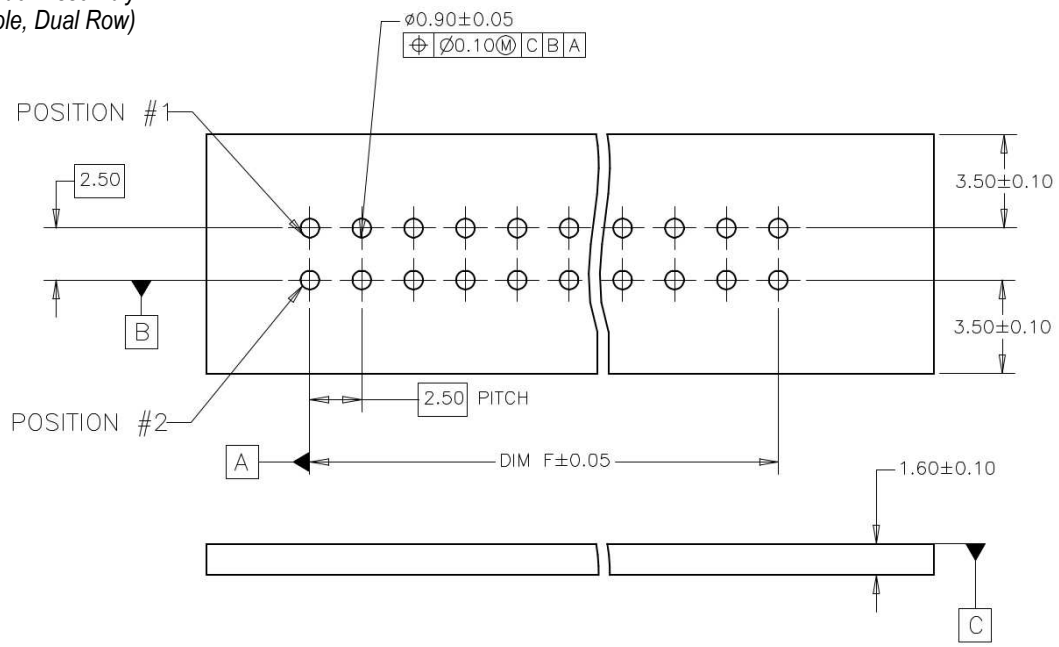


Figure 8 (cont'd)

Vertical Header Assembly
(Through hole, Dual Row)



Right-Angle Header Assembly
(Through hole, Dual Row)

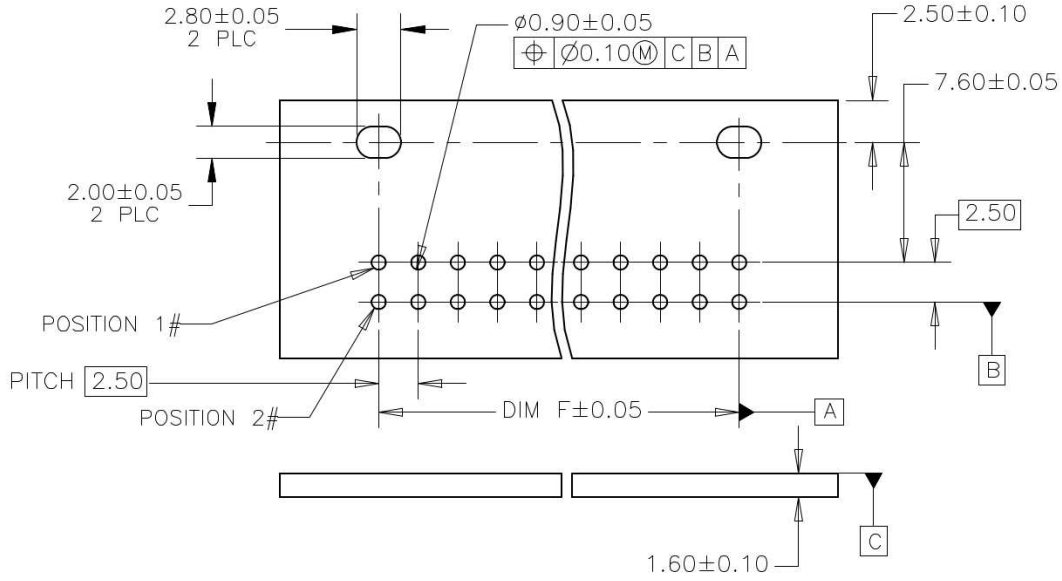


Figure 8 (cont'd)

NUMBER OF POSITIONS	DIMENSION				
	SINGLE ROW VERTICAL HEADER ASSEMBLY (mm)		SINGLE ROW RIGHT-ANGLE HEADER ASSEMBLY (mm)		DUAL ROW VERTICAL AND RIGHT-ANGLE HEADER ASSEMBLY (mm)
	"A"	"C"	"A"	"B"	"F"
2	7.50	2.50	7.50	2.50	---
3	10.00	5.00	10.00	5.00	---
4	12.50	7.50	12.50	7.50	---
5	15.00	10.00	15.00	10.00	---
6	17.50	12.50	17.50	12.50	---
7	20.00	15.00	20.00	15.00	---
8	22.50	17.50	22.50	17.50	7.50
9	25.00	20.00	25.00	20.00	---
10	27.50	22.50	27.50	22.50	10.00
11	30.00	25.00	30.00	25.00	---
12	32.50	27.50	32.50	27.50	12.50
13	35.00	30.00	35.00	30.00	---
14	37.50	32.50	37.50	32.50	15.00
15	40.00	35.00	40.00	35.00	---
16	42.50	37.50	42.50	37.50	17.50
17	45.00	40.00	45.00	40.00	---
18	47.50	42.50 [	47.50	42.50	20.00
19	50.00	45.00	50.00	45.00	---
20	52.50	47.50	52.50	47.50	22.50
22	---	---	---	---	25.00
24	---	---	---	---	27.50
26	---	---	---	---	30.00
28	---	---	---	---	32.50
30	---	---	---	---	35.00
32	---	---	---	---	37.50
34	---	---	---	---	40.00
36	---	---	---	---	42.50
38	---	---	---	---	42.50
40	---	---	---	---	47.50

Figure 8 (end)

D. 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 9. The drilled hole size, plating types, and plating thickness will depend on application requirements.

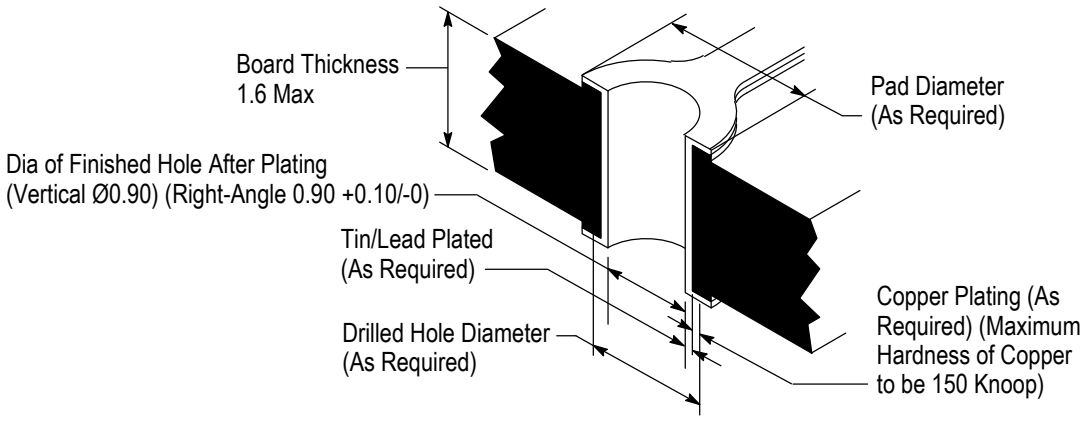


Figure 9

3.9. PC Board Header Assembly Placement

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

A. Manual Placement

i. Through Hole Mount Connectors When placing through hole mount connectors on the PC board, align the header assembly solder tines with the appropriate holes in the PC board. Start all solder tines into the board, then press on the header until it seats on the pc board.

ii. Surface Mount Connectors Optimally, the contact solder tines should be centered on the PC board circuit pads. However, slight misalignment is permissible as shown in Figure 10

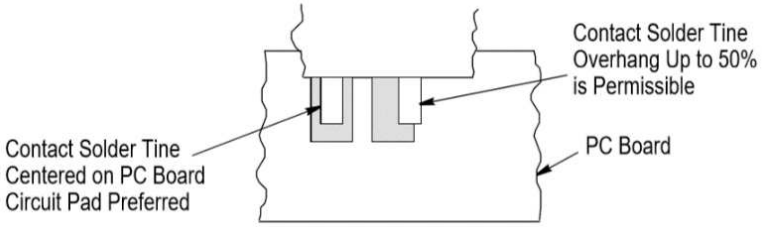


Figure 10

B. Robotic Placement

The robotic equipment must be adjusted to feed, pick up, and place the headers on the pc board with an accuracy as required. The header assembly datum surfaces detailed on the customer drawing will ensure correct placement of the header.

3.10. 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 number at the bottom of Page 1 for consideration of other types of flux. Some fluxes are compatible with these header assemblies are provided in Figure 11.

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

Figure 11

B. Soldering Guidelines

These header assemblies can be soldered using a variety of soldering techniques. The temperatures and exposure time shall be within the ranges specified in Figure 12. 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	MAXIMUM TEMPERATURE	TIME (At Max Temperature)
Wave	260°C [500°F] (Wave Temperature)	5 Seconds
IR reflow	260°C [500°F]	5 Seconds

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 header assemblies for the time and temperature specified. See Figure 13.

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.

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 13

D. Drying

When drying cleaned assemblies and pc 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.

3.11. Checking Installed Header Assemblies

The header assemblies must be seated on the pc board to the dimension shown in Figure 14.

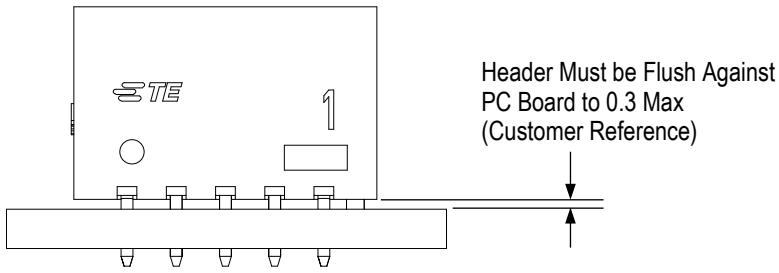


Figure 14

3.12. Polarization

The configuration of the EP 2.5 Connector mating cavities prevents accidental inversion when mating the two components.

3.13. Mating of Connectors

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

3.14. Header Assembly Spacing

Care must be used to avoid interference between adjacent header assemblies and/or other components. If robotic equipment is used, space allowances will be required for the grippers. See Figure 15.

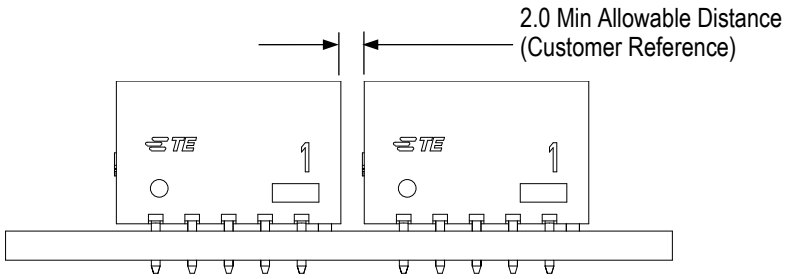


Figure 15

3.15. Disassembly

The TPA must be removed from the receptacle housing by releasing the locking latch(es) from the nub(s) of the receptacle housing and pulling the TPA straight from the receptacle housing. No contact can be extracted until the TPA is removed.

The contacts can be extracted by deflecting the locking latch from the receptacle housing locking ramp. Refer to Section 5 for tooling. A contact must not be re-inserted after extraction.

3.16. Replacement and Repair

CAUTION
Defective or damaged contacts or receptacle housings must not be used. Contacts must not be re-used by removing the wire nor after they have been extracted from the receptacle housing.

4. QUALIFICATION

The EP 2.5 connectors are Recognized by Underwriters Laboratories, Inc. to U.S. and Canadian requirements in UL File E28476.

5. TOOLING

Recommended tooling and instructional material packaged with the tooling is shown in Figure 16.

5.1. Hand Tool

The hand tool crimps a loose-piece contact onto a pre-stripped wire. This hand tool features a flip locator that positions the contact in the crimping dies.

5.2. Applicator

The applicators are designed to crimp strip-fed, precision formed contacts onto pre-stripped wire, and provides for high volume, heavy duty production requirements. The applicator must be installed onto a power unit.

5.3. Power Unit

Each power unit includes the power source used to supply the force to an applicator.

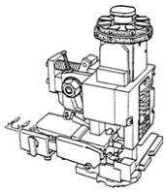
5.4. Contact Extraction

The extraction tool is designed to extract a contact by lifting the receptacle housing locking ramp away from the contact locking latch, allowing the contact to be pulled out of the receptacle housing.

A commercially-available small blade screwdriver can be used by inserting the tip into the window of the contact cavity of the contact to be removed, then pulling the wire of the contact to be removed until the contact is free from the receptacle housing.

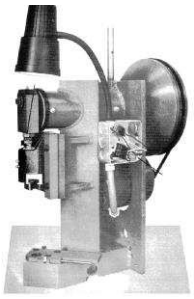
Mini Single Action Hand Tool (SAHT) 2217074-1 (408-32091)

Extraction Tool 2161958-1 for EP 2.5 Contacts (408-32061)

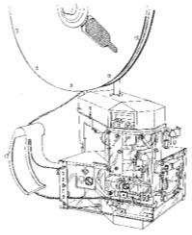


Heavy Duty Miniature Quick-Change Applicators (Side-Feed Type) 1530232-1, 1530232-2, 1530232-6, 7-1530232-1, 7-1530232-2, 7-1530232-6 (408-8040)

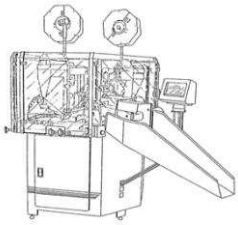
Ocean Side-Feed Applicators 2151793-[ ] or 2151950-[ ] (408-10389)



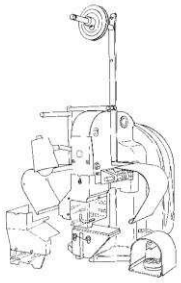
Model "T" Terminating Units 694620-[ ] (409-5207) or 458000-4 (409-5289)



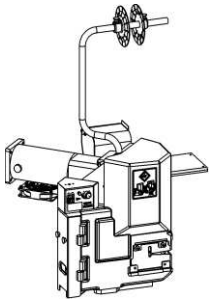
AMP-O-LECTRIC Model "G" Terminating Machines 354500-[ ] (409-5842)



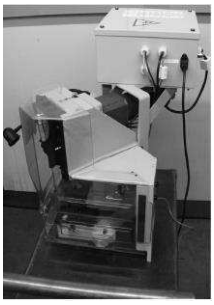
AMPOMATOR CLS III-G Lead-Making Machines 122500-2 and -3 (409-5852) AMPOMATOR CLS IV+ Lead-Making Machines 356500-[ ] (409-5878)



AMP-O-LECTRIC Model "K" Terminator Machines 565435-5 or 1-471273-2 (409-5128)



AMP 3K and AMP 5K Terminating Machines 1725950-[ ] and 1725900-[ ] (409-10047)



AMP 3K/40 Terminating Machines 2119683-[ ] or AMP 5K/40 Terminating Machines 2119684-[ ] (409-10099)

WIRE		TOOLING (DOCUMENT)				
WIRE SIZE mm² [AWG]	INSUL DIA (mm)	APPLICATOR (HDM Side-Feed Type)	APPLICATOR (Ocean Side Feed Type)	POWER UNIT	HAND TOOL	EXTRACTION TOOL
0.13-0.33 [22-26] and 0.20-0.52 [24-20]	1.30-1.90	1530232-[ ] (408-8040)	2151793-[ ] 2151950-[ ] 408-10389)	122500-2 (409-5852) 122500-3 (409-5852) 354500-[ ] (409-5842) 356500-[ ] (409-5878) 458000-4 (409-5289) 1-471273-2 (409-5128) 528324-[ ] (N/A)) 565435-5 (409-5128) 694620-[ ] (409-5207) 1725900-[ ] (409-10047) 1725950-[ ] (409-10047) 2119683-[ ] (409-10099) 2119684-[ ] (409-10099)	2217074-1 (408-32091)	2161958-1 (408-32061)

Figure 16

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.

SOCKET CONTACT SHOWN, PIN CONTACT HAS SAME REQUIREMENTS.
SINGLE HOUSING AND SINGLE HEADER SHOWN, DUAL HOUSING AND DUAL HEADER HAVE SAME REQUIREMENTS.

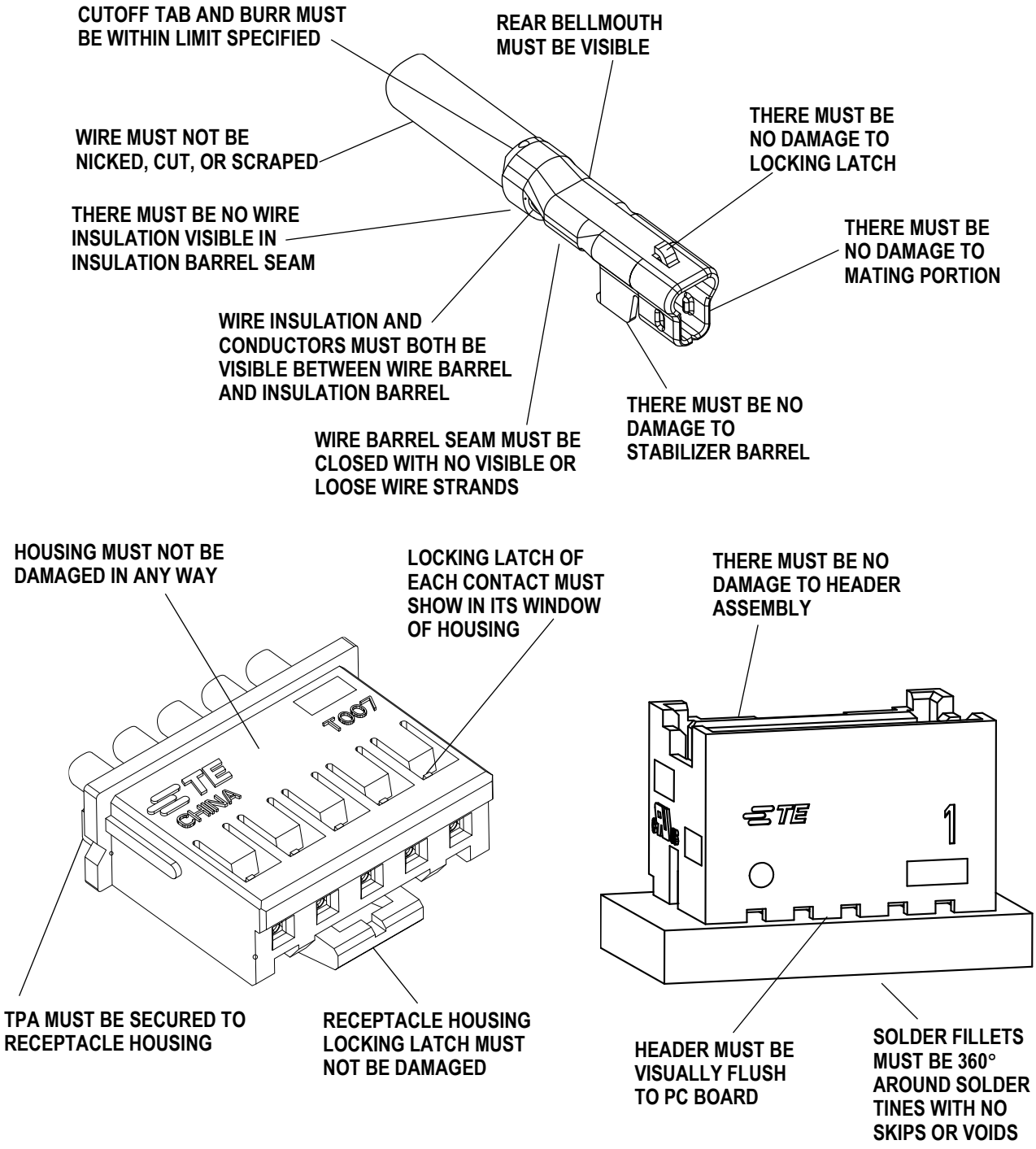


Figure 17. VISUAL AID