1.0 SCOPE

This information is provided to aid our customers in applying and processing the Rib-Cage II Connector System.

2.0 DESIGN AND APPLICATION CONSIDERATIONS

Rib-Cage II connector system is intended for use up to 100 positions maximum.

2.1 The guidelines presented here are in four sections:

2.1.1 Parallel board interface with a single pair of connectors,

2.1.2 Parallel board interface with multiple connectors,

2.1.3 Interface of a flex circuit to a board,

2.1.4 Unmating guidelines for mated connectors.

2.1.5 Soldering process information

Figure 1 shows the general concept for application guidelines.

2.2 These guidelines are important for anyone interested in applying less than .100 center connectors. The Rib-Cage system is not only less than 0.100 centers, it halves the spacing to 0.050 centers. These connectors are very small in order to achieve the .250 board-to-board parallel spacing and occupy a minimal amount of surface area on the board. This miniaturization has resulted in very tight tolerances not only on each component, but also on the mating interface between connectors. **Please read each selection carefully because the requirements for each application are different.**

2.3 In all cases the connectors are not to be used as board stiffeners or supports. The connectors are, very simply, interconnects.

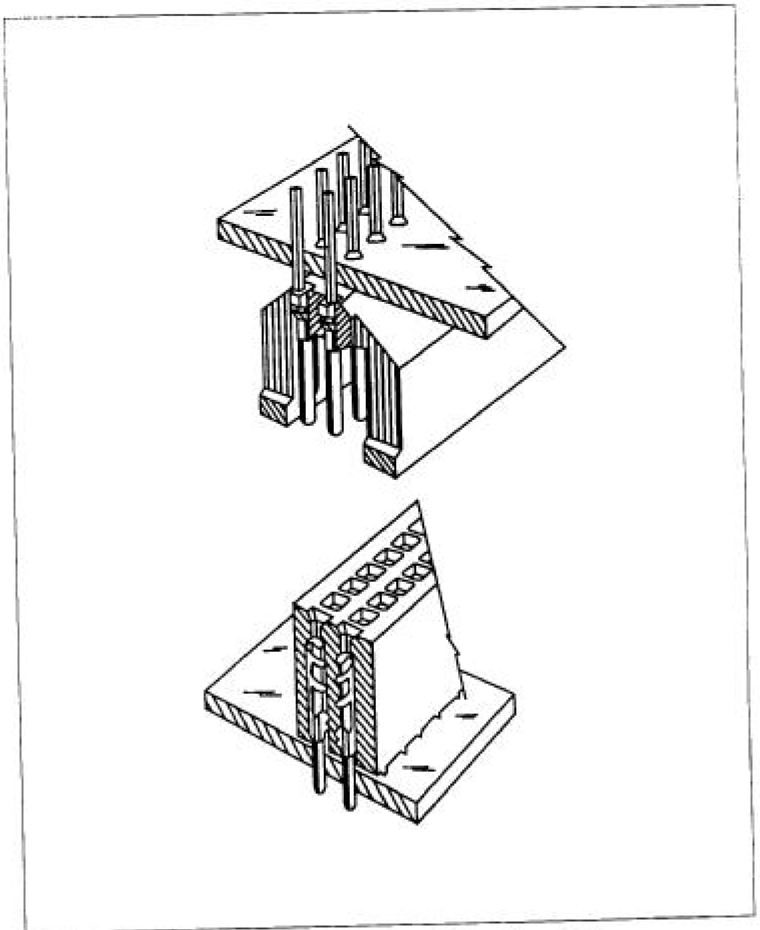


Figure 1. General Concept Mating Cross-View

3.0 Parallel Board Interface with a Single Pair of Connectors

3.1 The primary consideration for this application is the need to keep the connectors perpendicular to the board. Since a mated interface requires both a male and female connector, each connector has the same requirements, namely the **connector to board angle must be 90 degrees +/- 2 degrees.**
This is shown in Figure 2

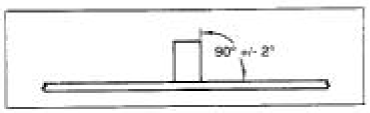


Figure 2. Connector to board 90-degree relationship

3.2 This is the original interface utilizing the Rib-Cage connector system. Various methods have been used to achieve this alignment including:

3.2.1 Hand-held fixtures used in conjunction with soldering equipment.

3.2.2 A simple weighted bar to hold the connector tightly to the board through the soldering process.

3.3 An additional aid in achieving this perpendicularity is the use of a connector with a location/hold-down feature. See prints P/N 87814, 87815, 87471, 87472, 87406, 87851, and 87401. These parts have a plastic feature with the cross-sectional shape of a diamond which is inserted into a drilled hole in the board. In addition to providing additional holding force to the board, it will hold the connector perpendicular through the various manufacturing processes associated with soldering and cleaning operations. This feature is highly recommended!

4.0 Parallel Board Interface with Multiple Connectors

4.1 The same concern for individual perpendicularity, mentioned in Section 3, exists in Section 4. However, an additional concern for the position (x and y location on each board) of each connector must be added. When the boards are being manufactured, it is important to reference location or mounting holds for each Rib-Cage II connector. Beginning at Datum 0,0 all mounting holes should be located with a positional tolerance of +/- .003 inch. See Figure 3.

4.2 The location/hold-down feature mentioned above will provide the needed registration of the connector to the drilled holes in the board. Again, this feature is highly recommended!

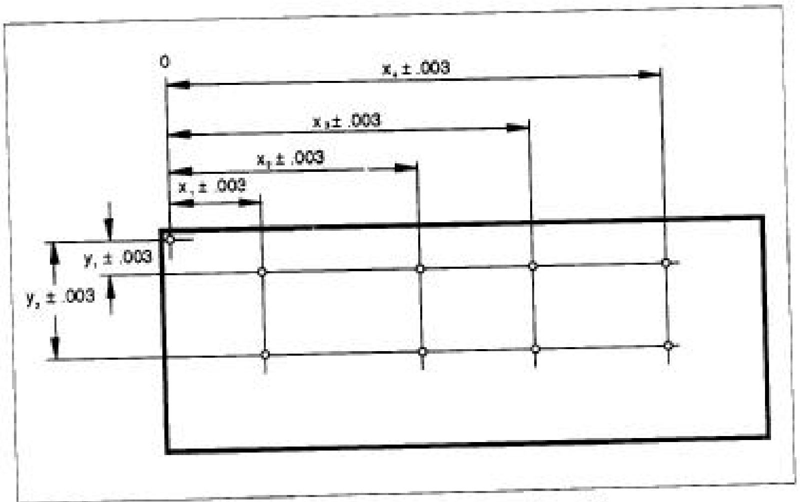


Figure 3. Mounting holes for Rib-Cage II

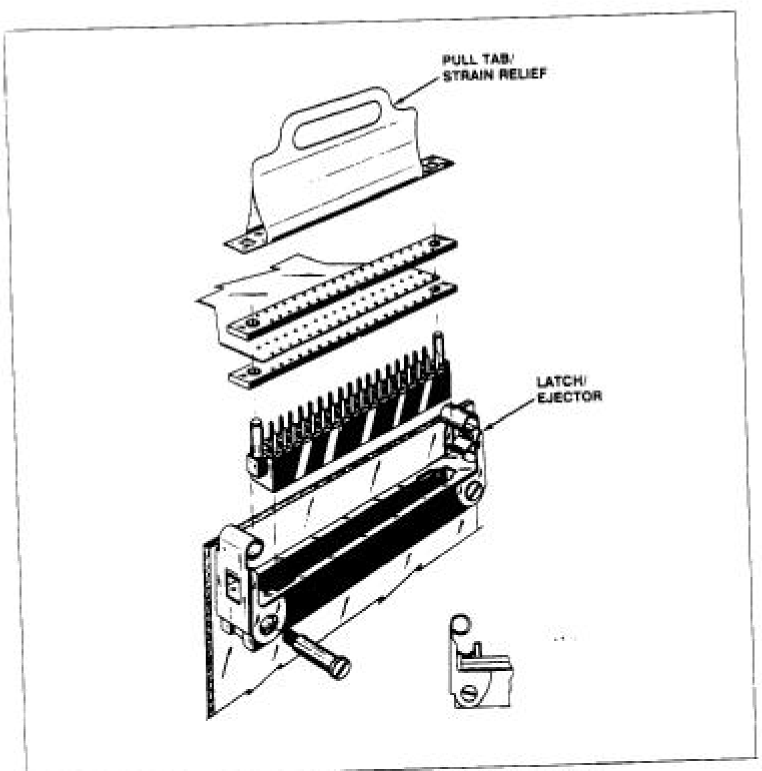


Figure 4. General Concept for Rib-Cage™ II
Flex Circuit Applications Guidelines

5.0 Interface of a Flex Circuit to a Board

5.1 Since the flex circuit allows some freedom of movement to the connector aligned to it, the need to maintain perpendicularity and positional accuracy is not as great. The major concern in this system is the need to provide some means of removal of the connector on the flex from the connector on the board. See Figure 4.

5.2 All flex applications should include the following:

5.2.1 The flex circuit must include a backer board. This is NOT supplied by Du Pont.

5.2.2 A strain relief should be used to provide additional mechanical strength to hold the flex to the connector as well as provide an attachment for a pull tab.

5.2.3 The locator/hold-down pin on the connector can be used for registration of the flex and the backer board of the connector.

5.2.4 Consideration of a male connector with a mechanical ejection system for the female connector should be incorporated into the design if possible.

6.0 Mating and Unmating Guidelines for Connectors

6.1 The introductory passage of these guidelines emphasized the small size and close tolerances of the Rib-Cage II connectors. The need to process connectors to keep them perpendicular (single pairs of connectors), and in addition, properly aligned for multiple connector interfaces must be followed with proper mating and unmating procedures in order to insure the performance specified for each connector. In very simple terms, the angles of approach between the male and female connectors must be controlled. The plastic housings used to support both the male and female contacts will provide guidance for proper initial entry between connectors; however, if the approach angles exceed 5 degrees, the following may happen:

6.1.1 The plastic housings may be cracked.

6.1.2 The housings may try to move out of perpendicular with the board in order to try to lessen the approach angles.

6.1.3 Housing movement (above) may result in loosening of the contacts within the housing.

6.1.4 The female contacts may become overstressed and sacrifice some performance.

6.2 Unmating of the connector pair may result in similar problems if the unmating angle (angle between the two boards holding the male and female connectors) exceeds 5 degrees. A preferred method to unmated the connectors would employ one of the following:

6.2.1 A board limiting feature which allows the daughter board to unmated on one end without exceeding the 4 degrees. Refer to Figure 5.

6.2.2 A removal tool which straddles the mated connectors and unmates the connectors in a parallel fashion may be needed. Du Pont has designed a tool which will work in some situations. Contact your sales engineer for more information.

6.2.3 Some connector configurations that incorporate latching and ejection systems have been developed for specific applications. Again a contact with your sales engineer should be made for more information.

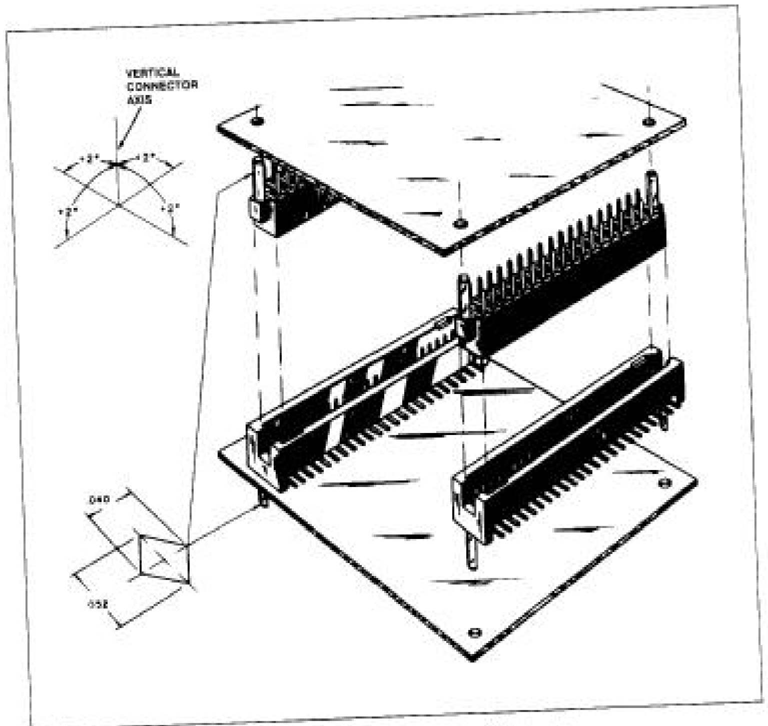


Figure 5. Unmating angle, 4 degrees

7.0 SOLDERING PROCESS INFORMATION

7.1 Surface Mounting (SMT) Processing

7.1.1 It is important to follow PCB layouts for all processes in order to provide acceptable solder joints without shorting. It is also important to provide proper PCB support throughout the heating and cooling processes. The components covered by this document have not been designed and are not to be used as PCB board stiffeners. See Figure 6-1.

7.2 Vapor Phase Soldering

7.2.1 Adequate drying of the PCBs prior to the screening and soldering process is recommended to prevent entrapped moisture from escaping in the reflow process. This drying time should be a minimum of 24 hours prior to subsequent processing.

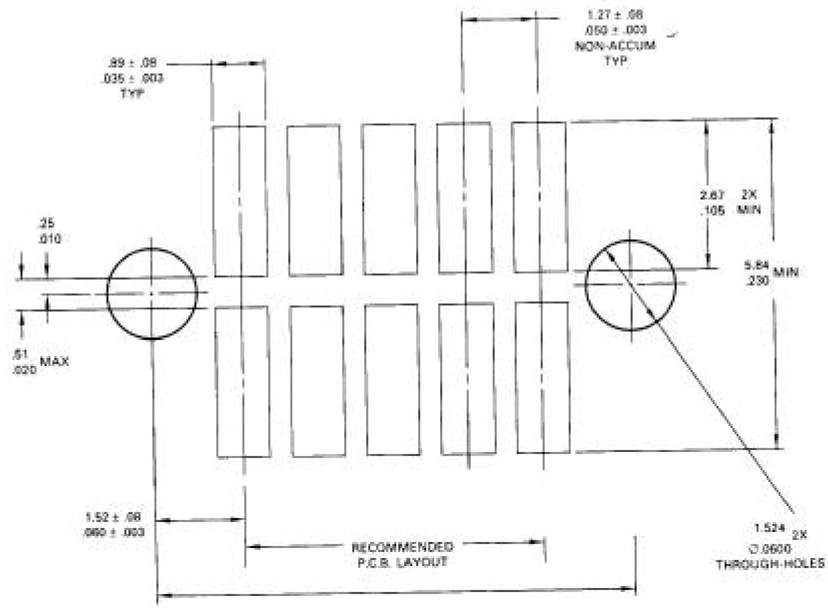


Figure 6-1. SMT Male and Female

7.2.2 This method for joining a surface mount component to a copper land of a PCB has been used successfully for many years. It is one of the first processes used for processing production quantities of surface-mounted components.

7.2.3 An in-line preheater is necessary to produce the best results. Adequate curing (removing volatiles from the solder paste to avoid spattering, and protection of the joints by the fluxes are vital in achieving quality solder joints. This cure temperature should increase gradually to a maximum of 120℃. In addition, the transition temperatures from cure to reflow should continually increase to keep the fluxes active. The actual reflow temperature is usually about 219℃, although various brands in inert fluids may vary slightly in reflow temperature. It is not the intent of this paper to recommend any particular equipment or fluids.

7.2.4 Below is a summary of the above suggestions:

- pre-bake with an in-line preheater (up to 120℃)
- continue heating of PCB and components while moving to reflow
- reflow for a minimum of 10 seconds.

7.3 IR Soldering

Infrared (IR) heating systems typically operate through three modes of heating: IR, conduction and convection.

7.3.1 Infrared heating works on the principle that every object emits infrared waves. These waves are absorbed by any object that is at a lower temperature. The hotter object will try to heat up the colder object until no temperature difference exists. Infrared waves can be reflected (focused or directed).

7.3.2 Conduction heating involves placing an object into a hot atmosphere or onto a hot object. Heat is absorbed on the outside surfaces and is conducted to the inside of the object.

7.3.3 Convection heating (similar to conduction heating) involves a moving atmosphere. It typically works faster than conduction since air that has given up its heat is consistently replaced by additional hot air.

7.3.4 The intent of this information is not to recommend any particular type of equipment, but to show the basic differences that exist between systems.

7.3.5 Wavelength dictates the temperature (short, medium and long).

7.3.6 The shorter the wavelength, the hotter the temperature. Typical short wave temperatures reach 2000℃. The source producing this wave is white light.

7.3.7 Medium wave temperatures (900℃ are produced by an orange source).

7.3.8 Long wave temperatures are 600℃ and below. At 600oC, the source is cherry red. As the temperature falls below 450℃, it becomes black (known as black source).

7.3.9 Wavelength is also described as a measured length (microns). A short wave is a 1.2, a medium wave is 2.5, and a long wave is 5. If the temperature of the heat source is known, the wave length can be computed by the following formula:

7.3.10 $$U \text{ (Maximum emission)} = \frac{2897}{T \text{ source}}$$

7.3.11 Where T is the temperature source in degrees Kelvin (degrees C +273).

7.3.12 All wave lengths can be used for reflow; however, the shorter the wavelength the more sensitive it is to color. Black white objects. Silver objects have a tendency to reflect short wave. The longer the wavelength, the less color becomes important to the process.

7.3.13 As stated earlier the intent of this information is not to recommend specific equipment, but the above information shows the importance of the type of system with respect to the color of devices being processed. Consequently, the use of long waveflow systems seems to be the industry trend. Please keep in mind that any IR system will also produce a certain amount of conduction and convection heating. These additional heating methods will influence not only the heating response of the system, but also the final internal temperatures of devices being processed.

7.3.14 Adequate drying of the PCBs prior to the screening and soldering process is recommended to prevent entrapped moisture from escaping during the reflow process. A general recommendation for adequate drying is to bake the PCB for 6 hours at 150℃. If the PCB is not used within 24 hours after the baking, another bake cycle is required. Curing process should follow. This should involve an initial temperature of 50℃ to release the volatiles followed by a bake at 120℃ to allow the fluxes to protect the joint. Once into this stage of the process, the temperature profile must continually increase in order to keep the flux active.

7.3.15 A final preheat of 180℃ should precede the final reflow temperature of 220℃.

7.3.16 A typical heat profile is shown in Figure 6-2. Note this profile should be representative of the PCB surface temperature. Whenever a new process is being setup, the heat profile should be checked using thermocouples attached to the PCB.

7.4 Through-Mount (Wave Solder) Processing

7.4.1 The most important aspect of successful wave solder processing is the proper PCB Layout for hole spacing and pad location. Shorting between adjacent pads or through-mount leads may result from not following these recommendations.

7.4.2 Be sure to examine the PCB direction through the wave and place components on the PCB correctly. If components must be oriented other than parallel to the PCB movement, special care of row-to-row spacing and pad layout may be needed.

7.4.3 Also note trailing pads at the past positions of the hole layout. These are needed to help draw the solder in the direction of PCB travel and prevent shorting between the last pair of through-mount leads on the component.

7.4.4 The amount of mixed reflow technologies (a combination of through-mount and surface-mount) has led to new types of wave soldering equipment. The introduction of ultrasonics to enhance wave turbulence and decrease reject rates on the bottom side surface-mounted components may contribute to a higher percentage of shorting than standard wave soldering processes. Consequently the need to follow PCB layout recommendations becomes increasingly important.

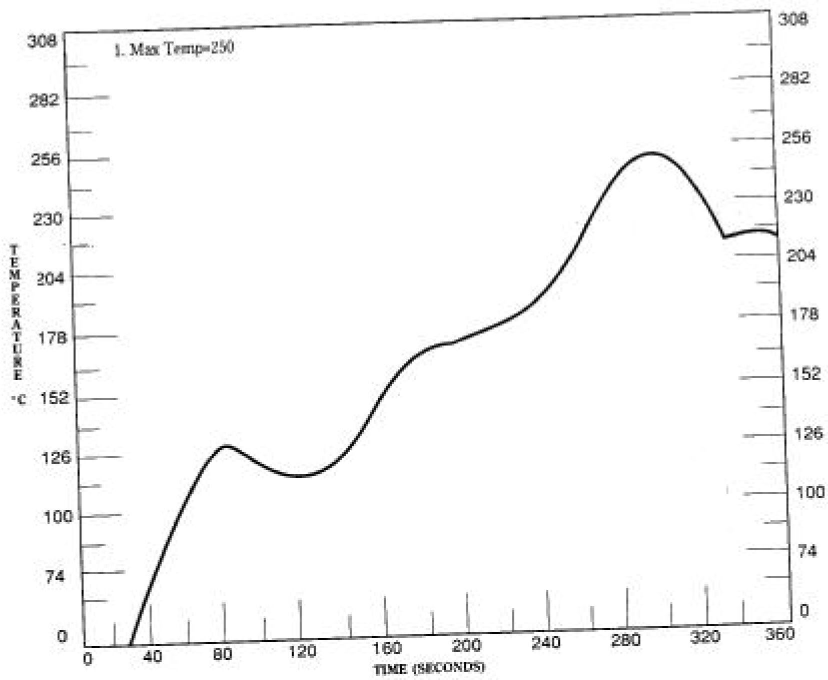
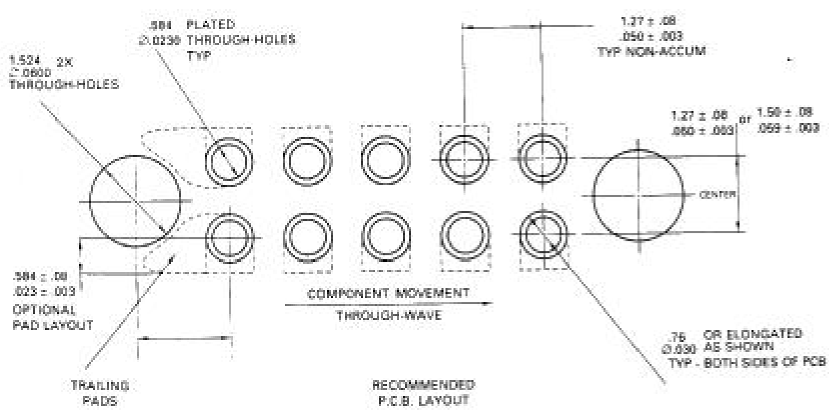
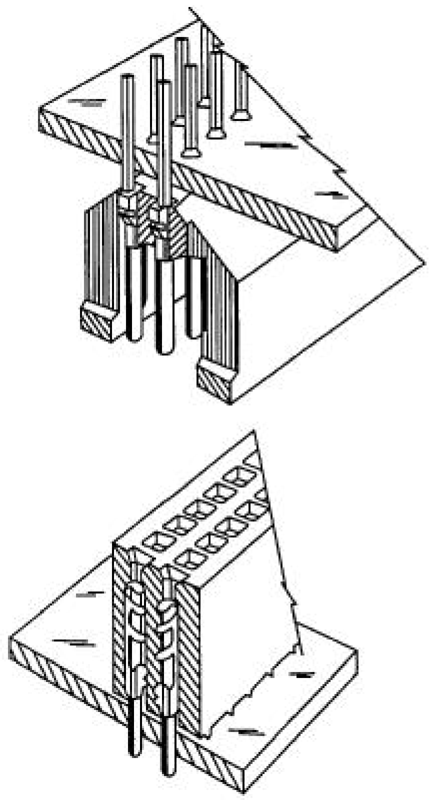


Figure 6-2. Heat Profile

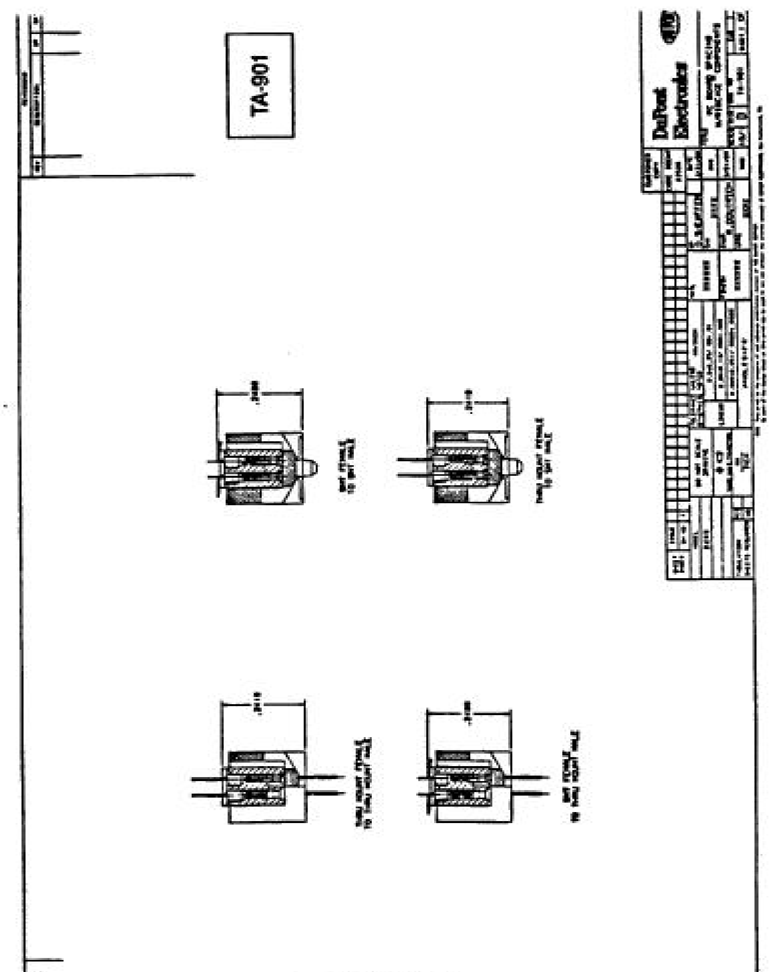


(See individual component drawing for additional details.)

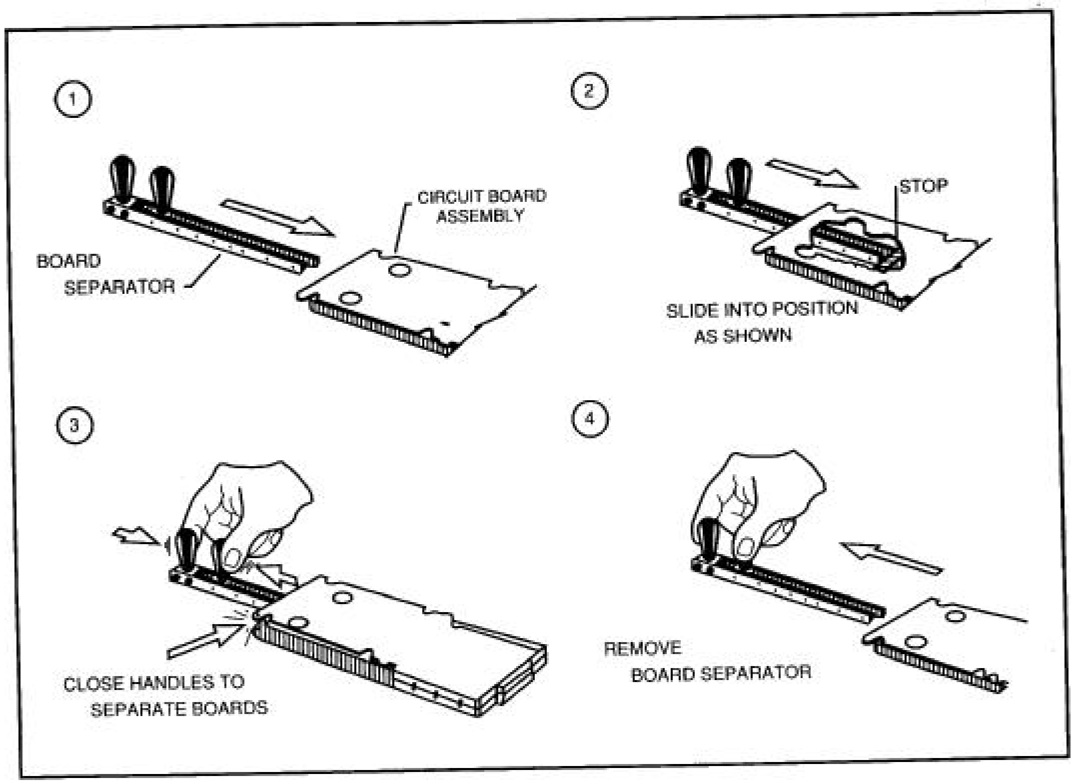
Figure 6-3. Through-Mount Male and Female



Cross-View Drawing



Mated Height TA-901


1
BOARD
SEPARATOR
CIRCUIT BOARD
ASSEMBLY
2
STOP
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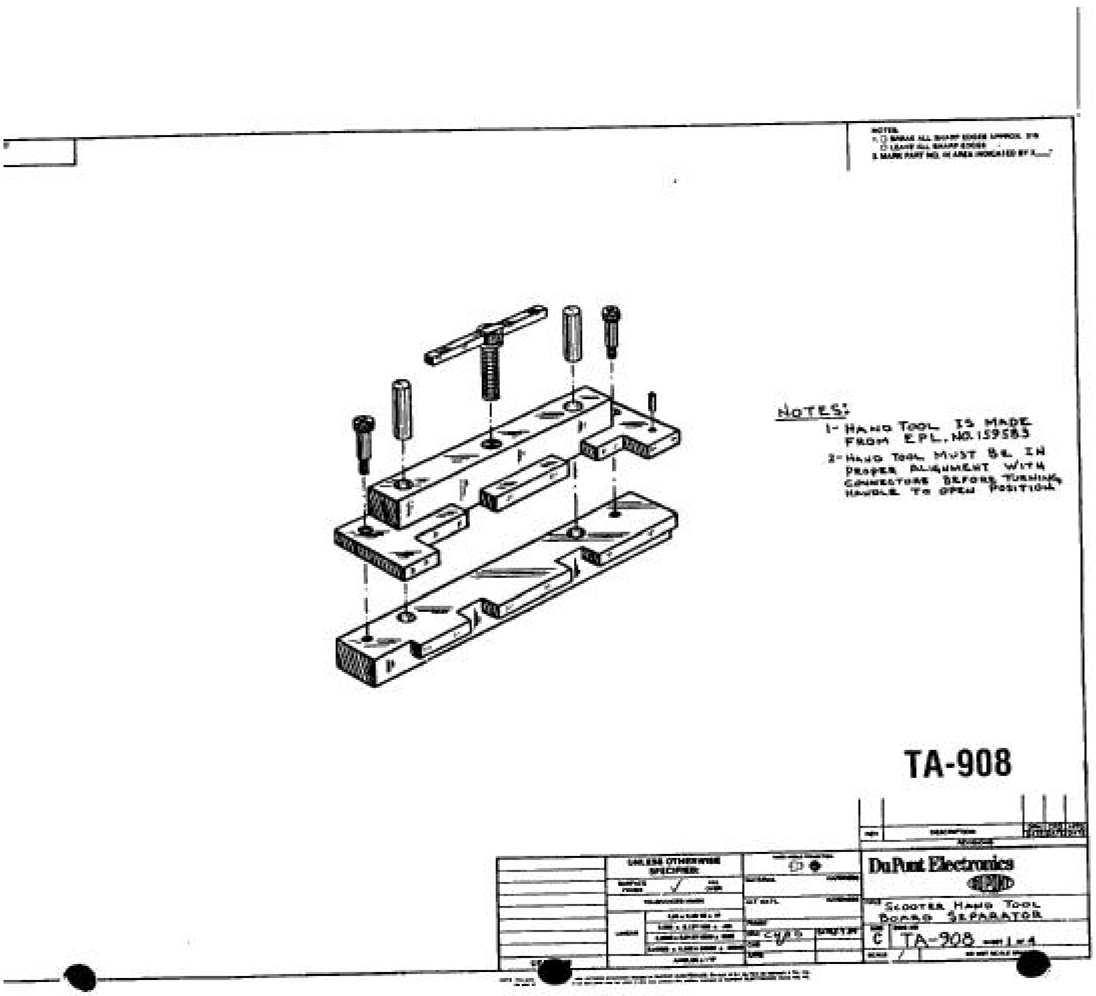
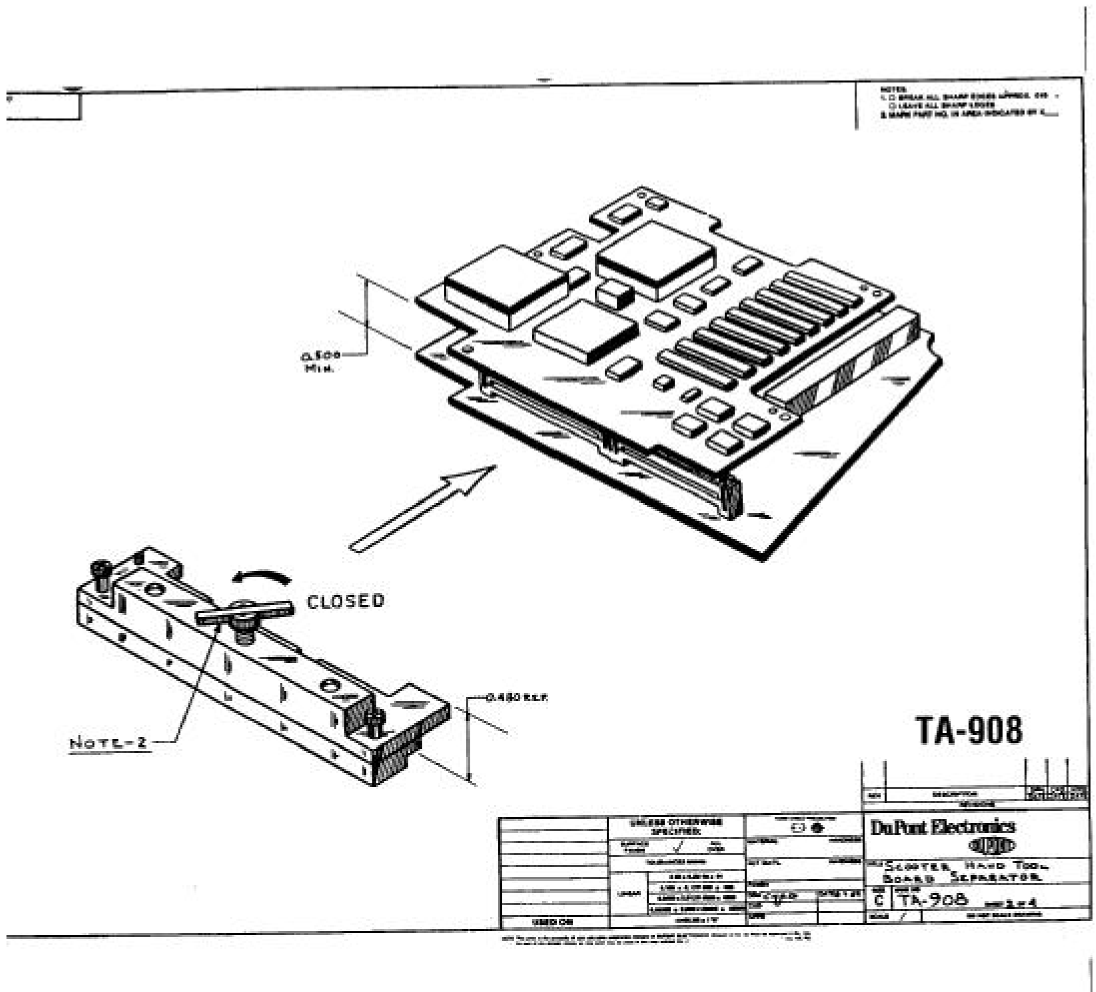


NOTES:
1- HAND TOOL IS MADE FROM EPL. NO. 159583
2- HAND TOOL MUST BE IN PROPER ALIGNMENT WITH CONNECTORS BEFORE TURNING HANDLE TO OPEN POSITION
TA-908
DuPont Electronics
SCOOTER HAND TOOL BOARD SEPARATOR
C
TA-908



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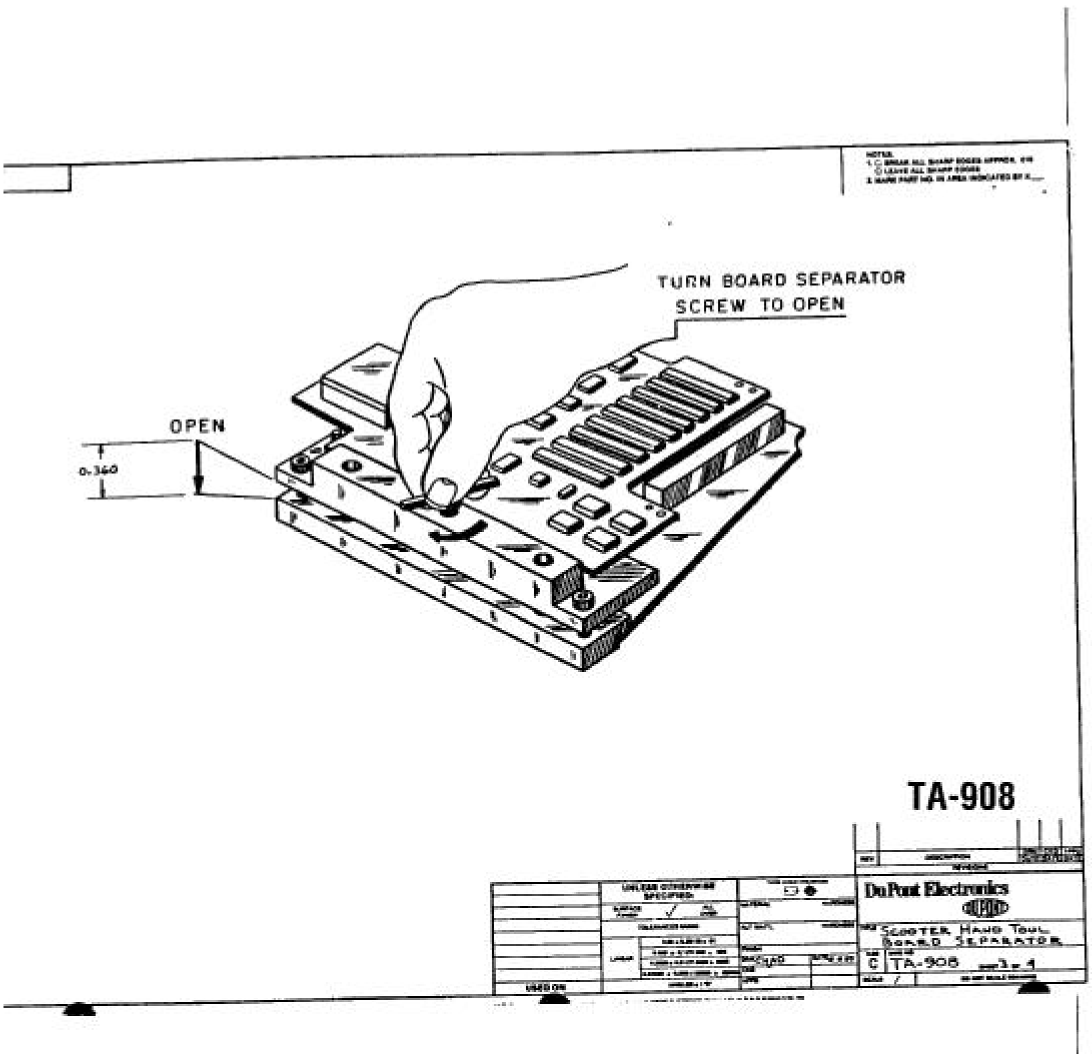

TURN BOARD SEPARATOR
SCREW TO OPEN
OPEN
0.360
TA-908
DuPont Electronics
SCOOTER HAND TOOL
BOARD SEPARATOR
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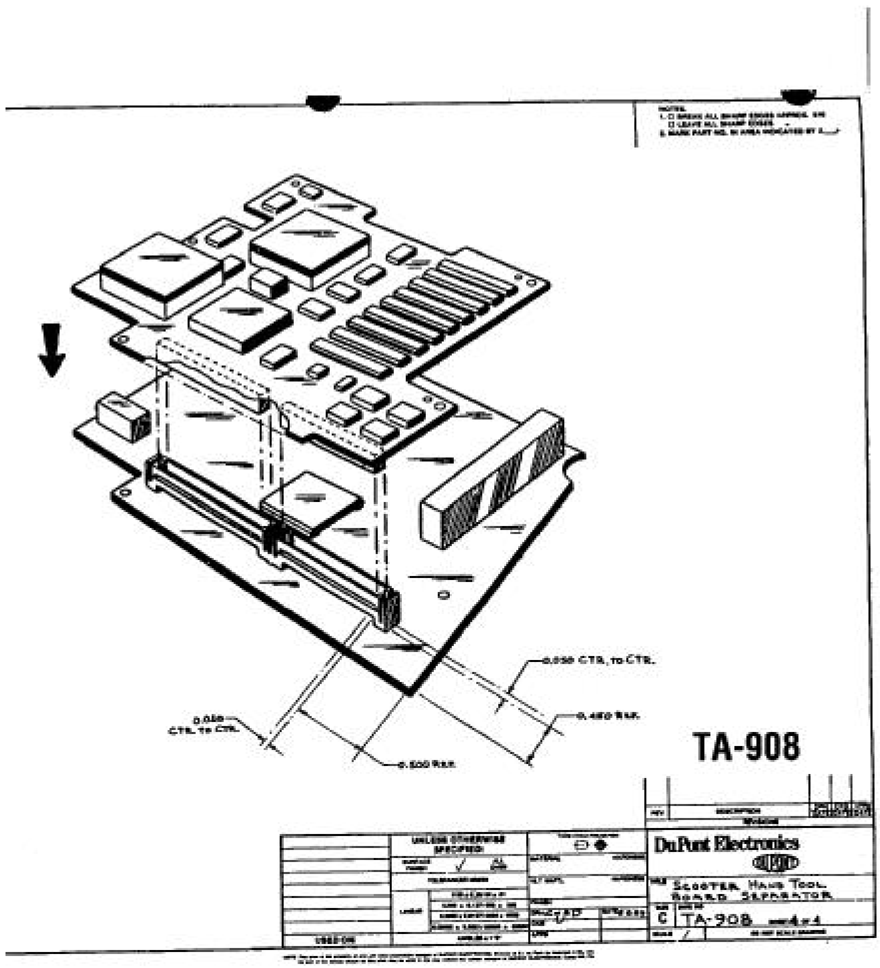

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0.450 REF.
0.050 CTR. TO CTR.
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TA-908
UNLESS OTHERWISE SPECIFIED
USED ON
DuPont Electronics
SCOOTER HAND TOOL BOARD SEPARATOR
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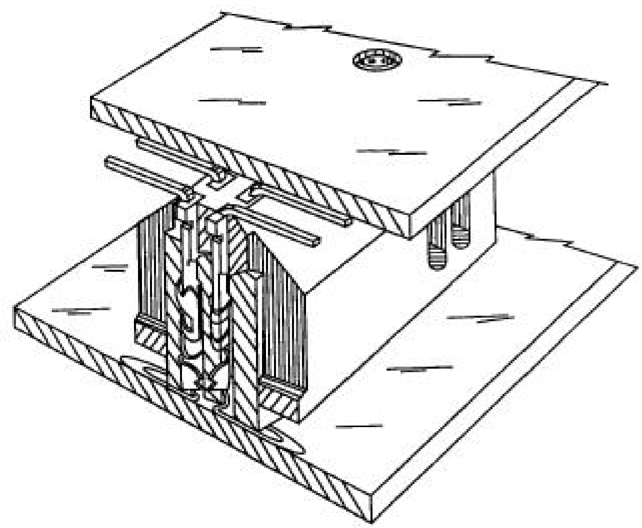
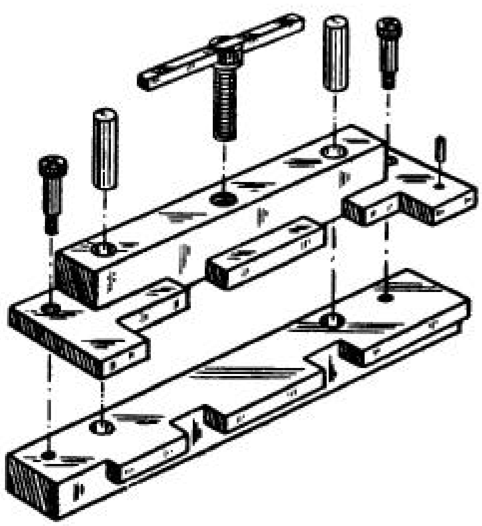
TA-908



Cross-View Drawing



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REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATA
A	**ALL**	**Released**	**V01172**	**11/09'90**
B	**ALL**	**Revised format to be consistent with GS-01-001, and change BERG, Dupont, etc. references to FCI.**	**V01922**	**08/03'00**
C	**ALL**	**Update the company logo in the document .**	**ELX-N-14738**	**05/10'13**