1.0 OBJECTIVE

To provide information on available product features and customer application considerations for Metral™ right angle press fit power receptacles.

2.0 SCOPE

This application spec provides regarding product features, customer application machines (CAM's), and customer use.

3.0 GENERAL

3.1 This document is meant to be an application guide. If information varies from that in the product drawings and specifications, the drawings and specifications take precedence.

3.2 This document contains the following sections:

4.0 PROCEDURE

4.1 Introduction

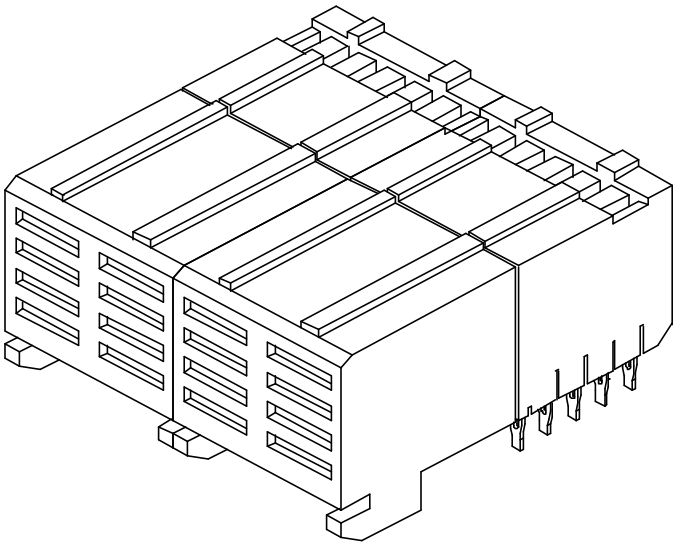


Figure 1 - Isometric view of right angle press fit receptacle.

A compliant press fit connection is an electrical connection made by mechanical means by inserting a press fit pin into a Plated Thru Hole (PTH). The forces required to provide this connection results from the deformation of the press fit section in the PTH. By using a press fit connection, it eliminates the need for soldering processes for connectors that are Pin In Hole (PIH) connectors. It also reduces re-work concerns on the connectors by allowing the damaged connector to pressed out with relative ease.

The “Eye of the Needle” (E-O-N) section was designed to meet the requirements for press fit terminations according to Bellcore GR-1217-Core. This applies to SnPb plated boards and also OSP boards (An OSP board uses copper plating, which is passivated to prevent corrosion of the copper). This specification requires:

- There shall not be an increase in contact resistance greater than 1m-Ω after environmental stress.
- Average hole deformation shall not exceed 0.0015”
- Maximum hole deformation shall not exceed 0.002”

Figure 2 shows the press fit pin, while Figure 3 shows an actual cross-section of a press fit pin inserted into a PCB.

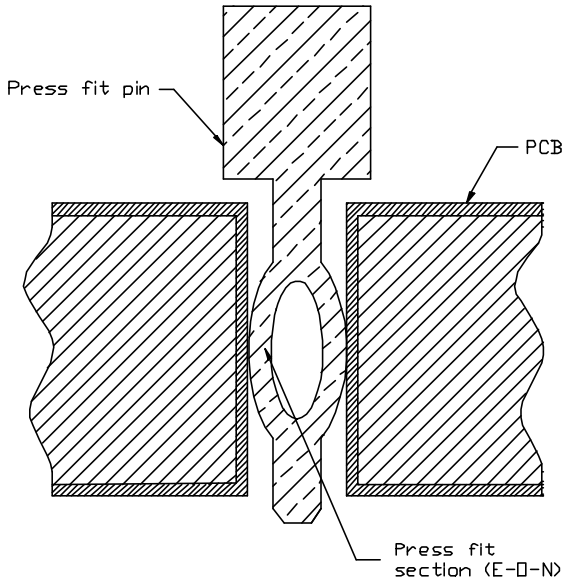


Figure 2 - Eye of the Needle design on the right angle press fit pins.

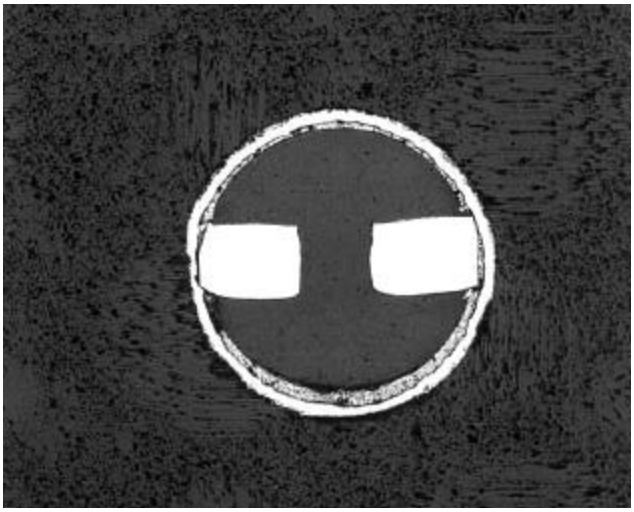


Figure 3 - Cross-section of the press fit pin in the middle of a PCB.

A press peg provides the retention of the header to the PCB. The press peg is designed to provide an interference fit with the corresponding hole in the PCB. This designed interference provides the retention of the connector to the board. The press peg is shown in Figure 4. This retention design has two purposes. First, the pegs provide positive retention to the PCB during board the assembly processes. Secondly, the pegs absorb the loading from mating and handling, thus protecting the solder joints form being exposed to forces.

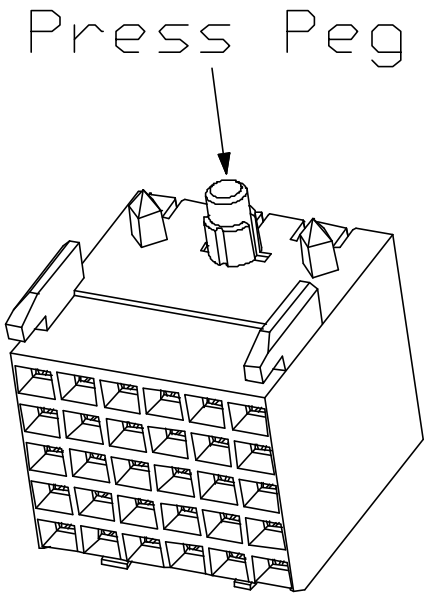


Figure 4 - Press Peg for the right angle press fit receptacle.

4.2 General Information

The right angle press fit Metral™ power receptacle is available in 4 and 5 row configurations. The features of this connector are:

- Modular building block based off 12 mm standard modular size (e.g. 4 x 2 & 5 x 2 modules are 12 mm long).
- The contacts are located on a 2 mm x 2 mm grid for high signal density.
- Available in 1 module size (12 mm).
- Stackable with other Metral™ products (e.g., signal, coax, guide pin).
- Customer specific select load. See tables 6 & 7.
- Current Rating
  - 8 A for a single contact.
  - 3 A when all contacts are powered.
- Dielectric Withstanding Voltage of 1000 V rms (at sea level).
- Insulation Resistance of 5000 MW minimum initially; 1000 MW after environmental testing.

Table 1 - Length and part numbers for all of the available right angle press-fit receptacles.

Number of Modules	Length (mm)	4 Row PN Std Load	5 Row PN Std Load
1	12	88949-XYY	89096-XYY

- The X & Y in the suffix stand for the following:
  - X – Contact Area Finish (Plating)

- Y – Tail Length After Assembly

Table 2 - The plating thickness with its specification and the suffix for ordering.

Plating Thickness	Suffix	Specification
30 µin (0.8 µm) Gold	- 1YYY	IEC class II
50 µin (1.3 µm) Gold	- 3YYY	IEC class I
80 µin (2.0 µm) Gold	- 2YYY	Telecom class
30 µin (0.8 µm) GXT	- 9YYY	IEC class II

Table 3 - Suffix's for right angle press fit receptacles.

Suffix	Board Attachment	Tail Length	PCB Thinckness
- X02	Press Peg	2.73	1.6
- X12	Press Peg	3.53	2.4

4.3 Part Information

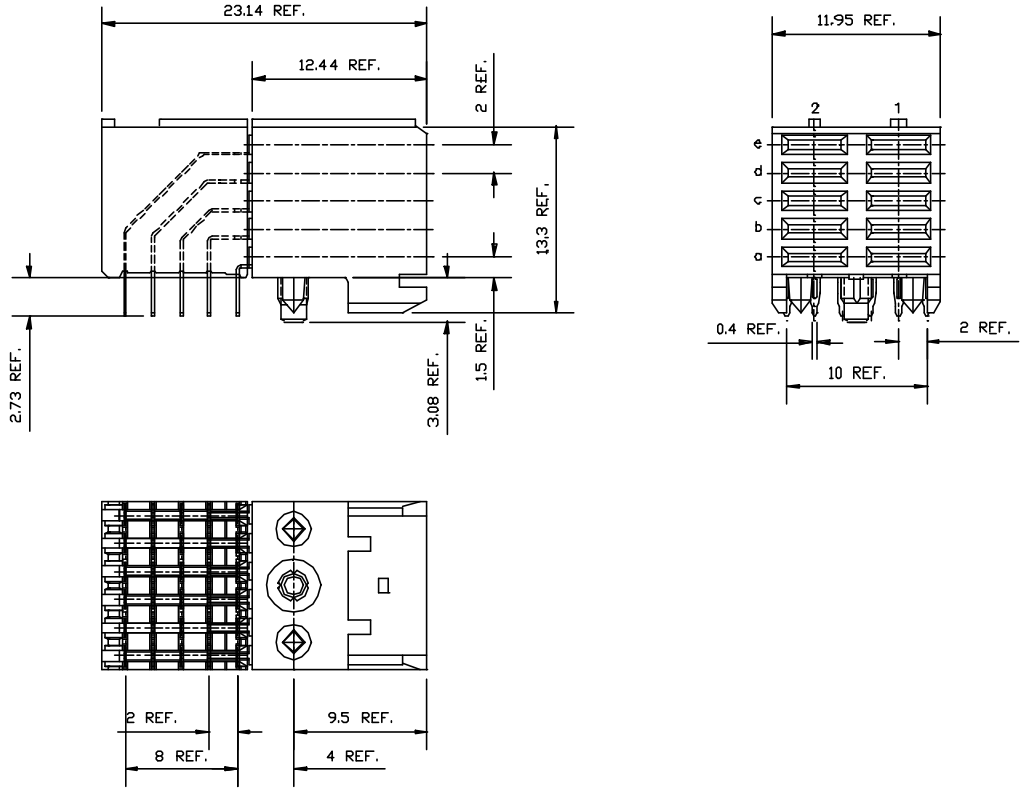


Figure 5 - Right angle press fit 5-row power receptacle. (All dimensions in mm)

- Press-fit Retention and Insertion Forces
  - The forces to install or remove the press fit receptacle are determined by the press fit contacts and the press peg.
  - The maximum insertion force required to press a terminal into the PCB is 50 N/terminal (11.24 lbf). The press peg has a maximum insertion force of 267 N/peg (60 lbf). For example, part number 88949, which has a 4 x 6 terminal matrix, has a maximum insertion force of 1467 N (330 lbf) ([50 N/terminal * 24 terminals] + 267 N/peg). Typical values for the insertion force of a receptacle are 22 N/terminal (5 lbf) and 200-220 N/peg (45-50 lbf).
  - The minimum retention force required for a press fit terminal is 9 N/terminal (2 lbf). The press peg has a minimum retention force of 90 N/peg (20 lbf). For example, part number 88949 has a minimum retention force 306 N (68 lbf) ([9 N/terminal * 24 terminals] + 90 N /peg).
  - These forces also apply when a connector is being reworked. A rework of a connector occurs when the connector is found to be damaged. The damaged connector is then removed and replaced with the appropriate connector. This process may be performed twice.
- Mating and Unmating Forces
  - The maximum mating force required to plug a receptacle into a header is 1.5 N/contact (0.35 lbf). For example, part number 88949, which has a 4 x 2 pin matrix, has a maximum mating force of 12 N (2.7 lbf) (1.5 N/contact * 8 contacts).
  - The minimum unmating force required to unplug a receptacle from a header is 0.30 N/contact (0.034 lbf). For example, part number 70227 has a minimum retention force of 7.2 N (1.62 lbf) (0.30 N/contact * 24 contacts).

4.4 Materials

- Housing material is 30% glass filled LCP (Liquid Crystal Polymer). It has an oxygen index of 38. The mass for the receptacle is given in Table 4.

Table 4 - Plastic mass of right angle power receptacles.

RA Power Receptacles	**4 x 6**	**4 x 12**	**4 x 24**	**4 x 48**
Housing (plastic)	1.07	2.14	4.28	8.56
Press Block (plastic)	0.91	1.82	3.64	7.28
Total Ass'y	3.69	7.38	14.76	29.52
	5 x 6	**5 x 12**	**5 x 24**	**5 x 48**
Housing (plastic)	1.13	2.26	4.52	9.04
Press Block (plastic)	1.35	2.70	5.40	10.80
Total Ass'y	4.72	9.44	18.88	37.76

- Contacts are made out of Phosphor Bronze.
- The mating area on the contact can be plated with gold or GXT (Palladium-Nickel alloy with gold flash). Refer to Table 2 for the various plating options.

4.5 PCB Requirements

A press fit connection is a means of terminating connectors to printed circuit boards without going through a soldering operation. The features that are important to define on the printed circuit board when using press fit technology are:

- Drilled hole diameter
- Plated hole diameter
- Plating in thru hole
- Printed circuit board thickness
- Land/pad size

Collectively, these define the reliability of the termination as well as the force required to apply the connector to the printed circuit board. For Metral™, the recommended features are shown in Table 5.

Table 5 - Recommended features for Metral™ PCB.

Feature	Dimension	
	mm	in
Drilled hole diameter	0.81 - 0.86	0.0319 - 0.0339
Recommended drill	0.85	0.0335
Plated hole diameter	0.65 - 0.80	0.0256 - 0.0315
Min. copper plating	0.025	0.00098
Tin/Lead plating (optional)	0.005 - 0.015	0.00019 - 0.00059
Min PCB thickness	1.57 ±10%	0.0618 ±10%
Max PCB thickness	2.4 ±10%	0.0945 ±10%
Land/Pad size	1.17	0.0461

- Figure 6 shows the important features of the PCB.
- Refer to Figure 7 for PCB layout.

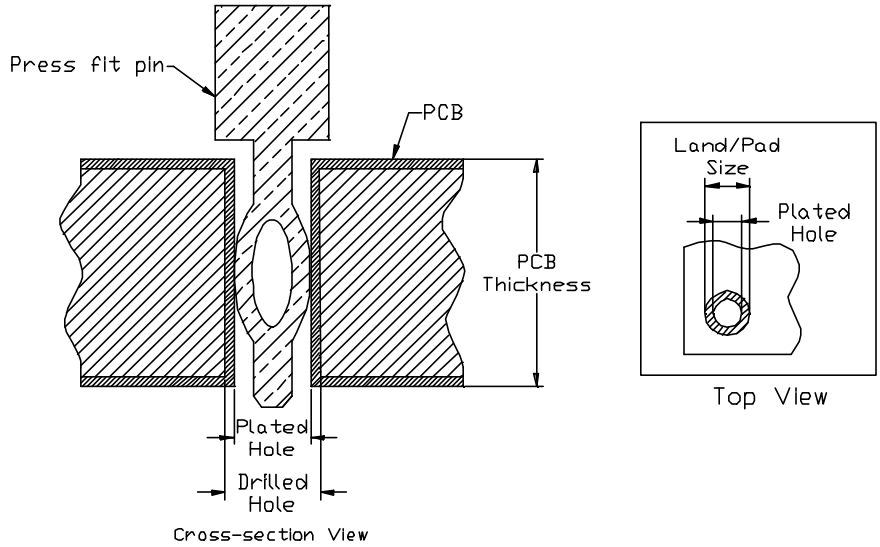
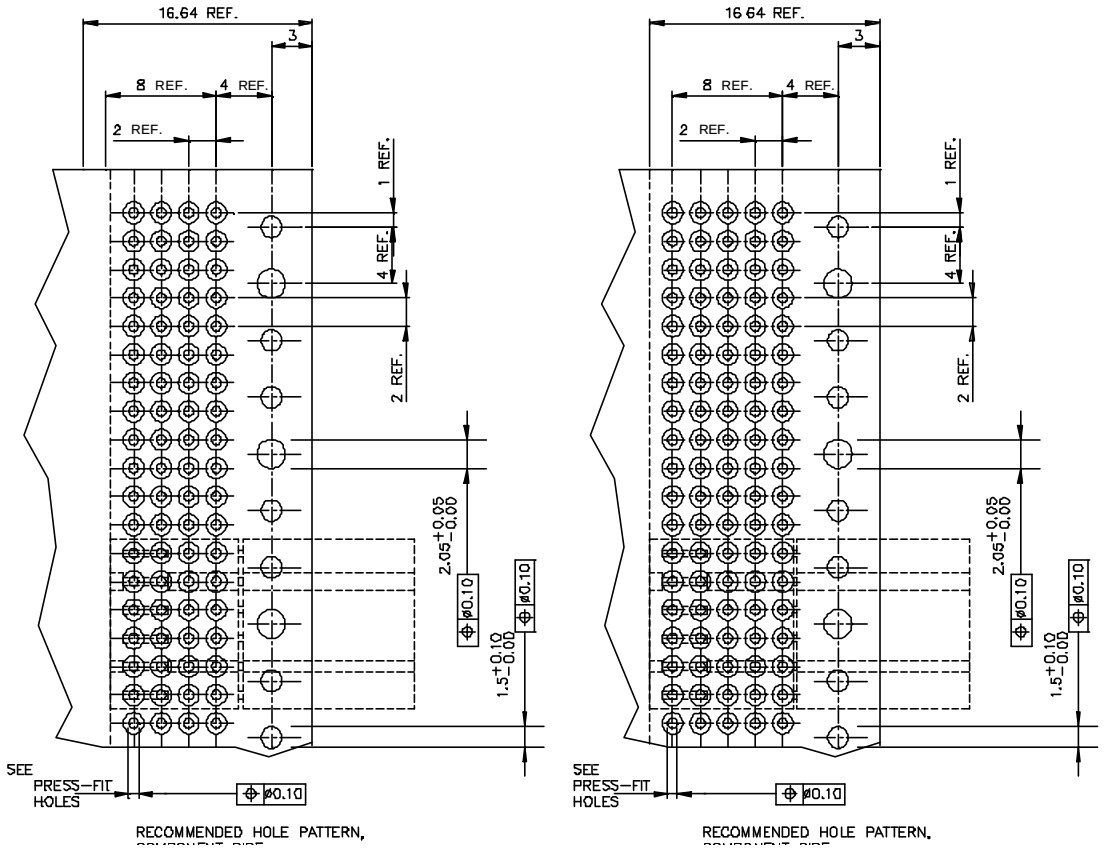
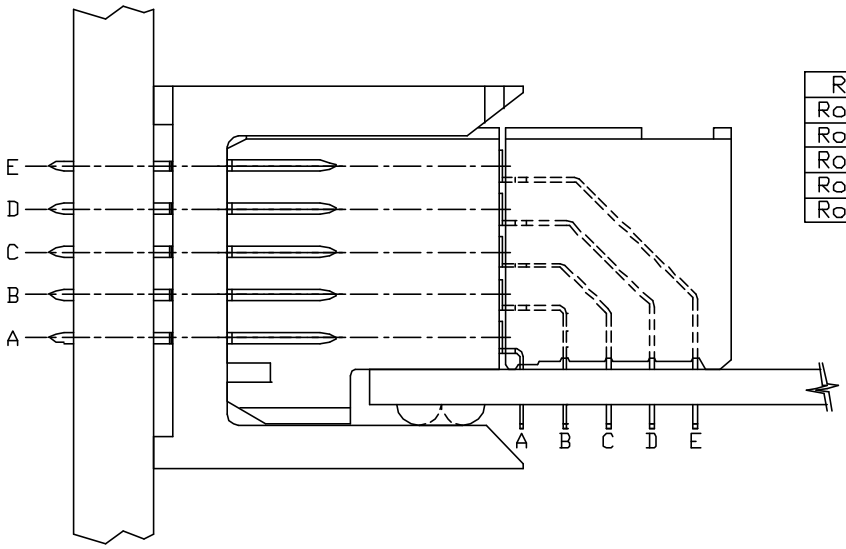


Figure 6 - Important features of PCB design for Metral™ Connectors.



4.6 Customer Design Considerations

- Preferred receptacle placement is on 12 mm centers. This enables the use of standard tooling for applying receptacles to the PCB.
- The bulk resistance will vary from row to row. The maximum bulk resistance is 10 mW/contact. The typical values of bulk resistance is given in the table in Figure 8.
- To enable the application of receptacles, there is a recommended keep out zone for components. Refer to Figure 9 for the recommended keep out zone.



Row	Resistance
Row A	3.8 mΩ
Row B	4.6 mΩ
Row C	5.4 mΩ
Row D	6.5 mΩ
Row E	7.2 mΩ

Figure 8- Mated header and receptacle showing maximum bulk resistance per row. (5-row shown)

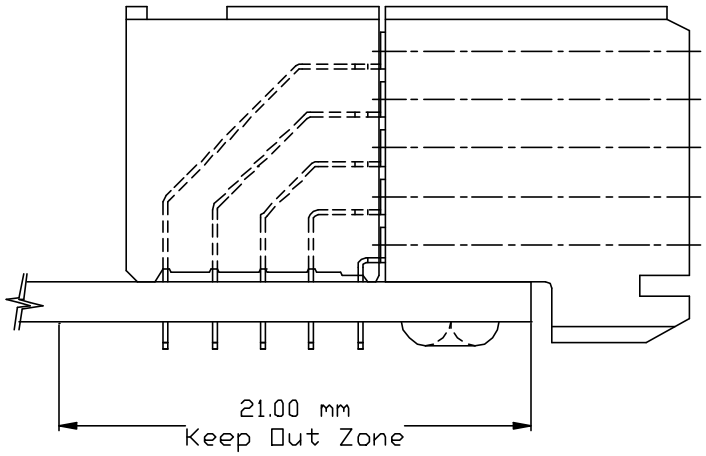


Figure 9 - Keep out zone for components around receptacles.

4.7 CAM's

4.7.1 Receptacle Insertion Tooling

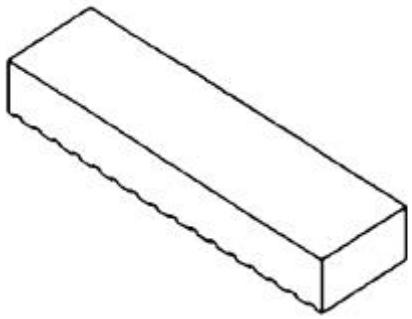
All Metral™ 4 and 5 row right angle receptacles (power and signal) can be installed with the same type of tooling.

The top tool is a modified "flat rock" press bar. The bottom tool serves as a board support during insertion and is cleared out in the areas that the tails come thru the PCB.

TOP TOOL PRESS BAR 162325-XXX
If all of the Metral™ modules that are to be inserted are stacked end to end, you can use a standard press bar. If you have groups of Metral™ connectors and then a space other than an even increment of 12 mm then you will need a custom top tool.

STANDARD TOP TOOLS

162325-001 8 (12 mm) Modules



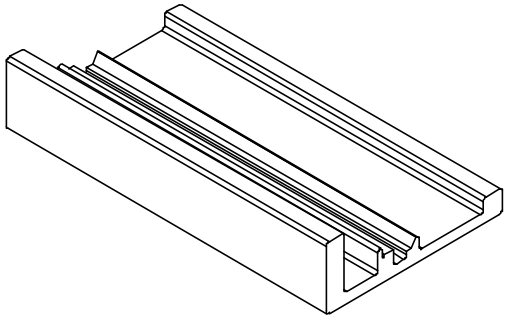
162325-002 12 (12 mm) Modules
162325-003 21 (12 mm) Modules

BOARD SUPPORTS (BOTTOM TOOLS) 162383-XXX

Some Metral™ users prefer to develop their own board supports or use a PCB with oversized holes. Either of these practices is acceptable, but FCI also offers bottom tools for those customers who prefer factory tooling. The bottom tools can be cut to the length needed.

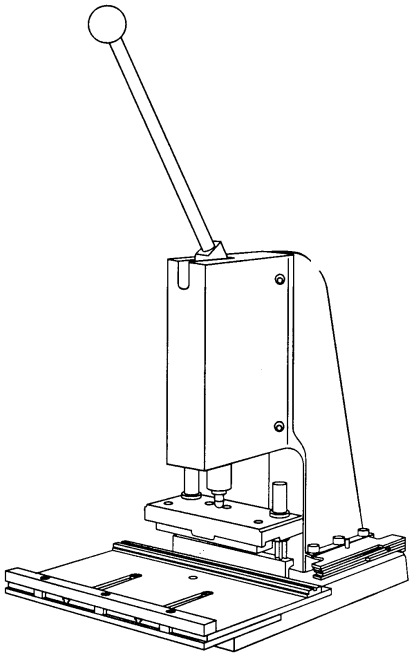
STANDARD BOTTOM TOOLS

	LENGTH (mm)	LENGTH (in)
162383-001	146.8 mm	5.780 in.



162383-002	194.8 mm	7.669 in.
162383-003	302.8 mm	11.921 in.
162383-004	457.2 mm	18.000 in.
162383-005	609.6 mm	24.000 in.

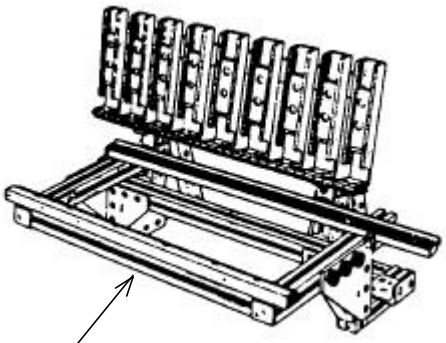
MT-510 P/N 162452-001



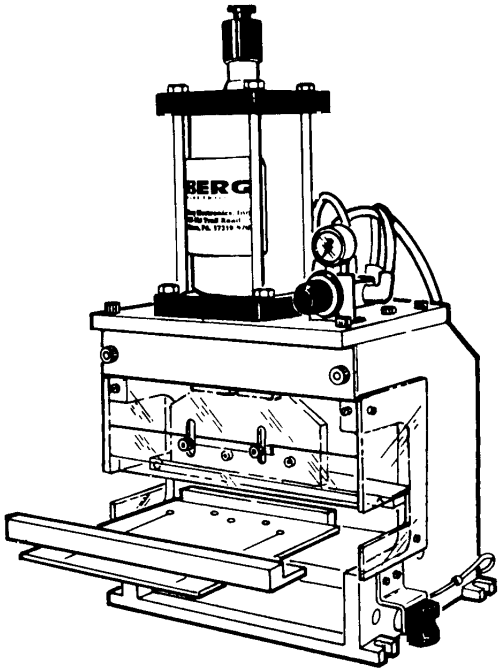
The MT-510 is a manuel press that can insert up to 128 press fit pins in one stroke. It can also be used for solder tail parts that have press pegs. The MT-510 can be used for all Metral™ right angle receptacles and right angle headers.

MT-511 INSERTION PRESS P/N 166380-001
LOADING STATION P/N 166505-001

The MT-511 is a pneumatic machine that can terminate up to (21) 12 mm modules per machine cycle. It can be used for all right angle receptacles and right angle headers. The optional loading station is used to stage the connectors prior to insertion.



Loading Station



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4.7.2 Receptacle Removal Tooling

In order to use any of these tools the press block must first be removed from the connector.

For 0.080 in. or more of tail protruding below the surface of the PCB then you can use the:

HT-0518 BASE PLATE PLUS ALL TOOLING P/N 415773-001

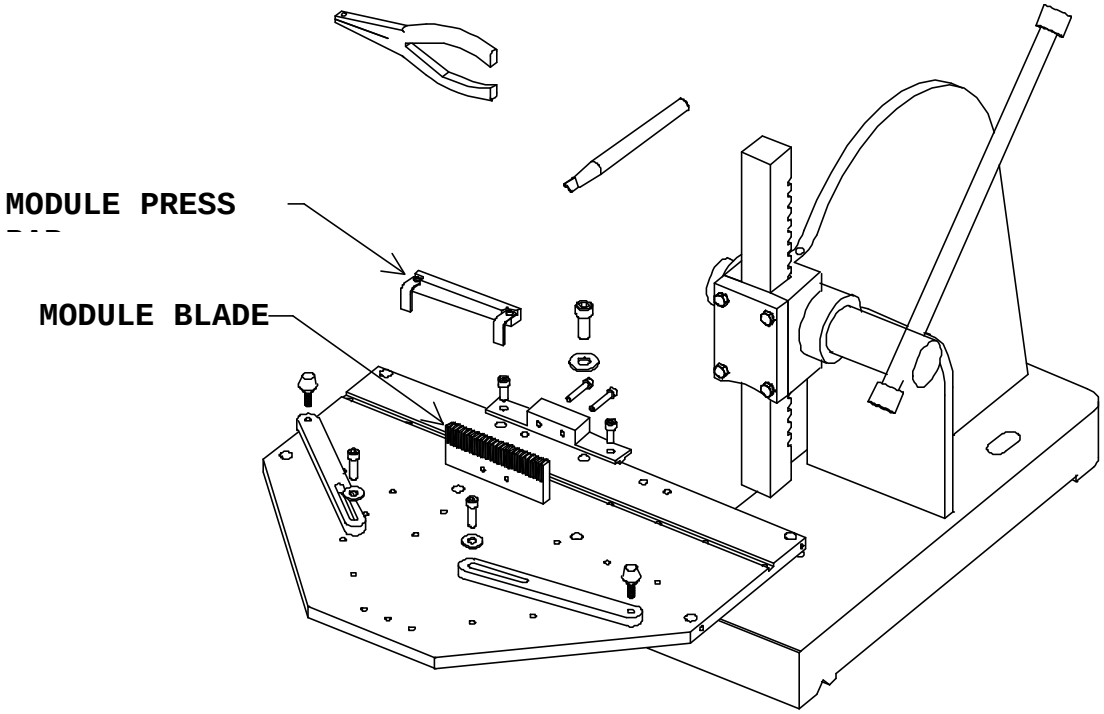
HT-0518 BASE PLATE P/N 415774-001

The HT-0518 pushes the connector away from the board be pressing against the tail of the connector on the bottom side of the board.

IF YOU ORDER THE 415774-001 THEN YOU ALSO NEED TO ORDER THE BLADE AND PRESS BAR FOR EACH SIZE MODULE YOU ARE USING.

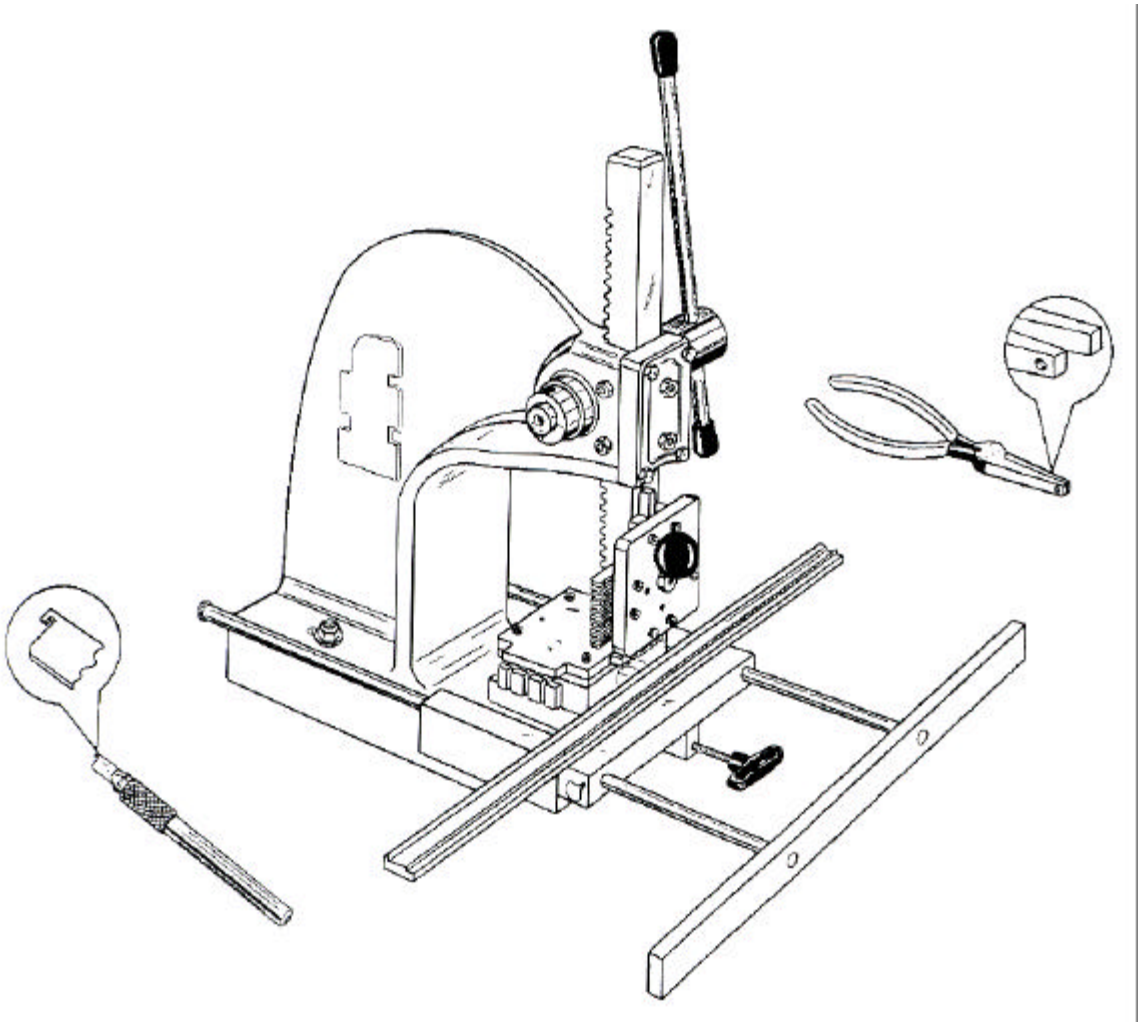
1 Module blade	**413773-001**	**1 Module press bar**	**415783-001**
2 Module blade	**413776-001**	**2 Module press bar**	**415783-002**
3 Module blade	**413775-007**	**3 Module press bar**	**415783-003**
4 Module blade	**413774-001**	**4 Module press bar**	**415783-004**

5 Module blade 413775-006 5 Module press bar 415783-005
8 Module blade 413775-001 8 Module press bar 415783-008
9 Module blade 413775-002 9 Module press bar 415783-009
11 Module blade 413775-003 11 Module press bar 415783-011
12 Module blade 413775-004 12 Module press bar 415783-012
13 Module blade 413775-005 13 Module press bar 415783-013



For less than 0.080 in. of tail protruding below the surface of the board. Then you use the:
HT-0503 P/N 413399-XXX
The HT-0503 holds the connector in place from the topside of the board and pushes the board downward away from the connector.

413399-001 1, 2, 4, and 8 Module tooling included
413399-002 9, 11, 12, and 13 Module tooling included
413399-003 1, 2, 4, 8, 9, 11, 12, and 13 Module tooling included



4.8 Order Forms

Table 6 - Order form for 4 row vertical power headers.

4 row
Base PN:

ROW	Col 2	Col 1
D		
C		
B		
A		

+	Contact Position
-	Empty Position

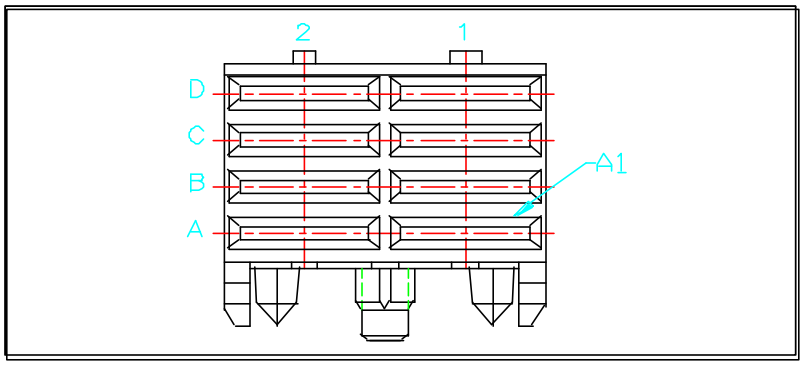
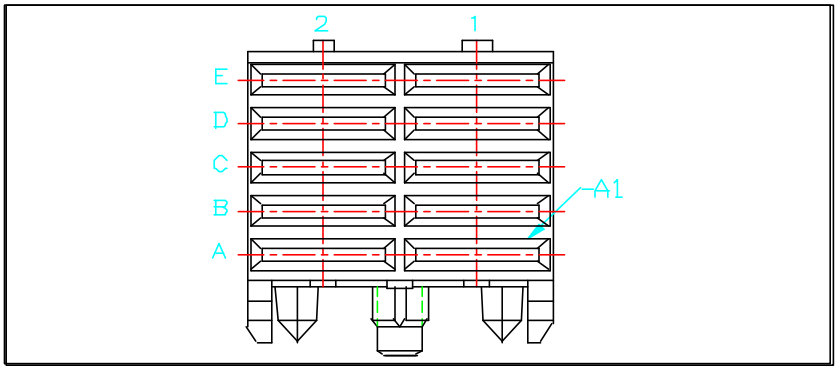


Table 7 - Order form for 5 row vertical power headers.

5 row
Base PN:

ROW	Col 2	Col 1
E		
D		
C		
B		
A		

+	Contact Position
-	Empty Position



5.0 REFERENCE DOCUMENTS

Any applicable product prints.
GES-12-002 -- Metral™ Connector System

6.0 RECORD RETENTION N/A

7.0 NOTES – N/A

REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	All	New Release	V90705	03/19/99
B	All	Revised format to be consistent with GS-01-001, and change BERG, Dupont, etc. references to FCI.	V01922	08/08/00

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