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1.0 OBJECTIVE

To provide information on available product features and customer application considerations for Converged Metral™ vertical press fit power headers and shrouds.

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:


<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
1.0	Objective	1
2.0	Scope	1
3.0	General	1
4.0	Procedure	2
4.1	Introduction	2
4.2	General Information	3
4.3	Part Information	5
4.4	Materials	7
4.5	PCB Requirements	7
4.6	Customer Design Considerations	9
4.7	CAM's (Customer Application Machines)	10
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4.7.2	Header Removal Tooling	12
4.7.3	Shroud Insertion Tooling	13
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4.7.5	Presses	15
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5.0	Reference Documents	18

3.3 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.

3.4 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.

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4.0 PROCEDURE

4.1 Introduction

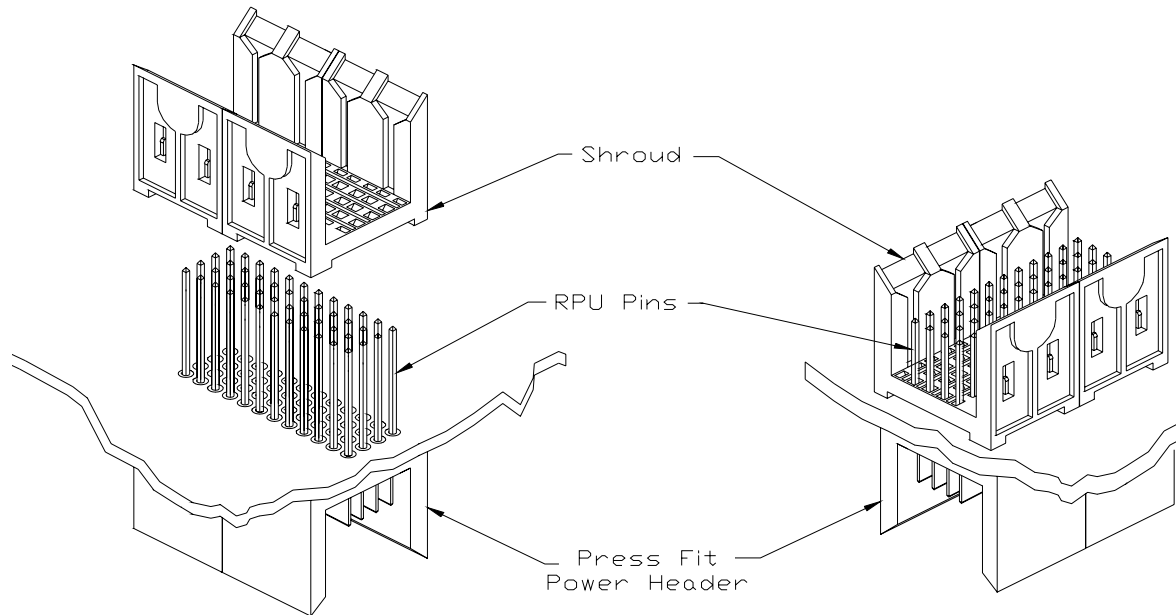


Figure 1 - Isometric view of a press fit power header and a shroud.

A compliant press fit connection is achieved by mechanically inserting a pin into a Plated Thru Hole (PTH). The electrical connection is maintained by the normal forces generated by the compliant section to the PTH walls. There are a number of benefits in the use of press fit connections. First, by using a press fit connection, it eliminates the need for soldering processes. Second, it reduces re-work concerns on the connectors by allowing single pin repair. Third, press fit headers offer Rear Plug Up (RPU) capability. This enables plugging to both sides of the Printed Circuit Board (PCB) without using any additional space on the board. Shrouds are used when RPU or midplane applications are required. The shrouds are pressed over the RPU tails of the press fit header. These shrouds come with various stand off heights, which, coupled with the multiple tail lengths available on the vertical press fit header, gives many possibilities for the mating length of the pins on the rear side.

The “Eye of the Needle” compliant 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 only, which is passivated to prevent corrosion of the copper). The performance requirements specified in this document are:

- 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”


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Figure 2 shows a cross section of the “Eye of the Needle” that is used in Converged Metral™ press fit headers. Figure 3 illustrates a typical cross-section of a press fit pin inserted in a PCB.

Figure 2 – Eye of the Needle on the vertical press fit pin.

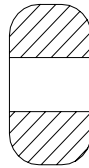



Figure 3 - Cross-section of vertical press fit pin in the middle of a PCB.



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4.2 General Information

The vertical press fit Converged Metral™ power header is available in 4 and 5 row configurations. The features of this connector are:

- Modular building block based on a 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).
- First Make/Last Break capability to support Hot Plugging applications. See Tables 11 & 12.
- Customer specific select load. See Tables 11 & 12.
- Rear Plug Up (RPU) supporting midplane or cable applications.
- 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 available vertical press-fit power headers.

Number of Modules	Length (mm)	4 Row P/N	5 Row P/N
1	12	70236-XYX	89099-XYX
2	24	84603-XYX	55446-XYX
4	48	55435-XYX	55447-XYX
8	96	55436-XYX	55448-XYX

The **-XYX** in the part number stands for the following:

X= Contact area finish (plating).

Y= Sequential designation of different pin loading configurations.


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Table 2 - The plating specification and the dash number for ordering.

PLATING IN CONTACT AREA	
DASH NUMBER	PERFORMANCE LEVEL
-1YY	TELCORDIA CO
-2YY	TETECOM CLASS
-3YY	IEC CLASS 1
-5YY	TELCORDIA UE
-9YY	TELCORDIA CO

Table 3 - Length and part numbers for available shrouds.

Number of Modules	Length (mm)	4 Row PN	5 Row PN
1	12	70203-1YZ	89055-1YZ
2	24	70203-1YZ	89055-1YZ
4	48	70203-1YZ	89055-1YZ
8	96	70203-1YZ	89055-1YZ

- The -1YZ in the part number stands for the following:
 - Y – Standoff height of shroud
 - Z – Number of modules in shroud


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Table 4 - Order data for shroud standoff height.

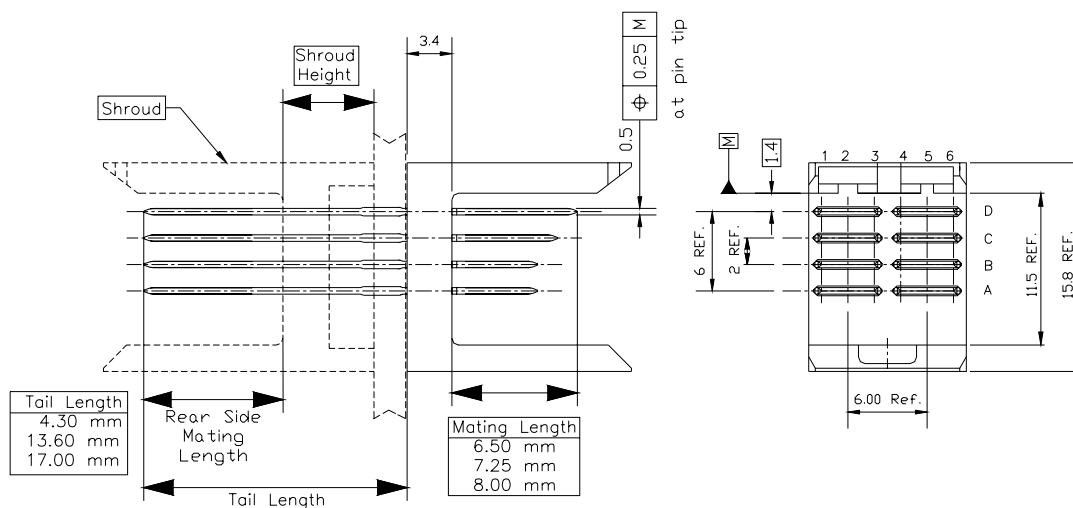
Suffix	Standoff Height (mm)	Application
-11Z	3.50	Rear Plug Up
-12Z	4.40	Rear Plug Up
-13Z	6.90	Wire Wrap & Rear Plug Up


Table 5 - Ordering data for shroud length.

Suffix	Number of Modules	Length (mm)
-1Y1	1	12
-1Y2	2	24
-1Y3	4	48
-1Y4	8	96

4.3 Part Information

- Three different mating lengths are available, as shown in Figure 4, enabling First Make/Last Break (Hot Plugging).
- True position of the pins is also shown in Figure 4.
- Three different standoff heights are available on the shrouds as shown in Figure 5.



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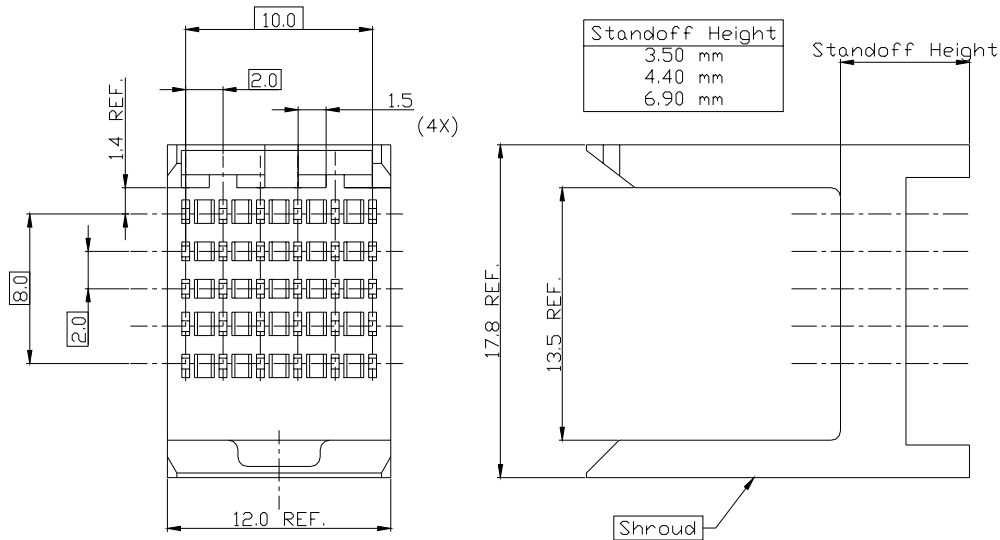


Figure 5 - Vertical 5-row shroud. (All dimensions in mm)

- Various tail lengths are available as shown in Figure 4. Rear Plug-up (RPU) options are also available to facilitate midplane applications and backside cabling. The use of the RPU pins necessitates the use of shrouds. The shrouds, coupled with the board thickness, determine the effective mating length of the RPU pins. Refer to Tables 6, 7, and 8 to find the effective mating length of the RPU pins.

Table 6 - Rear side pin lengths with a 3.5 mm shroud with various board thickness'.

PCB Thickness (mm)	1.6	2.4	3.2	4.0	4.8	5.6	6.4
Header Tail	EFFECTIVE REAR SIDE PIN						
Length (mm)	LENGTH WITH 3.5 mm SHROUD						
4.30							
13.60		7.70	6.90	6.10	5.30		
17.00						7.90	7.10

Table 7 - Rear side pin lengths with a 4.4 mm shroud with various board thickness'.

PCB Thickness (mm)	1.6	2.4	3.2	4.0	4.8	5.6	6.4
Header Tail	EFFECTIVE REAR SIDE PIN						
Length (mm)	LENGTH WITH 4.4 mm SHROUD						
4.30							
13.60	7.60	6.80	6.00	5.20			
17.00					7.80	7.00	6.20


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Table 8 - Rear side pin lengths with a 6.9 mm shroud with various board thickness'.

PCB Thickness (mm)	1.6	2.4	3.2	4.0	4.8	5.6	6.4
Header Tail Length (mm)	EFFECTIVE REAR SIDE PIN LENGTH WITH 6.9 mm SHROUD						
4.30							
13.60	5.10						
17.00		7.70	6.90	6.10	5.30		

- Press-fit Retention and Insertion Forces
 - The maximum insertion force required to press a header into the PCB is 100 N/pin (22.5 lbf/pin). For example, part number 70236, which has a 4 x 6 pin matrix (there are three pins per power blade), has a maximum insertion force of 2400 N (245 lbf) (100 N/pin * 24 pins). Typical values for the insertion force is 82 N (18.5 lbf).
 - The minimum retention force required for a press fit header is 20 N/pin (7.42 lbf). For example, part number 70236 has a minimum retention force of 480 N (108 lbf) (20 N/pin * 24 pins). Typical values for the retention force is 58 N (13 lbf).
 - These forces also apply when a connector is being reworked. A damaged power blade requires reworking the entire connector. All the blades are removed followed by removing the housing. A new connector may then be placed on the board.

4.4 Materials

- Housing material is 30% glass filled LCP (Liquid Crystal Polymer). It has an oxygen index of 38. The mass for the header is shown in Table 9.


Table 9 - Mass for vertical power headers.

VERT. Power Headers	
4 x 2	
Housing (plastic)	1.32
Total Ass'y W/ 5 mm STUB PIN (-X11)	2.76
Total Ass'y W/ 5 mm RPU PIN (-X21)	3.22
5 x 2	
Housing (plastic)	1.33
Total Ass'y W/ 5 mm STUB PIN (-X11)	2.93
Total Ass'y W/ 5 mm RPU PIN (-X21)	3.51

- Pins are made out of Phosphor Bronze.
- The mating area on the pin can be plated with gold or GXT. 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 a soldering operation. The features that are important to define on the printed circuit board when using press fit technology are:

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- 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 Converged Metral™, the recommended features are shown in Table 10.

Table 10 - 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.

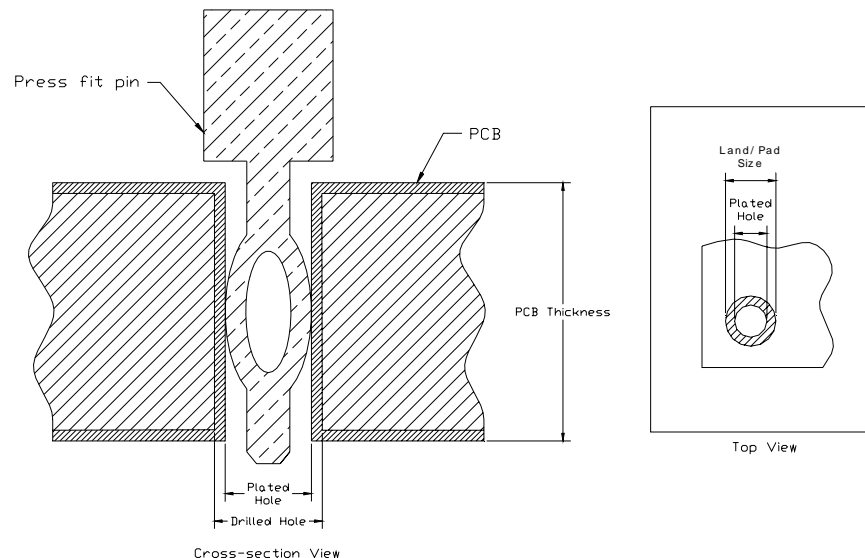



Figure 6 - Important features of PCB design for Converged Metral™ Connectors.

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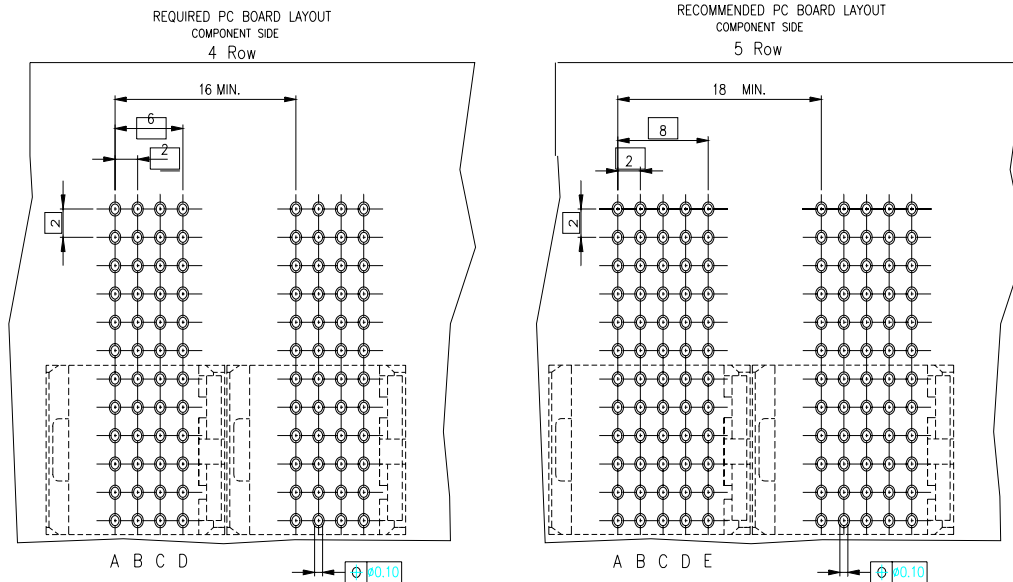



Figure 7 - Required board layout for press fit vertical header. (All dimensions in mm)

4.6 Customer Design Considerations

- Headers should be placed on 12 mm (0.472 in.) increments within a slot (to be consistent with the preferred module placement on the daughtercard); if 12 mm (0.472 in.) increments are not possible, headers should be placed on multiples of 2 mm (0.0787 in.) within a slot.
- Keep outside walls of the headers a minimum of 4 mm (0.157 in.) from any edge of the backpanel to avoid handling and shipping damage.
- In applications which require additional components to be mounted from the non-component side, a minimum slot spacing of 22 mm (0.866 in.) is preferred when possible, to facilitate fixturing.
- 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.

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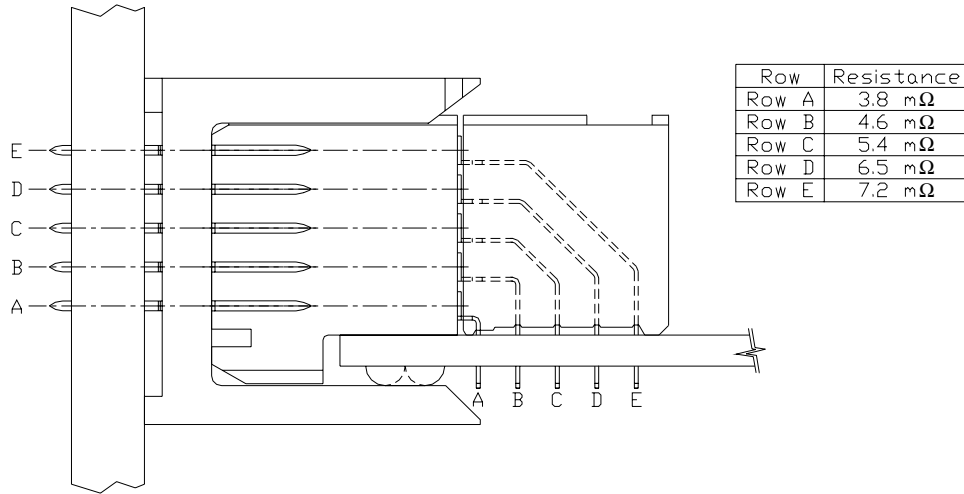


Figure 8 - Mated header and receptacle showing typical bulk resistance per

4.7 row.
CAM's

4.7.1 Header Insertion Tooling

In order to insert the Metral 4 and 5 Row Vertical Power Headers, two pieces of top tooling are required:

- Press block holder
- Press block

There is also an optional bottom tool (pcb support). Most users develop their own bottom tool (pcb support).

Metral™ headers are sold in 12 mm modules. The following are standard module sizes.

	4 Row Pin Grid	5 Row Pin Grid
1 Module (12 mm)	4 X 2	5 X 2
2 Module (24 mm)	4 X 4	5 X 4
4 Module (48 mm)	4 X 8	5 X 8
8 Module (96 mm)	4 X 16	5 X 16

Some larger module monoblocks are also available.

4 AND 5 ROW PRESS BLOCK HOLDER:

415446-001 THRU -021


A -001 holder is one 12 mm module and a -021 is a 21 12 mm module holder.

4 ROW PRESS BLOCK:

<u>416393-001</u>	1- 12 mm Module
<u>416393-002</u>	1- 24 mm Module
<u>416393-003</u>	1- 48 mm Module
<u>416393-004</u>	1- 96 mm Module

5 ROW PRESS BLOCK:

<u>416394-001</u>	1- 12 mm Module
<u>416394-002</u>	1- 24 mm Module
<u>416394-003</u>	1- 48 mm Module
<u>416394-004</u>	1- 96 mm Module

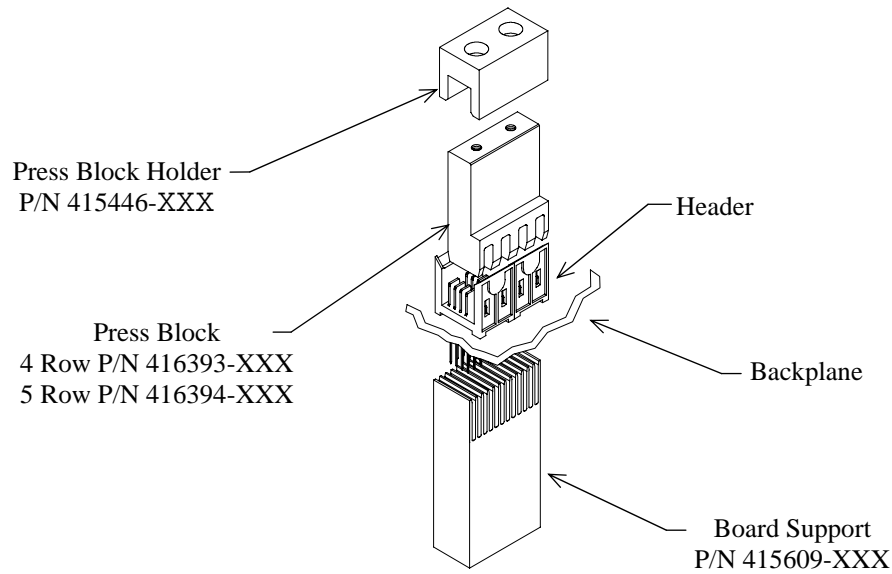
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4 AND 5 ROW BOARD SUPPORT:

- 415609-001** 1- 12 mm Module
- 415609-002** 1- 24 mm Module
- 415609-003** 1- 48 mm Module
- 415609-004** 1- 96 mm Module

To order the correct tooling simply match the number of connector modules to the corresponding number of press block modules and a holder that is large enough to hold the total of the press blocks.

IT IS IMPORTANT TO NOTE THAT YOU CAN MIX SIGNAL AND POWER PRESS BLOCKS IN THE SAME HOLDER. YOU ALSO USE THE SAME HOLDER FOR 4 AND 5 ROW PRESS BLOCKS.



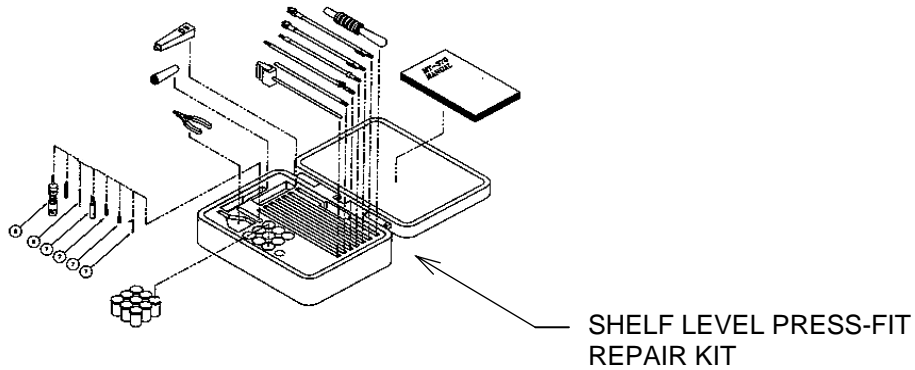
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4.7.2 Header Removal Tooling

SINGLE PIN REMOVAL TOOLS:

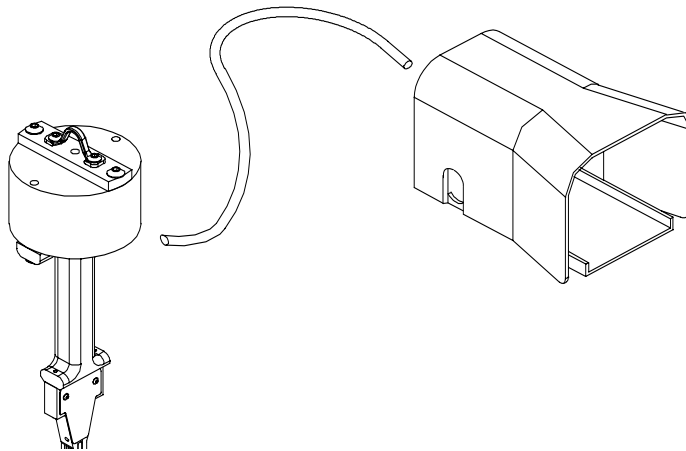
MT370-01 P/N MT370-01

This is a shelf level repair kit that has tools to remove power pins (POWER OR SIGNAL) when the board is in a rack. It can also be used when the board is not in a rack. In order to remove power pins with this kit, you must first remove the plastic housing. This kit has a tool to remove single module housings. After the housing has been removed you can use a different tool in this kit to remove the power pin from the mating side. If you have a housing that is more than (1) 12 mm module then you have to use the HT-0530 (P/N 415895-001).



MULTIPLE POWER PIN REMOVAL

The HT-0530 (P/N 415895-001) is a pneumatic tool that is used to remove 1 row (5 power blades) at a time. The tool pulls the power blades out through the plastic from the mating side.




4.7.3 Shroud Insertion Tooling

PDS: Rev :D

STATUS:Released

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In order to insert the Converged Metral™ 4 and 5 row shroud two pieces of tooling are required:

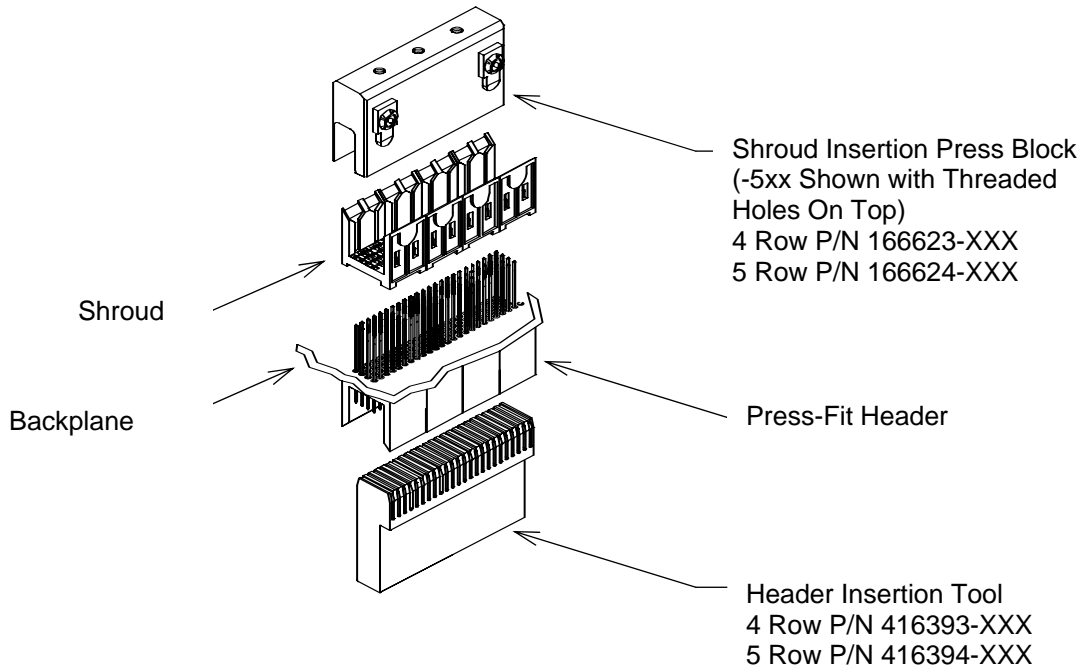
- Press Block
- A Bottom Tool (Board Support)

In order to insert a shroud you must have already installed a header on the opposite side of the board. The header insertion tool can be used as a board support while applying the shroud.

Insertion Tool Number	4 ROW	5 ROW	Qty of 12 mm Modules
	166623-001	166624-001	8
	166623-002	166624-002	4
	166623-003	166624-003	2
	166623-004	166624-004	3
	166623-005	166624-005	5
	166623-006	166624-006	6
	166623-007	166624-007	7
	166623-009	166624-009	9
	166623-010	166624-010	10
	166623-011	166624-011	11
	166623-012	166624-012	12
	166623-013	166624-013	13
	166623-014	166624-014	14
	166623-015	166624-015	15
	166623-016	166624-016	16
	166623-017	166624-017	17
	166623-018	166624-018	18
	166623-019	166624-019	19
	166623-020	166624-020	20

NOTE: If you change the first digit of the dash number from a "0" to a "5" the insertion tool will come with three threaded holes on top so that can be mounted to another piece of tooling if desired.

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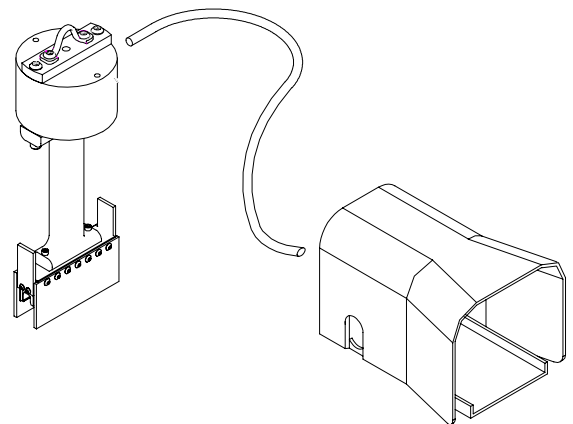
4.7.4 Shroud Removal Tooling


HT-0533 P/N 415923-XXX 4 Row pneumatic shroud removal tool

- 415923-001 1 Module
- 415923-002 2 Module
- 415923-003 3 Module
- 415923-004 4 Module
- 415923-008 8 Module

HT-0534 P/N 415922-XXX 5 Row pneumatic shroud removal tool

- 415922-001 1 Module
- 415922-002 2 Module
- 415922-003 3 Module
- 415922-004 4 Module
- 415922-008 8 Module



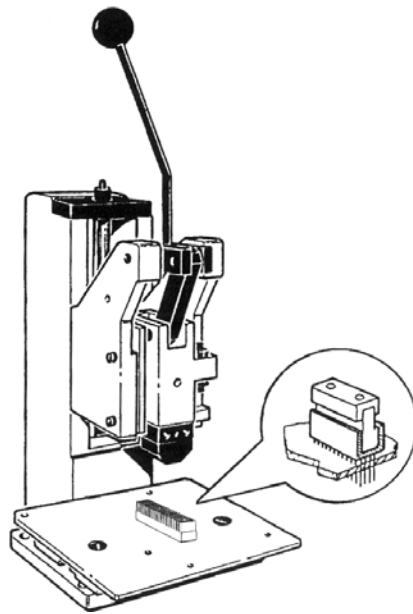
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4.7.5 Presses

Metral vertical press fit headers can be installed with any standard press as long as it has enough force to properly install the number of pins that are being installed.


In addition, FCI offers a couple of presses that can be used.

MT-301 HANDPRESS P/N 194205-002



Impress Press

FCI manufactures a complete line of servo-driven electric presses to install all press fit connectors. The Impress line of presses range from a manual placement, operator actuated press to a fully automated pick, place, and press unit. The entire line up of machine features includes state of the art electronic press controls with a closed loop feedback system. Contact your local sales representative for additional information on the Impress line of presses.

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4.8 Order Forms

Table 11 - Order sheet for 4 row select load vertical press fit signal headers.

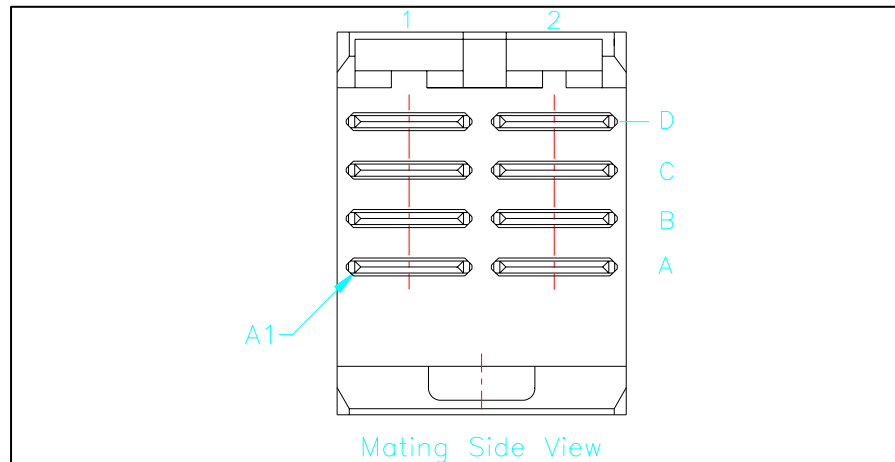
4 row

Base PN:

ROW	Col. 1	COL. 2
D		
C		
B		
A		

Standard Pins

CODE	Mating Side	RPU
01	6.50	4.30
02	7.25	4.30
03	8.00	4.30
04	6.50	13.60
05	7.25	13.60
06	8.00	13.60
07	6.50	17.00
08	7.25	17.00
09	8.00	17.00




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Table 12 - Order sheet for 5 row select load vertical press fit signal headers.

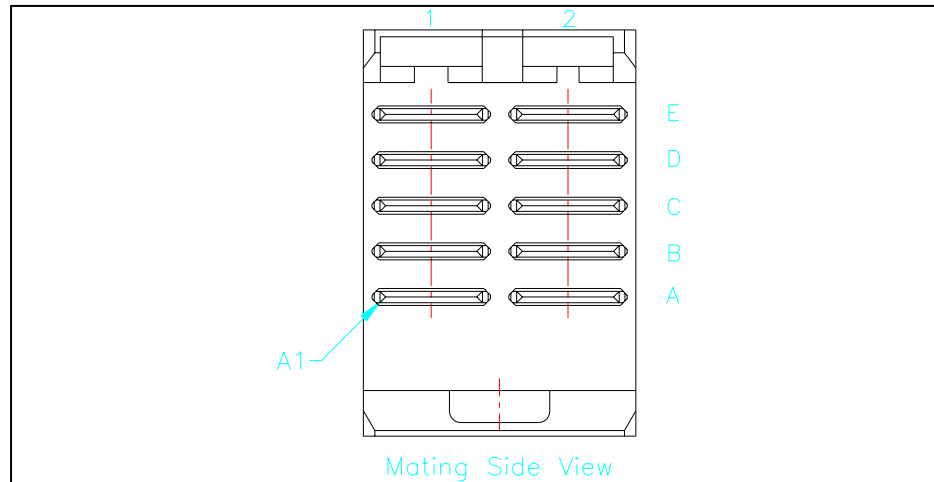
5 row

Base PN:

ROW	Col. 1	COL. 2
E		
D		
C		
B		
A		

Standard Pins

CODE	Mating Side	RPU
01	6.50	4.30
02	7.25	4.30
03	8.00	4.30
04	6.50	13.60
05	7.25	13.60
06	8.00	13.60
07	6.50	17.00
08	7.25	17.00
09	8.00	17.00




5.0 REFERENCE DOCUMENTS

Any applicable product prints.

GES-12-002 -- Metral™ Connector System

GES-12-004 -- Specification for Metral™ Compliant Contacts

	TYPE APPLICATION SPECIFICATION	NUMBER BUS-20-075	
	TITLE Application Guide for Converged Metral™ Vertical Press Fit Power Headers and Shrouds	PAGE 19 of 19	REVISION D
AUTHORIZED BY J.R. Volstorf		DATE 26-Apr-06	
CLASSIFICATION UNRESTRICTED			

REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	All	New Release	V10045	02/05/01
B	All	Change to generic plating specifications	V04-0611	06/08/04
C	All	Add lead free information	V05-0931	10/04/05
D	All	Change logo	V06-0405	04/26/06