	TYPE <b>APPLICATION SPECIFICATION</b>	NUMBER <b>GS-20-017</b>	
	TITLE Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	PAGE 1 of 15	REVISION D
		AUTHORIZED BY J. R. Volstorf	DATE 26-Apr-06
STATUS <b>UNRESTRICTED</b>			

**TABLE OF CONTENTS**

1. **OBJECTIVE**..... 1

2. **SCOPE** ..... 1

3. **GENERAL** ..... 2

4. **DRAWINGS AND APPLICABLE DOCUMENTS** ..... 4

5. **APPLICATION REQUIREMENTS** ..... 4

6. **APPLICATION TOOLING** ..... 5

7. **APPLICATION PROCEDURE** ..... 9

8. **POST-APPLICATION INSPECTION REQUIREMENTS** ..... 11

9. **REMOVAL TOOLING** ..... 12

10. **REMOVAL PROCEDURE**..... 14

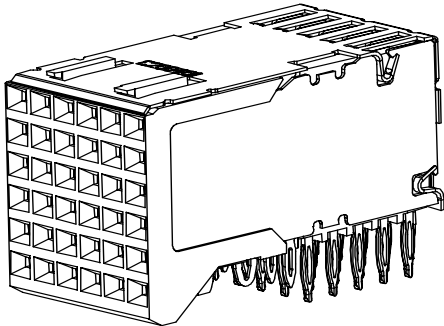
11. **REVISION RECORD**..... 15

**1. OBJECTIVE**


This specification provides information and requirements for customer application of the 5 row Metral™ 1000 & 4000 Series right angle press-fit receptacle. It is intended to provide general guidance for process development. It should be recognized that no single process will work under all customer applications and that customers should develop processes to meet individual needs. However, if the processes vary greatly from the recommended one, FCI cannot guarantee acceptable results.

**2. SCOPE**

This specification provides information and requirements regarding application of 5 row Metral™ 1000 & 4000 Series right angle press-fit receptacles to printed circuit boards (PCB).




**Figure 1 -- Generic Metral™ 1000/4000 Receptacle**

	TYPE <b>APPLICATION SPECIFICATION</b>	NUMBER <b>GS-20-017</b>	
TITLE Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	PAGE 2 of 15	REVISION D	
	AUTHORIZED BY J. R. Volstorf	DATE 26-Apr-06	
STATUS <b>UNRESTRICTED</b>			

### 3. GENERAL

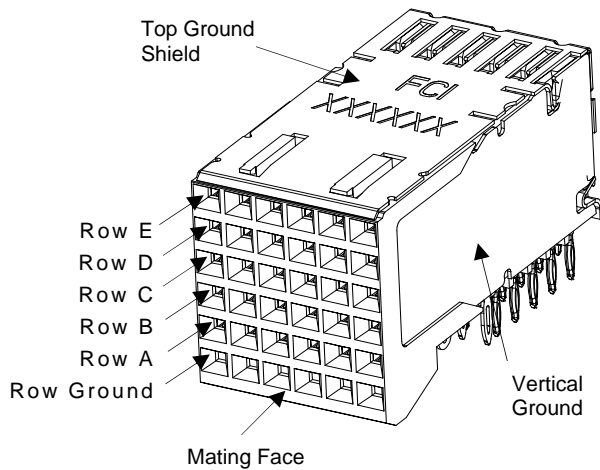
This document is a general application guide. If there is a conflict between the product drawings and this specification, the drawings take precedence.

- Metral™ 1000 & 4000 Series receptacles mate with either 1000, 2000 or 4000 Series 5 row headers.
- *Metral™ 4000 Series receptacles accept a limited number of header pin lengths. See GS-20-014 (noted in Section 4) for details on acceptable pin lengths.*
- Reduced mating forces can be achieved by specifying headers with lubricated and staggered length pins.
- 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
- Manufacturing Processability: All products covered by this specification will withstand exposure to 260°C for 60 seconds in a convection, infra-red or vapor phase reflow oven

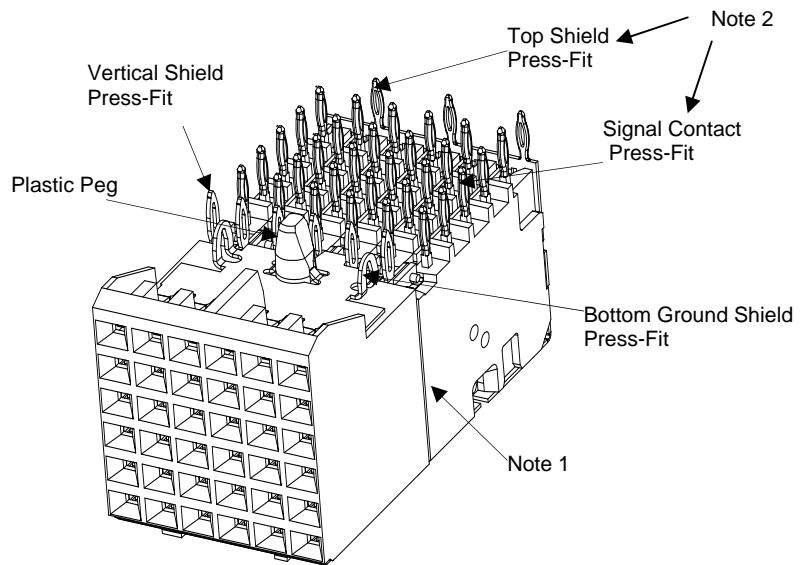
	TYPE <b>APPLICATION SPECIFICATION</b>	NUMBER <b>GS-20-017</b>	
	TITLE Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	PAGE 3 of 15	REVISION D
		AUTHORIZED BY J. R. Volstorf	DATE 26-Apr-06
		STATUS <b>UNRESTRICTED</b>	

Figures 2 & 3 illustrate important features of the Metral™ 1000 & 4000 Series 5 row right angle receptacles. Figure 2 illustrates a generic 5 row (signal) by 6 column 1000/4000 Series receptacle assembly. Rows A - E are signal rows, while Row Ground, the Top Shield and the Vertical Shield are designated as ground paths.

Figure 3 illustrates the bottom features that locate and secure the receptacle to the PCB. The compliant press-fit tails provide a reliable electrical connection between the receptacle and the plated through hole (PTH) of the PCB. Press-fit tails eliminate the need for soldering processing of through-board solder tails. Press-fit technology simplifies rework of assembled boards by allowing a damaged receptacle to be pressed out and replaced.




**Figure 2**



**Figure 3**

- *Note 1* – There is no vertical ground shield on this side of the receptacle. Side-to-side receptacle stacking provides an alternating ground and signal pattern.
- *Note 2* – The signal and top shield press-fit tail geometries differ between the Metral™ 1000 & 4000 Series products and thus use different PTH sizes. Please see the customer drawings for the correct PTH dimensions.

	TYPE <b>APPLICATION SPECIFICATION</b>	NUMBER <b>GS-20-017</b>	
	TITLE Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	PAGE 4 of 15	REVISION D
	AUTHORIZED BY J. R. Volstorf	DATE 26-Apr-06	
	STATUS <b>UNRESTRICTED</b>		

#### 4. DRAWINGS AND APPLICABLE DOCUMENTS

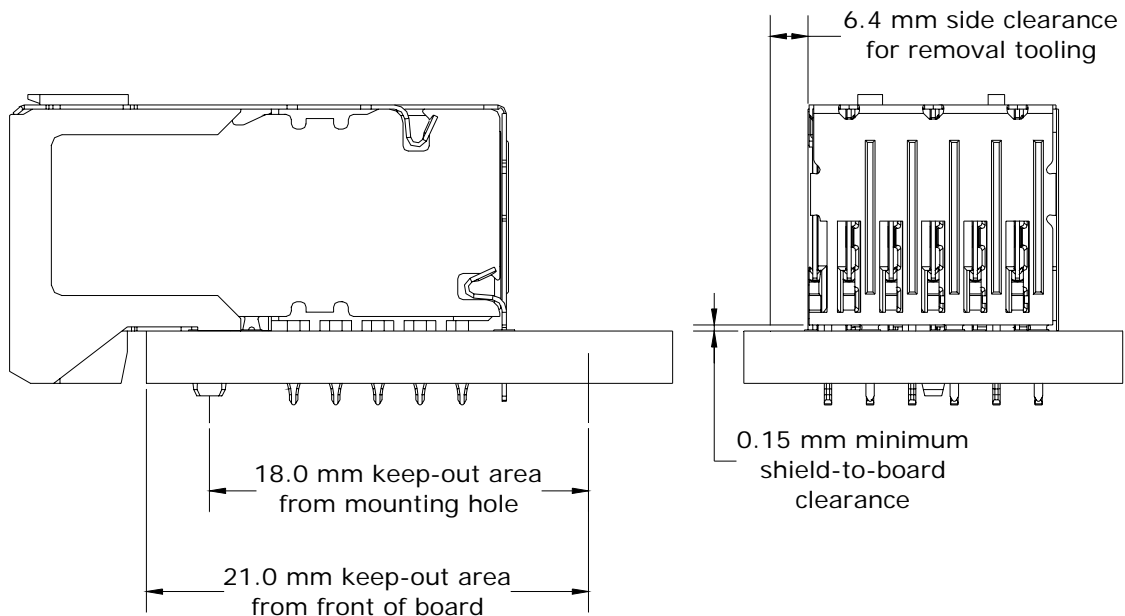
- FCI Product Specification GS-12-110 (Metral™ 1000 & 2000 Series 5 Row Receptacle)
- FCI Product Specification GS-12-184 (Metral™ 4000 Series 5 Row Receptacle)
- FCI Product Drawings
- FCI Application Specification GS-20-010 (Metral™ 1000 & 2000 Series 5 & 8 Row Headers & Shrouds)
- FCI Application Specification GS-20-014 (Metral™ 4000 Series 5 & 8 Row Headers)

FCI product drawings and specifications are available by accessing the FCI website or contacting the FCI Technical Service. In the event of a conflict between this specification and the product drawing, the drawing takes precedence. Customers should refer to the latest revision level of FCI product drawings for appropriate product details.


#### 5. APPLICATION REQUIREMENTS

For specifics of the PCB layout, refer to the customer drawing of the part number being applied.

To enable proper application and repair/removal of the receptacles, there are recommended keep-out zones (see Figure 4).



**Figure 4 -- Keep-out Zones**

	TYPE	APPLICATION SPECIFICATION		NUMBER	GS-20-017
	TITLE	Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row		PAGE	5 of 15
				REVISION	D
				AUTHORIZED BY	J. R. Volstorf
				DATE	26-Apr-06
				STATUS	UNRESTRICTED

## 6. APPLICATION TOOLING

The application tooling recommended for the Metral™ 1000 & 4000 Series 5 row receptacle is defined in Table 1:

Table 1

Tool P/N	Tool Description
415754-5XX	Press Bar (Top Tool)
162383-XXX	PCB Support (Bottom Tool)

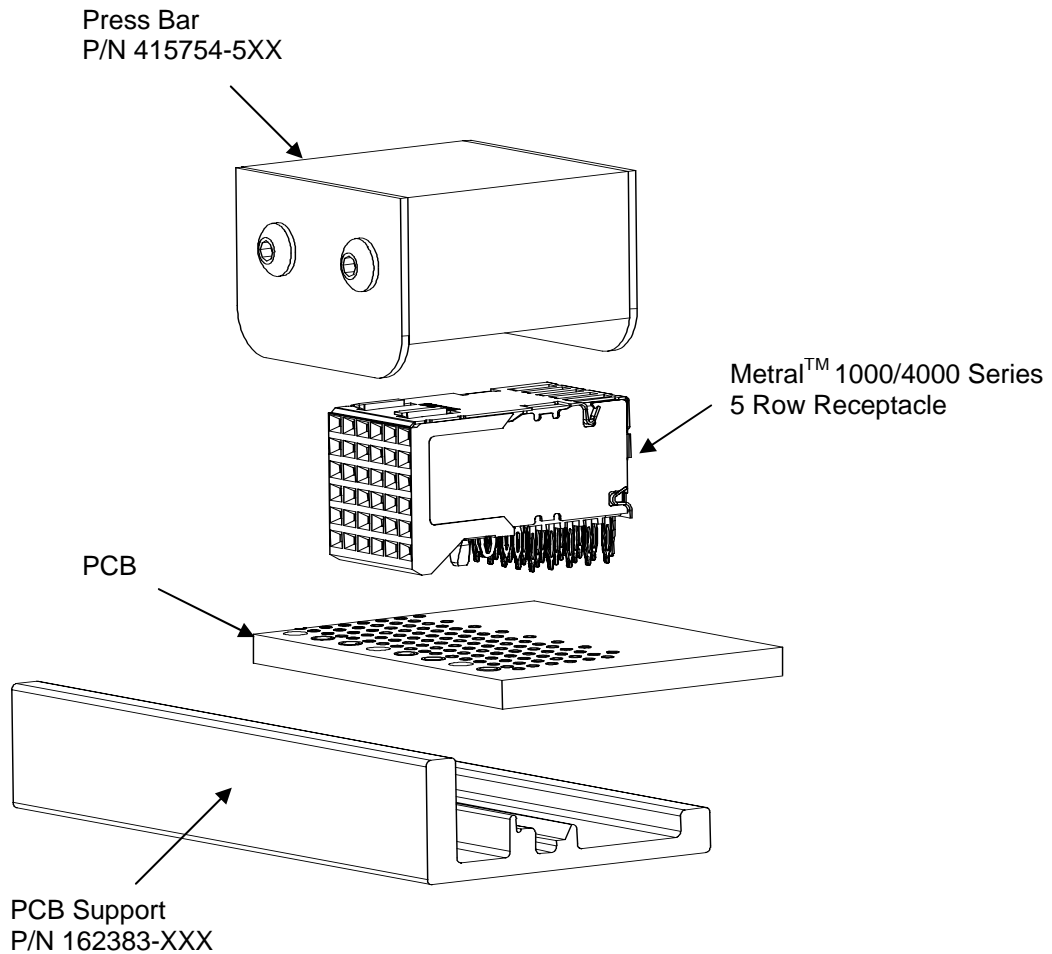



Figure 5 – Application Tooling Overview

	TYPE	APPLICATION SPECIFICATION		NUMBER	GS-20-017			
	TITLE	Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row		PAGE	6 of 15	REVISION	D	
				AUTHORIZED BY	J. R. Volstorf		DATE	26-Apr-06
				STATUS	UNRESTRICTED			

### 6.1. PRESS BAR (TOP TOOL) P/N 415754-5XX

The Press Bar (see Figure 6) is a modified “flat rock” top tool with plates on the sides to support the top shield during insertion. The correct length tool is based on the number of modules being applied. See Table 2 for a list of Press Bar part numbers.

- When applying 1000/4000 Series receptacles that are stacked end-to-end, a standard Press Bar can be used. When applying 1000/4000 Series receptacles separated by spaces with an increment other than 12 mm, a custom Press Bar is required.

Table 2

Tool P/N	Description (Length of Modules)
415754-502	24 mm
415754-503	36 mm
415754-504	48 mm
415754-505	60 mm
415754-506	72 mm
415754-507	84 mm
415754-508	96 mm
415754-509	108 mm
415754-510	120 mm
415754-511	132 mm
415754-512	144 mm
415754-513	156 mm
415754-514	168 mm
415754-515	180 mm
415754-516	192 mm
415754-517	204 mm
415754-518	216 mm
415754-519	228 mm

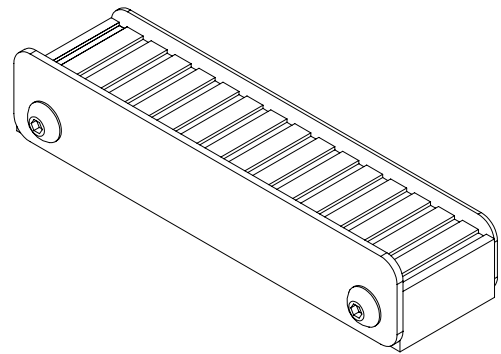



Figure 6 -- Press Bar

	TYPE	APPLICATION SPECIFICATION		NUMBER	GS-20-017			
	TITLE	Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row			PAGE	7 of 15	REVISION	D
				AUTHORIZED BY	J. R. Volstorf		DATE	26-Apr-06
				STATUS	UNRESTRICTED			

## 6.2. PCB SUPPORT (BOTTOM TOOL) P/N 162383-XXX

The PCB Support (see Figure 7) provides a support surface during insertion and includes clearance areas for the press-tails as protrude through the board. FCI offers various PCB Support sizes as listed Table 3. These supports can be cut to length as required. A PCB with oversized holes can also be used, however the FCI tooling is recommended for best results.

Table 3

Part No.	Tool Length
	(mm)
162383-001	146.8
162383-002	194.8
162383-003	302.8
162383-004	471.7
162383-005	609.6

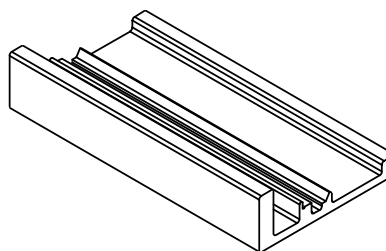


Figure 7 -- PCB Support

## 6.3. APPLICATION TOOLING

### Insertion Press

The insertion tooling can work in a variety of presses. Several important items to consider when utilizing an insertion press:

- The press must have sufficient force capabilities to insert the specific receptacle configuration.
- The press ram should be sufficiently long to cover the Press Bar tooling. This will prevent tooling flex.
- The press table should be large enough to properly accommodate the PCB size.


Typical press types are:

- \* Manual arbor press
- \* Pneumatic press
- \* Hydraulic press
- \* Servo driven electronic press (IMPRESS)

Typical frame types:

- \* "C" frame
- \* "H" frame

The preferred press type is the servo driven electronic press. This press gives the best control during the insertion process and offers the most flexibility. FCI offers arbor, pneumatic and electronic presses. For more information, contact your local Customer Service Representative.

	TYPE	APPLICATION SPECIFICATION		NUMBER	GS-20-017			
	TITLE	Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row			PAGE	8 of 15	REVISION	D
				AUTHORIZED BY	J. R. Volstorf		DATE	26-Apr-06
				STATUS	UNRESTRICTED			

FCI provides a range of state-of-the-art press-fit insertion machines. The IMPRESS family has the following offerings:

**IMPRESS 2000:** a modular based fully automated pick-and-place insertion machine.

**IMPRESS 1000:** a semi-automatic step-and-repeat press with motor driven xy-table.

**IMPRESS 500E:** a hand-operated servo driven C-frame press.


**Baby IMPRESS:** a flat-bed servo motor driven bench-press.

**IMPRESS 500M+:** a hand-operated C-frame bench-press.

Please refer to the following table for relevant specifications:

Type	2000 XL	1000 XXL	500E	Baby IMPRESS	500M+
Cat. No.	PAH13302	PAH156	PAY284A2	PAY326	PAY479
Press force	40 kN	80 kN	80 kN	20 ... 50 kN	15 kN
Board size (1)	950 x 635 mm	1200 x 625 mm	720 x 580 mm	600 mm between posts of the H-bridge	270 mm throat depth
Max. tool size	160 mm	255 mm	255 mm	255 mm	150 mm
Press cycle per hour (2)	900	700 ... 900	600	500	300
Tool exchange	Automatically	Manually or automatically (option)	Manually	Manually	Manually
Board stuffing	Automatic pick-and-place	Manually	Manually	Manually	Manually
Board positioning	Automatically	Automatically	Manually (LMT-system optional)	Manually	Manually
Board support	Rising post	Rising post	Rising post	Flat bed	Fixed anvil or flat bed
Force controlled press stroke	Provided	Provided	Provided	Provided	Not provided

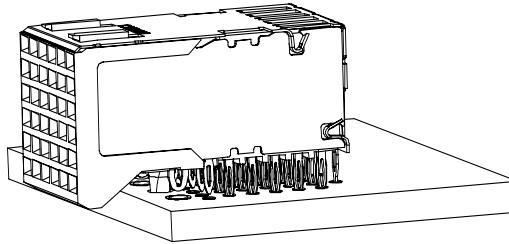


	TYPE <b>APPLICATION SPECIFICATION</b>	NUMBER <b>GS-20-017</b>	
TITLE Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	PAGE 9 of 15	REVISION D	
	AUTHORIZED BY J. R. Volstorf	DATE 26-Apr-06	
STATUS <b>UNRESTRICTED</b>			

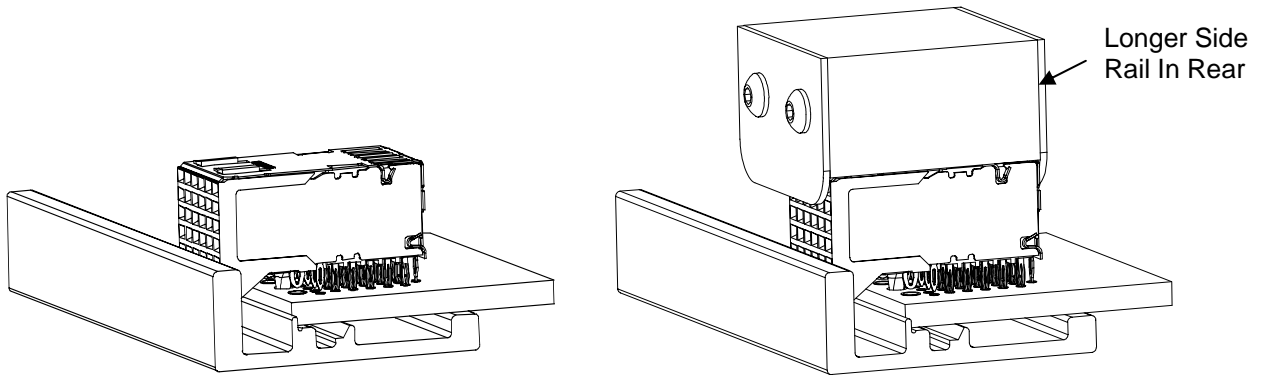
## 7. APPLICATION PROCEDURE

The application procedure for 1000 & 4000 Series receptacles is as follows:


- Place receptacle(s) in the desired location on the PCB taking care to assure that all press-fit tails line up with the proper holes.



- Place the Press Bar and PCB Support in the proper location with respect to the receptacle(s) and PCB as shown below.



- To ensure proper insertion, **RECEPTACLES MUST BE CENTERED BENEATH THE PRESS RAM.** Offset loading may result in improper seating of the receptacle(s) and mating problems.

	TYPE <b>APPLICATION SPECIFICATION</b>	NUMBER <b>GS-20-017</b>	
	TITLE Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	PAGE 10 of 15	REVISION D
		AUTHORIZED BY J. R. Volstorf	DATE 26-Apr-06
STATUS <b>UNRESTRICTED</b>			

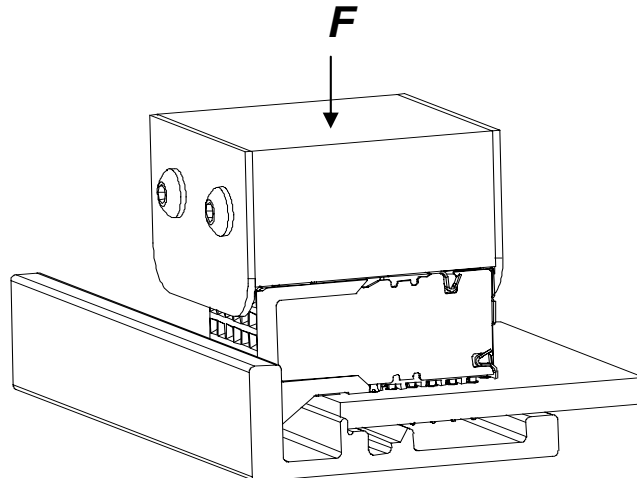
- Insertion press guidelines:

Product Version	Recommended Max Force Setting For Application Press
Metral™ 1000 Series 5 Row Receptacle	45 N (10.1 lbs) Maximum Force Per Press-Fit (Including Grounds)
Metral™ 4000 Series 5 Row Receptacle	60 N (13.5 lbs) Maximum Force Per Press-Fit (Including Grounds)


- There are several types of press-fit tail geometries on the receptacle. The recommended maximum force per press-fit has been determined to yield acceptable insertion results for SnPb PTHs. While it is acceptable to use a lower force per press-fit, steps should be taken to guarantee that the receptacle is fully seated (see Section 8). Force settings may vary with different types of PTH finishes. Customers should develop parameters that best suit individual application requirements.

**EXAMPLE:** For one Metral™ 1000 Series 5x6 receptacle module, there are 41 press-fit tails being inserted into the PC board (including both signals and grounds). Therefore, the maximum recommended press setting would be 1845 N (41 press-fit tails x 45 N).

- Actuate the insertion press
  - Actuation of the insertion press should be slow and controlled, not fast like a punch press. Inserting to a certain pressure will yield more consistent results than inserting to a set distance.



- Remove assembly from insertion press.
- Inspect product for proper application.

	<b>TYPE</b> <b>APPLICATION SPECIFICATION</b>	<b>NUMBER</b> <b>GS-20-017</b>	
	<b>TITLE</b> Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	<b>PAGE</b> 11 of 15	<b>REVISION</b> D
	<b>AUTHORIZED BY</b> J. R. Volstorf	<b>DATE</b> 26-Apr-06	
	<b>STATUS</b> <b>UNRESTRICTED</b>		

## 8. POST-APPLICATION INSPECTION REQUIREMENTS

Post-application inspection should consist of several simple checks to assure that the receptacle is applied properly and is not damaged.

- Visually assure that all press-fit tails are seated in the proper PCB holes and that none have been crushed during application.
- Visually assure that the plastic standoffs on the bottom of the assembly are seated within 0.13 mm of flush to the PCB but not crushed (see Figure 8). A larger gap beneath the standoffs may indicate that the receptacle is not seated parallel to the board. This can cause receptacle misalignment with adjacent Metral™ components.
- For Metral™ 1000 product shipped prior to November 2001, position of the bottom ground contact is sensitive to over/under application of the product. Consequently, it should be checked relative to the windows of the housing mating face. In a proper application, the bottom ground contact should intrude into its respective housing window no more than 0.35 mm (see Figure 9). A visual screening can be implemented where the mating surface of the contact should not protrude more than halfway into the window.
- In applications where a 1000 or 4000 Series receptacle is positioned adjacent to a standard Metral™ receptacle, the maximum allowable vertical misalignment between contact windows in adjacent receptacles is 0.3 mm.

Correct Seating: Standoffs within 0.13 mm of flush to the PCB

Incorrect Seating: Standoffs lifted more than 0.13 mm off of board

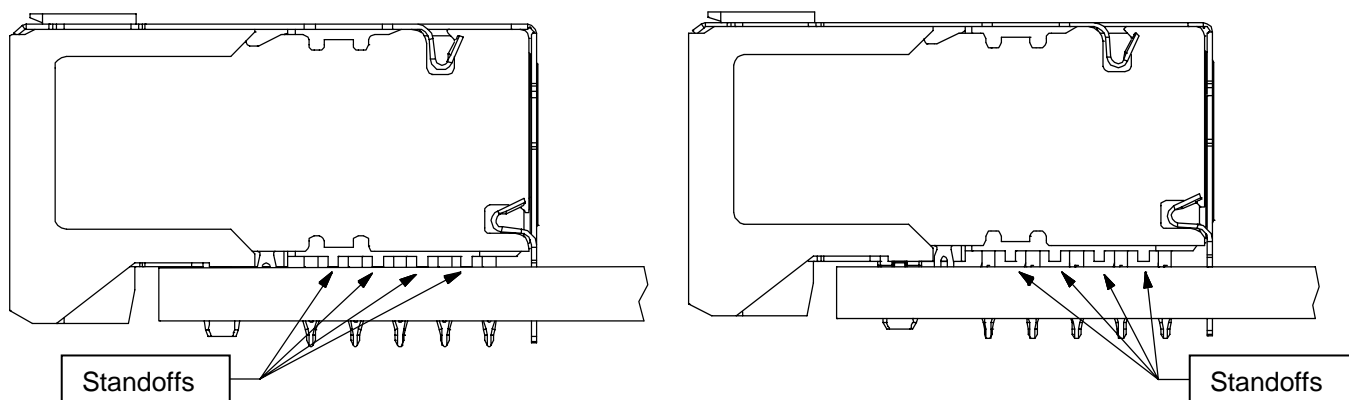

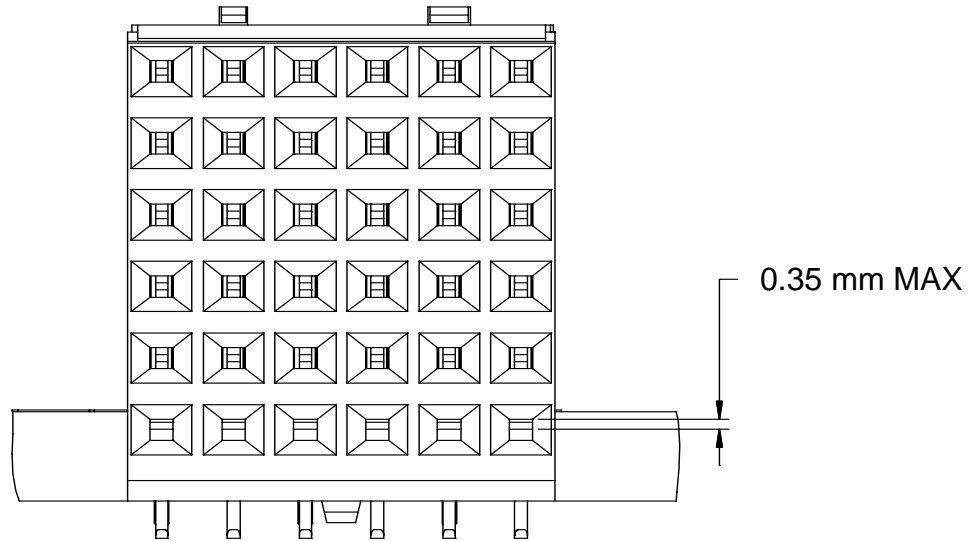


Figure 8 -- Proper Receptacle Seating

	<b>TYPE</b> <b>APPLICATION SPECIFICATION</b>	<b>NUMBER</b> <b>GS-20-017</b>	
	<b>TITLE</b> Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	<b>PAGE</b> 12 of 15	<b>REVISION</b> D
	<b>AUTHORIZED BY</b> J. R. Volstorf	<b>DATE</b> 26-Apr-06	
	<b>STATUS</b> <b>UNRESTRICTED</b>		




**Figure 9 -- Proper Bottom Ground Contact Position**

*For product manufactured prior to November 2001*

## 9. REMOVAL TOOLING

There are two removal tooling options:

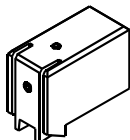
Option No.	Tool Description	FCI P/N	Product Description	Application
1	HT-542 Removal Tool Assembly, Protruding Pin	415744-001	1 module (5x6) Metral™ 1000/4000 Series Right Angle Receptacle	Configuration in which the press-fit tails protrude at least 1.02 mm (0.040 in) below the board.
2	HT-536 Removal Tool Assembly, Universal	416293-001	1 module (5x6) Metral™ 1000/4000 Series Right Angle Receptacle	Configuration that is independent of the press-fit tail protrusion below the board.

	TYPE	APPLICATION SPECIFICATION		NUMBER	GS-20-017	
	TITLE			PAGE	REVISION	
Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row			13 of 15		D	
			AUTHORIZED BY		DATE	
			J. R. Volstorf		26-Apr-06	
			STATUS			
			UNRESTRICTED			

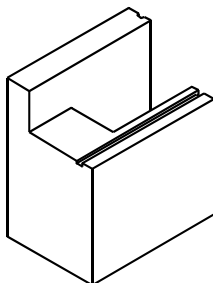
### 9.1. Option 1 Removal Tooling (see Figure 10)

#### FEATURES:

- Removes one (1) 5x6 1000/4000 Series receptacle from a 2.03 mm (0.080 in) MAX thick PCB.
- Used manually with the HT-518 (FCI P/N 415774-001) Removal Press or in any standard arbor press.
- Alignment features to ensure proper tooling-to-receptacle relationship.
- Pressing pin to ensure that the press peg is removed before the contacts.
- Removal kit includes Removal Press Block and Bottom Board Support Block.



Removal Press Block  
P/N 415765-001 (Included)




Bottom Board Support Block  
P/N 415940-001 (Included)

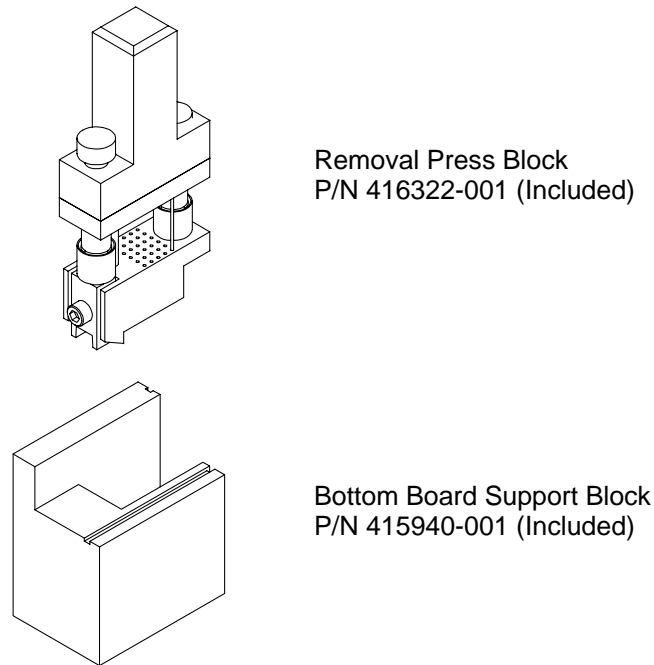
Figure 10 -- Removal Tooling, P/N 415744-001, Option 1

### 9.2. Option 2 Removal Tooling (see Figure 11)

#### FEATURES:

- Removes one (1) 5x6 1000/4000 Series receptacle from a PCB of thickness > 2.03 mm (0.080 in).
- Used manually with the HT-518 (FCI P/N 415774-001) Removal Press or in any standard arbor press.
- Alignment features to ensure proper tooling-to-receptacle relationship.
- Pressing pin to ensure the press peg is removed before the contacts.
- Removal kit includes Removal Press Block and Bottom Board Support Block.

	<b>TYPE</b> <b>APPLICATION SPECIFICATION</b>	<b>NUMBER</b> <b>GS-20-017</b>	
	<b>TITLE</b> Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row	<b>PAGE</b> 14 of 15	<b>REVISION</b> D
	<b>AUTHORIZED BY</b> J. R. Volstorf	<b>DATE</b> 26-Apr-06	
	<b>STATUS</b> <b>UNRESTRICTED</b>		




**Figure 11 -- Removal Tooling, P/N 416293-001, Option 2**

## 10. REMOVAL PROCEDURE

The procedure is summarized below. For further details, see FCI Manual 415942-001 for the Option 1 Removal Tooling and 416335-001 for the Option 2 Removal Tooling.

- Insert the Bottom Board Support Block in the removal press.
- Properly place the PCB onto the Bottom Board Support Block.
- Align and place the Removal Press Block onto the receptacle that is to be removed.
- Actuate the removal press until the receptacle is free of the PCB.
- Replace with a new receptacle per the application procedure in Section 7 of this specification.

	TYPE	APPLICATION SPECIFICATION		NUMBER	GS-20-017		
	TITLE	Application Guide Metral™ 1000 & 4000 Series Receptacles – 5 Row		PAGE	15 of 15	REVISION	D
				AUTHORIZED BY	J. R. Volstorf	DATE	26-Apr-06
				STATUS	UNRESTRICTED		

## 11. REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	ALL	INITIAL RELEASE (SUPERSEDES BUS-20-071)	V20203	01/31/02
B	4-6,10-13 10,11	CORRECT FIGURE NAMES (FIGS. 4 – 10) UPDATE 'PRIOR TO 2002' TO 'PRIOR TO NOVEMBER 2001'	V20708	04/17/02
C	ALL	ADD LEAD FREE INFORMATION	V05-0929	10/3/05
D	ALL	CHANGE LOGO	V06-0405	4/26/06