


NUMBER	GS-20-001	TYPE	APPLICATION SPECIFICATION			
TITLE			Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)		PAGE	1 of 17
					REVISION	F
					AUTHORIZED BY	Heaven Cen
					DATE	Feb/15/09
					CLASSIFICATION	UNRESTRICTED

## 1.0 OBJECTIVE

This specification provides information and requirements regarding customer application of Metral™ B series right angle press-fit receptacles. This specification is intended to provide general guidance for process development. It is recognized that no single process will work under all customer applications and that customers will develop their processes to meet their needs. However, FCI cannot guarantee results if these processes vary from the recommendations.

## 2.0 SCOPE

This specification provides information and requirements regarding customer application of Metral™ B series right angle press-fit receptacles.

## 3.0 REFERENCE DOCUMENTS


Any applicable product drawing  
GS-12-002, Metral™ Connector System

## 4.0 GENERAL

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.

This document contains the following sections:

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
1.0	Objective	1
2.0	Scope	1
3.0	Reference Documents	1
4.0	General	1
5.0	Application Information	2
5.1	General Product Information	2
5.1.1	Terminal and press peg information	3
5.1.2	Component masses	5
5.1.3	Application forces	5
5.2	Available Product Features	6
5.3	PCB Requirements	7
5.4	Customer Application Machines (CAMS)	10
5.4.1	Insertion Tooling	10
5.4.2	Removal Tooling	13
5.5	Post-Installation Inspection Criteria	15
	Revision Record	16
4.1	Banned/Restricted Substances	
	All product where the part number ends in 'LF' meet the European Union directives and other country regulations as described in GS-22-008. The part numbers that do not end in 'LF' meet all regulations except for Pb in SnPb plating.	
4.2	Manufacturing Processability	
	All products covered by this specification will withstand exposure to 240°C for 60 seconds in a convection, infra-red or vapor phase reflow oven.	

NUMBER	GS-20-001	TYPE	APPLICATION SPECIFICATION		FCI 		
TITLE  Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)				PAGE	2 of 17	REVISION	F
				AUTHORIZED BY	Heaven Cen	DATE	Feb/15/09
				CLASSIFICATION UNRESTRICTED			

## 5.0 APPLICATION INFORMATION

### 5.1 General Product Information

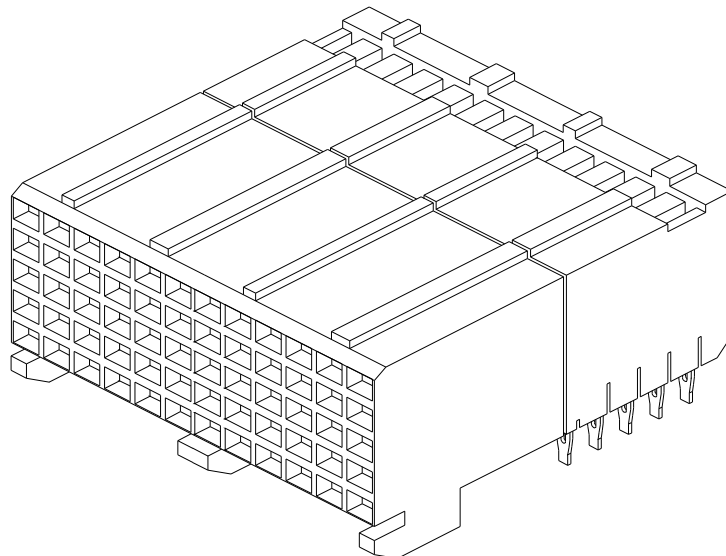


Figure 1: 5 row right angle press-fit signal receptacle

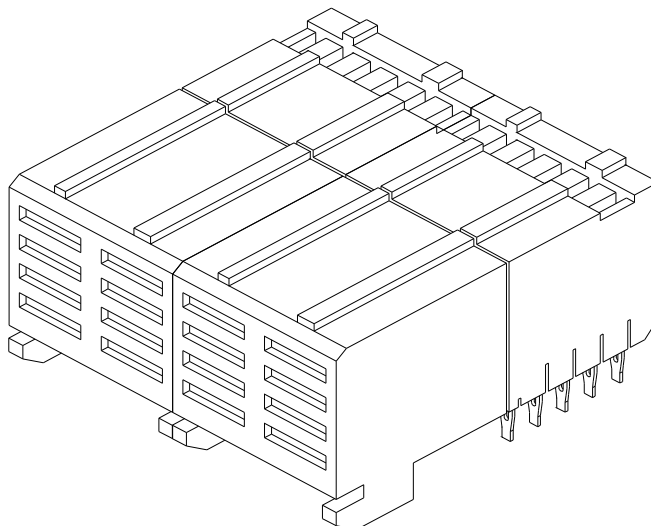



Figure 2: 4 row right angle press-fit power receptacle

NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>3 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

### 5.1.1 Terminal and press peg information

Metral™ right angle press-fit receptacles utilize terminals that make compliant connection to the plated through hole (PTH) in the printed circuit board (PCB). Electrical connection is made by mechanical means when a press-fit pin is inserted into a PTH. Refer to Figure 3 for a profile sketch of the compliant pin in a PCB. The forces required for a reliable electrical connection result from the deformation of the press-fit section by the PTH. Using a press-fit connection eliminates the need for a soldering process. Connector assemblies with press-fit technology can be re-worked by pressing a damaged connector out of the board and replacing it with a new assembly (this process may be performed a maximum of two times in the same PCB).

The “Eye of the Needle” (EON) compliant section was designed to meet the requirements for press-fit terminations according to the Telcordia GR-1217-CORE specification. Refer to Figure 4 for a section view of the EON terminal. The EON terminal may be used in a tin-lead PTH or in a copper OSP PTH. The OSP boards have special protective coatings to reduce oxidation. The Telcordia specification requires the following:

- 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”

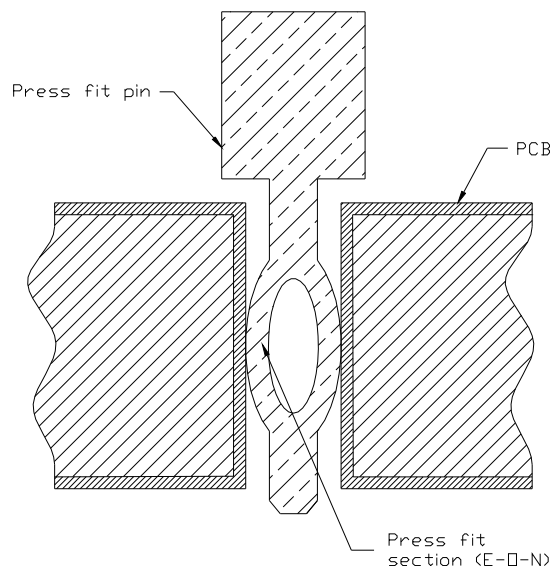



Figure 3: Profile view of an EON terminal in the PTH

NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>4 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

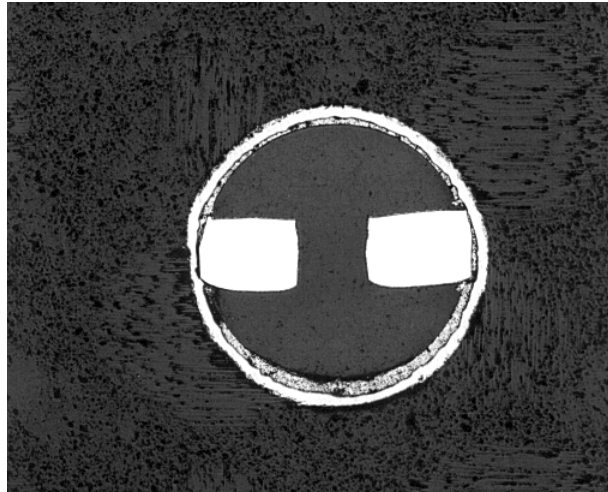



Figure 4: Cross-section of an EON pin

A press peg provides retention of the receptacle to the PCB (see Figure 5a). This press peg, which is designed to have an interference fit with the corresponding hole in the PCB, serves two purposes. First, the peg provides positive retention to the PCB during other board assembly processes. Secondly, the pegs absorb the loading from mating/unmating and handling, thus protecting the tails from being directly exposed to forces.

Tensile test: When tested in accordance with figure 5b of this specification, a single press peg shall be capable of sustaining a 30N minimum load.

NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>5 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

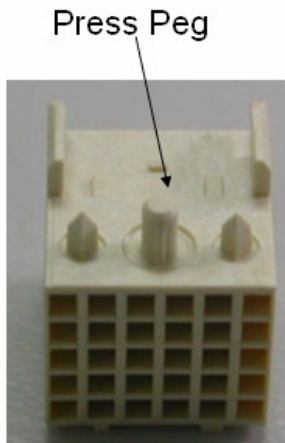


Figure 5a: Press peg for the right angle Press-fit receptacle housing

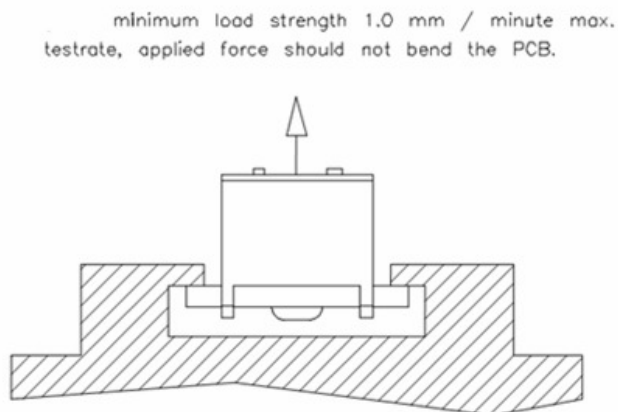



Figure 5b: Tensile Test

#### 5.1.2 Component masses:

Table 1: Approximate mass of components (in grams)


<b>4 row</b>	<b>1 mod</b>	<b>2 mod</b>	<b>4 mod</b>	<b>8 mod</b>
Housing (plastic)	1.18	2.36	4.72	9.44
Press block (plastic)	0.91	1.82	3.64	7.28
Total assembly	3.56	7.12	14.24	28.48
<b>5 row</b>	<b>1 mod</b>	<b>2 mod</b>	<b>4 mod</b>	<b>8 mod</b>
Housing (plastic)	1.37	2.74	5.48	10.96
Press block (plastic)	1.35	2.70	5.40	10.80
Total assembly	4.58	9.16	18.32	36.64

#### 5.1.3 Application forces:

NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>6 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

The number of press-fit terminals and press pegs determines the force required to properly apply a press-fit receptacle. The recommended insertion force to fully press each EON terminal into the PCB is 53 N (12.0 lbf). The recommended insertion force for each press peg is 120 N.

For example, part number 88945 (which has a 4 x 6 terminal matrix) has a maximum insertion force of  $[(53 \text{ N/terminal})(24 \text{ terminals}) + (120 \text{ N/peg})(1 \text{ peg})] = 1402 \text{ N}$

NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>7 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

## 5.2 Available Product Features

The features of right angle press-fit B-style Metral™ receptacle connectors include:

- Standard module size is 12 mm.
- 4 row and 5 row configurations are available.
- Each 4 row 12mm module contains 24 signal terminals or 8 power terminals.
- Each 5 row 12mm module contains 30 signal terminals or 10 power terminals.
- Signal terminals are located on a 2 mm x 2 mm grid for high signal density.
- 1, 2, 4, and 8 module connectors are standard. Other sizes are available.
- Standard tail lengths include 2.90mm (for use with a 1.6mm nominal thickness PCB) and 3.53mm (for use with a 2.4mm nominal thickness PCB)
- Terminals may be selectively loaded.
- Available accessories which are end-to-end stackable include guide, keying, DIN power, and Din coax.

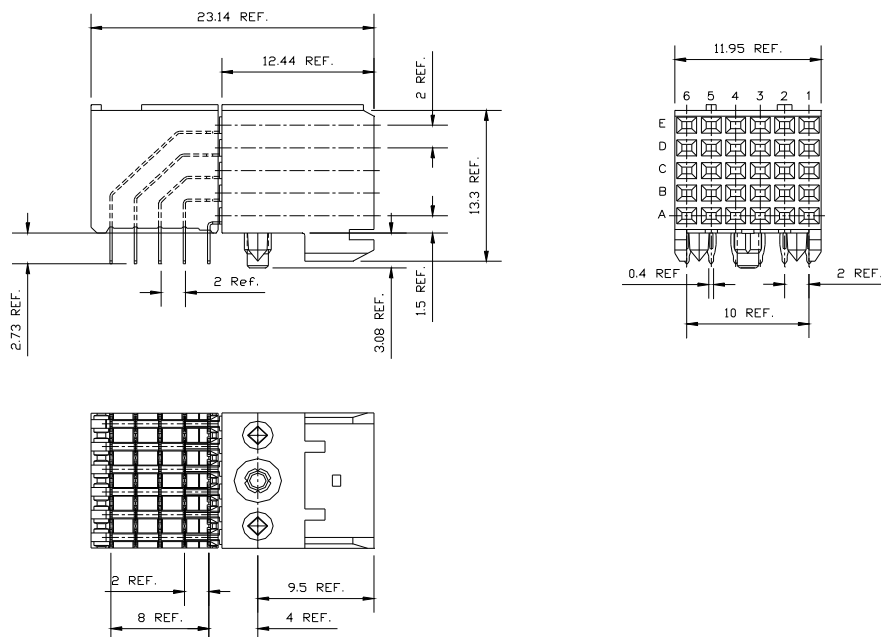



Figure 6: Right angle press-fit 5-row signal receptacle (all dimensions in mm)

NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>8 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

### 5.3 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 type in thru hole
- Printed circuit board thickness
- Land/pad size

Collectively, these features influence the reliability of the termination as well as the force required to apply the connector to the printed circuit board. The recommended values are shown on customer drawing 58351, and a sketch showing these features is shown in Figure 7.

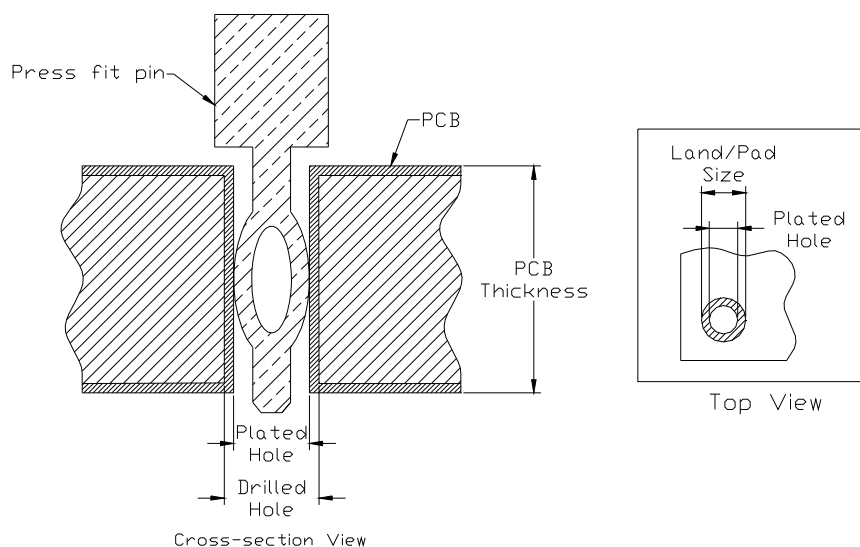



Figure 7: Critical features of PCB design for Metral™ Connectors





NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>10 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

The preferred spacing for Metral™ connectors is on 12 mm centerlines. This enables the use of standard tooling for applying the receptacles to the PCB. There is also a recommended keep-out zone for other components to allow room for application tooling as shown in Figure 9. This keep-out zone applies to both the top and bottom sides of the PCB.

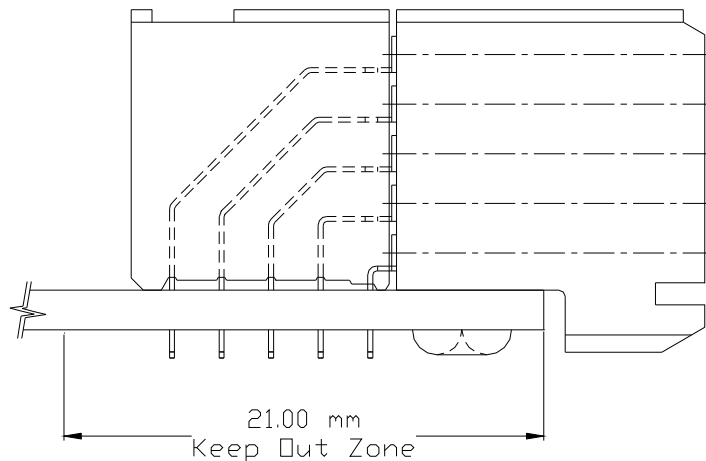



Figure 9: Recommended keep-out zone for components around receptacles

NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>11 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

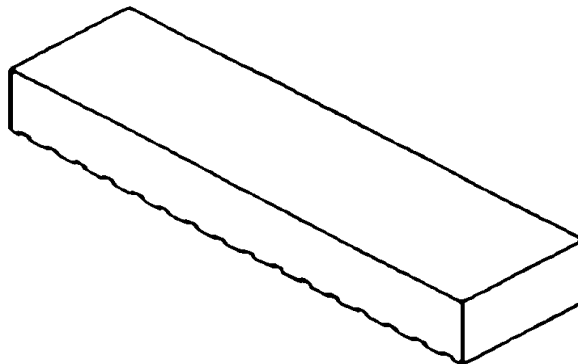
#### 5.4 Customer Application Machines (CAMS)

##### 5.4.1 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 protrude through the PCB.

#### TOP TOOL (PRESS BAR), P/N 162325-XXX

If all Metral™ modules to be inserted are located on 12mm centerlines, a standard press bar can be used. Spacing between Metral™ connectors other than an even increment of 12 mm requires a custom top tool.



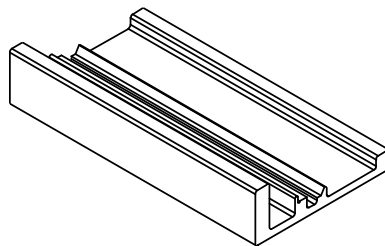
#### STANDARD TOP TOOL PART NUMBERS:

- 162325-001** (8 modules max)
- 162325-002** (12 modules max)
- 162325-003** (21 modules max)

NUMBER	GS-20-001	TYPE	APPLICATION SPECIFICATION	FCI	
TITLE Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)				PAGE	12 of 17
				REVISION	F
				AUTHORIZED BY	Heaven Cen
				DATE	Feb/15/09
				CLASSIFICATION	UNRESTRICTED

#### **BOTTOM TOOLS (BOARD SUPPORT), P/N 162383-XXX**

Board insertion options include customer developed board supports, PCB's with oversized holes, or FCI produced bottom tools. The bottom tools can be cut to the length needed.

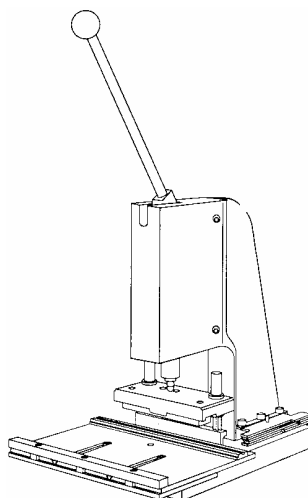



#### STANDARD BOTTOM TOOL PART NUMBERS:

	<u>LENGTH (mm)</u>	<u>LENGTH (in)</u>
<b>162383-001</b>	146.8	5.780
<b>162383-002</b>	194.8	7.669
<b>162383-003</b>	302.8	11.921
<b>162383-004</b>	457.2	18.000
<b>162383-005</b>	609.6	24.000

#### **MT-510 MANUAL PRESS, P/N 162452-001**

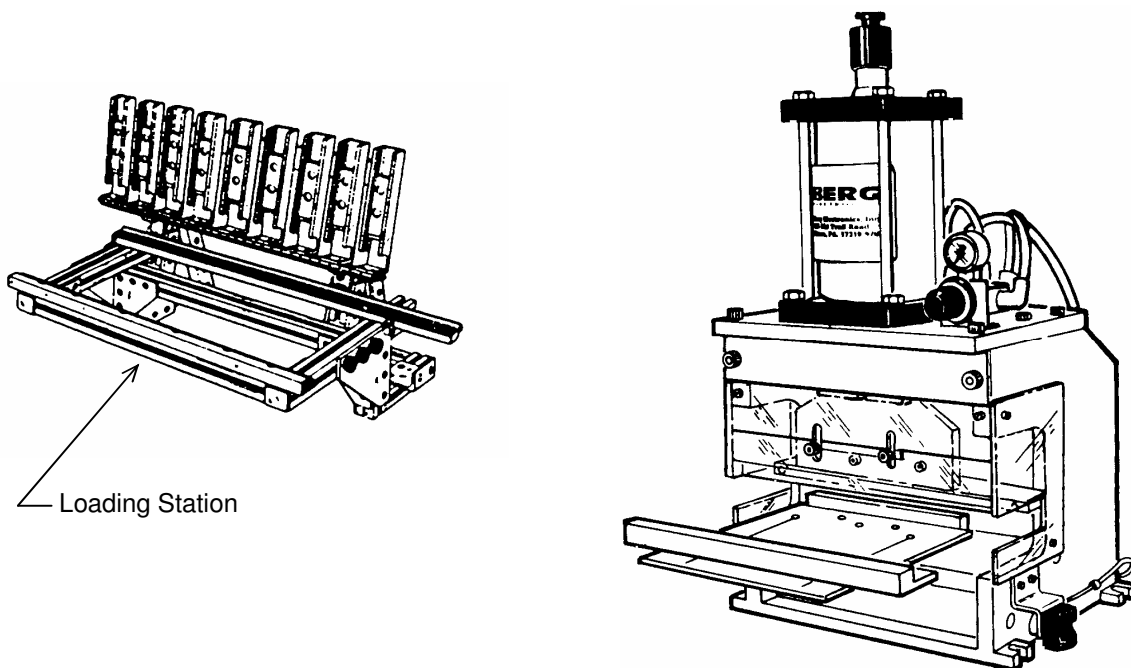
The MT-510 press can insert up to 128 press-fit pins in one stroke.




NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>13 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

**MT-511 PNEUMATIC PRESS, P/N 166380-001 &  
LOADING STATION, P/N 166505-001**

The MT-511 is a pneumatic press that can terminate up to 21 modules per machine cycle. The optional loading station is used to stage the connectors prior to insertion.



NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>14 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

**5.4.2 Removal Tooling** - EACH PRESS BLOCK MUST BE REMOVED BY HAND BEFORE USING ANY REMOVAL TOOLS

**For situations where at least 2.0mm (0.080in) tail length protrudes through the PCB:**

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

The HT-0518 pushes the connector away from the board by pressing against the tails from the bottom side of the board.

**HT-0518 BASE PLATE, P/N 415774-001**

If base plate P/N 415774-001 is ordered, the blade and press bar for each size module to be used is also required.

BLADE PART NUMBERS:  
**413773-001** (1 module)

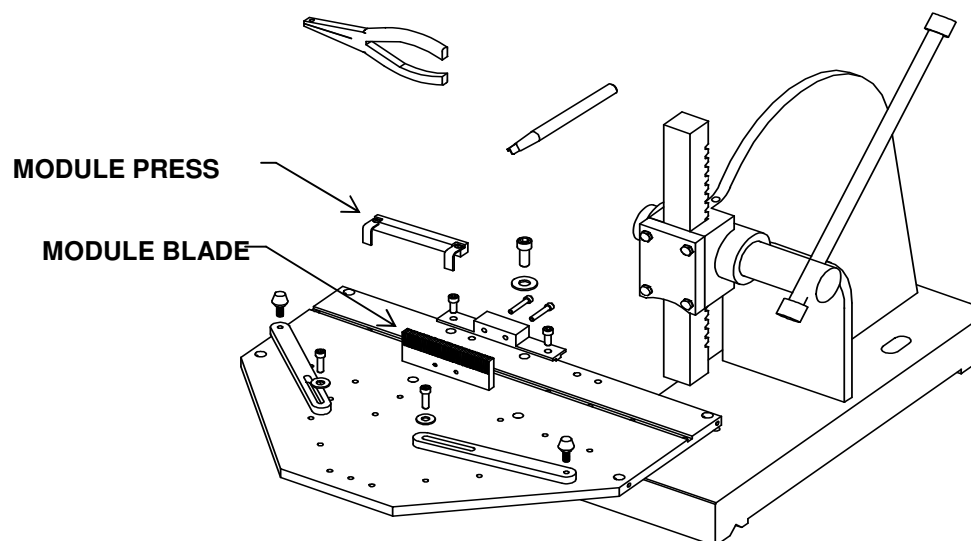
CORRESPONDING PRESS BAR PART NUMBERS:  
**415783-001**


**413776-001** (2 module)

**415783-002**

**413775-007** (3 module)  
**413774-001** (4 module)  
**413775-006** (5 module)  
**413775-001** (8 module)  
**413775-002** (9 module)  
**413775-003** (11 module)  
**413775-004** (12 module)  
**413775-005** (13 module)

**415783-003**  
**415783-004**  
**415783-005**  
**415783-008**  
**415783-009**  
**415783-011**  
**415783-012**  
**415783-013**



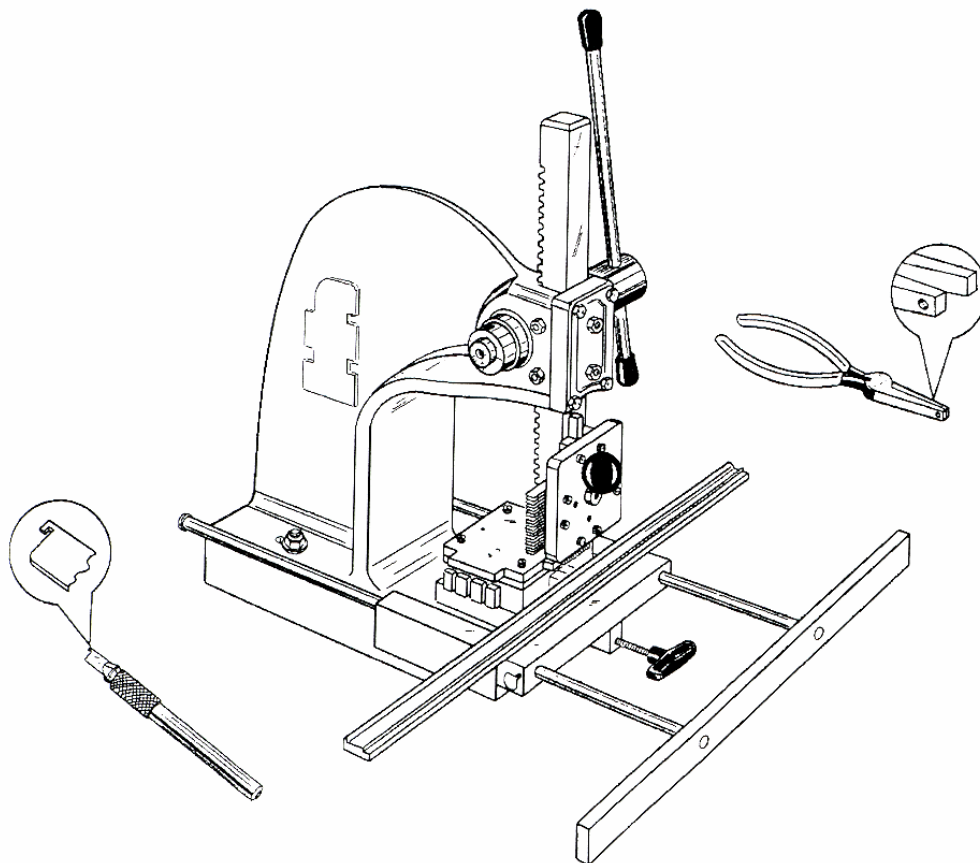
NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>15 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	


**For situations where less than 2.0mm (0.080in) tail length protrudes through the PCB:**

**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)



NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>16 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

## 5.5 Post-Installation Inspection Criteria

### Missing or non-conforming heat stake or press pegs

On any connector, press pegs may be missing or not conforming to the requirements provided that they are bounded on either side by two press pegs that are conforming. The outer two press pegs on either end of the connector must conform to production requirements.

### Gap between bottom surface of receptacle housing and top surface of PCB

In order to decrease the risk of interference between mating connector parts during insertion of the circuit board into the shelf system, it is desirable to not have a gap larger than 0.1mm (.004in) between the bottom surface of the connector receptacle housing and the top surface of the PCB.


### Press-fit tails

All press-fit tails should be fully inserted into the PCB. This requirement shall be considered met if all rows of leads protrude uniformly through the bottom side of the PCB as gauged by eye.

### Mixed Connectors

In applications where this Metral connector system is positioned on a PCB adjacent to another Metral connector system (Metral 1000, Metral 2000, Metral EE, etc.), the allowable vertical misalignment between the housing windows of the two products is 0.3mm (.012in) maximum.



NUMBER <b>GS-20-001</b>	TYPE <b>APPLICATION SPECIFICATION</b>		
TITLE <b>Metral™ B series Right Angle Press-Fit Receptacles (Signal and Power types)</b>		PAGE <b>17 of 17</b>	REVISION <b>F</b>
		AUTHORIZED BY <b>Heaven Cen</b>	DATE <b>Feb/15/09</b>
		CLASSIFICATION <b>UNRESTRICTED</b>	

## REVISION RECORD

### REVISION RECORD

REV.	PAGE	DESCRIPTION	EC#	DATE
A	All	Release	H70651	Oct 1, 1997
B	7	Inserted page 7 with missing fig.4	H80042	Jan 2, 1998
C	3	Change tensile strenght HSTPG in 40 N in 4.2	H80790	Nov 2,1998
	5	New drawing dimensional limits		
D	All	Berg -> FCI Format	H00419	Nov 2, 2000
E	All	Combine Application Specification BUS-20-060	DG08-0057	March 13 <sup>th</sup> 2008
F	All	Updated the press peg retention force	DG09-0054	Feb 15 <sup>th</sup> ,09

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