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 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 Multi-Directional Interface (MDI) connectors designed for printed circuit (pc) board to pc board applications. These connectors consist of 6-position pc board header assembly for through-hole applications and 6-position pc board receptacle assembly for use in surface mount technology (SMT) or through-hole applications.

The header assembly features a plastic housing with pre-installed through-hole contacts with retentive or straight solder tines. The contacts help secure the header assembly to the pc board prior to soldering. The housing has offset mounting posts to assure proper orientation on the pc board.

The receptacle assembly features a plastic housing with pre-installed right-angle surface mount contacts or through-hole contacts with right-angle or vertical straight solder tines. The housing has boardlocks with gripping shoulders that engage the pc board and lock the assembly into position.

The housings have standoffs to allow easy pc board cleaning after the soldering operation. The header assemblies mate with compatible receptacle assemblies; and vice versa. The connectors can be placed on the pc board manually or by robotic equipment.

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.

Receptacle Assemblies

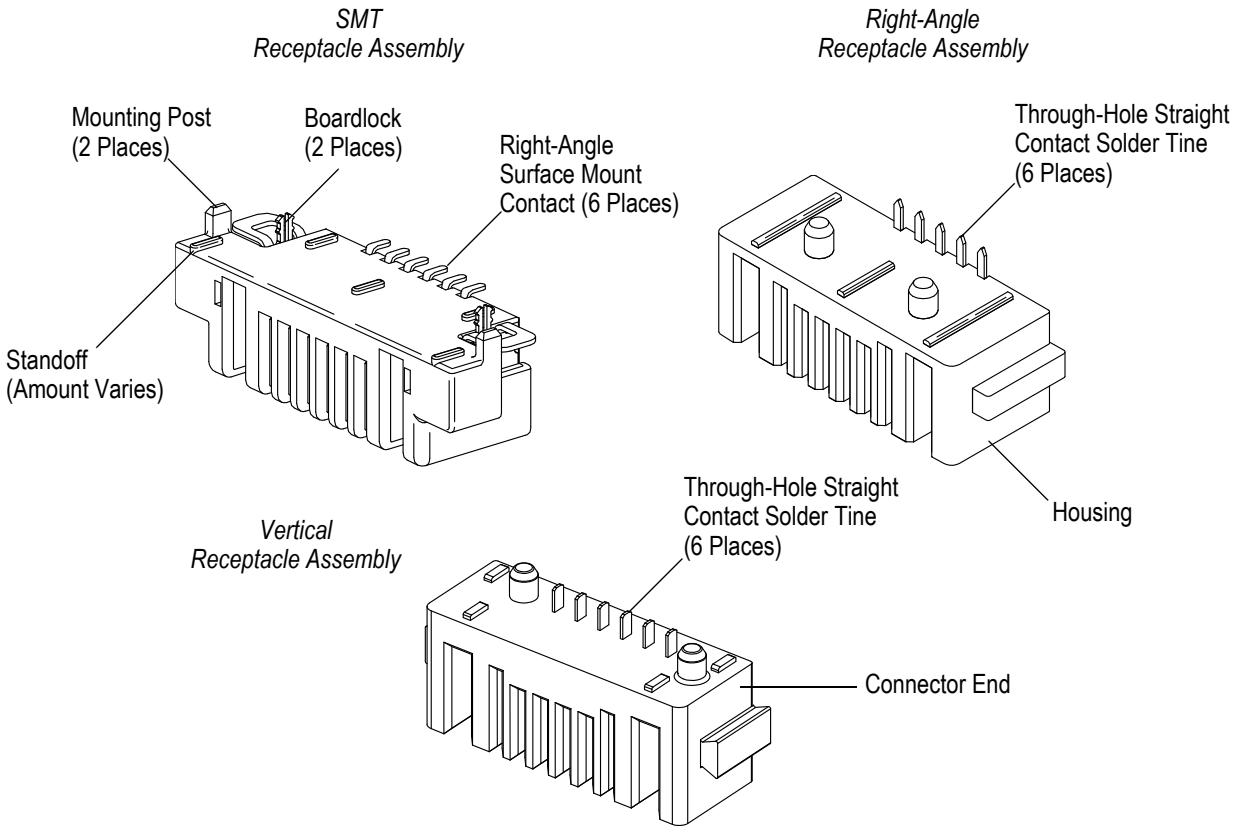


Figure 1 (Cont'd)

©2010 Tyco Electronics Corporation, Berwyn, PA
All Rights Reserved
TE logo and Tyco Electronics are trademarks.
*Trademark. Other products, logos, and company names might be trademarks of their respective owners.

Header Assemblies

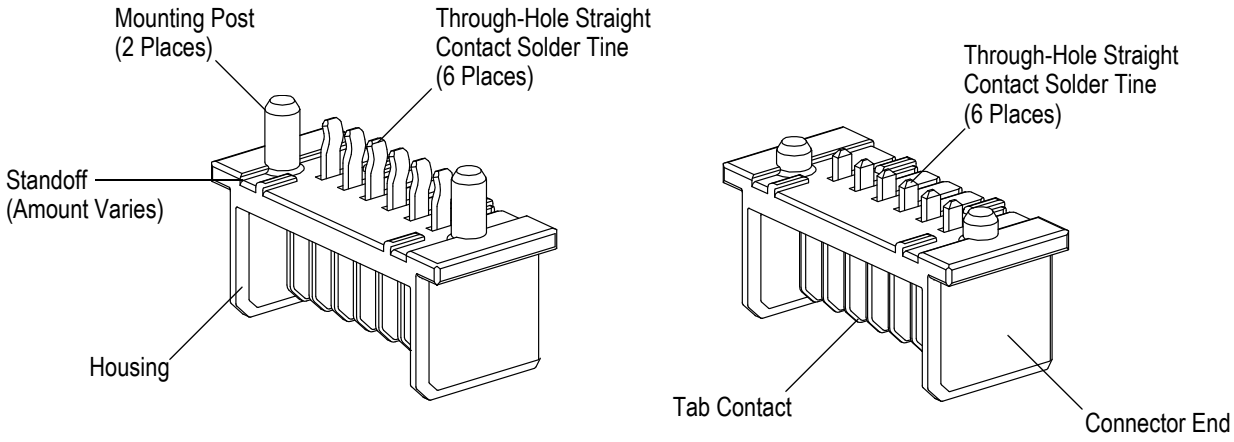


Figure 1 (End)

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Updated application specification to corporate requirements

2.2. Customer Assistance

Reference Product Base Part Number 787090 and Product Code 2657 are representative of MDI connectors. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local Representative or, after purchase, 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 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 is available upon request and 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 108-1503 (surface mount receptacle assemblies) and 108-1503-1 (through-hole header assemblies) provide product performance and limitations that may apply to the connectors.

Test Specification 109-11-1 and Workmanship Standard 101-21 provide requirements and evaluation of solder fillets for surface mount connectors.

2.6. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions or tool setup and operation procedures. Documents available which pertain to this product are:

408-6927 Design Recommendations for PC Board Support Fixtures

3. REQUIREMENTS

3.1. Storage

Each connector is packaged and shipped in individual anti-static tube containers. To prevent damage to solder tines, connectors should remain in the tube until ready for installation. Also, to prevent possible storage contamination and preserve maximum solderability, the connectors should be used on a first in, first out basis.

3.2. Material

The connector housings and hold-downs are made of LCP (liquid crystal polymer) thermoplastic, UL94-V-0. The contacts are made of phosphor bronze; contact area is plated with gold over nickel, and solder tines are plated with tin lead over nickel. The boardlocks are made of copper alloy.

3.3. PC Board

A. Material and Thickness

The pc board material shall be glass epoxy (FR-4 or G-10). The pc board thickness shall be 1.57+0.15.

NOTE

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

B. Tolerance

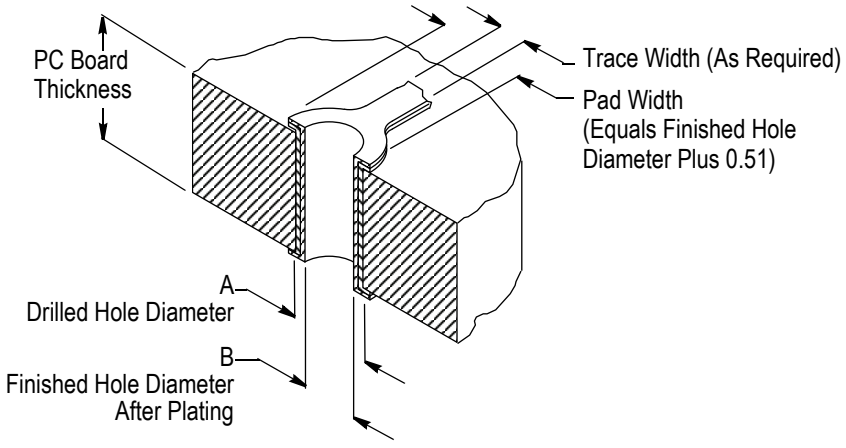
The maximum allowable bow of the pc board is 0.03 over the length of the connector.

C. Pads

At the time of connector placement, the coplanarity of the pad pattern must be held to 0.03 maximum. The pads must be solderable in accordance with Test Specification 109-11-1.

D. Hole Dimensions

The through hole contacts may be used with or without plated through holes. If plated, the drilled hole size, plating types, and plating thickness are dependent on the application requirements. The finished hole size must be as stated to provide unrestricted insertion and ensure adequate application of solder to the solder tines. See Figure 2.



CONNECTOR	DIMENSION	
	A	B
Header Assembly	1.50±0.03	1.34±0.08
Receptacle Assembly	1.19±0.03	1.03±0.08

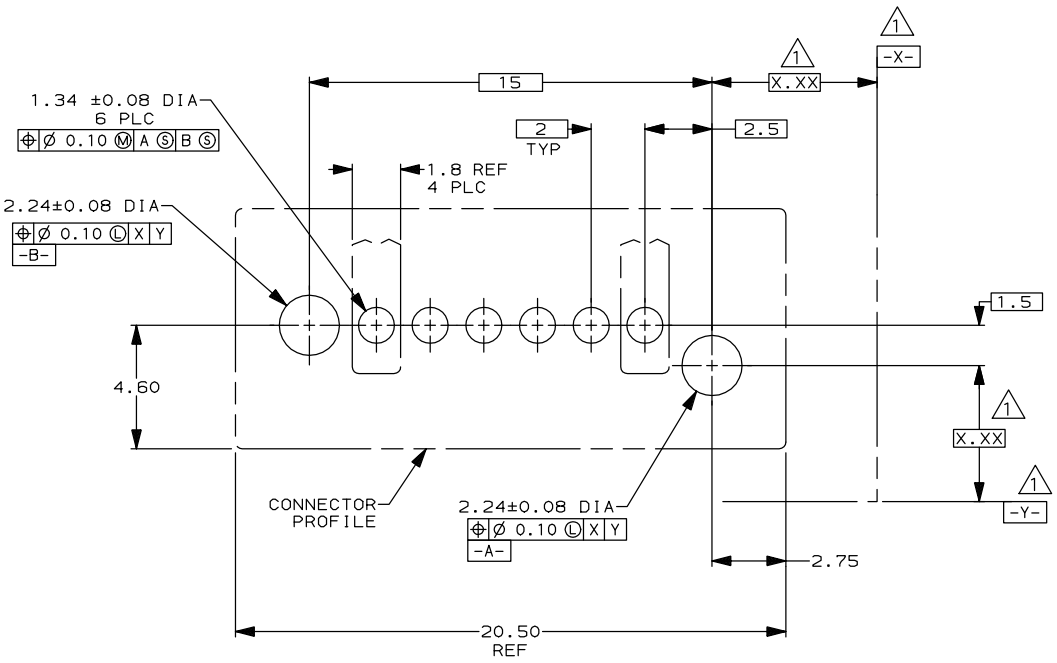
Figure 2

E. Layout

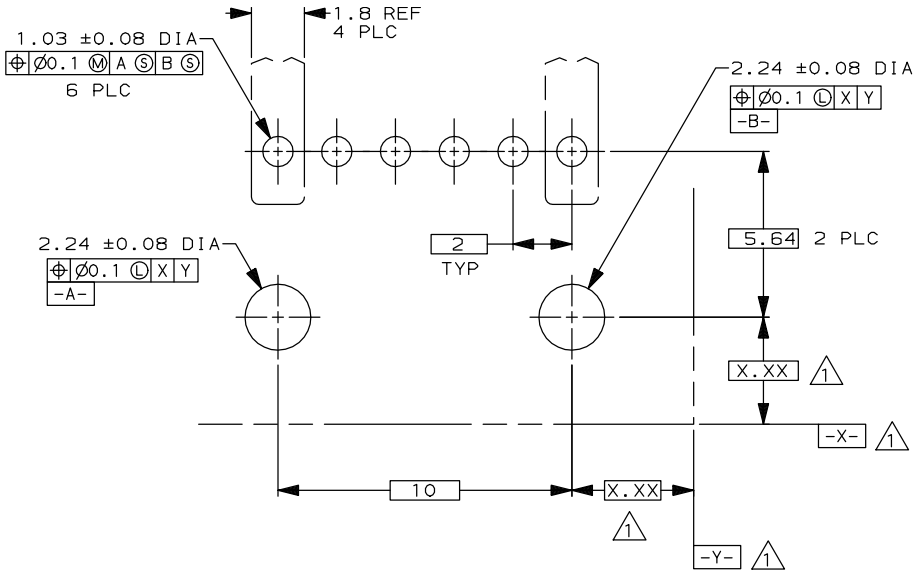
The contact solder tine holes, pads (for receptacle assemblies), boardlock, and mounting post holes must be precisely located to assure proper placement and optimum performance of the connector. For pc board layout dimensions, refer to Figure 3.

Recommended PC Board Layout
(Connector Side of PC Board)

Header Assembly with Through-Hole Contacts



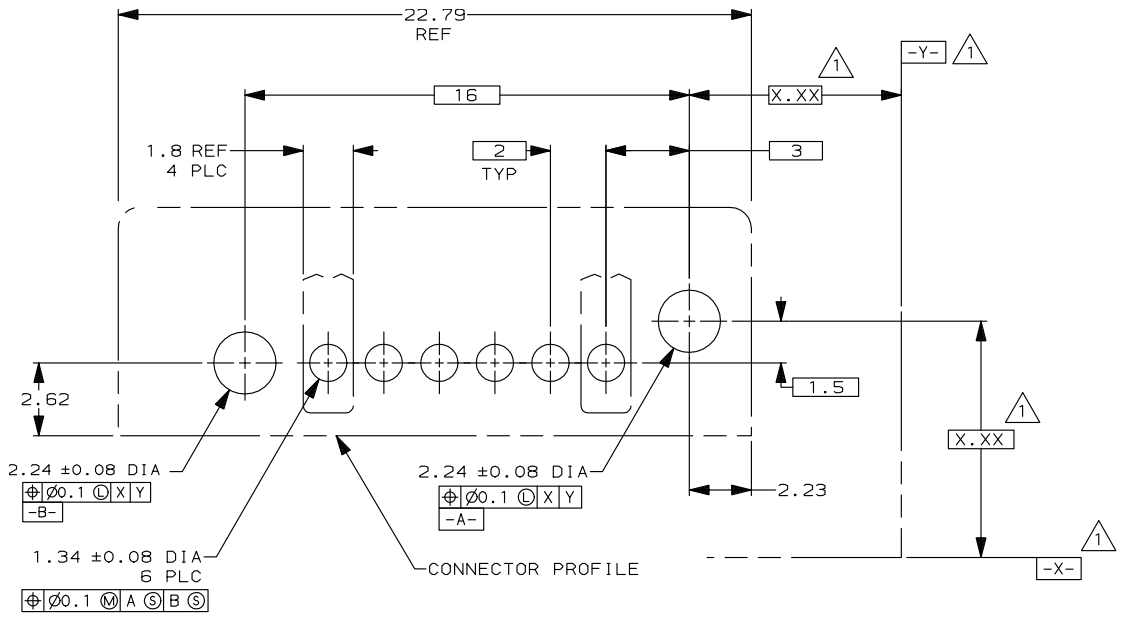
Receptacle Assembly with Right-Angle Through-Hole Contacts



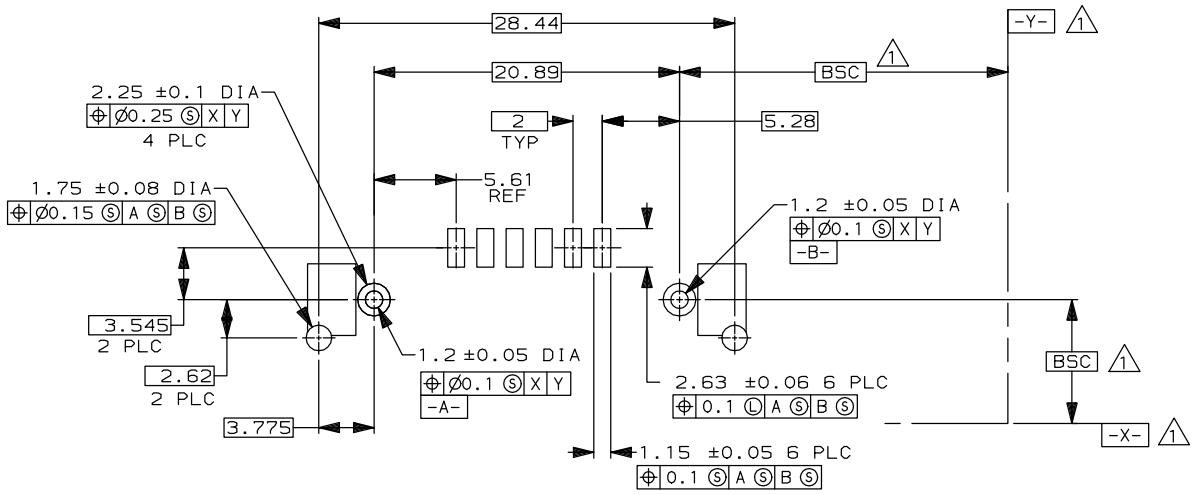
1 Datums and basic dimensions established by customer.

Figure 3 (Cont'd)

Receptacle Assembly with Vertical Through-Hole Contacts



Receptacle Assembly with Surface Mount Contacts



1 Datums and basic dimensions established by customer.

Figure 3 (End)

3.4. Soldering Surface Mount Connectors

The pc board pads must be coated with solder paste to ensure a good solder joint. The pc board pads must be adaptable for soldering as defined in Test Specification 109-11-1. It is recommended using a solder stencil to keep the solder off the pc board traces.

A. Solder Paste Characteristics

1. Alloy type shall be 63 Sn/37 Pb, 60 Sn/40 Pb, or 62 Sn/36 Pb/2 Ag.
2. Flux incorporated in the paste shall be rosin, mildly active (RMA) type.

3. Paste will be at least 85% solids by volume.
4. Mesh designation -200 to +325 (74 to 44 square micron openings, respectively).
5. Minimum viscosity of screen print shall be 5×10^5 cp (centipoise).
6. Minimum viscosity of stencil print shall be 7.5×10^5 cp (centipoise).

B. Solder Paste Volume

1. 0.603 mm^3 per contact solder tine
2. 3.66 mm^3 per hold-down flange
3. 9.13 mm^3 per boardlock

NOTE

Solder paste volume may vary depending on solder paste composition.

C. Solder 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. The recommended contact tine aperture width is 1.15. It may be wider, however care must be taken to ensure against solder bridging during processing. The recommended 0.20 thick solder stencil layout for receptacle assemblies is shown in Figure 4.

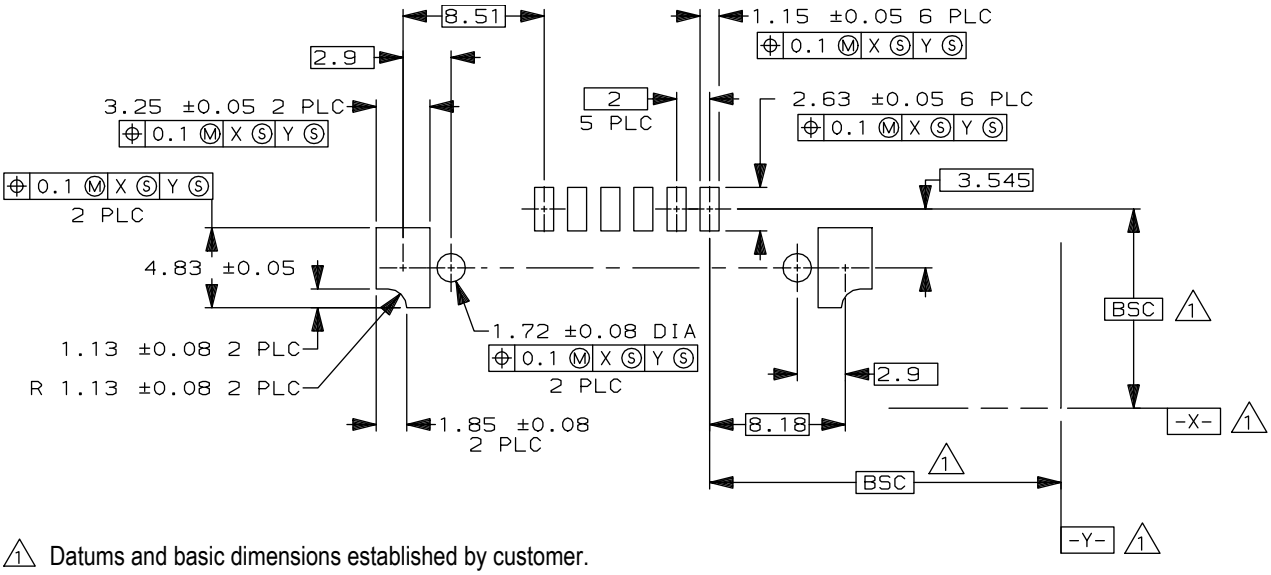
CAUTION

All traces must be covered by solder mask in the solder paste area. Exposed traces could cause bridging and create a short or wick solder away from the solder tines, producing a weak solder joint.

CAUTION

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

Recommended Stencil Layout



1 Datums and basic dimensions established by customer.

Figure 4

D. Solder Screen

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

E. Solder Mask

A solder mask is recommended to minimize solder bridging between the pads. The solder mask must not exceed the height of the pad by more than 0.05 or a poor solder joint will result.

3.5. Soldering Through Hole Connectors

The contact solder tines must be fluxed with rosin base, aqueous, or suitable no-clean flux before soldering. Selection of flux will depend on the type of pc board material and other components mounted on the pc board. Additionally, the flux must be compatible with the wave solder line, manufacturing, health, and safety requirements. Call one of the phone numbers listed at the bottom of page 1 for consideration of types of flux.

A. Process

The header assembly should be soldered using wave or hand soldering, but can be soldered using vapor phase reflow (VPR), double-sided non-focused infrared (IR), or equivalent soldering technique with the addition of plated through-holes and solder pads to the pc board.

The receptacle assembly should be soldered using vapor phase reflow (VPR), double-sided non-focused infrared (IR), or equivalent soldering technique.

NOTE

Contact Engineering for additional details concerning IR or VPR applications.

Temperatures to which connectors are subjected should not exceed 220°C for more than three minutes.

B. Cleaning

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Cleaners must be free of dissolved flux and other contaminants. The following is a list of common cleaning solvents that will not the affect connectors for the time and temperature specified. See Figure 5.

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	Solvent	1	Ambient Room
Isopropyl Alcohol	Solvent	5	100°C [212°F]
KESTER 5778	Aqueous	5	
KESTER 5779	Aqueous	5	
LONCOTERGE 520	Aqueous	5	
LONCOTERGE 530	Aqueous	5	
Terpene Solvent	Solvent	5	

Figure 5

ALPHA is a trademark of Alpha Metals, Inc.
BIOACT is a trademark of Petroferm, Inc.
CARBITOL is a trademark of Union Carbide Corporation
KESTER is a trademark of Kester Inc.
LONCOTERGE is a trademark of London Chemical Company, Inc.

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.

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. It is not recommended using Trichloroethylene and Methylene Chloride because of harmful occupational and environmental effects. Both are carcinogenic (cancer-causing).

NOTE

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

C. Drying

When drying components, make sure the temperatures are within the limitations of -55° to 105°C; otherwise, housing degradation could occur.

3.6. Connector Placement

Placement of connectors on the pc board can be done by picking it up by the ends and inserting the mounting posts and boardlocks, and contact solder tines (for through hole connectors) into their respective pc board holes. Mounting posts and boardlocks are designed to assure proper alignment of surface mount contact solder tines with the pc board pads.

CAUTION

The connectors must ALWAYS be handled by the ends to prevent contamination and distortion of the contact solder tines.

A. Position

Optimally, the contact solder tines should be centered on the pc board circuit pads. However, slight misalignment is permissible for certain performance classifications as specified in IPC-S-815. Refer to Figure 6 .

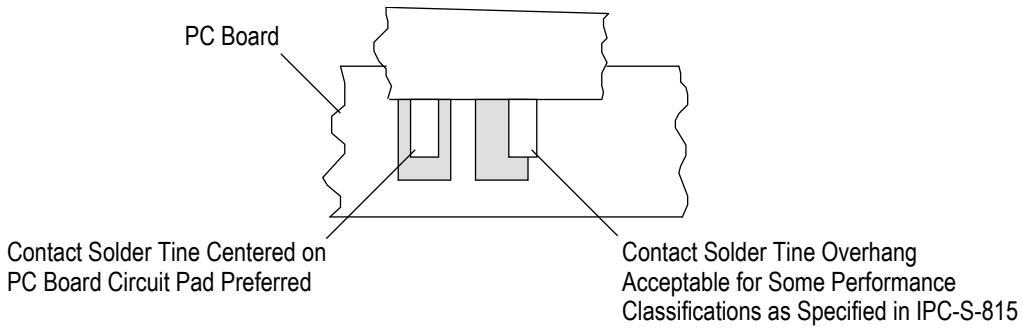


Figure 6

B. Seating and Retention Forces

The force required to seat through-hole connectors with non-protrusive boardlocks on the pc board should not exceed 39 newtons. The connector provides a minimum of 2.45 newtons retention force on the pc board.

3.7. Inspection

The connector housing standoffs must be bottomed on the pc board. All solder fillets should comply to the Workmanship Standard 101-21. See Figure 7.

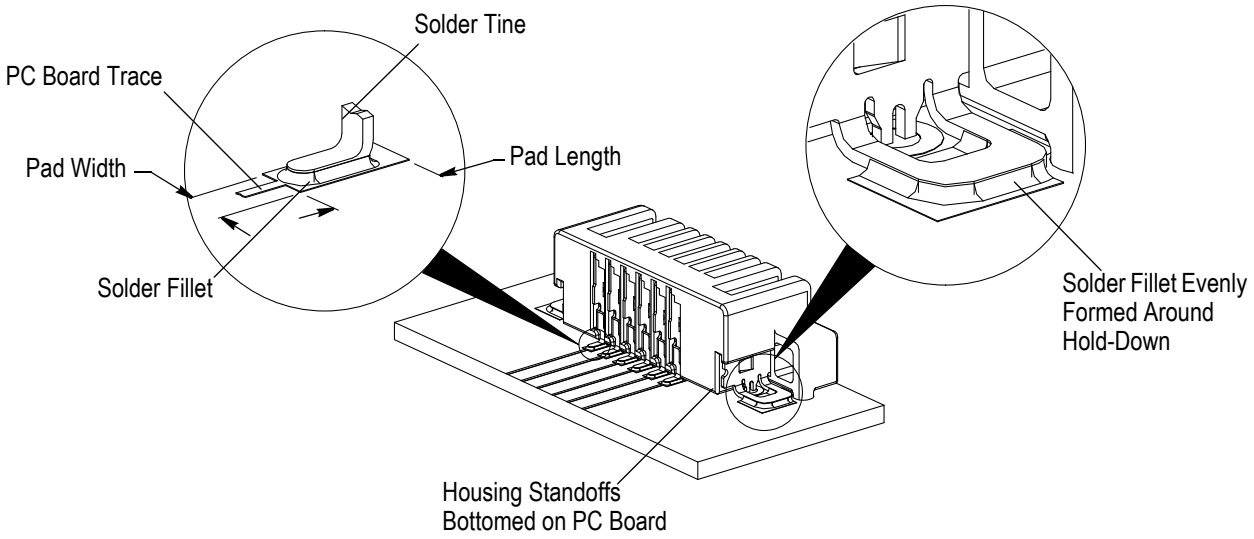


Figure 7

3.8. Mating

A. Connector Angle

The connectors can be mated horizontally (0°), vertically (90°), or any angle in between 0 and 90° as shown in Figure 8.

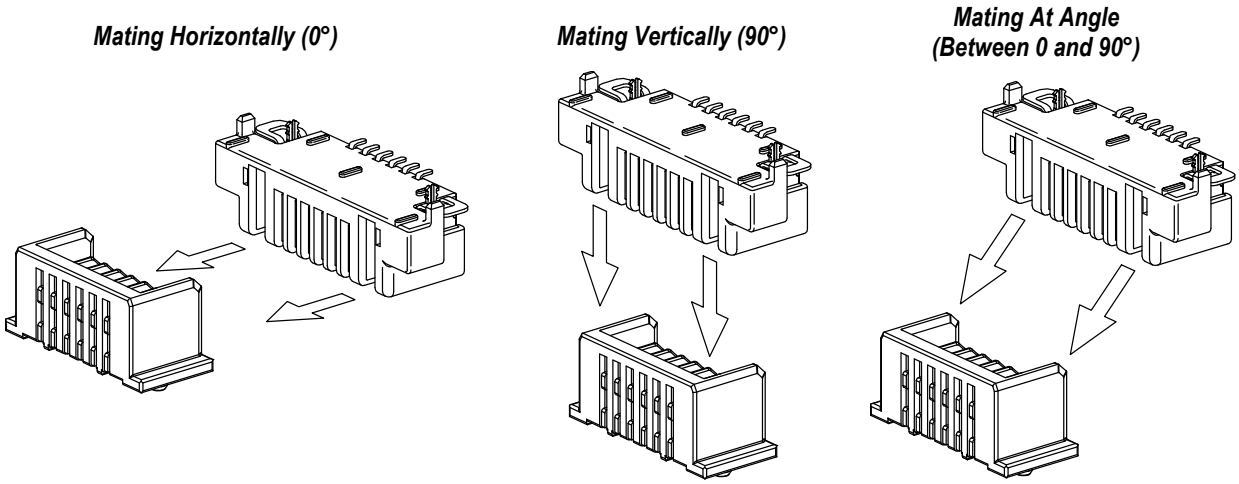


Figure 8

B. PC Board Orientation

The connectors are capable of mating with pc boards oriented parallel or perpendicular to each other as shown in Figure 9.

PC Board Orientation

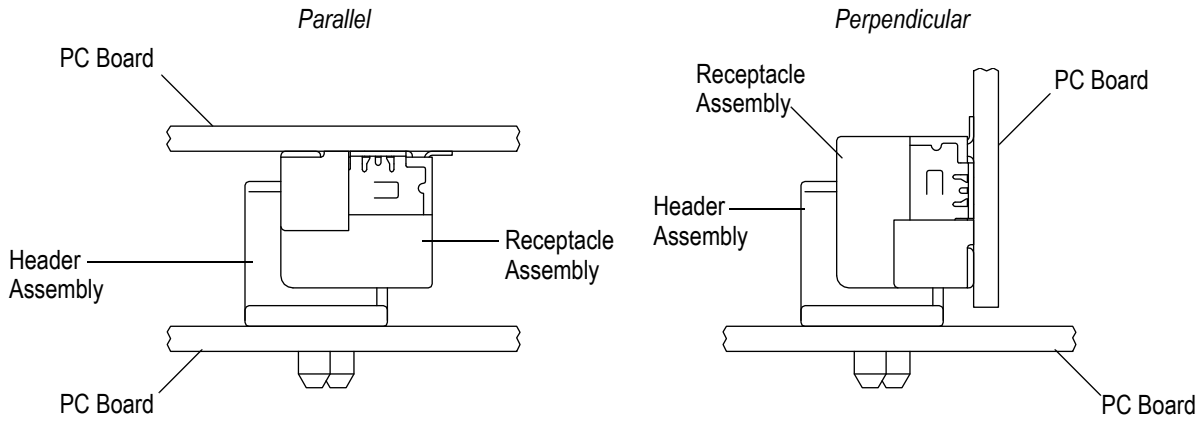
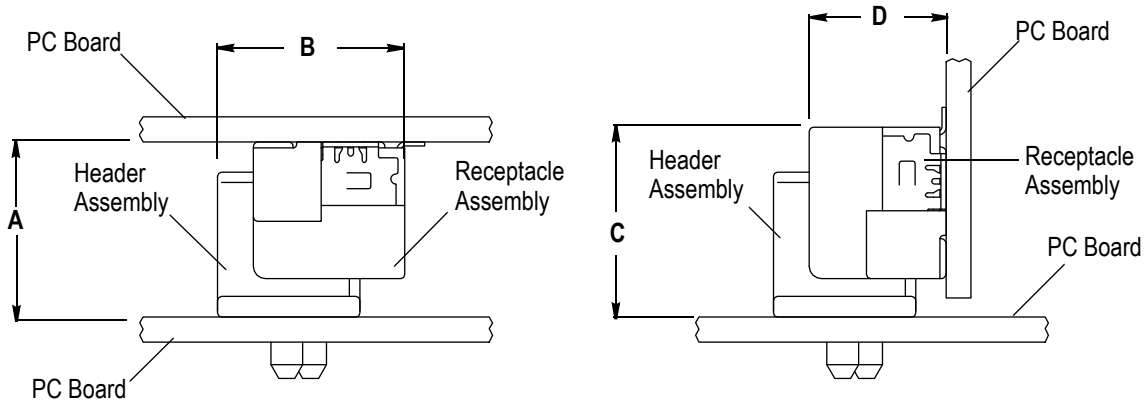


Figure 9

C. Dimensional Limits

The dimensions required to assure full mating of connectors are shown in Figure 10.

Dimensional Limits



MATING COMBINATION		DIMENSION (±0.20)			
HEADER ASSEMBLY	RECEPTACLE ASSEMBLY	A	B	C	D
All	With Right-Angle Through-Hole Contacts	11.03	11.78	11.96	10.85
All	With Vertical Through-Hole Contacts	12.34	10.47	10.65	12.16
All	With Surface Mount Contacts	11.03	11.78	11.96	10.85

Figure 10

3.9. Replacement and Repair

Damaged connectors must be removed, discarded, and replaced. Connectors may be removed from the pc board by standard de-soldering methods. The connectors must be unmated by rocking them apart. It is recommended that one end should be free, but should not be pulled more than 5 degrees before rocking the same end back. This will release the opposite end, and the two connectors will be freed or separated.

4. QUALIFICATION

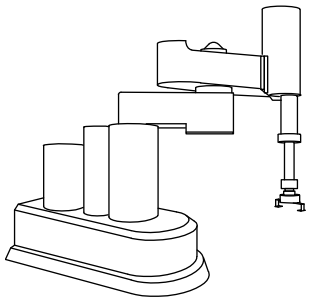
MDI connectors have been Recognized by Underwriters Laboratories Inc. (UL) under File E28476 and Certified by CSA International under File LR16455.

5. TOOLING

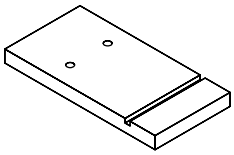
No tooling is required for manual placement of the connectors. For automatic machine placement, a pc board support must be used to prevent bowing of the pc board during the placement of connectors on the board. It should have flat surfaces with holes or a channel large enough and deep enough to receive the contact tines. The robotic equipment must have a true position accuracy tolerance to properly locate the connectors. This includes gripper and fixture tolerances as well as equipment repeatability. It must use the connector datum surfaces detailed on the customer drawing to ensure reliable placement. See Figure 11.

NOTE

For assistance in setting up prototype and production line equipment, contact Engineering through your local representative or call the TOOLING ASSISTANCE CENTER at the number at the bottom of page 1.



Robotic Equipment (Ref)



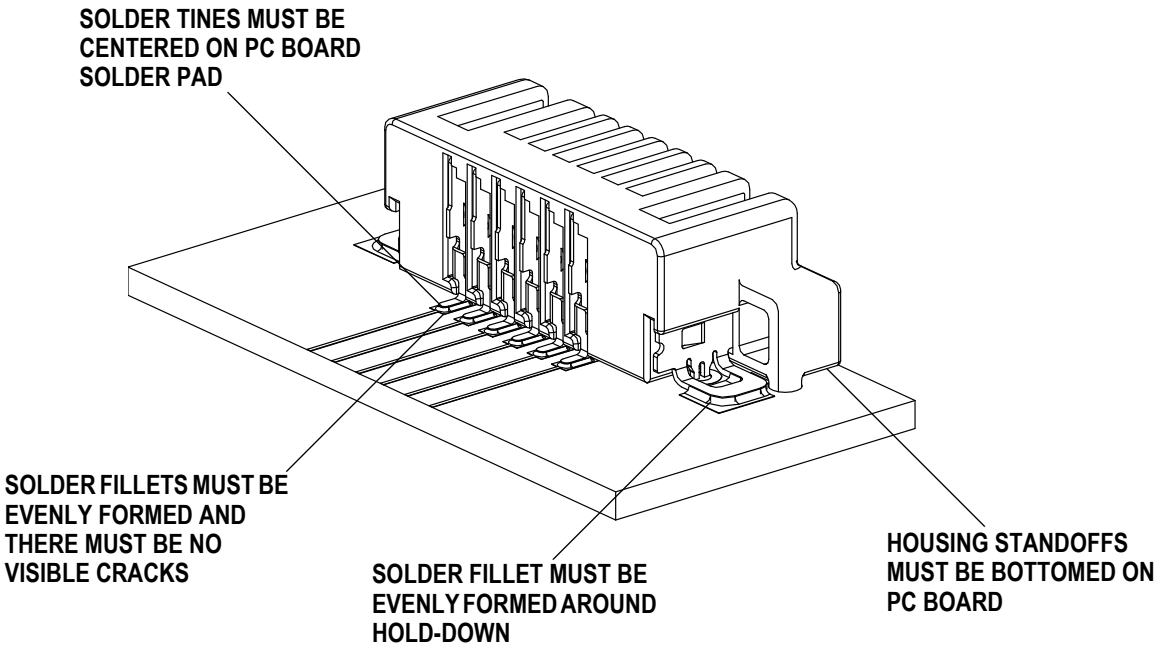
PC Board Support
(Custom Made, Refer to 408-6927)

Figure 11

6. VISUAL AID

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

RECEPTACLE ASSEMBLY WITH SURFACE MOUNT CONTACTS



HEADER ASSEMBLY WITH THROUGH-HOLE CONTACTS

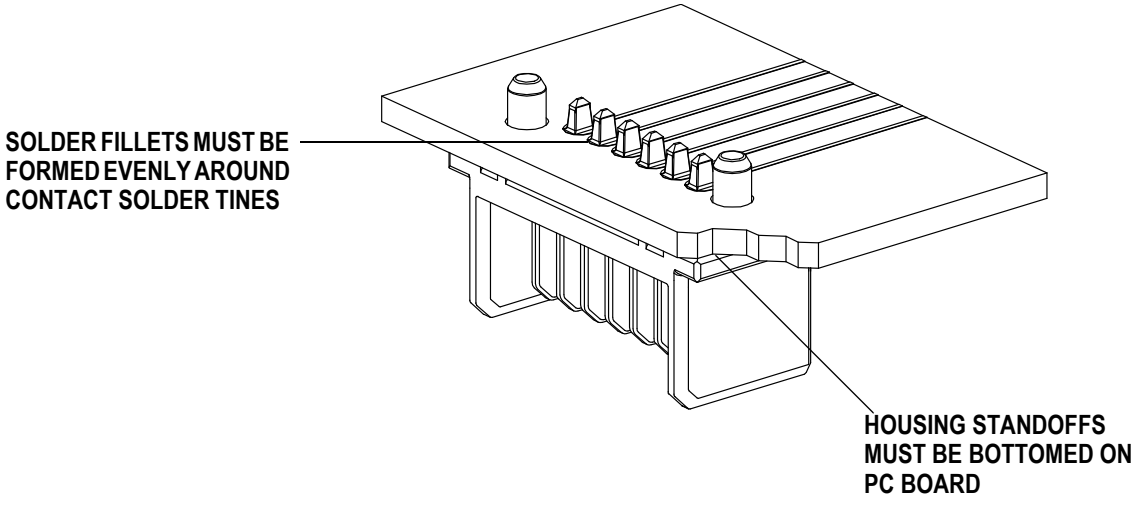


Figure 12. VISUAL AID