

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 ± 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 AMPMODU System 50 SMT Receptacles and Headers for printed circuit (pc) board applications. These connectors feature contacts with in-row spacing on 1.27 [.050] centers, row-to-row spacing on 2.54 [.100] centers, and mechanical hold-downs. They are available in sizes of 10 through 100 positions, and are designed for hand or automatic machine application.

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

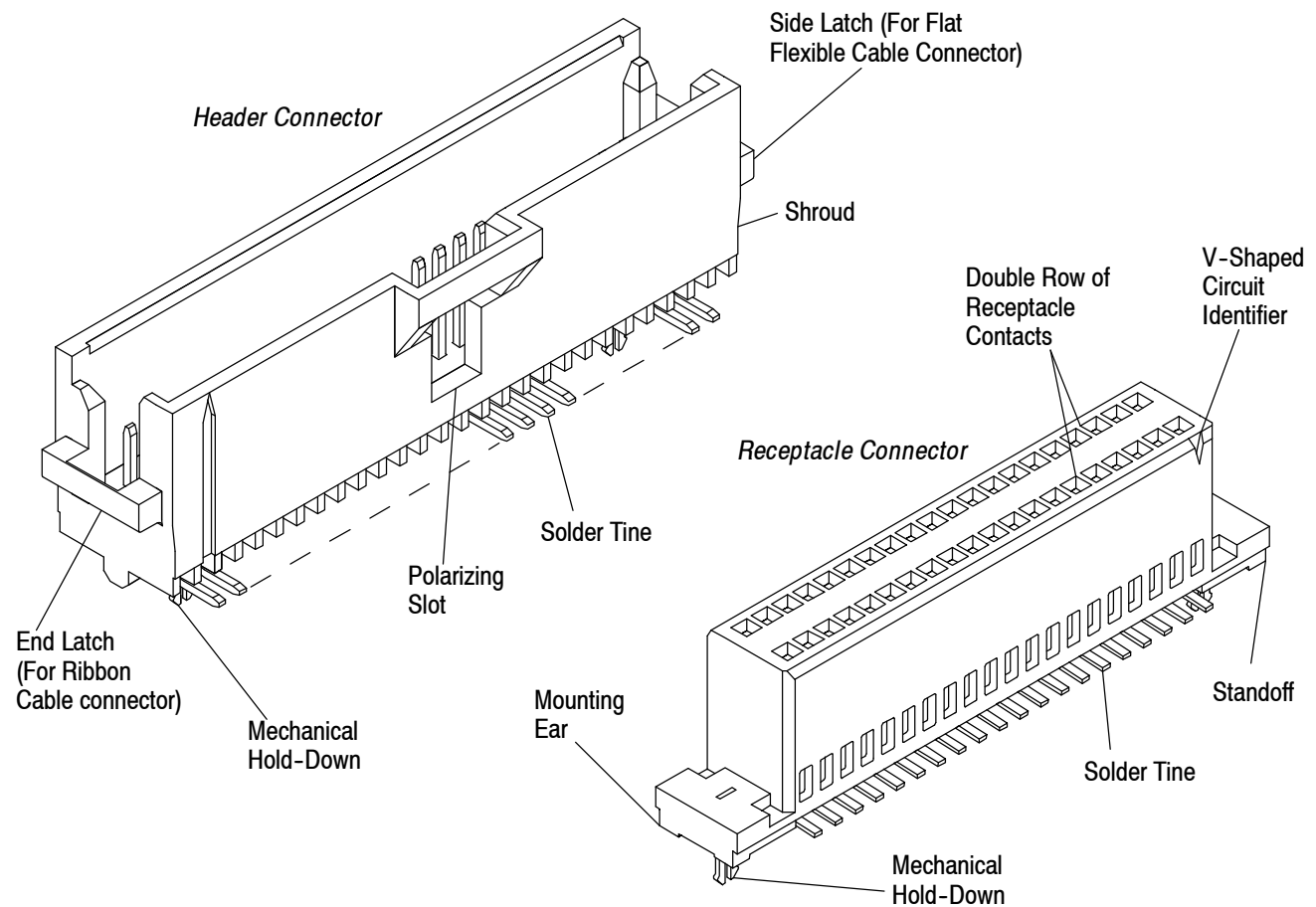


Figure 1

2. Revision Summary

2.1. Revision Summary

- Updated specification to corporate requirements
- New logo

2.2. Customer Assistance

Reference Part Number 104550 and Product Code 5576 are representative numbers of AMPMODU System 50 SMT Receptacles and Headers. 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 TE Representative or, after purchase, by calling the Tooling Assistance Center or the Product Information Center number at the bottom of page 1.

2.3. 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 TE.

2.4. Specifications

Product Specification 108-1093 and Solderability Specification 109-11-1 provide performance and test procedures for these connectors. Workmanship Specification 201-21 and IPC-S-815 provide solder joint requirements for these connectors. Application Specifications 114-25031, 114-16008, and 114-25029 cover receptacles and headers for through-board and cable-to-board connectors that will mate with these SMT connectors.

2.5. 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.

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

Each connector is packaged and shipped in an individual antistatic tube container. To prevent damage to the housings and contact solder tines, the connectors should remain in the container until ready for installation. Also, to prevent possible storage contamination and ensure maximum solderability, the connectors should be used on a first in, first out basis.

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. Product Materials

AMPMODU System 50 SMT Receptacles and Header Connectors are constructed of high temperature thermoplastic - Liquid Crystal Polymer, UL94V-0. The receptacle and header contacts are made of phosphor bronze with the mating interface of the contacts underplated with nickel and finished with gold plating. The solder tines have matte tin-lead plating.

3.3. Circuit Identification

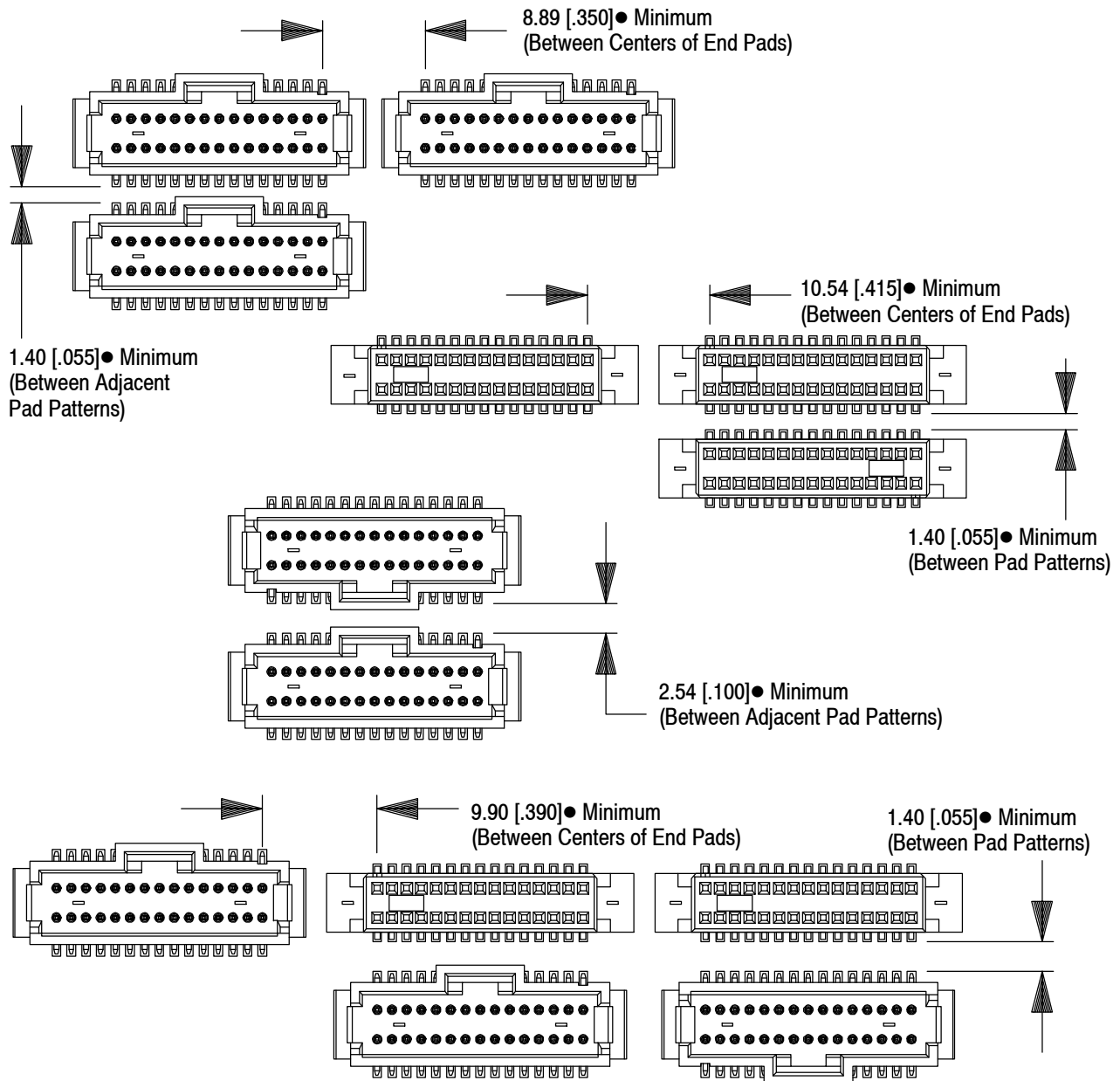
AMPMODU System 50 SMT Receptacles Connectors are marked with a V-shaped circuit identifier. See Figure 1.

3.4. Spacing

A. On PC Board Spacing

NOTE

Careful consideration to the tolerances must be observed when more than one connector pair is to be used between pc boards. Tolerance build-up on the pc board in conjunction with the tolerances associated with placing the connectors could cause a stress load on the solder joints which could affect their reliability. See Figure 2.



●Spacing dimensions for these headers do not include space needed for operating the latches on mating cable-to-board receptacles. The space needed for latch operation will depend on the specific location and application requirements which must be determined by the user. These dimensions take into account space required to operate tooling. Clearance around the header and receptacle will be required for operation of the gripper placement tooling. The required area will vary depending on the connector type, size, and gripper design. For specific information on this, contact the Tooling Assistance Center or the Product Information number at the bottom of page 1.

Figure 2

B. Between PC Board Spacing

Figure 3 provides board-to-board stacking dimensions for various mating combinations.

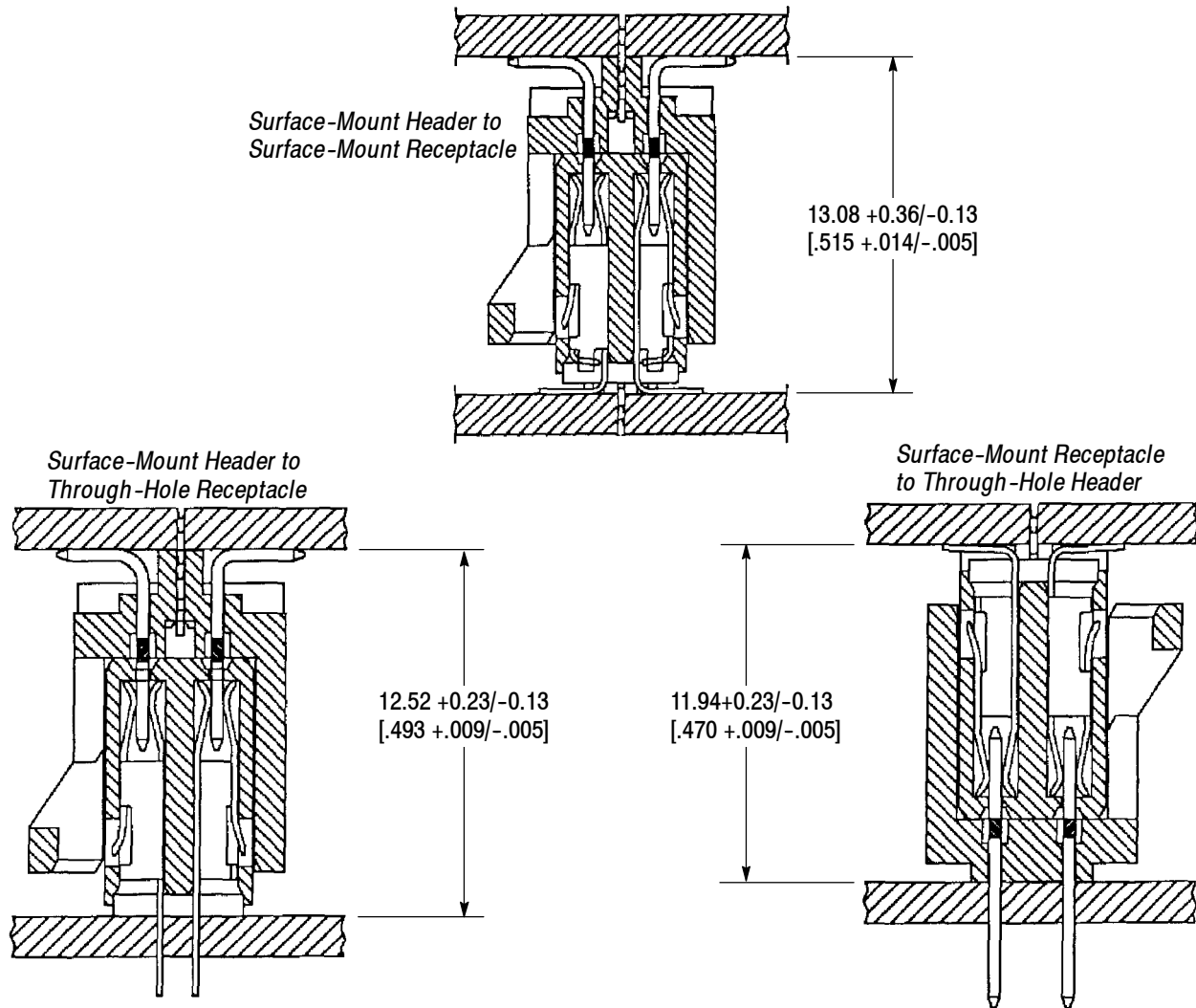


Figure 3

3.5. Printed Circuit Boards for AMPMODU System 50 SMT Receptacles and Headers

A. Tolerance

At the time of connector placement, the coplanarity of the pad pattern must be held to 0.05 [.002] maximum. We recommend a solder mask to minimize solder bridging between pads. The mask must not exceed the height of the pad by more than 0.05 [.002]. Maximum allowable bow of the pc board shall be 0.10 [.004] over the length of the connector.

CAUTION

Since the connector housings may rest on top of the solder mask, an excessively high mask will allow too much space between the solder tine and pad for a good solder joint. A solder joint under these conditions would be weak, and would not provide long term performance for the connector.

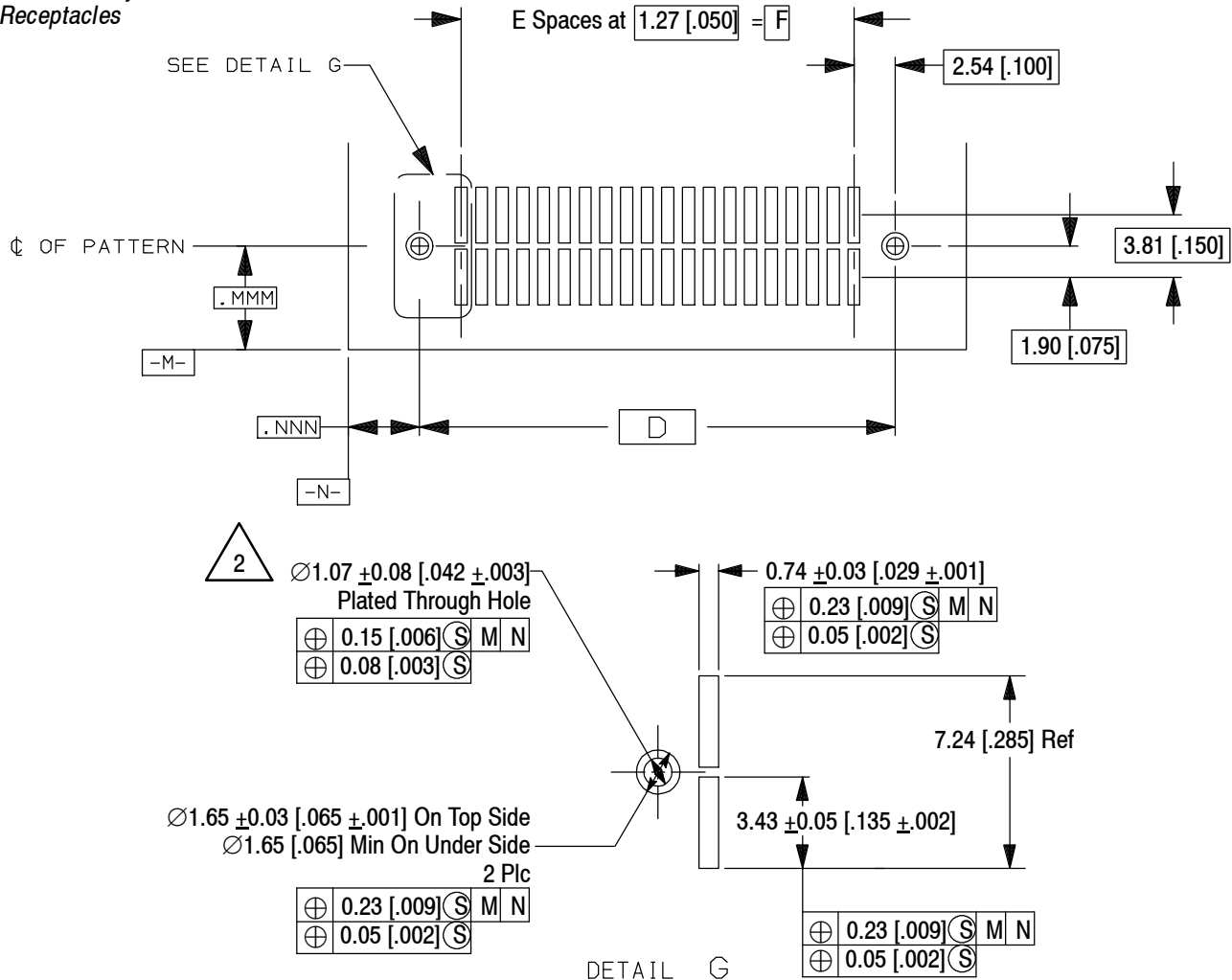
B. Material and Thickness

The pc board material shall be glass epoxy (FR-4 or G-10). The thickness of the pc board should be 1.57 ± 0.18 [$.062 \pm .007$] thick to ensure retention and stability for which the hold-downs are designed. Consult TE Engineering for suitability of other materials. A solder mask is recommended when soldering connectors. Those most suitable are Liquid Photo Imageable and Dry Film.

C. PC Board Layout

Recommended pc board patterns for plug and receptacle connectors are provided in Figures 4 through 6.

PC Board Layouts for Receptacles

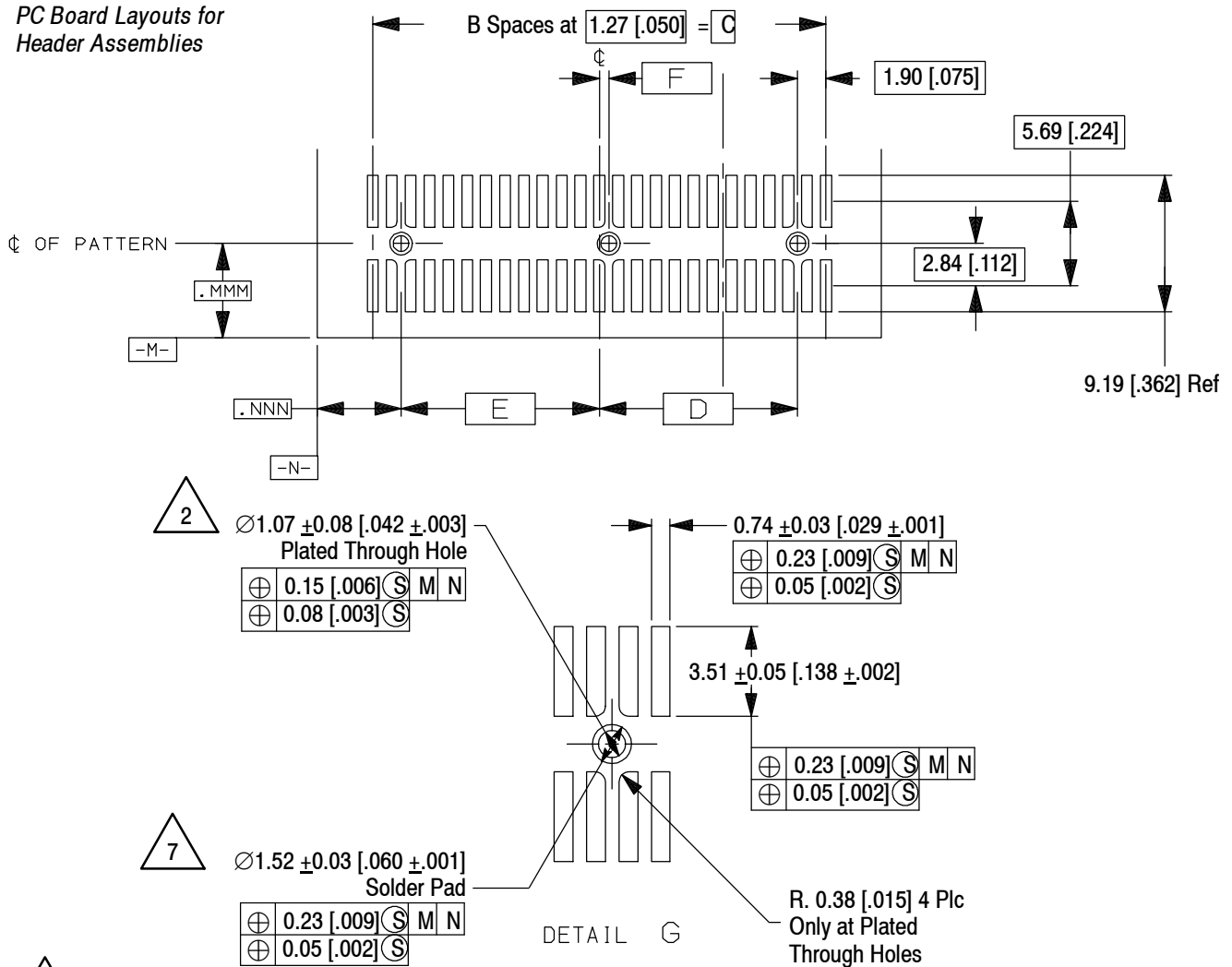


2 Use 1.181 ±0.025 [.0465 ±.0010] drilled hole (#56 drill) finish to be tin-lead over 0.03 [.001] minimum copper.

NUMBER OF POSITIONS	DIMENSION		
	F	E	D
10	5.08 [.200]	4	10.16 [.400]
20	11.43 [.450]	9	16.51 [.650]
24	13.97 [.550]	11	19.05 [.750]
30	17.78 [.700]	14	22.86 [.900]
40	24.13 [.950]	19	29.21 [1.150]
50	30.48 [1.200]	24	35.56 [1.400]
60	36.83 [1.450]	29	41.91 [1.650]
80	49.53 [1.950]	39	54.61 [2.150]
100	62.23 [2.450]	49	67.31 [2.650]

Figure 4

PC Board Layouts for Header Assemblies



2 Use $1.181 \pm 0.025 [0.0465 \pm 0.0010]$ drilled hole (#56 drill) finish to be tin-lead over $0.03 [0.001]$ minimum copper.

7 Pads on the opposite side of the pc board to be $\phi 1.65 [0.065]$ minimum.

NUMBER OF POSITIONS	DIMENSION				
	F	E	D	C	B
10	---	---	0.64 [0.25]	5.08 [2.00]	4
20	---	3.81 [1.50]	3.81 [1.50]	11.43 [4.50]	9
24	---	5.08 [2.00]	5.08 [2.00]	13.97 [5.50]	11
26	---	5.72 [2.25]	5.72 [2.25]	15.24 [6.00]	12
30	---	6.98 [2.75]	6.98 [2.75]	17.78 [7.00]	14
40	---	10.16 [4.00]	10.16 [4.00]	24.13 [9.50]	19
50	0.64 [0.25]	13.34 [5.25]	13.34 [5.25]	30.48 [1.200]	24
60	0.00 [0.000]	16.51 [6.50]	16.51 [6.50]	36.83 [1.450]	29
80	0.00 [0.000]	22.86 [9.00]	22.86 [9.00]	49.53 [1.950]	39
100	0.00 [0.000]	29.21 [1.150]	29.21 [1.150]	62.23 [2.450]	49

Figure 5

Typical Wiring Arrangements for PC Board Layouts for Circuit Traces

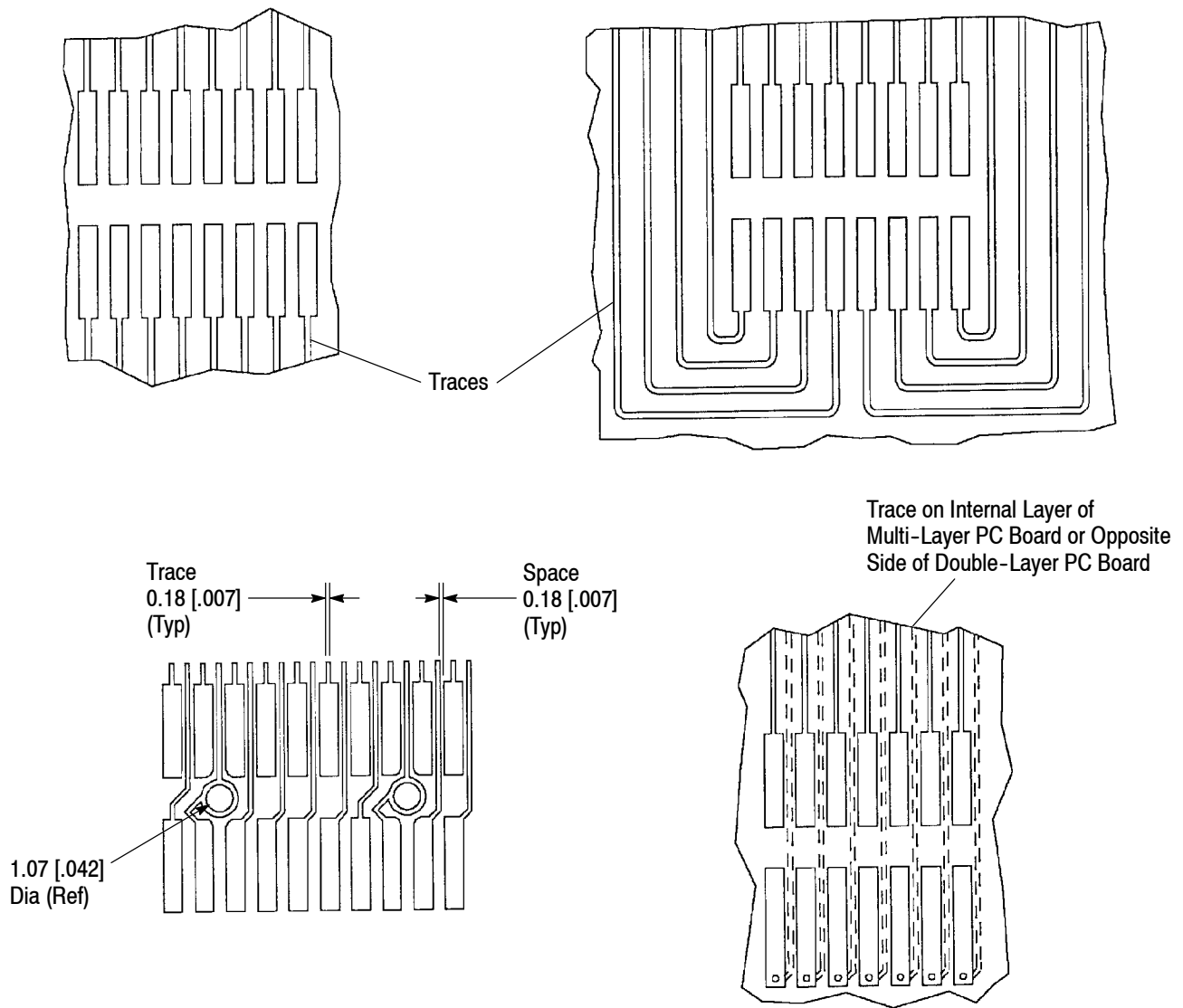


Figure 6

CAUTION TE does not recommend the use of more than one connector pair to interconnect two pc boards; if such a configuration is necessary to meet design requirements, contact the Tooling Assistance Center or the Product Information number located at the bottom of page 1.

3.6. Mating Configurations

A. Receptacles

Surface-Mount receptacles will mate with all AMPMODU System 50, shrouded and unshrouded, through-board and surface-mount headers that have identical double-row contact positions.

NOTE A shrouded header should be used where there is a severe corrosive environment to provide the maximum protection for the connector interface.

B. Headers

Surface-mount shrouded headers will mate with all AMPMODU System 50 through-board (except right-angle), surface-mount, and cable-to-board receptacles that have identical double-row contact positions.

3.7. Polarization

The polarizing slot in a surface-mount header will accommodate mating cable-to-board receptacles that have a side latch. See Figure 1.

3.8. Circuit Identification

A V-shaped recess in the housing provides a reference point for circuit identification. This feature typically identifies the number one circuit. See Figure 1.

3.9. Mechanical Supports

A. Integral Hold-Downs

Hold-downs are an integral part of each connector. They go into the pc board to stabilize the connectors prior to soldering and provide strain relief after soldering. They are soldered on both sides of the pc board during the soldering of the solder tines.

B. Packaging Hardware

CAUTION *Surface-mount connectors are not to be used as the only mechanical standoff supports between two pc boards in a system.*

To minimize stress on the connector solder joints, surface-mount connectors should not be used as the only support between boards. Similarly, bulky cable assemblies should not hang unsupported from the mating headers.

3.10. Processing

The pc board pads must be solderable in accordance with the Test Specification 109-11-1.

A. Recommended Solder Paste Characteristics

- Alloy type shall be either 63 Sn/37Pb or 60 Sn/40Pb
- Flux shall be RMA type
- Solids by weight shall be 85% minimum
- Mesh particle size shall be of -200 to +325 designation
- Minimum viscosity of screen print shall be 5×10^5 cp (centipoise)
- Minimum viscosity of stencil print shall be 7.5×10^5 cp (centipoise)

B. Solder Volume

Solder Volume for each component shall be:

- Receptacle is 0.17 mm^3 [$.0000106 \text{ in.}^3$] per contact
- Header is 0.71 mm^3 [$.0000432 \text{ in.}^3$] per contact
- Hold-down is 1.34 mm^3 [$.0000819 \text{ in.}^3$] per hold-down

C. Stencil

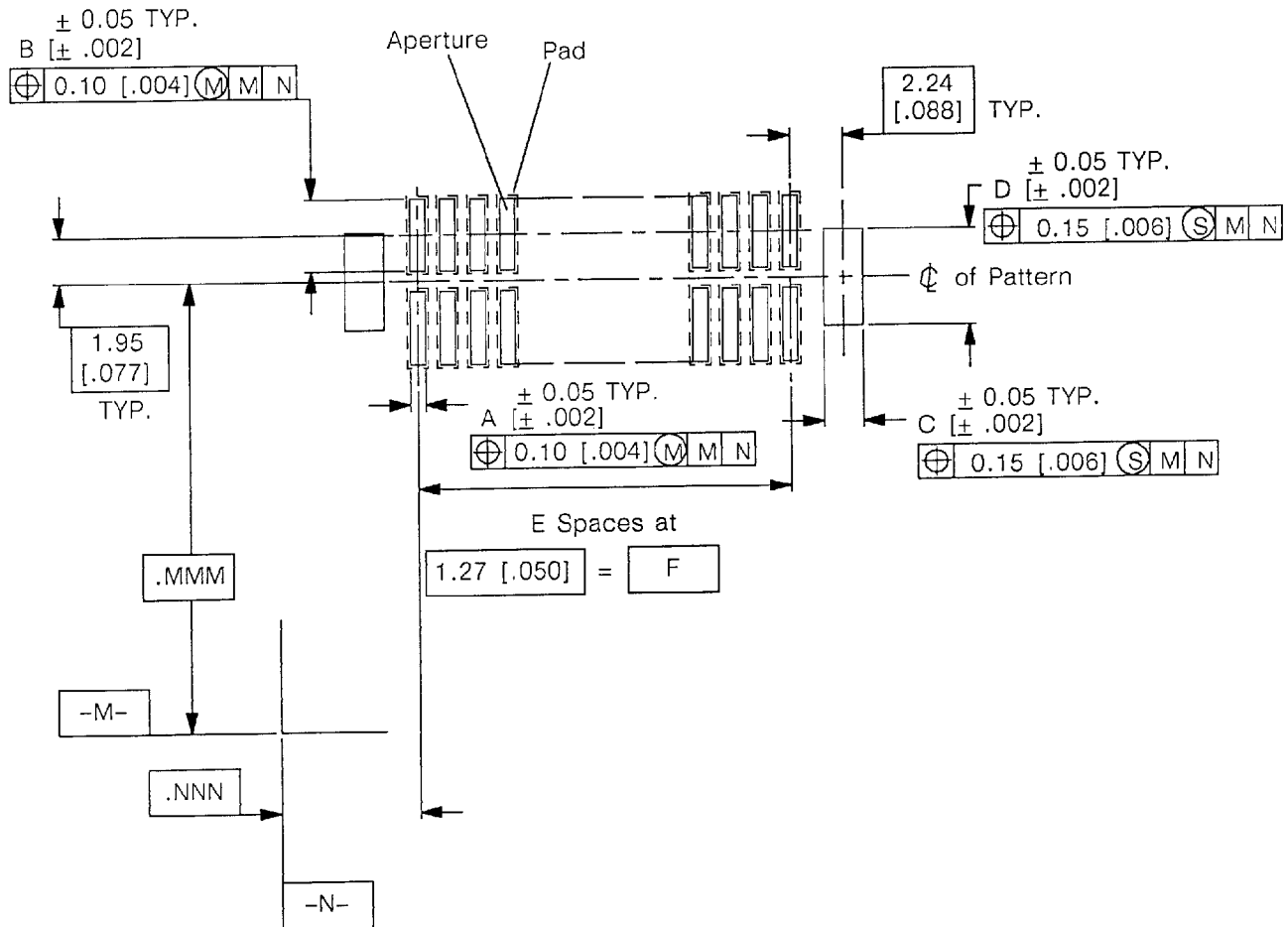
Stencil aperture will be determined by the thickness of the stencil being used. Generally, the thinner stencils will have a larger aperture to maintain a given volume of solder paste. Solder deposition should be within the pad area of the solder tines. Typical aperture openings are provided in Figures 7 and 8.

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 hold-down, 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.*

NOTE *The recommended aperture width is 0.64 [$.025$] for both the receptacles and headers. The width may be wider; however, care must be given to ensure against solder bridging during processing.*

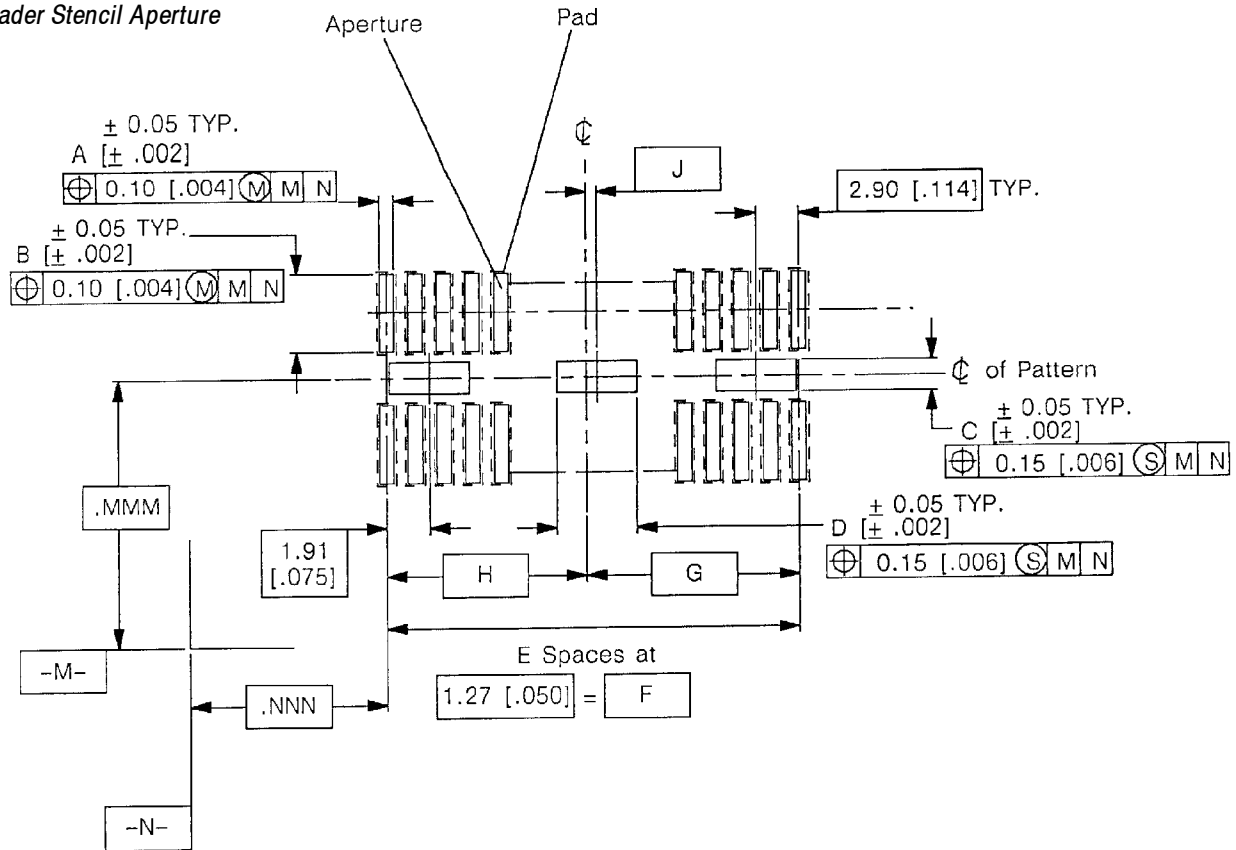
Receptacle Stencil Aperture



CONN TYPE	NOMINAL PAD SIZE	STEN THKNS	APERTURE PAD DIM		APERTURE HOLD-DOWN DIM		NO. OF POSN	DIMENSION	
			A	B	C	D		E	F
RECPT	0.73 X 3.43 [.029 X .135]	0.23 [.009]	0.64 [.025]	3.05 [.120]	1.65 [.065]	4.06 [.160]	10	4	5.08 [.200]
							20	9	11.43 [.450]
							24	11	13.97 [.550]
							30	14	17.78 [.700]
		0.25 [.010]	2.79 [.110]	3.81 [.150]	40	19	24.13 [.950]		
					50	24	30.48 [1.200]		
					60	29	36.83 [1.450]		
					80	39	49.53 [1.950]		
							100	49	62.23 [2.450]

Figure 7

Header Stencil Aperture



CONN TYPE	NOMINAL PAD SIZE	STEN THKNS	APERTURE PAD DIM		APERTURE HOLD-DOWN DIM		NO. OF POSN	DIMENSION				
			A	B	C	D		E	F	G	H	J
HDR	0.73 X 3.51 [.029 X .138]	0.23 [.009]	0.64 [.025]	3.05 [.120]	1.40 [.055]	3.55 [.140]	10	4	5.08 [.200]	0.64 [.025]	---	---
							20	9	11.43 [.450]	3.81 [.150]	3.81 [.150]	---
							24	11	13.97 [.550]	5.08 [.200]	5.08 [.200]	---
							26	12	15.24 [.600]	5.72 [.225]	5.72 [.225]	---
							30	14	17.78 [.700]	6.99 [.275]	6.99 [.275]	---
		0.25 [.010]	0.64 [.025]	3.05 [.120]	1.27 [.050]	3.55 [.140]	40	19	24.13 [.950]	10.16 [.400]	10.16 [.400]	---
							50	24	30.48 [1.200]	13.34 [.525]	13.34 [.525]	0.64 [.025]
							60	29	36.83 [1.450]	16.51 [.650]	16.51 [.650]	0.00 [.000]
							80	39	49.53 [1.950]	22.86 [.900]	22.86 [.900]	0.00 [.000]
							100	49	62.23 [2.450]	29.21 [1.150]	29.21 [1.150]	0.00 [.000]

Figure 8

D. Solder Screen

Generally, we do not recommend screen application of solder paste because of the limited volume of paste that can be deposited. If a screen application is required, we recommend removal of all screen from the contact and hold-down pad areas. Consult your supplier for compatibility of screen and paste, and for application techniques.

E. Solder Mask

Solder mask is recommended between all pads. If a trace is run between adjacent pads 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 tines. 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.

F. Connector Placement

NOTE

Optimally, the connector tines should be aligned on the pc board pads. However, misregistration is permissible for certain performance classifications as specified in IPC-S-815. See Figure 9.

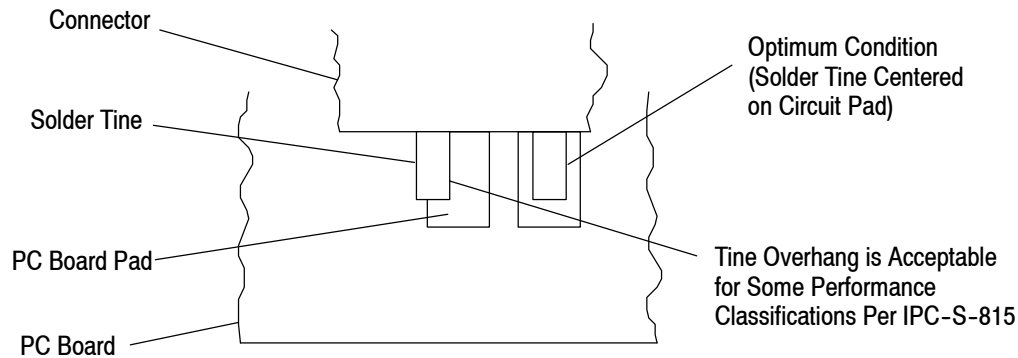


Figure 9

1. Manual Placement

Manual Placement of the receptacles and headers on the pc board is relatively easy. To avoid damage, the connectors should be emptied directly from the tube in which they are supplied into a pick-up track. The connectors may be picked up using the hold-downs as guiding features, pushed evenly into the pc board holes until the hold-downs go into the pc board and the housing is seated.

NOTE

A pc board support will be required under the pc board in the area of the connector. See Section 5 for recommended tooling.

2. Machine Placement

Receptacles and headers may be placed using a variety of insertion machines, including semi-automatic and fully automatic in-line bench units as well as conventional robot/gripper technology. These machines and associated hardware will automatically position the connector under the insertion head using a gravity fed tube system. Insertion locations will be pre-programmed by the user by a simple pantograph/template system, or a software package in the case of robotic installation. Insertion is accomplished similarly to that of the manual process described above. Again, support will be required under the board during insertion.

G. Soldering

NOTE

Manual 402-40 provides some guidelines for establishing soldering practices.

1. Fluxing

The contact solder tines and, if applicable, attaching hardware 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 that are compatible with these connectors are provided in Figure 10.

FLUX TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			KESTER	ALPHA
Type RMA (Mildly Activated)	Mild	Noncorrosive	185/197	611
Center (Activated)	Medium	May be Corrosive	1544, 1545, 1547	711, 809, 811

Figure 10

2. Parameters

The connectors will withstand temperatures of 230°C [446°F] for a maximum of three minutes. Higher temperatures can be withstood for short periods of time as indicated in Figure 11 for the infrared (IR) reflow. Refer to the recommendations provided in Figure 11 for typical reflow parameters. Due to the many variables involved with the reflow process (ie, component density, orientation, etc), we recommend that the user conduct trial runs under actual manufacturing conditions to ensure product and process compatibility.

Preheat 350°C [662°F]	ZONE 1	ZONE 2	ZONE 3
TOP HEATER	285° [545°]	265° [509°]	310° [590°]
BOTTOM HEATER	285° [545°]	265° [509°]	310° [590°]

Figure 11

3. Techniques

It is recommended that the connector be soldered using convection, vapor phase (VPR), double sided non-focused infrared (IR), or equivalent soldering technique provided the temperatures and exposure time are within the ranges specified in Figure 12. Higher temperatures can be withstood for short periods of time as indicated in Figure 12 for the IR reflow. TE recommends using a Corpane Batch Vapor Phase† (Model VVP 10 BU) and Vitronics IR‡ (Model SMD 718) equipment.

SOLDERING PROCESS	TEMPERATURE		TIME (At Max Temp)
	CELSIUS	FAHRENHEIT	
VAPOR PHASE SOLDERING	215	419	5 Minutes
INFRARED REFLOW SOLDERING	230	446	5 Minutes
CONVECTION	230	446	5 Minutes

Figure 12

4. Reflow Parameters

Due to the many variables involved with the reflow process (ie, component density, orientation, etc), we recommend that the user conduct trial runs under actual manufacturing conditions to ensure product and process compatibility.

H. Cleaning

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder paste and flux for recommended cleaning solvents. The following is a listing of common cleaning solvents that will not affect the connectors. The connectors will be unaffected by any of these solvents for 5 minutes at 105°C [221°F]. 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

CAUTION Even when using “no clean” solder paste, it is imperative that the contact interface be kept clean of flux and residue, since it acts as an insulator. Flux may migrate under certain conditions with elevated temperatures and, therefore, cleaning is necessary even with “no clean” paste.

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CLEANER		TIME (Minutes)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
Alpha 2110	Aqueous	1	132	270
Bioact EC-7	Solvent	5	100	212
Butyl Carbitol	Solvent	1	Room Ambient	
Isopropyl Alcohol	Solvent	5	100	212
Kester 5778	Aqueous	5	100	212
Kester 5779	Aqueous	5	100	212
Loncoterge 520	Aqueous	5	100	212
Loncoterge 530	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

Figure 13

DANGER

Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Trichloroethylene and Methylene Chloride can be used with no harmful affect to the connectors; however, TE does not recommend them because of the harmful occupational and environmental effects. Both are carcinogenic (cancer-causing) and Trichloroethylene is harmful to the earth's ozone layer.

NOTE

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

I. Drying

Air drying of cleaned connectors is recommended. Temperature for the connectors should not exceed -55 to 105°C [-67 to 221°F]. Degradation of the housings could result from extreme temperatures.

3.11. Repair/Removal

Connectors may be removed from the pc board by standard de-soldering methods. Damaged connectors must be replaced.

4. QUALIFICATIONS

AMPMODU System 50 SMT Receptacles and Headers are Recognized in the component program by Underwriters Laboratories Inc. (UL) File Number E28476 and Certified to CSA International in File LR7189.

5. TOOLING

No special tooling is required for the installation or removal of AMPMODU System 50 SMT Receptacles and Headers. The following information is provided for the robotic application of these assemblies.

- **Robotic Equipment**

Robotic equipment for placement of the connector on a pc board must have a true position accuracy of 0.25 [.010] to ensure proper location and insertion of the contact tines. This includes gripper and fixture tolerances as well as equipment repeatability. It must use the connector datum surface to ensure reliable placement. If you need assistance in setting up prototype or production line equipment, contact TE Tooling Engineering through your local TE Representative or call the TE Tooling Assistance Center number at the bottom of page 1.

- **PC Board Support**

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

Alpha, Bioact, Carbitol, Kester, and Loncoterge are trademarks of their respective owners.

6. VISUAL AID

Figure 14 shows a typical application of AMPMODU System 50 SMT Receptacles and Headers. This illustration should be used by production personnel to visually ensure suitable applications. Installations which appear visually incorrect should be inspected using the dimensional information given in the preceding pages of this application specification.

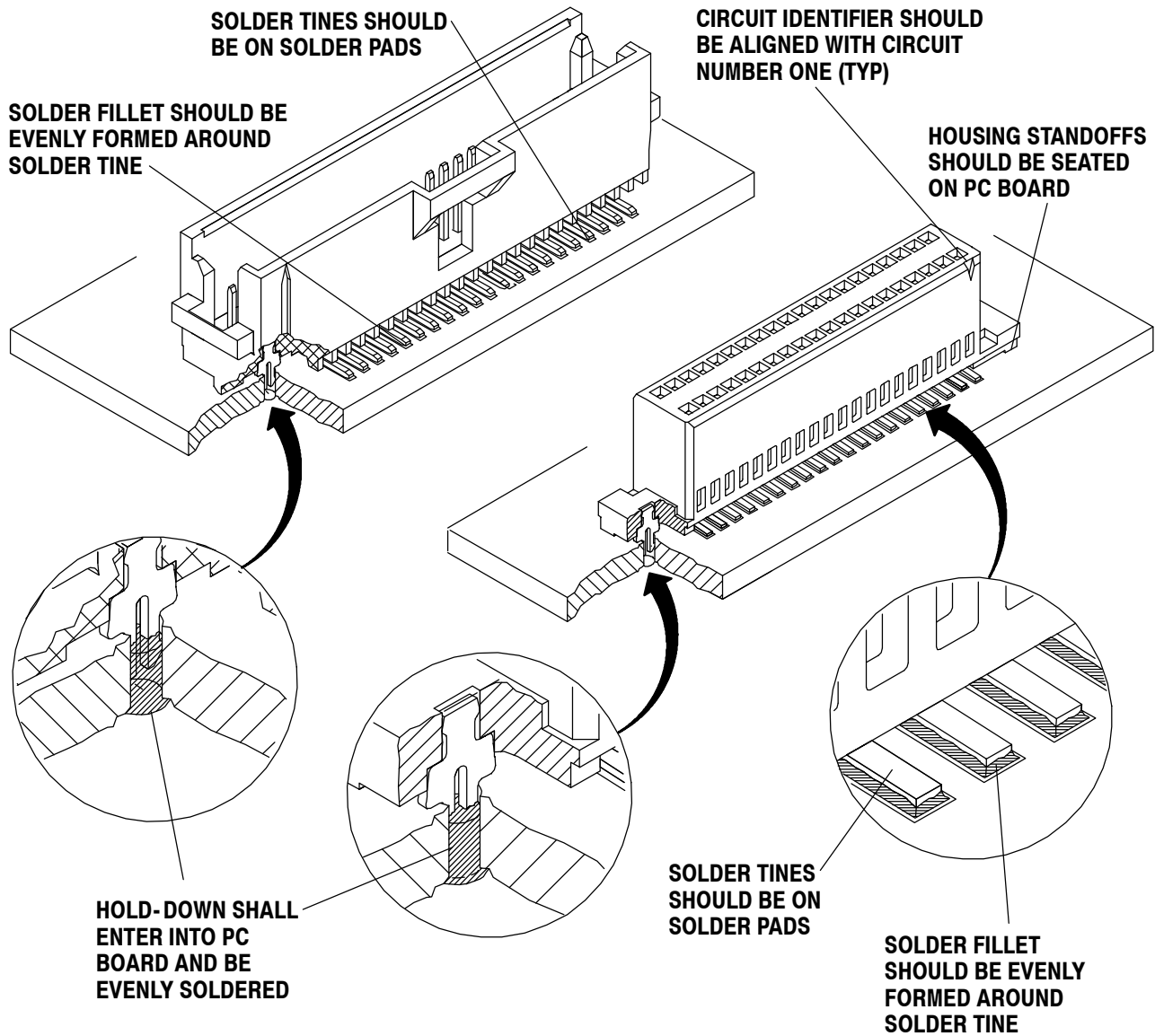


FIGURE 14. VISUAL AID