



TYPE  
**APPLICATION SPECIFICATION**

NUMBER  
**GS-20-022**

TITLE  
Application Guide  
Millipacs® HM 5 and 8 Row Right Angle & Straight Signal Receptacles  
Millipacs® HM Right Angle Headers

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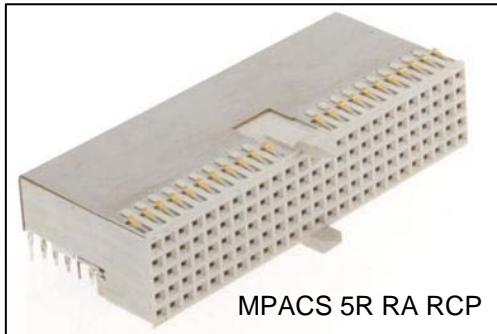
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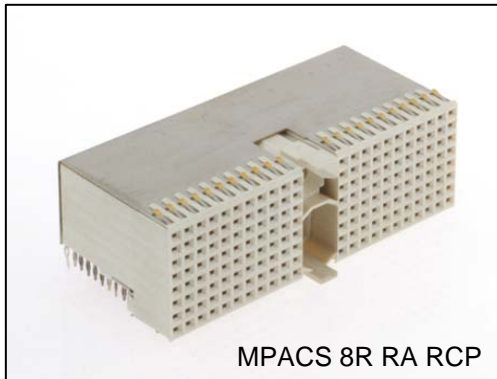
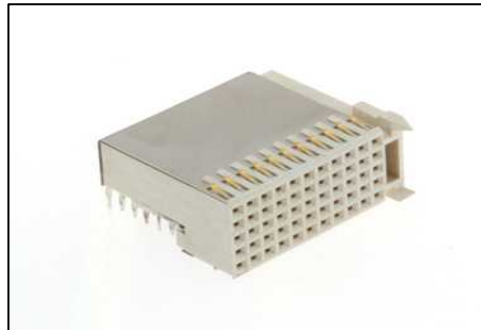
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## Millipacs® HM 5 & 8 Row Receptacle & Right Angle Header

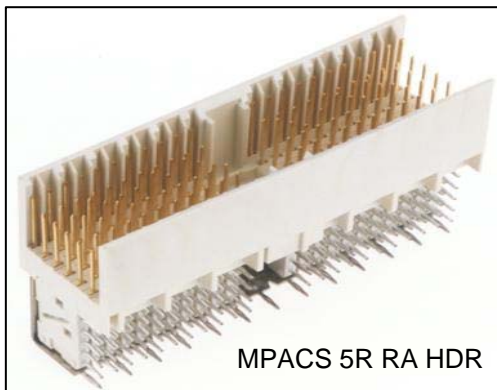
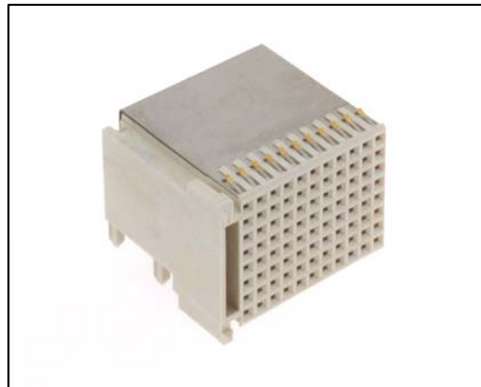
### Application Specification



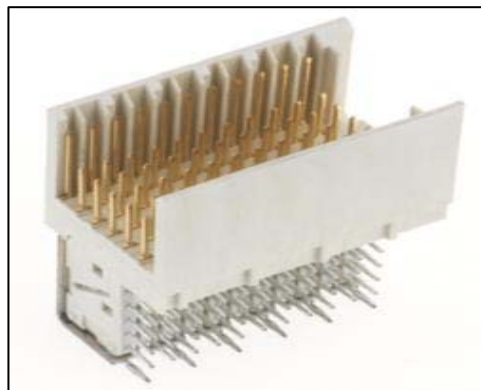
MPACS 5R RA RCP




MPACS 8R RA RCP




MPACS 5R RA HDR



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## 1. OBJECTIVE

This specification provides information and requirements for customer application of the 5 & 8 row Millipacs<sup>®</sup> HM right angle press-fit receptacles and right angle headers. It is intended to provide general guidance for process development and the use of FCI application tooling. 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 & 8 row Millipacs<sup>®</sup> HM right angle press-fit receptacles and right angle headers to printed circuit boards (PCB) along with the application of associated shielding.

## 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.

Figures 3 & 4 illustrate important features of the Millipacs<sup>®</sup> HM 5 & 8 row right angle receptacles.

Figure 4 illustrates the bottom features that locate and secure the connectors to the PCB. The compliant press-fit tails provide a reliable electrical connection between the connector and the plated through hole (PTH) of the PCB. Press-fit tails eliminate the need for soldering processing of through-board solder tails.

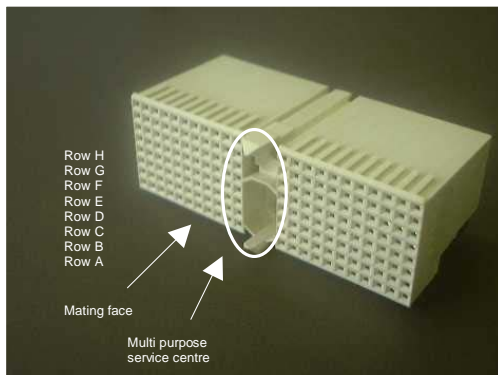


Figure 3

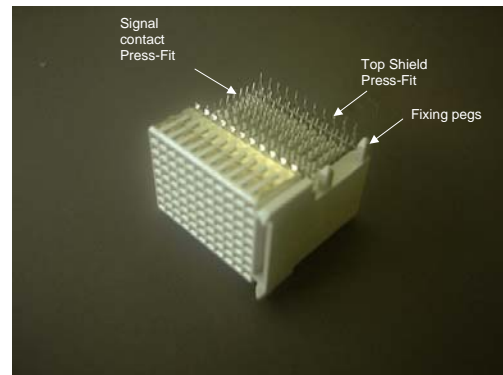



Figure 4

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#### 4. DRAWINGS AND APPLICABLE DOCUMENTS

- FCI Product Specification GS-12-203 Millipacs® HM
- FCI Product Drawings
- FCI Application Specification GS-20-XXX (Millipacs® HM 5 & 8 Row Headers & Shrouds)
- FCI Product Catalog
- IEC 1076-4-101
- IEC 917

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.

##### 4.1. Part Numbering Logic

			HM2	P	07	P	D	5	1	1	0	N9	LF	LF – Lead Free Blank - Leaded																															
P	Vertical Header																																												
J	Right Angle Header																																												
<table border="1"> <thead> <tr> <th>with fixing peg</th> <th>w/o fixing peg</th> <th>Housing Type</th> </tr> </thead> <tbody> <tr><td>07</td><td>40</td><td>A (22 pos)</td></tr> <tr><td>n/a</td><td>08</td><td>B (25 pos)</td></tr> <tr><td>n/a</td><td>70</td><td>B (22 pos)</td></tr> <tr><td>n/a</td><td>71</td><td>B (19 pos)</td></tr> <tr><td>n/a</td><td>65</td><td>AB (25 pos)</td></tr> <tr><td>n/a</td><td>66</td><td>AB (22 pos)</td></tr> <tr><td>n/a</td><td>67</td><td>AB (19 pos)</td></tr> <tr><td>09</td><td>60</td><td>C</td></tr> <tr><td>80</td><td>n/a</td><td>C reverse</td></tr> </tbody> </table>			with fixing peg	w/o fixing peg	Housing Type	07	40	A (22 pos)	n/a	08	B (25 pos)	n/a	70	B (22 pos)	n/a	71	B (19 pos)	n/a	65	AB (25 pos)	n/a	66	AB (22 pos)	n/a	67	AB (19 pos)	09	60	C	80	n/a	C reverse	"5" Rows												
with fixing peg	w/o fixing peg	Housing Type																																											
07	40	A (22 pos)																																											
n/a	08	B (25 pos)																																											
n/a	70	B (22 pos)																																											
n/a	71	B (19 pos)																																											
n/a	65	AB (25 pos)																																											
n/a	66	AB (22 pos)																																											
n/a	67	AB (19 pos)																																											
09	60	C																																											
80	n/a	C reverse																																											
<table border="1"> <thead> <tr> <th>with fixing peg</th> <th>w/o fixing peg</th> <th>Housing Type</th> </tr> </thead> <tbody> <tr><td>87</td><td>81</td><td>D (22 pos)</td></tr> <tr><td>85</td><td>n/a</td><td>D (16 pos)</td></tr> <tr><td>n/a</td><td>88</td><td>E (25 pos)</td></tr> <tr><td>n/a</td><td>95</td><td>DE (25 pos)</td></tr> <tr><td>89</td><td>n/a</td><td>F</td></tr> <tr><td>82</td><td>90</td><td>F reverse</td></tr> </tbody> </table>			with fixing peg	w/o fixing peg	Housing Type	87	81	D (22 pos)	85	n/a	D (16 pos)	n/a	88	E (25 pos)	n/a	95	DE (25 pos)	89	n/a	F	82	90	F reverse	"8" Rows																					
with fixing peg	w/o fixing peg	Housing Type																																											
87	81	D (22 pos)																																											
85	n/a	D (16 pos)																																											
n/a	88	E (25 pos)																																											
n/a	95	DE (25 pos)																																											
89	n/a	F																																											
82	90	F reverse																																											
P	Press-fit																																												
													L9	Telcordia UE																															
													E9	Level 1(500 Mating cycl;es)																															
													N9	Level 2 (250 Mating cycles)/Telcordia CO																															
													Z1	Level 3 (50 mating cycles)																															
													GE	Telcordia UE ->Rear Plug-up																															
													GL	Level 1 (500 Mating cycles)-> Rear Plug-up																															
													GF	Level 2 (250 mating cycles) -> Rear Plug-up																															
													GC	Level 3 (50 Mating cycles) -> Rear Plug-up																															
													0	Not Shielded																															
													1	Shielded																															
													Other	Special Shielding																															
													1	Standard mating height (5.3mm)																															
													Other	sequential assignment for custom pattern																															
													1	Standard mating height (5.3mm)																															
													Other	sequential assignment for custom pattern																															
													Other	Sequential assignment for patterns																															
													Z	2.1mm tails																															
													C	4.5mm tails																															
													D	3.7mm tails (standard)																															
													K	13.0 mm tails -> rear plug-up																															
													M	14.5 mm tails -> rear plug-up																															
													N	16.0 mm tails -> rear plug-up																															

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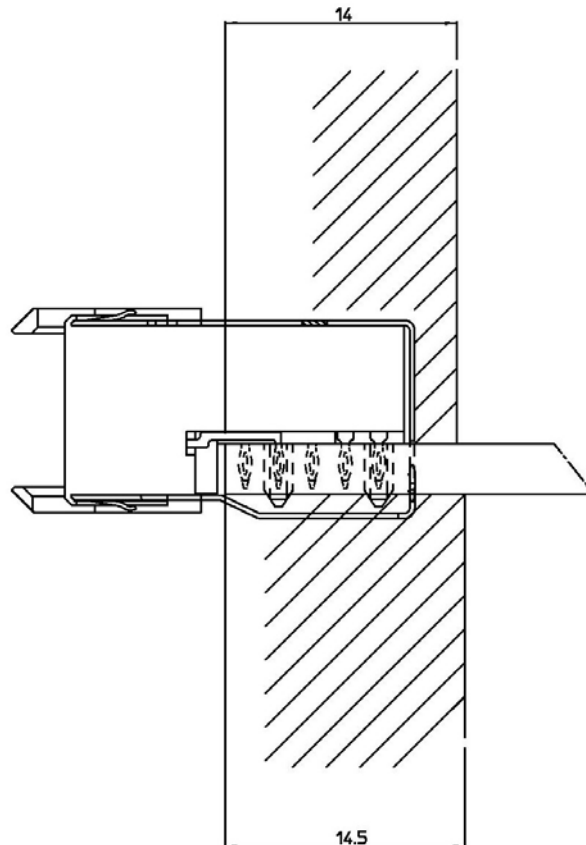
## 5. APPLICATION REQUIREMENTS

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 5, 6, 7, 8).

### 5.1. *Shielded right angle receptacle connectors*

#### 5.1.1. 5 Row connector with one piece cover shield



**Figure 5 -- Keep-out Zones**



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### 5.1.2. 8 Row connector with one piece cover shield

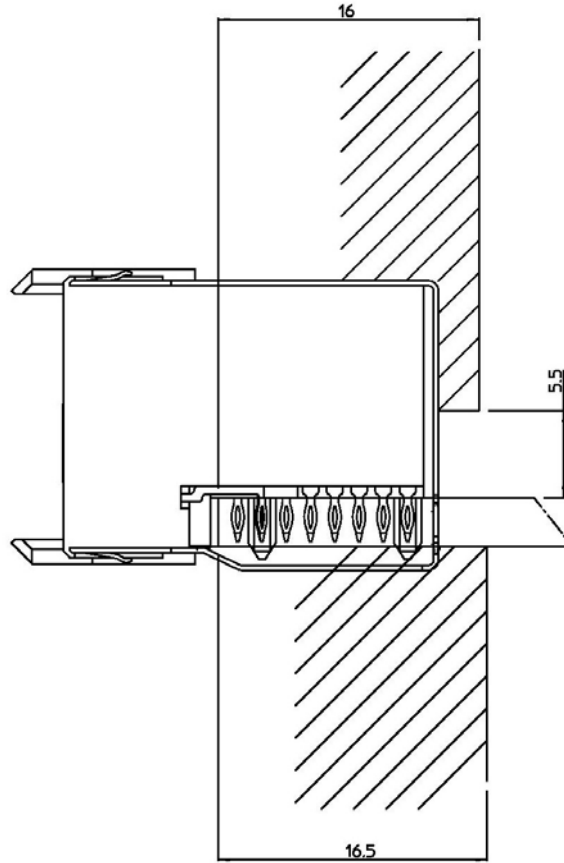


Figure 6 -- Keep-out Zones



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### 5.1.3. 8 Row connector with clip on shield

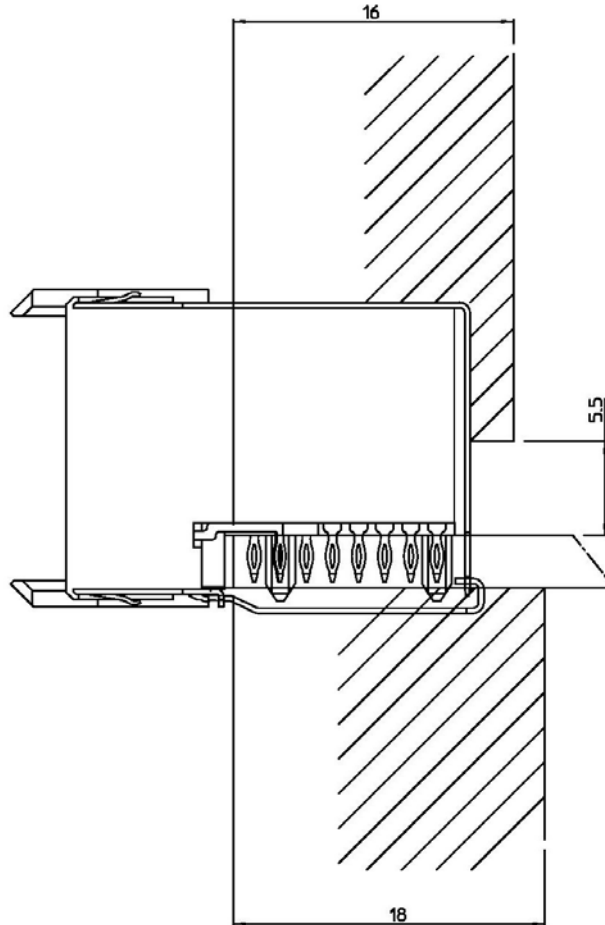



Figure 7 -- Keep-out Zones

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**5.2. Shielded right angle Header connector**

Same keep out zones as the 5 row receptacle connector.

**5.3. Non-shielded connectors**

For non-shielded connectors there are no keep-out zones specified.

**6. CODING KEYS**

Connectors with a Service Center can be set up with Coding Keys which create defined intermatable pairs preventing all electrical contact to any connector outside of the coded configuration. Coding Keys are inserted into the connector Service Center using FCI tool HM2Y197E.




**Figure 8 -- Coding Keys**



**Figure 9 -- HM2Y197E**



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## 7. APPLICATION TOOLING

The application tooling recommended for the Millipacs® HM 5 & 8 row receptacle is defined in Table 1:

**Table 1**

IMPRESS 500					
5 ROW	without LMT			with LMT**	
	Anvil	Adapter*	Push blade***	Anvil	LMT-blade
<b>MODULES</b>					
A	PAY307A3	PAY308A91	PAY308A2	PAY307A3	PAY308A49
B (25pos.)	PAY307A3	PAY308A91	PAY308A2	PAY307A3	PAY308A49
B (19pos.)	PAY307A91	On request	PAY308A2	PAY307A91	PAY308A68
B (22pos.)	PAY307A90	On request	PAY308A2	PAY307A90	PAY308A67
AB (25pos.)	PAY307A3	PAY308A91	PAY308A2	PAY307A3	PAY308A49
AB (22pos.)	PAY307A90	On request	PAY308A2	PAY307A90	PAY308A67
AB (19pos.)	PAY307A91	On request	PAY308A2	PAY307A91	PAY308A68
C / CR	PAY307A92	PAY308A92	PAY308A2	PAY307A92	PAY308A110
M	PAY307A3	On request	PAY308A2	PAY307A3	PAY308A49
M (pre-ass.)	PAY307A68	On request	PAY308A2	on request	On request
L (pre-ass.)	PAY307A69	On request	PAY308A2	on request	On request
N (pre-ass.)	PAY307A70	On request	PAY308A2	on request	On request
8 ROW	without LMT			with LMT**	
	Anvil	Adapter*	Push blade	Anvil	LMT-blade
<b>MODULES</b>					
D	PAY307A71	PAY308A54	PAY308A2	PAY307A71	PAY308A30
E	PAY307A71	PAY308A54	PAY308A2	PAY307A71	PAY308A30
F / FR	PAY307A74	PAY308A55	PAY308A2	PAY307A74	PAY308A73
DE (25pos.)	PAY307A71	PAY308A54	PAY308A2	PAY307A71	PAY308A30
DE (22pos.)	PAY307A76	PAY308A111	PAY308A2	PAY307A76	PAY308A106
DE (19pos.)	PAY307A75	PAY308A112	PAY308A2	PAY307A75	PAY308A107
CPCI	without LMT			with LMT **	
	Anvil	Adapter*	Push blade	Anvil	LMT-blade
<b>MODULES</b>					
AB (22pos.)	PAY307A45	On request	PAY308A2	PAY307A45	PAY308A67
AB (19pos.)	PAY307A44	On request	PAY308A2	PAY307A44	PAY308A68
A	PAY307A3	On request	PAY308A2	PAY307A3	PAY308A49
B (19pos.)	PAY307A44	On request	PAY308A2	PAY307A44	PAY308A68
B (22pos.)	PAY307A45	On request	PAY308A2	PAY307A45	PAY308A67
STRAIGHT	without LMT			with LMT **	
	Anvil	Adapter*	Push blade	Anvil	LMT-blade
<b>MODULES</b>					



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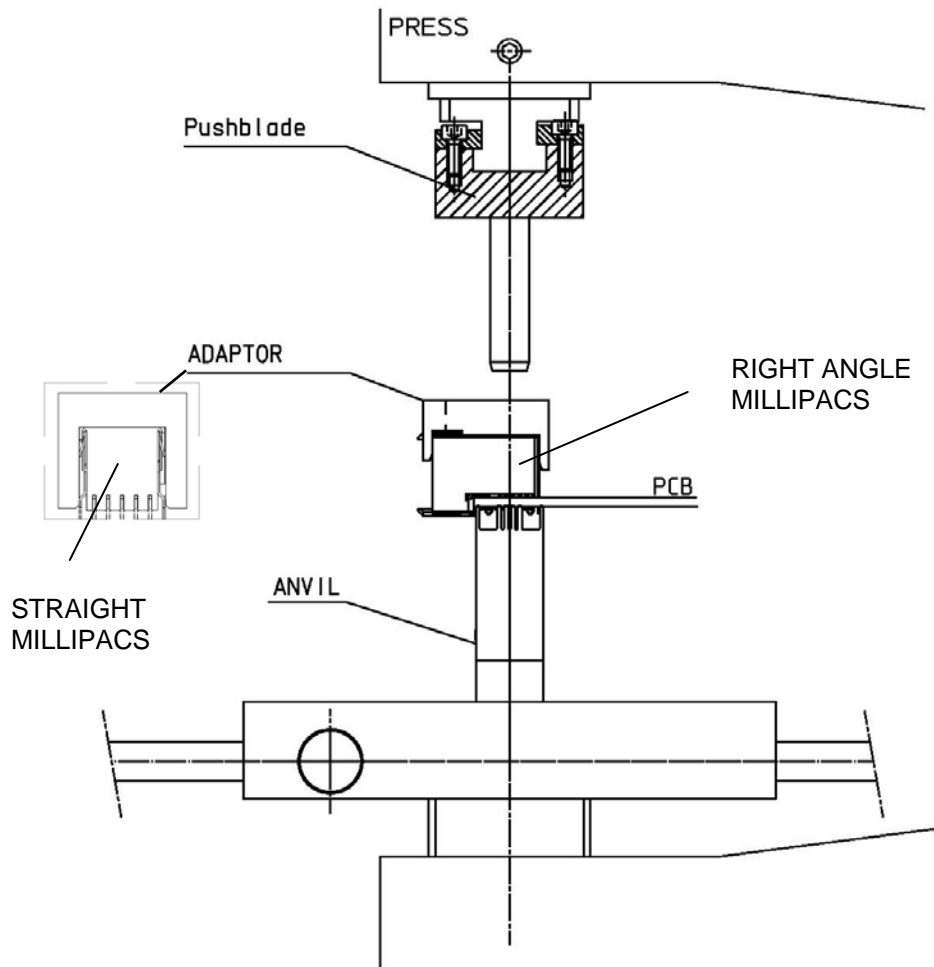
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<b>A/B</b>	PAY307A3	10118254	PAY308A2	PAY307A3	PAY308A49
<b>C</b>	PAY307A92	10118255	PAY308A2	PAY307A92	PAY308A110
(***) : PAY308A2 is 50mm long. In case of 19 and 22 pos. on request.					
(**) : not available on IMPRESS 500M+ and Baby IMPRESS					
(*) : adapter is only needed in case of shielded connectors					

**Remark :**

- Tooling for the Millipacs® HM 5 row right angle header is the same as the tooling in table 1, except for the adapter. The adapters for the headers are only needed in case of shielded connectors. The part numbers for the headers adapters are on request.
- Tools for the IMPRESS 1000 are the same as for the IMPRESS 500 with LMT.
- Tools for the IMPRESS 2000 are on request.



**Figure 10 – Application Tooling Overview**

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### 7.1. *Push blade (TOP TOOL)*


The Press Bar is a “flat rock” type of tool. The correct length tool is based on the length of the module being applied.

- When applying receptacles (headers) that are stacked end-to-end, a longer Press Bar can be used.
- When applying receptacles (headers) separated by spaces a custom Press Bar may be required.
- When applying shielded and non-shielded connectors stacked end-to-end, a custom Press Bar is required.

### 7.2. *Anvil (BOTTOM TOOL)*

The PCB Support 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 1.

- When applying receptacles (headers) that are stacked end-to-end, a longer Anvil can be used.

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### 7.3. 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 (header) configuration.
- When pressing shielded connectors, the push blade should be sufficiently long to cover the adapter 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
- \* Servo driven electrical press

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

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.

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Please refer to the following table 2 for relevant specifications:


**Table 2**

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

(1) : board size means maximum PCB size. For maximum daughterboard size refer to the specifications.

(2) : these capacity figures are only an indication while the real capacity depends on the board and production parameters.

**Note** : The tools between the IMPRESS machines (except the IMPRESS 2000) are interchangeable.

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## 8. APPLICATION PROCEDURE

The application procedure for right angle receptacles and headers is as follows:

- Place receptacle (header) in the desired location on the PCB taking care to assure that all press-fit tails line up with the proper holes.
  
- Place the Push blade and Anvil in the proper location with respect to the receptacle (header) and PCB as shown below.

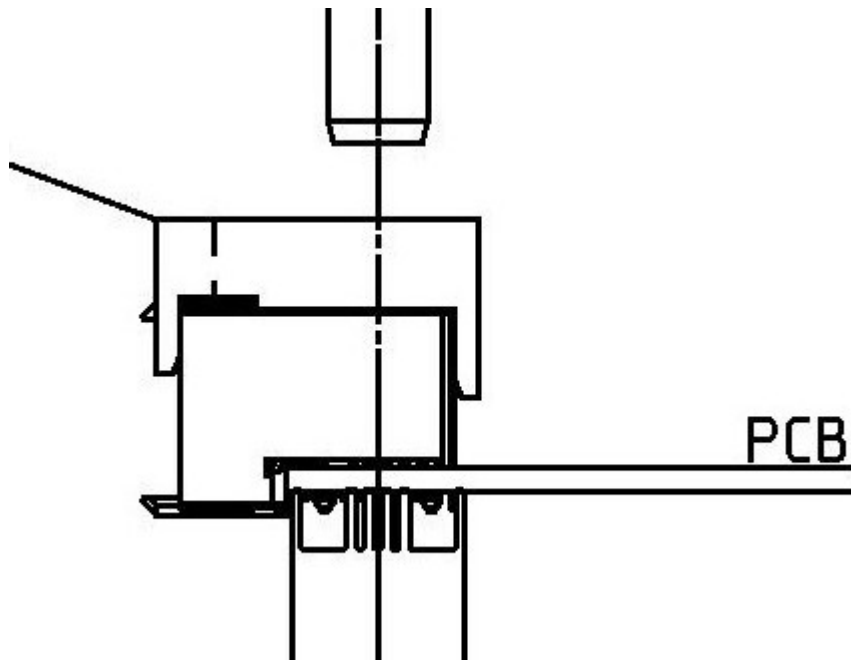



Figure 11 – Insertion Procedure

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

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- Insertion press guidelines:

Product Version	Recommended Max Force Setting For Application Press
Millipacs® HM 5 Row Receptacle or Header	45 N (10.1 lbs) Maximum Force Per Press-Fit
Millipacs® HM 8 Row Receptacle	45 N (10.1 lbs) Maximum Force Per Press-Fit

- 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 (header) is fully seated (see Section 10). Force settings may vary with different types of PTH finishes. Customers should develop parameters that best suit individual application requirements.

**EXAMPLE:** For one Millipacs® HM 5 row Type A receptacle, there are 110 press-fit tails being inserted into the PC board (signals only). Therefore, the maximum recommended press setting would be 4950 N (110 press-fit tails x 45 N).

**EXAMPLE:** For one Millipacs® HM 8 row Type D receptacle, there are 176 press-fit tails being inserted into the PC board (including both signals and grounds). Therefore, the maximum recommended press setting would be 7920 N (176 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. Be sure to follow any safety requirements associated with the application equipment.

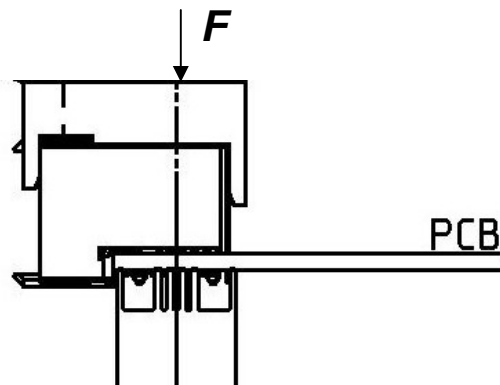



Figure 12 – Applying Force

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

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## 9. COVER SHIELD INSTALLATION

The Cover Shield is an optional component and is applied to the bottom side of the PCB opposite the side the connector is mounted on for the purpose of bottom side electrical shielding. There are two Cover Shield designs that are available (Shown in Figures 13 and 14).

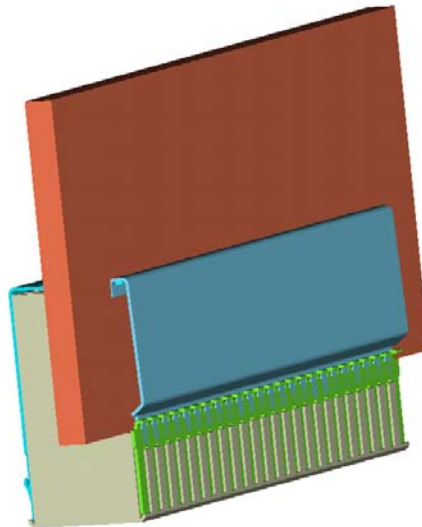


Figure 13 – Clip on cover shield

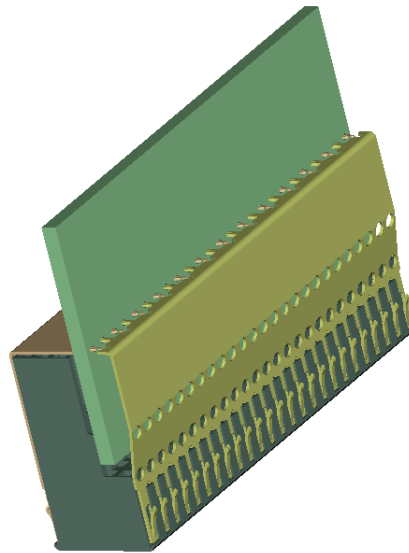

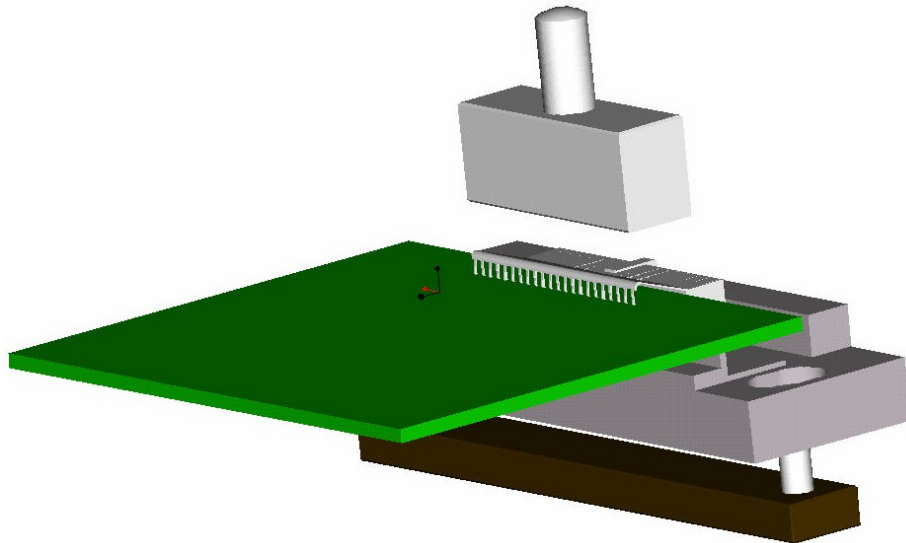


Figure 14 – One piece cover shield



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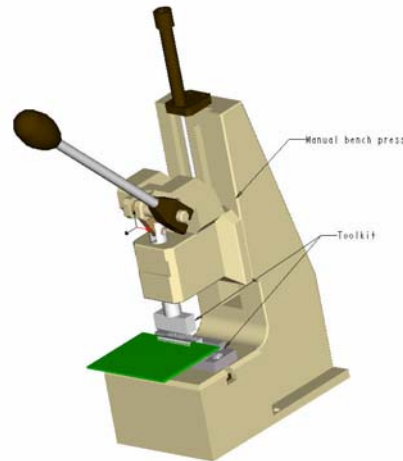
**9.1. One piece cover shield with 5 or 8 row receptacle connectors**



**Figure 15 - One Piece Cover Shield Tool HM2Y509**


- ✓ To Install the Clip on Cover Shield Identify the FCI Application tool from the information below.

Description	Part number
<b>Press</b>	HM1Y291A
<b>Toolkit for 8 row connectors</b>	On request
<b>Toolkit for 5 row connectors</b>	HM2Y509

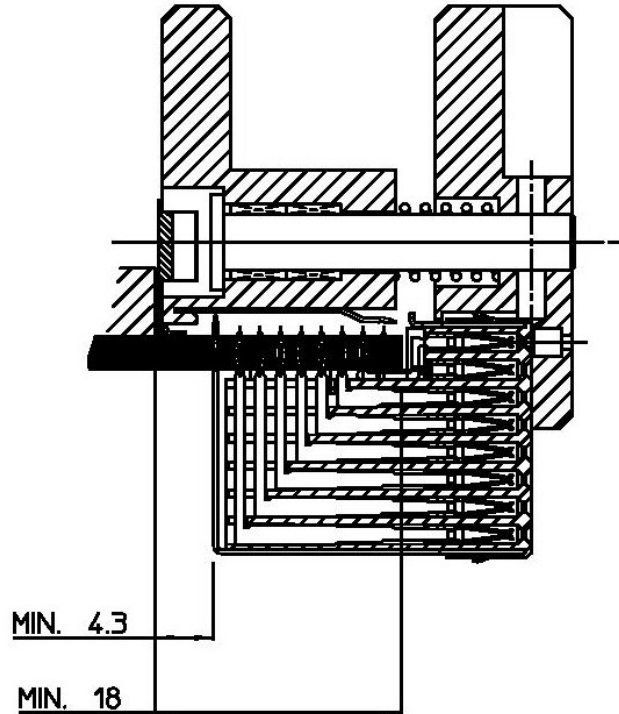


Insert the Cover Shield into the Application tool as defined by the application tool instructions.

Locate the application tool onto the connector as described by the application tool instructions. Attach the Cover Shield to the connector as described by the instruction sheet.


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## 9.2. *Clip on Cover Shield with 8 row connectors*



**Figure 15 - Clip on Cover Shield Tool HM2Y290**

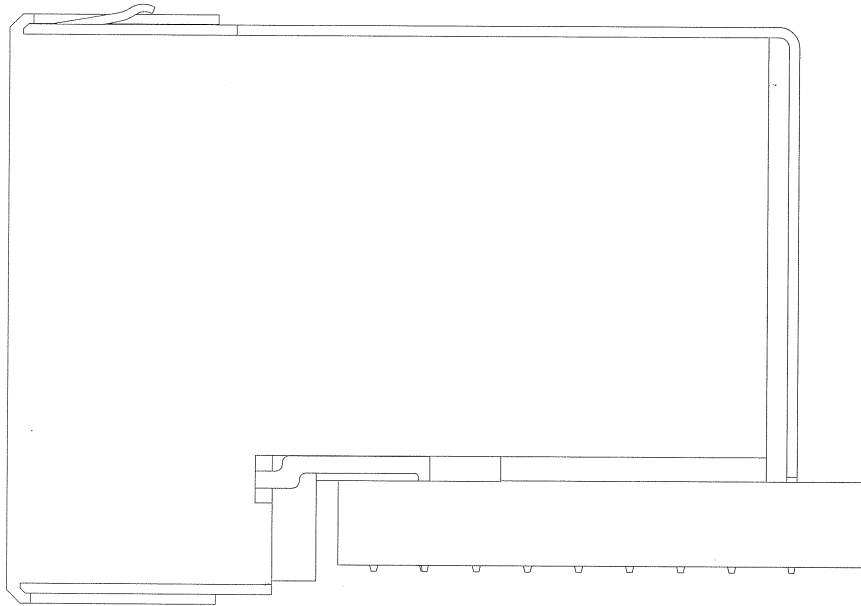
- ✓ Use the tool HM2Y290 for placing the Clip on cover shield in the connector
- ✓ Manually place the Clip on cover shield in the tool.
- ✓ Place the tool with the shield over the connector pins and by squeezing the tool manually the shield is pressed over the press fit pins.
- ✓ For more detail information, check the instruction manual of the tool.

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## 10. POST-APPLICATION INSPECTION REQUIREMENTS

Post-application inspection should consist of several simple checks to assure that the receptacle (header) is applied properly.

- 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 16). A larger gap beneath the standoffs may indicate that the receptacle (header) is not seated parallel to the board. This can cause receptacle (header) misalignment with adjacent Millipacs® HM components.



**Figure 16 -- Proper Receptacle (header) assembly**

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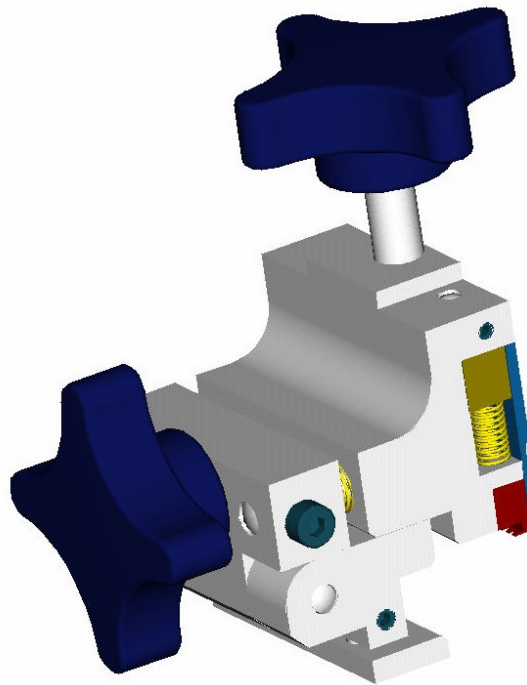
## 11. REMOVAL TOOLING

Removal tooling for the 5 & 8 Row right angle press-fit receptacle consists of the following:

### 11.1. *Removal tooling for the clip on cover shield*


The shield can easily be removed manually.

### 11.2. *Removal tooling for one piece cover shield*



**Figure 17 -- Shielding Removal tooling HM2Y463**

- Place the tool over the shielding and by turning the handle the shield will be extracted from the PCB.
- For more detail information, check the instruction manual of the tool.

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### 11.3. Removal tooling for the 5+8 row connector




**Figure 17 -- Connector Removal tooling HM2Y350**

- For more detail information, check the instruction manual of the tool.

#### **FEATURES:**

- Removes one (1) receptacle connector.
- By cutting the connector the connector can be easily removed.
- Removal kit includes Xcelite Pliers, a Comb Removal Tool and the Connector Removal Tool. The Xcelite Pliers are for removal of the top shield.
- The hand tool can be adjusted to remove a connector in the middle of the row.
- A manual force of 20 – 30 lbs is required to properly operate the Removal Tool.

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## 12. REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	ALL	INITIAL RELEASE	V	16/05/2002
B	4/22	Plating Performance Level Added	I10-0060	23/02/2010