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 [±.005] 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 CLOUDSPLITTER SMT jack assemblies for printed circuit (pc) board and panel mount applications. Each jack has a housing with integral light emitting diodes (LED) (green/orange and yellow), alignment posts, and signal and power surface-mount contacts. The jack has 8 signal positions and 2 power positions. These jacks are available with additional power contacts.

The jack features a shield over the housing, which provides continuity for electromagnetic compatibility (EMC) applications. The shield contacts and shield ground tabs (when soldered to the pc board) and panel ground tabs (when tensioned to the panel) provide electrical continuity to any ground path on the pc board and through the equipment panel. Grounding continuity is achieved when the jack is mated with a corresponding shielded plug.

When corresponding with 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.

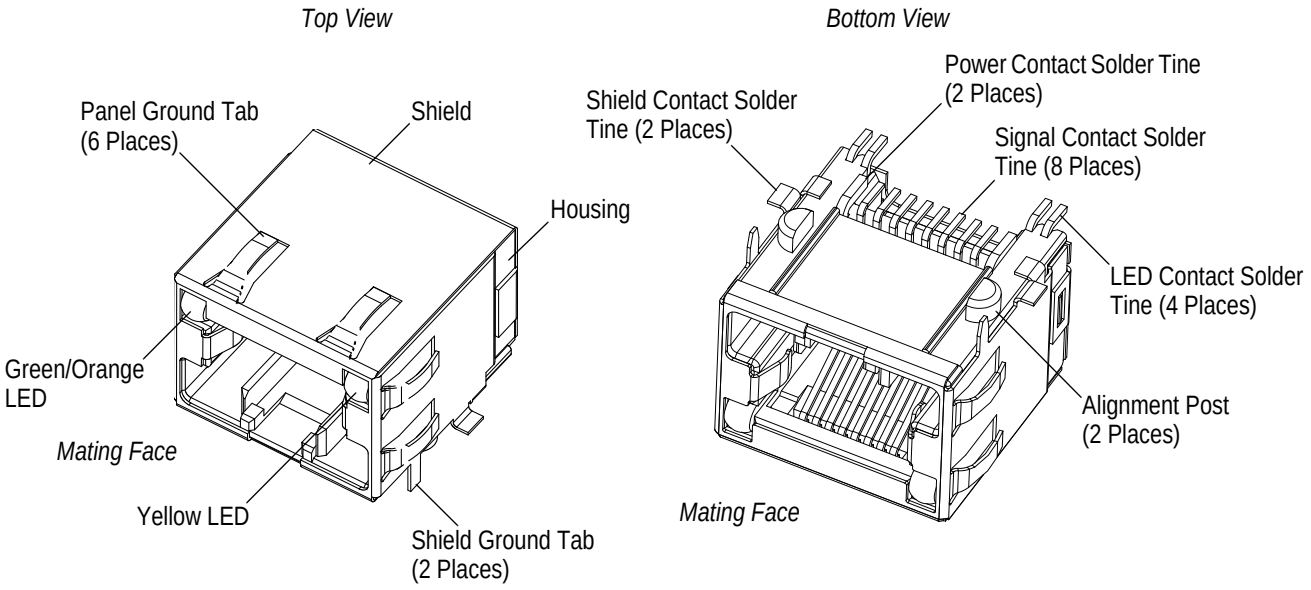

Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Changed name of product and modular plug to plug
- Changed Section 4

2.2. Customer Assistance

Reference Product Base Part Number 2178126 and Product Code 4149 are representative of CLOUDSPLITTER SMT jack assemblies. 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 Representative, by visiting our website at www.te.com, or by calling PRODUCT INFORMATION or the TOOLING ASSISTANCE CENTER at the numbers at the bottom of this page.

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, call PRODUCT INFORMATION at the number at the bottom of page 1.

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, flux removal procedures, and a guide for information on soldering problems.

2.5. Specifications

Product Specification 108-64022 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. There are no documents available that pertain to this product.

3. REQUIREMENTS

3.1. Storage

A. Ultraviolet Light

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

B. Shelf Life

The jacks should remain in the shipping containers until ready for use to prevent any damage. The jacks 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 jacks near any chemical listed below as they may cause stress corrosion cracking in the contacts.

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

3.2. Operation

The operating requirements for the LED of the jack are given in Figure 2.

3.3. PC Board

A. Material and Thickness

The pc board material must be glass epoxy (FR-4 or G-10). The pc board thickness range must be 1.45 through 1.70 [.057 through .067].

NOTE
Contact the PRODUCT INFORMATION CENTER at the number listed at the bottom of page 1 for suitability of other board materials and thicknesses.

B. Tolerance

Maximum allowable bow of the pc board must be 0.13 [.005] over the length of the jack. Coplanarity of the pads on the pc board must be 0.03 [.001].

C. Pads

The pc board pads must be solderable in accordance with Test Specification 109-11-1 and Joint Industry Standard J-STD-003, “Solderability Tests for Printed Boards.”

DESCRIPTION	ABSOLUTE MAXIMUM RATING (T_A = 25° C [77° F])			
	GREEN	ORANGE	YELLOW	(Unit)
Wavelength at Peak Emission I_F = 20 mA	565	607	590	nm
Lens Type	Diffused	Diffused	Diffused	—
Luminous Intensity—Minimum (I_F = 10 mA)	5	5	5	mcd
Luminous Intensity—Maximum (I_F = 10 mA)	14	14	13.8	mcd
Forward Voltage (Typ) I_F = 20 mA	2.20	2.00	2.10	V
Forward Voltage (Max) I_F = 20 mA	2.50	2.50	2.50	V
Reverse Voltage (V_R)	5	5	5	V
Forward Current (I_F) (1/10 Duty Cycle, 0.1 ms Pulse Width)	25	25	30	mA
Forward Current (Peak)	145	145	140	mA
Reverse Current V_R = 5 V	10	10	10	µA (micro)
Power Dissipation	62.5	62.5	75	mW
Low-Current Application: Forward Voltage (Typ) I_F = 2 mA	1.90	1.70	1.80	V
Forward Voltage (Max) I_F = 2 mA	2.20	2.00	2.10	V
Forward Current (I_F) (1/10 Duty Cycle, 0.1 ms Pulse Width)	7	7	7	mA
Forward Current (Peak)	150	150	150	mA
Power Dissipation	24	26	25	mW

Figure 2

D. Layout

The pc board pads and holes must be precisely located to ensure proper placement and optimum continuity for circuits after soldering. The pc board layout must be designed using the dimensions are provided on the customer drawing for the specific jack. A reference *sample* recommended pc board layout is given in Figure 3.

Sample Recommended PC Board Layout (Component Side)

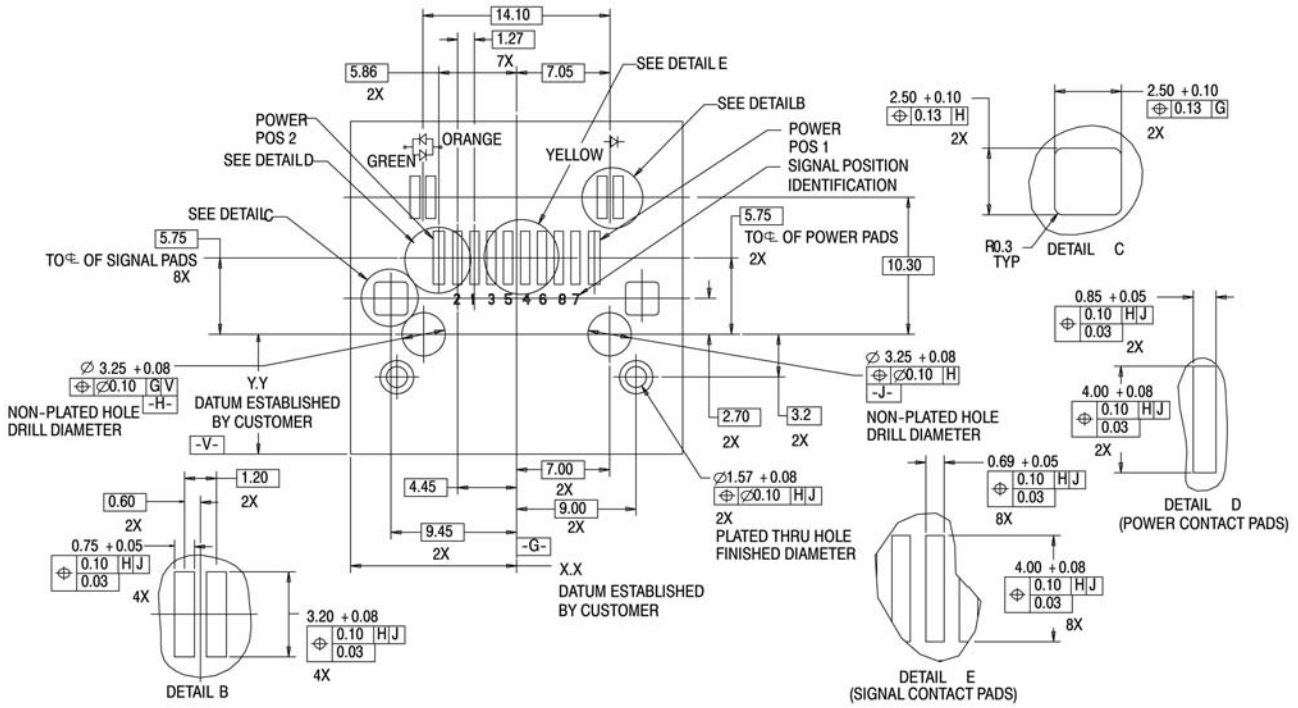

Figure 3

E. Holes

The shield ground tab drilled hole size and plating type and thickness are dependent on the application. The alignment post hole must be unplated. To prevent stubbing during placement of the jack on the pc board, the shield ground tab finished hole size and alignment post drilled hole size must be within the dimensions given in Figure 4.

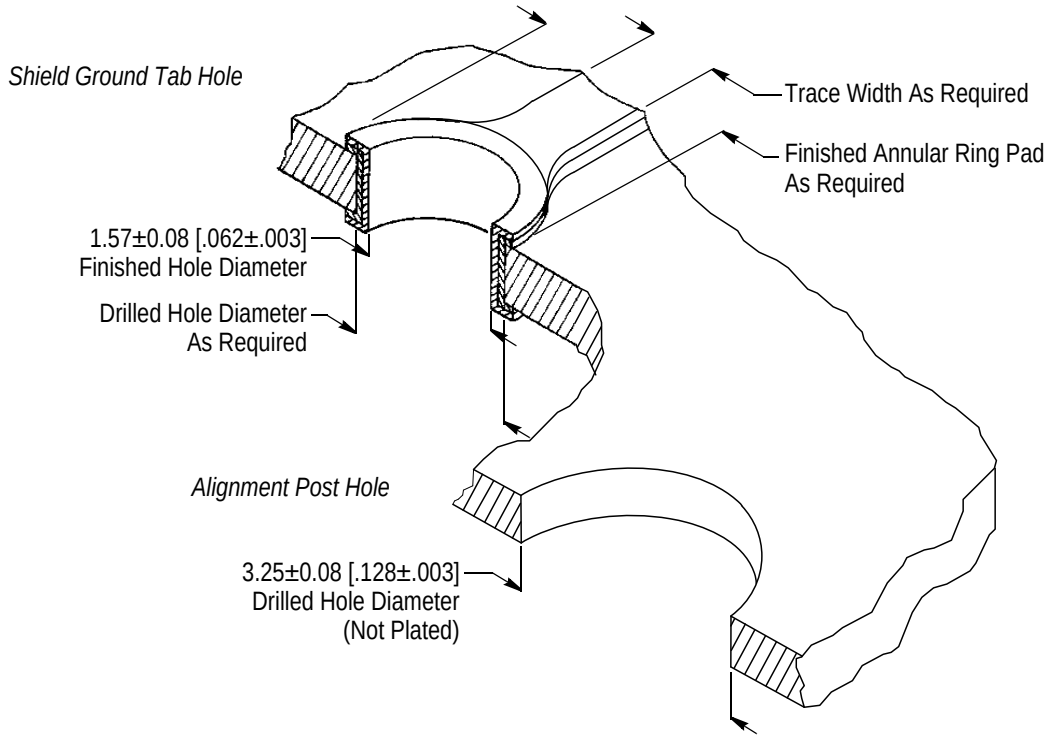

Figure 4

3.4. Spacing

Care must be taken to avoid interference between adjacent jacks and/or other components. There is no required spacing between jacks, however spacing may be dependent on variable hardware used and the clearance required for the mating plugs.

NOTE
The information provided is for manual placement of jacks. If robotic equipment is used, other space allowances will be required for the grippers.

3.5. Placement

CAUTION
Jacks should be handled only by the housing to avoid deformation, contamination, or damage to the contacts.

When manually placing jacks on the pc board, the contact solder tines must be aligned with matching pads and the shield ground tabs and alignment posts must be placed over their intended pc board holes, then the jack can be gently pressed downward.

NOTE
Automatic machine (robotic equipment) placement is recommended (instead of manual placement) for these jacks.

Optimally, each contact solder tine should be centered on its pc board pad; however, slight misalignment is permissible for the performance classifications specified in Association of Connecting Electronics Industries (IPC) J-STD-001, “Requirements for Soldering Electrical and Electronic Assemblies”. See Figure 5.

NOTE
The jack is packaged in tape-and-reel containers in accordance with Electronic Industries Alliance (EIA)-481, "8-mm Through 200-mm Embossed Carrier Taping and 8-mm and 12-mm Punched Carrier Taping of Surface Mount Components for Automatic Handling."

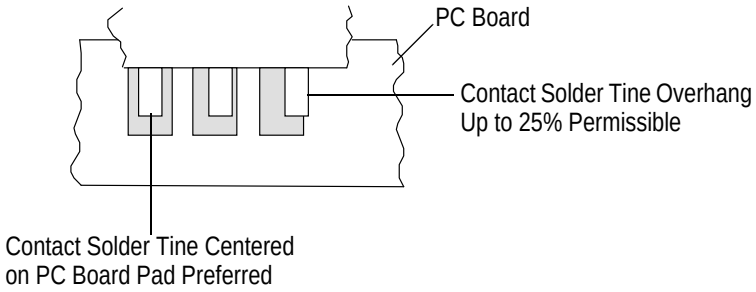

Figure 5

3.6. Soldering

Guidelines and procedures must be observed when soldering contacts. All leads to contact solder tines must be soldered, cleaned, and dried according to the following.

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. Flux that is compatible with the jack is provided in Figure 6.

FLUX TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			KESTER	ALPHA
RMA	Mild	Noncorrosive	185/197	611

Figure 6

B. Process

The jack should be soldered using vapor phase reflow (VPR), double-sided, non-focused infrared (IR), forced air convection, or equivalent soldering techniques.

For the tin-lead process, the jack will withstand the temperature and exposure time specified in Figure 7.

NOTE
Due to many variables involved with the reflow process (i.e., component density, orientation, etc.), it is recommended that trial runs be conducted under actual manufacturing conditions to ensure product and process compatibility.

TEMPERATURE (Max)	TIME (At Max Temperature)
220°C [428°F]	3 Minutes

Figure 7

For a lead-free process, a reflow profile is shown in Figure 8.

C. Solderability

All solder joints should conform to Institute for Interconnecting and Packaging Electronic Circuits (IPC) Workmanship Specification IPC-A-610, "Acceptability of Electronic Assemblies" and Joint Industry Standard J-STD-001, "Requirements for Soldered Electrical and Electronic Assemblies."

Lead-Free Reflow Soldering Process Cycle

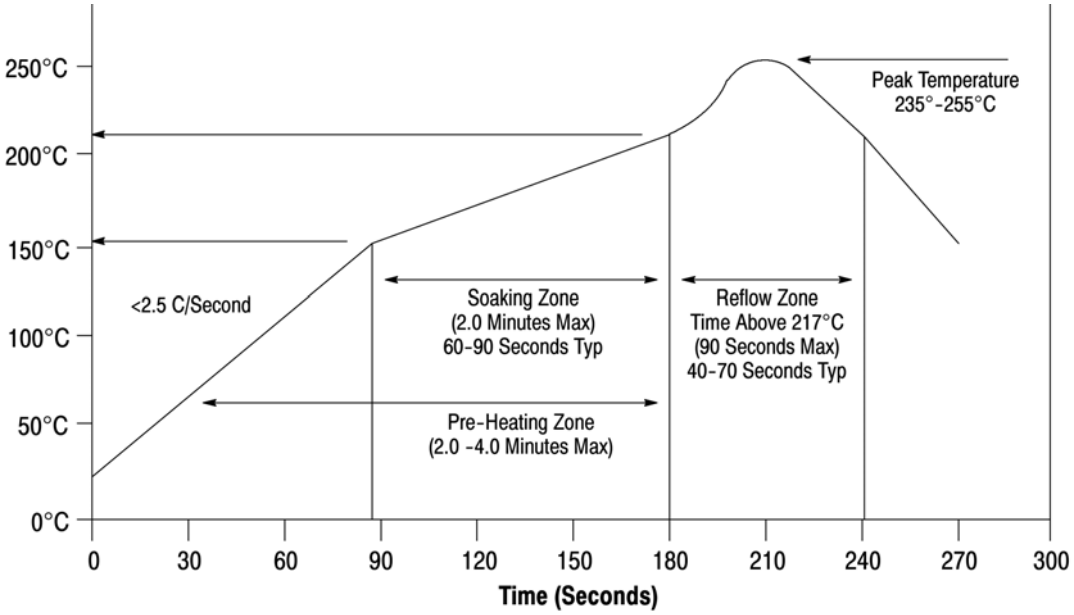

Figure 8

D. Solder Paste Characteristics

Lead-free solder paste characteristics shall be:

— Alloy type shall be SAC 305; Sn 96.5/Ag 3.0/Cu 0.5

— Flux incorporated in the paste shall be rosin, mildly active (RMA) type

— Paste will be at least 80% solids by volume

— Mesh designation -200 to +325 (74 to 44 square micron openings, respectively)

— Minimum viscosity of screen print shall be 5x10% cp (centipoise)

— Minimum viscosity of stencil print shall be 7.5x10% cp (centipoise)

E. Solder Paste Volume

NOTE
Solder paste volume may vary depending on the solder paste composition. The outgassing factor (typically approximately 50%) will reduce volume after curing.

Recommended lead-free solder volume per component calculated per 50% solid content before curing is given in Figure 9.

POWER CONTACT	SIGNAL CONTACT	LED CONTACT	SHIELD CONTACT
0.55 mm^3 [.000034 $in.^3$]	0.46 mm^3 [.000028 $in.^3$]	0.41 mm^3 [.000025 $in.^3$]	0.78 mm^3 [.000048 $in.^3$]

Figure 9

Since solder paste can be deposited with a stencil or screen, the following calculation should serve as a guideline in varying deposition parameters.

With: Vi being minimum solder volume before curing,

a being aperture corresponding to pad width,

b being aperture corresponding to pad length, and

Tp being thickness of stencil (if used) or deposited solder paste,

minimum solder volume before curing for each pad is calculated as follows:

$$a \times b \times Tp = Vi$$

Using paste volume in excess of that recommended could cause excessive wicking of reflowed solder up the contact solder tine, resulting in reduction of compliance and potential solder joint failure.

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 contact solder tines, producing a weak solder joint.

CAUTION
If a hold-down aperture is required other than that specified, the design must ensure that the jack housing will not sit on the solder deposit.

F. Screen

Solder screen is recommended between all pads when soldering these jacks to minimize solder bridging between pads. The screen must not exceed the height of the pad by more than 0.05 [.002]. If a trace is run between adjacent pads on the solder side of the pc board, a screen must be applied over the trace to prevent bridging and wicking of solder away from the contact solder tines. Additionally, there should be screen covering any traces in the area of the contact solder tine deposit. Those most suitable screens are Liquid Photo Imageable and Dry Film.

CAUTION
Since the jack housing may rest on top of the screen, an excessively high screen will allow too much space between the contact 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 jack.

Since weave thickness and percent open area are dependent on the mesh count of the screen, the following calculation should serve as a guideline in varying screen parameters.

With: Te being screen emulsion thickness,

Tp being thickness of deposited solder paste,

Tw being screen weave thickness, and

Ao being decimal equivalent to percent open area,

screen emulsion thickness can be calculated as follows:

$$Te = Tp - Tw \times Ao$$

For example, an 80-mesh screen has a 49.5% open area and nominal weave thickness of 0.20 [.008]. The amount of paste deposited through a screen is dependent on the aperture, the wire mesh, and applied emulsion. Therefore, the emulsion would be calculated as follows:

$$0.20\ [.008] - (0.02\ [.0008] \times 0.495\ [.0195]) = 0.10\ [.004]$$

NOTE
Varying aperture dimensions and mesh count will change the required emulsion thickness needed to deposit the recommended solder paste volume.

G. Stencil

A 0.15 [.006] thick stencil is recommended.

The stencil aperture may be any shape as long as it prevents solder bridging from one pad to another. Varying apertures will change the required stencil thickness needed to deposit the recommended solder paste volume. Generally, the thinner stencil will need a larger aperture to maintain the given volume of solder paste. If the aperture on the stencil is the same as the nominal pad dimensions, stencil thickness would be calculated as follows:

$$Tp = \frac{Vi}{a \times b)}$$

H. Cleaning

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Common cleaning solvents that will not affect the jack for the times and temperatures provided without any adverse effects are listed in Figure 10.

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 is not recommended because of harmful occupational and environmental effects. Both are carcinogenic (cancer-causing).

NOTE
If a particular solvent is not listed, contact PRODUCT INFORMATION at the number on the bottom of page 1.

CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)
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 10

I. Drying

When drying cleaned assemblies and pc boards, temperatures should not exceed 220°C [492°F] for more than 3 minutes.

CAUTION
Excessive temperatures may cause housing and plating degradation.

3.7. Checking Installed Jack

The shoulder of each jack alignment post must be through its intended hole in the pc board.

Solder fillet must be evenly formed around each contact solder tine and shield ground tab. The solder must have 75% minimum solder coverage over the pc board pad. The maximum height of solder fillet and the maximum distance between the contact solder tine and pc board pad must not exceed the dimensions given in Figure 11.

Each shield contact solder tine must be covered with solder having no visible skips or voids.

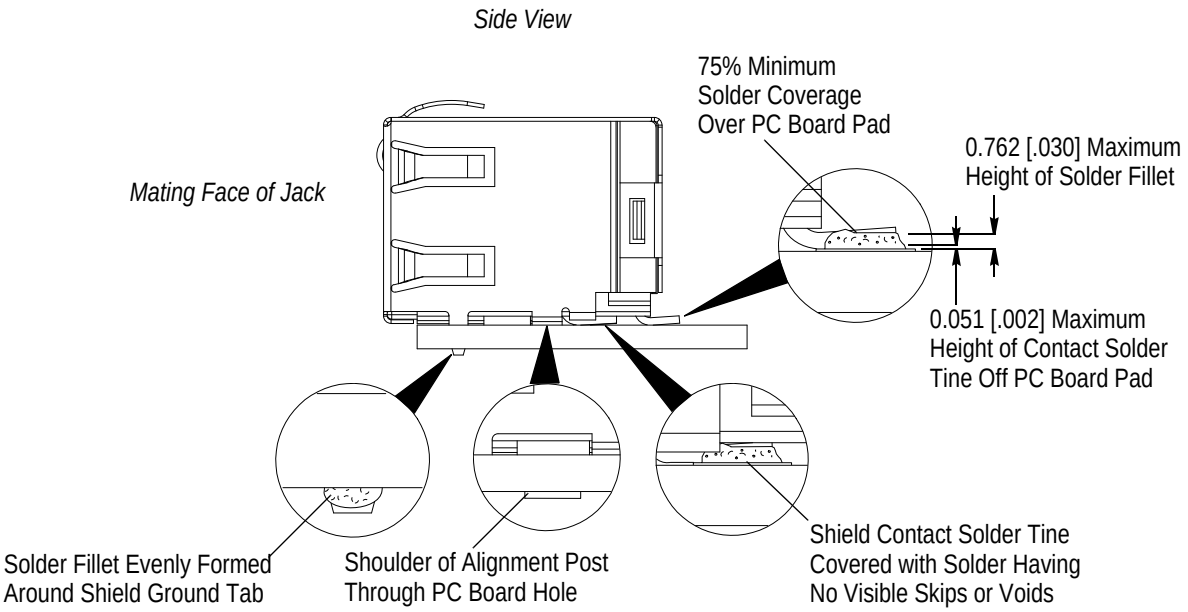

Figure 11

3.8. Panel

A. Thickness

The maximum panel thickness shall be 2.41 [.095].

B. Cutout

The panel must be cut using the dimensions provided on the customer drawing for the specific jack. A reference *sample* panel cutout is given in Figure 12.

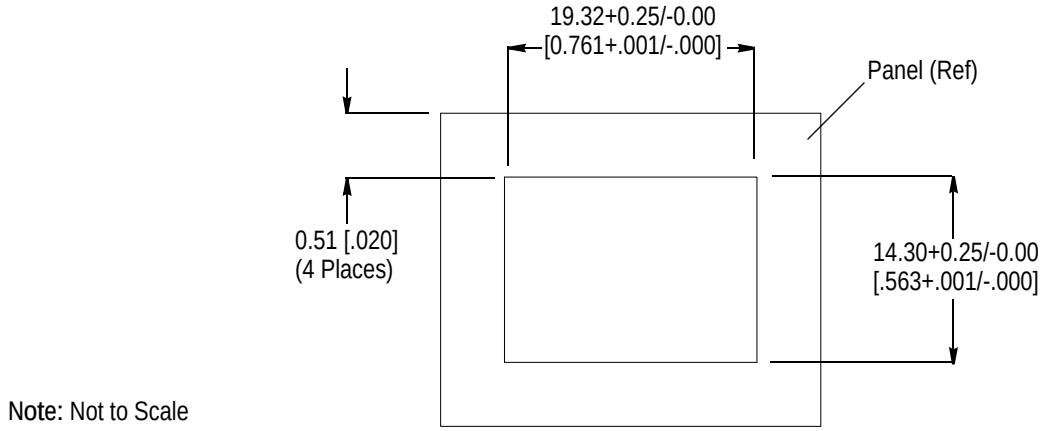

Figure 12

C. Mounting

The jack should be mounted in the front or the back of the panel meeting the requirements given in Figure 13.

The suggested clearance between the top of the jack to the panel cutout is also given.

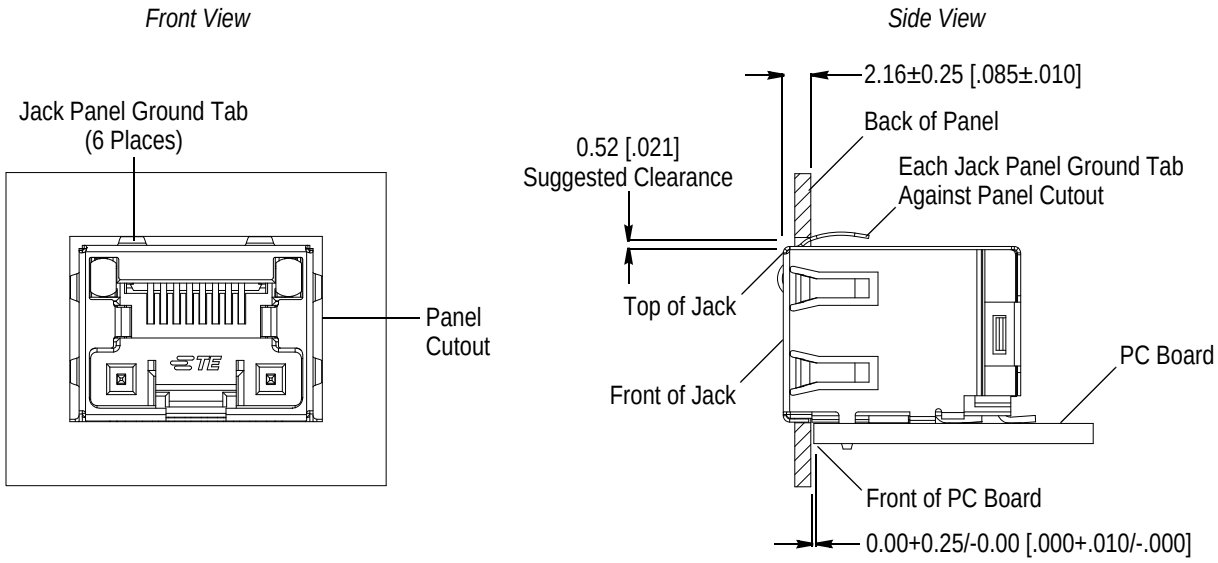

Figure 13

3.9. Removal and Repair

The jacks can be replaced, but cannot be repaired. The jack must be removed from the pc board using standard de-soldering methods. Damaged or defective jacks must not be used.

CAUTION
When replacing a jack, care must be taken not to damage other pc board component.

4. QUALIFICATIONS

CLOUDSPLITTER SMT jack assemblies are Recognized by Underwriters Laboratories Inc. (UL) in File E81956 (Vol. 37) and Certified by CSA International.

5. TOOLING

Tooling needed to seat the jacks onto the pc board is shown in Figure 14.

5.1. Automatic Equipment

Automatic machine (robotic equipment) must have a true position accuracy tolerance of 0.25 [.001] (including gripper and fixture tolerances as well as equipment repeatability) to properly locate the jack.

5.2. PC Board Support Fixture

For automatic machine placement, a pc board support fixture must be used to prevent bowing of the pc board during the placement of jacks. It should have flat surfaces with holes or a channel large enough and deep enough to receive any protruding components.

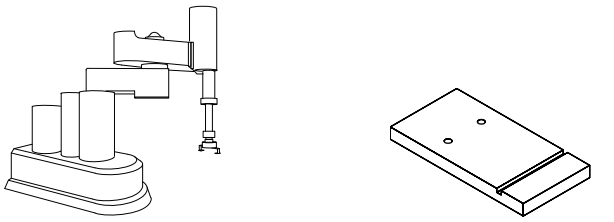

Figure 14

6. VISUAL AID

The illustration below shows a typical application of CLOUDSPLITTER SMT jack assemblies. 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.

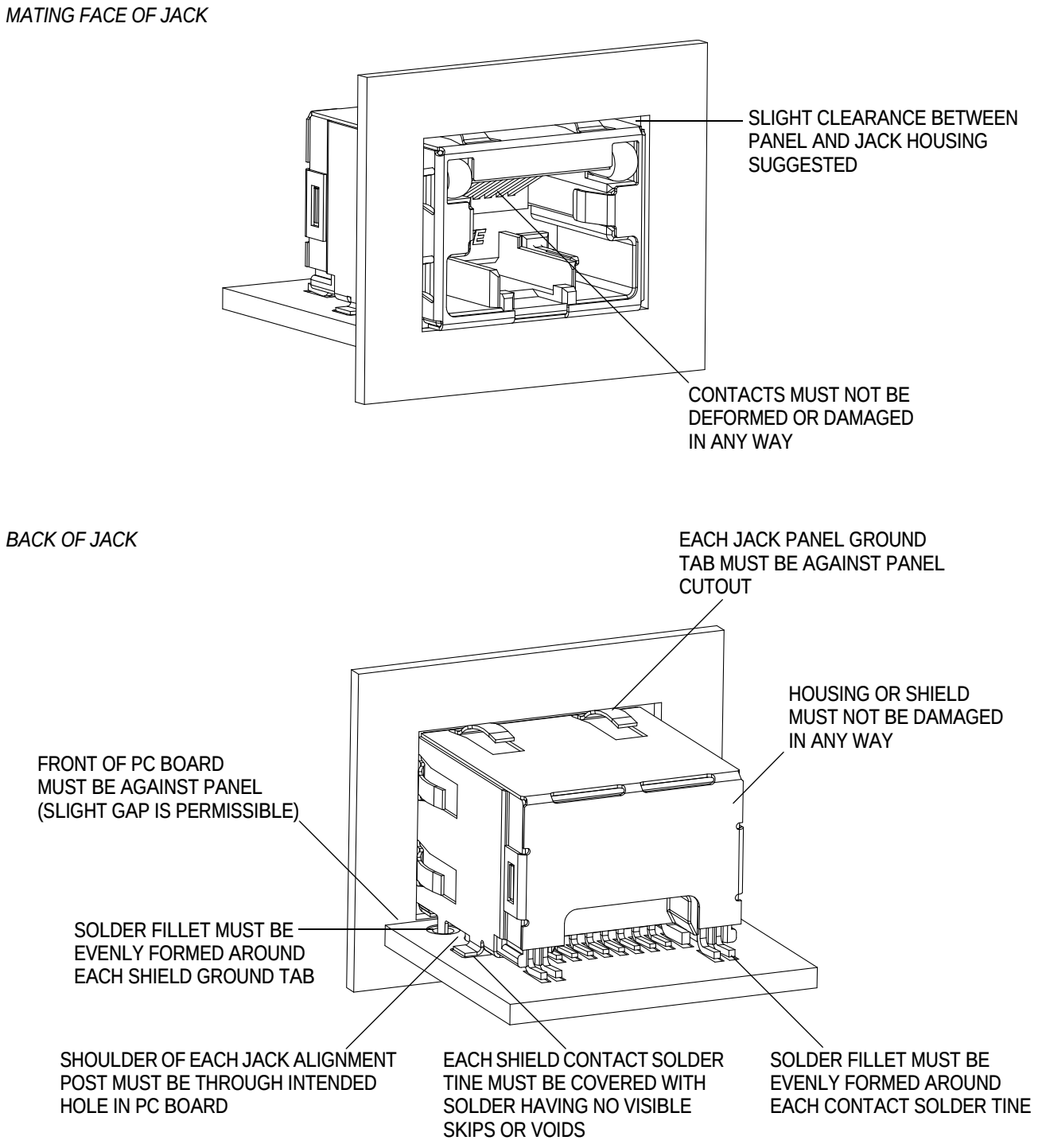

FIGURE 15. VISUAL AID