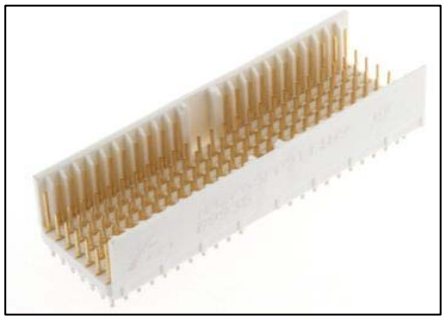
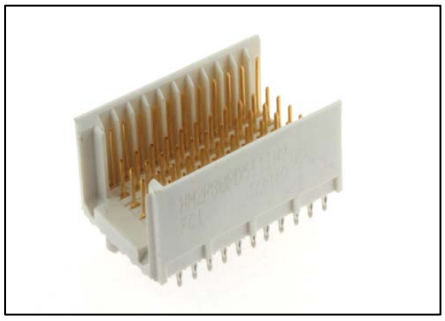
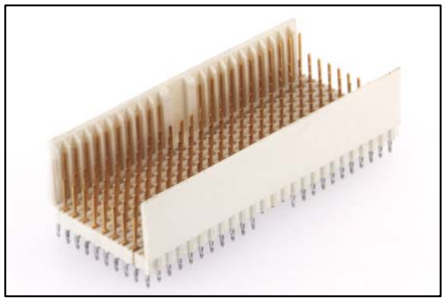
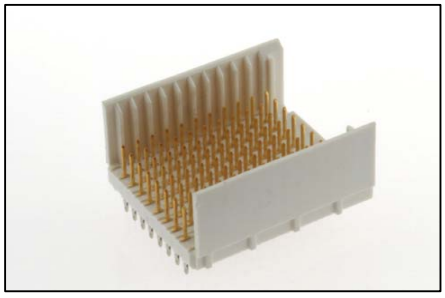
Millipacs® HM 5 & 8 Row Header & Shrouds

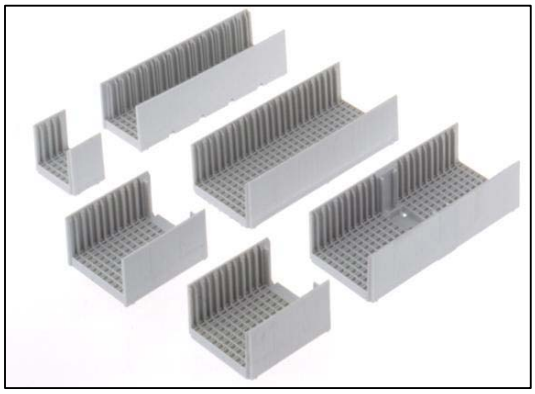
Application Specification











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1. PURPOSE

This specification covers end product and workmanship requirements for insertion into circuit boards for Millipacs® HM 5 & 8 row Headers and shrouds along with general product information. Contact your local FCI representative for additional information.

2. SCOPE

- Product description
- Define product variations
- Define connector outline for circuit board designs.
- Recommended application equipment
- Recommended requirements and procedure for board insertion
- Recommended repair procedures

3. GENERAL

3.1. Method of Specifying

We do not recommend any exceptions unless approval is obtained in advance from the FCI engineering design group. If there is a conflict between the product drawings and this specification, the product drawings shall take precedence.

3.2. Workmanship

Workmanship shall be of a level that indicates controlled conditions of manufacture such that subsequent operations, functionality and performance are not degraded.

3.3. Usage

The headers and shrouds covered by this instruction are intended for use in a wide variety of environments and are designed to meet the conditions specified in Bellcore GR-1217-CORE and IEC-1076-4-101

3.4. Visual

Visual examinations shall be performed with a magnification of up to 10x. (8 to 10x recommended)

4. Product Descriptions

4.1. General Information on Headers and Shrouds

This information applies only to product covered by this specification. The following figures only show a typical module of each product. Custom loads and lengths are typically available. Check with your local FCI representative for the availability variations.

4.2. Electrical Performance of Millipacs® HM Connector Systems

4.2.1. Test data and SPICE models

Test data along with SPICE models are available on the FCI web page or through your local FCI sales person. Data is available for Impedance, crosstalk, risetime, eye patterns and band width.

4.3. 5-row Millipacs® HM Headers

This header shown is a Type A. Headers come in various lengths, standard lengths are defined IEC and cPCI specifications. Three contact mating heights are available. Three plating levels are available. Lubricated contacts are available. Various tail lengths are available including Rear plug Up terminals which are used with Shrouds.

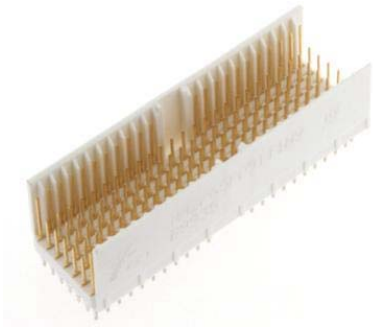


Figure 1 5-row Header

4.4. 5-row Millipacs® HM Shrouds

This shroud shown is a Type B.

Figure 2 5-row Shroud

4.5. 8-row Millipacs® HM Headers

The header shown is a Type D

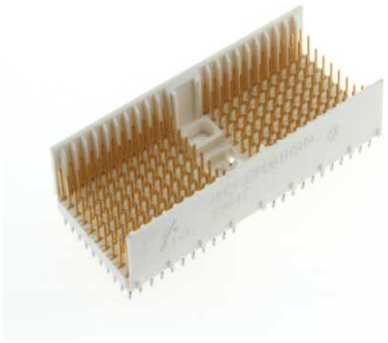


Figure 3 8-row Headers

4.6. 8-row Millipacs® HM Shrouds

This shroud shown is a Type D.

Figure 4 8-row Shroud

4.7. 5 & 8-row Millipacs® HM Coding Keys

A Coding Key provides a mechanical feature to define matching intermateable pairs. Interfering coding keys block off insertion to prevent connector mating and electrical contact.
You can use the insertion tool HM2Y197E to easily insert the coding keys.

Figure 5 5 & 8-row Coding Keys

5. Product Variations

The following information lists the various headers and pins that are covered by this application specification.

5.1. Part numbing overview for Millipacs® HM Headers

This table defines the part number format that is used in the products covered by this application.

HM2	P	07	P	D	5	1	1	0	N9

P Vertical Header

with fixing peg	*w/o fixing peg*	*Housing Type*	
07	**40**	*A (22 pos)*	***"5" Rows***
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*	

with fixing peg	*w/o fixing peg*	*Housing Type*	
87	**81**	*D (22 pos)*	***"8" Rows***
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 Level _ (1.3µm / 50µin Au)
E9 Level 1 (1.0µm / 40µin Au)
N9 Level 2 (0.8µm / 30µin Au)
Z1 Level 3 (0.4µm / 15µin Au)

GL Level 1 (1.0µm / 40µin Au) -> Rear Plug-u
GF Level 2 (0.8µm / 30µin Au) -> Rear Plug-u
GC Level 3 (0.4µm / 15µin Au) -> Rear Plug-u

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

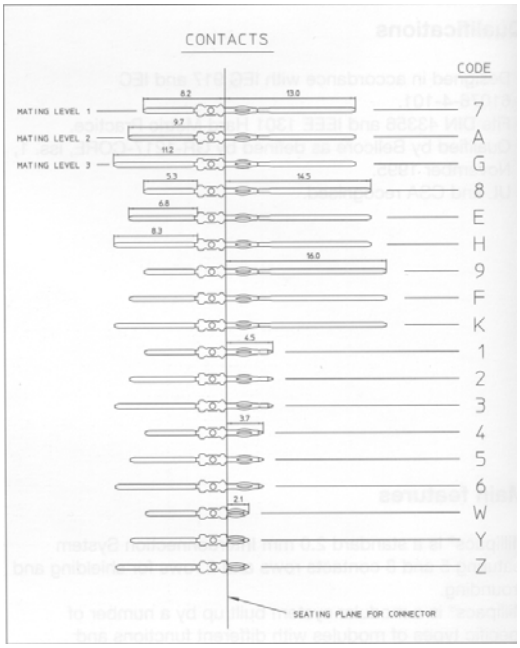
Other Sequential assignment for patterns

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

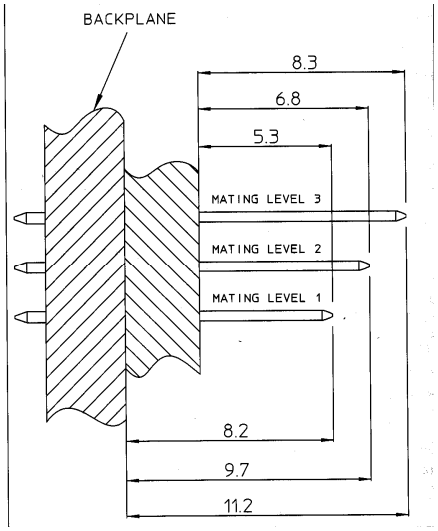
5.2. Contact overview for Millipacs® HM Headers

This table lists the various pin lengths that are used in the headers covered by this application specification.



5.3. Contact Mating Levels for Millipacs® HM Headers

This table lists the various mating levels that are used in the headers covered by this application.



5.4. Contact Plating overview for Millipacs® HM Headers

This table lists the various plating levels that are be used in the headers covered by this application.

Front mating contacts (termination C,D)

Performance level	Mating cycles	Plating code
3	50	Z1
2	**250**	**N9**
1	500	E9

Front + rear mating contacts (termination K,M and N)

Performance level	Mating cycles	Plating code
3	50	GC
2	**250**	**GF**
1	500	GL

5.5. General Information on Headers and Shrouds

FCI product catalog defines general information regarding Millipacs® HM headers and shrouds. Millipacs

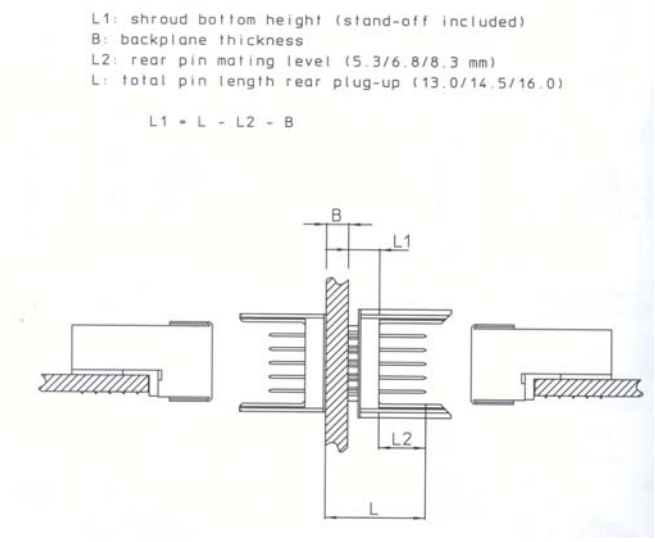


Figure 6

6. Other Design Considerations on Header Circuit Boards

6.1. Guide Pin Modules

Guide modules are used to provide additional alignment and carry electrical power. They can be used in line with any 5 row headers. See the following customer drawings for information

- BSC201911003 – part nr: HM2G01
- BSC201911008 – part nr: HM2G03

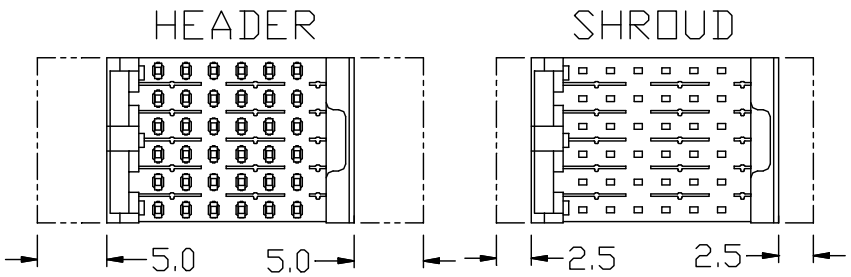
6.2. Circuit Board Layout

Follow the information shown on the product drawing for PCB layout.

6.3. Defining the Header and Shroud Outline on the Circuit Board

The minimum space or outline that is required for header and shrouds covered by this application spec. is shown on the individual customer drawings. Additional space is required to allow for various repair operations. Generally no additional space is required for individual pin replacement. To allow support tooling for replacement of the whole header or shroud we recommend as shown on the following figure. 3D models are available of most parts for PCB design.

Figure 7 Header and Shroud Repair Outline



7. Application Tooling

The application tooling needed for 5 & 8-row headers and shrouds consist of the following.

Table 1

		IMPRESS 500				
(5 + 2) ROW		**without LMT**			**with LMT****	
		Anvil	**Insert**	**Push blade**	**Anvil**	**LMT-blade**
A	**male**	PAY307A1	PAY245A20	PAY308A2	PAY307A1	PAY308A16
	fem.straight	PAY307A1	--	PAY308A2	on request	
	fem.str.shielded	PAY307A1	PAY245A17	PAY308A2	on request	
	shroud	PAY307A65	--	PAY308A87	PAY307A65	PAY308A87
B (25pos.)	**male**	PAY307A1	PAY245A21	PAY308A2	PAY307A1	PAY308A17
	fem.straight	PAY307A1	--	PAY308A2	on request	
	fem.str.shielded	PAY307A1	PAY245A18	PAY308A2	on request	
	shroud	PAY307A65	--	PAY308A87	PAY307A65	PAY308A87
B (19pos.)	**male**	PAY307A44	HM2Y196A30	PAY308A2	PAY307A44	PAY308A58
	fem.straight	PAY307A44	--	PAY308A2	on request	

	fem.str.shielded	PAY307A44	PAY245A77	PAY308A2	on request	
	shroud	PAY307A67	--	PAY308A90	PAY307A67	PAY308A90
B (22pos.)	**male**	PAY307A45	HM2Y196A29	PAY308A2	PAY307A45	PAY308A59
	fem.straight	PAY307A45	--	PAY308A2	on request	
	fem.str.shielded	PAY307A45	PAY245A76	PAY308A2	on request	
	shroud	PAY307A66	--	PAY308A89	PAY307A66	PAY308A89
AB (25pos.)	**male**	PAY307A1	PAY245A73	PAY308A2	PAY307A1	PAY308A69
	shroud	PAY307A65	--	PAY308A87	PAY307A65	PAY308A87
AB (22pos.)	**male**	PAY307A45	PAY245A74	PAY308A2	PAY307A45	PAY308A70
	shroud	PAY307A66	--	PAY308A89	PAY307A66	PAY308A89
AB (19pos.)	**male**	PAY307A44	PAY245A75	PAY308A2	PAY307A44	PAY308A71
	shroud	PAY307A67	--	PAY308A90	PAY307A67	PAY308A90
C / CR	**male**	PAY307A2	PAY245A22	PAY308A2	PAY307A2	PAY308A18
	fem.straight	PAY307A2	--	PAY308A2	on request	
	fem.str.shielded	PAY307A2	PAY245A19	PAY308A2	on request	
	shroud	PAY307A89	--	PAY308A88	PAY307A89	PAY308A88
M	**male**	PAY307A1	PAY245A20	PAY308A2	PAY307A1	PAY308A16
	shroud	on request			on request	
M (pre-ass.)	**male**	PAY307A68	PAY245A29	PAY308A2	on request	
L (pre-ass.)	**male**	PAY307A69	PAY245A30	PAY308A2	on request	
N (pre-ass.)	**male**	PAY307A70	PAY245A31	PAY308A2	on request	
L	**Hybrid**	PAY307A65	--	PAY308A87	PAY307A65	PAY308A87
N	**Hybrid**	PAY307A89	--	PAY308A88	PAY307A89	PAY308A88
CPCI			**without LMT**		**with LMT****	
		Anvil	**Insert**	**Push blade**	**Anvil**	**LMT-blade**
AB (22pos.)	**male**	PAY307A45	PAY245A74	PAY308A2	PAY307A45	PAY308A70
	shroud	PAY307A66	PAY245A43	PAY308A2	on request	
AB (19pos.)	**male**	PAY307A44	PAY245A75	PAY308A2	PAY307A44	PAY308A71
	shroud	PAY307A67	PAY245A44	PAY308A2	on request	
A	**male**	PAY307A1	PAY245A20	PAY308A2	PAY307A1	PAY308A16
	shroud	PAY307A65	HM2Y196A31	PAY308A2	on request	
B (19pos.)	**male**	PAY307A44	HM2Y196A30	PAY308A2	PAY307A44	PAY308A33
	shroud	PAY307A67	PAY245A44	PAY308A2	on request	
B (22pos.)	**male**	PAY307A45	HM2Y196A29	PAY308A2	PAY307A45	PAY308A34
	shroud	PAY307A66	PAY245A43	PAY308A2	on request	
(8 + 2) ROW			**without LMT**		**with LMT****	
		Anvil	**Insert**	**Push blade**	**Anvil**	**LMT-blade**
D	**male**	PAY307A40	PAY245A13	PAY308A72	PAY307A40	PAY308A74
	shroud	PAY307A87	--	PAY308A85	PAY307A87	PAY308A85
E	**male**	PAY307A40	PAY245A12	PAY308A72	PAY307A40	PAY308A75

	shroud	PAY307A87	--	PAY308A85	PAY307A87	PAY308A85
F / FR	**male**	PAY307A41	PAY245A14	PAY308A72	PAY307A41	PAY308A76
	shroud	PAY307A88	--	PAY308A86	PAY307A88	PAY308A86
DE (25pos.)	**male**	PAY307A40	PAY245A106	PAY308A72	PAY307A40	PAY308A103
	shroud	PAY307A87	--	PAY308A85	PAY307A87	PAY308A85
DE (22pos.)	**male**	PAY307A43	PAY245A107	PAY308A72	PAY307A43	PAY308A104
	shroud	PAY307A97	--	PAY308A108	PAY307A97	PAY308A108
DE (19pos.)	**male**	PAY307A42	PAY245A108	PAY308A72	PAY307A42	PAY308A105
	shroud	PAY307A96	--	PAY308A109	PAY307A96	PAY308A109
(**) : not available on IMPRESS 500M+ and Baby IMPRESS						

7.1. Brief Summary

In order to properly insert press fit headers and shroud onto a circuit board you need two items:

- A press
- Insertion tooling

7.2. Insertion Press

The tooling can work in a variety of presses. The important thing to remember is that you need to have a press with enough force to insert the specific configuration you are working with and that the press table can properly hold the your circuit board size.

Typical types of presses are:

* Manual arbor press
* Servo driven electronic press

The preferred type of press to insert the headers and shrouds is the servo driven electrical press. This press gives you the best control during the insertion process and offers the most flexibility. FCI offers arbor and electric presses. For more information contact your local Sales person.

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 2 for relevant specifications:

Table 2

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

(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.

7.3. Press Blocks and Press Block Holders

The press blocks fit inside the headers and shrouds. In the headers the press block presses on both the pin shoulders and the inside bottom of the header housing. In the shrouds the press block presses only on the inside bottom of the shroud housing.

8. Installation Procedure

The installation procedure for the headers and shrouds cover by this application specification can be summarized as follows:

- Properly place header or shroud in desired location on PC board. Check to see compliant sections line up with holes in board.

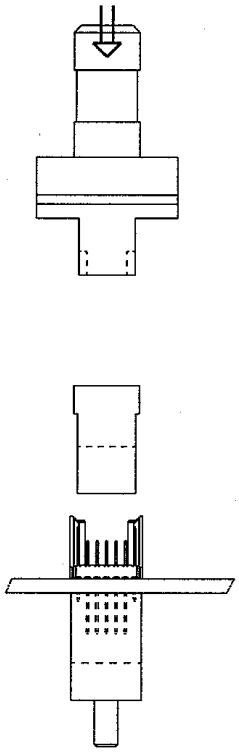


Figure 12 - Insertion Procedure

- Place appropriate top and bottom tooling in their correct locations. See manual on insertion tooling for correct locations of top and bottom tooling for press being used.
- To insure proper insertion into the board, **HEADERS AND SHROUDS MUST BE CENTERED BENEATH RAM OF PRESS.** Offset loading may result in improper seating of headers or shrouds and lead to bending of pins.
- Actuate insertion press and then remove assembly from press after press returns.

FCI recommends that the insertion force for headers to be maximum 45 Newtons per pin.

Actuation of Insertion Press should be slow and controlled. Pressing to a certain change in slope will yield more consistent results than pressing to a set distance due to variances in board thickness.

9. Post-Installation Inspection Procedures

9.1. Header and Shroud to Board Clearance

The headers and shroud should be seated flush to the board but in no instance be more than 0.1mm (0.004 inch) off the board. In case of RPU Header with alignment strip, the Max gap allowed between PCB and HDR Bottom surface is 0.28 mm considering the alignment strip thickness. Also after the Press fit, the maximum allowable height difference between two adjacent header connectors is 0.1 mm.

9.2. Visual

All pins inserted into circuit board via holes. Pins and plastic not damaged.

9.3. Pin Tip Variations

The pin tips shall be within .20mm true position (±.10mm) of location after insertion of the header on the header side and should be within the same tolerance on the back side of the board after shroud insertion.

10. Removal Tooling and Repair Procedures

The removal procedures vary depending on your board layout, the pin length and the board thickness. There are also cases in which a single pin repair is the best action to take. There are manuals supplied with the tooling that is shown below to help you through the pin removal process. If you are not sure what type of repair process is best for your application, contact your local FCI sales person.

Replacement Pins

When removing and replacing individual pins use order replacement pins from the following table. Pins may be replaced twice.
Consult the FCI sales person to obtain the replacement pins.

10.1. Individual Pin Extraction Tool – HM2Y197A, HM2Y197C, HM2Y197D

The extraction tool, P/N HM2Y197A or HM2Y197C or HM2Y197D, pushes the pins out of the circuit board from the opposite side of the header one at a time. After all the pins have been removed you can then pull the header or shroud off the board with a pair of pliers. Individual pin repair can be accomplished by removing the defective pin and inserting a replacement pin.

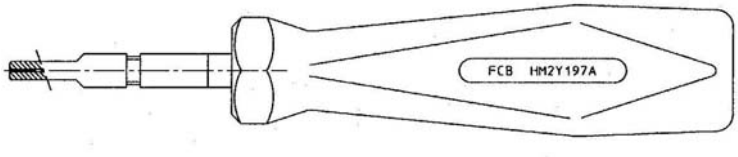


Figure 8 - HM2Y197A
Pushout Tool for Signal Contacts

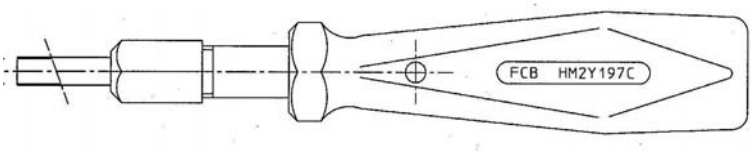


Figure 9 - HM2Y197C
Pushout Tool for Power and High frequency contacts

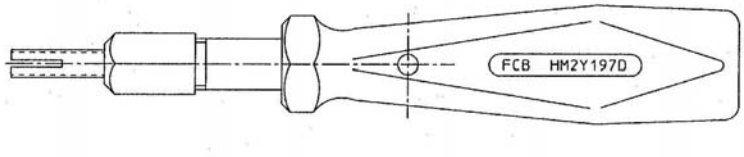


Figure 10 - HM2Y197D
Pushout Tool for Power and High frequency contacts

10.2. Contact row Extraction Tool - PAY245A10-PAY245A11

The extraction tool, P/N PAY245A10 or PAY245A11 pushes the pins out of the circuit board from the opposite side of the header one at a time. After all the pins have been removed you can then pull the header or shroud off the board with a pair of pliers.

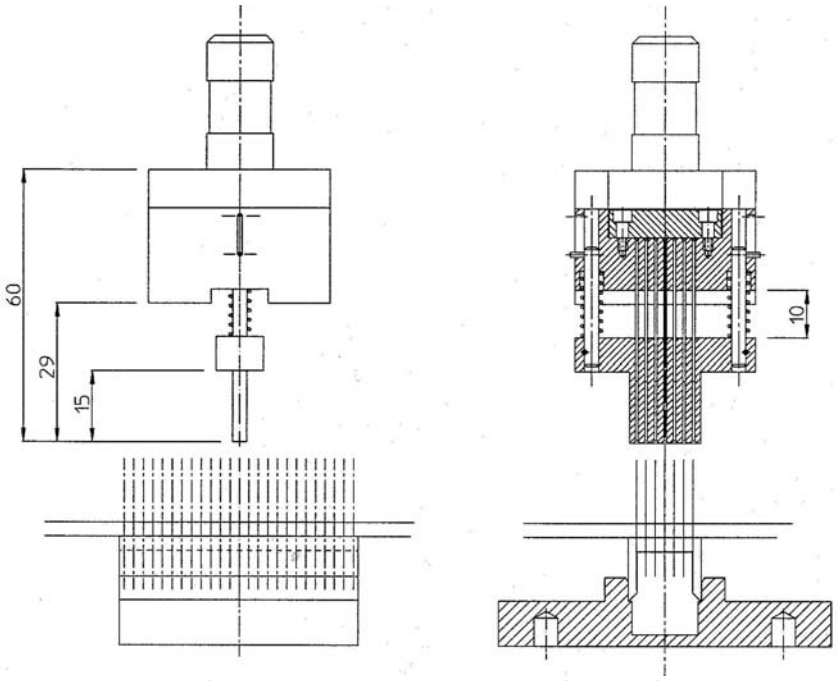
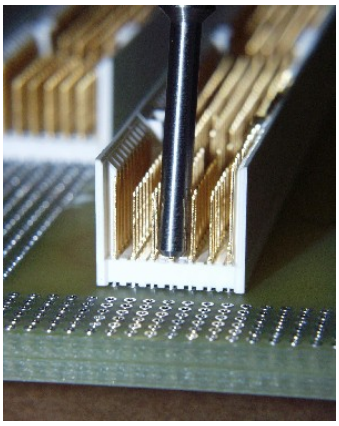


Figure 11 - Contact row Extraction Tool

The tool is used in combination with an IMPRESS 500M.
The tool PAY245A10 is used for extracting long contact pins and the tool PAY245A11 is used for extracting short contact pins.

10.3. Individual Pin Insertion Tool – HM2Y197B2

The Insertion tool, P/N HM2Y197B2, pushes the pins individual into the connector.



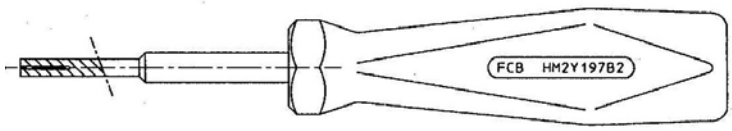


Figure 12 - HM2Y197B2 Insertion Tool

10.4. Repairing Bent Pins

Bent pins must either be straightened or replaced. We recommend that if the pin is bent more than 45º it be replaced. If the pin is bent equal to or less than 45º, it can be straightened with a pliers or equivalent tool that has a smooth surface on the inside jaws. The repair shall be considered a success if the repaired pin is not 'kinked' nor the contact surface scraped. Burnish marks on the contact surface of the pins are acceptable. Do not use any pliers or tools made of aluminum as they could contaminate the contact surface.

10.5. Shroud removal tool - HM2Y241

The shroud removal tool, P/N HM2Y241 pulls the shroud out of the circuit board from the opposite side of the header one at a time. After all the pins have been removed you can then pull the header or shroud off the board with a pair of pliers.

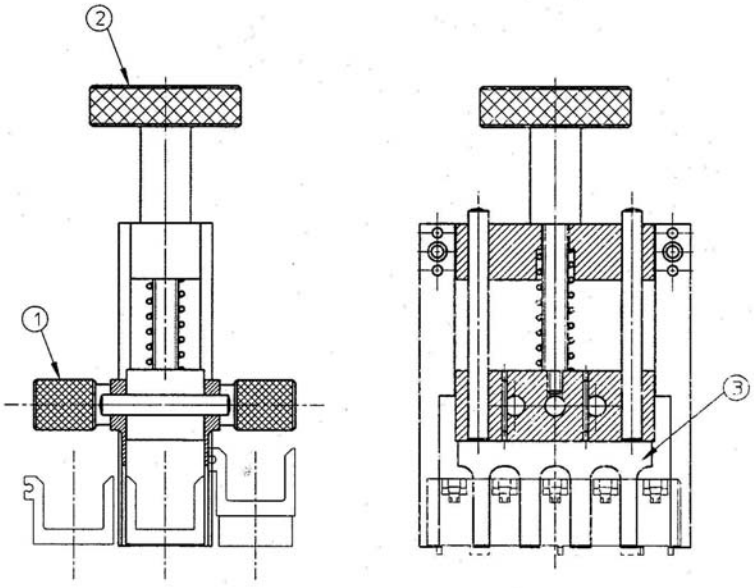


Figure 13 - HM2Y241 Shroud Removal Tool

11. REFERENCE DOCUMENTS

Bellcore GR-1217-CORE
IEC-1076-4-101

REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	ALL	NEW DOCUMENT		
B	ALL	Logo Change	I06-0085	22 Jun 2006
C	ALL	Alignment Strip Thickness Consideration	ELX-I-19949	13 Jan 2015