8602 NAFI

Applications

Military airborne computer

Standards

According to MIL-C 28754 and NAVORD WS 6157

Description

- NAFI board-mounted connectors are used as interface between daughter-boards and back planes or between two adjacent daughter-boards.
- The connector support is of light alloy. It is drilled to a 2.54 x 2.54 mm (.100 x .100) matrix accommodating contacts housed in modular insulators with one, two or four contacts. On assembly, the blocks form inter-connections of different length and width.
- The daughter board is generally associated with a male header. The male header is an aluminum alloy extrusion holding blade contacts for solder angle and straight spill termination.
- The system is highly flexible. Aluminum alloy is robust, light, simple and may be machined accurately.
- The association of blade and tuning fork contacts is a simple design, highly efficient under severe vibration.
- Contact numbers : from 10 to 300.

Characteristics

Mechanical

- Contact insertion and extraction forces per contact pair :
  - mating ≤ 0.45 N average
  - unmating > 0.25 N
- Block retention in support ≥ 35 N
- Contact retention in insulator ≥ 35 N
- Contact endurance : mating/unmating cycles ≥ 500

Electrical

- Signal contacts :
  - maximum current rating per contact 3 A
  - DWV 1000 V
  - insulation resistance ≥ 5000 MΩ
  - contact resistance ≤ 6,7 mΩ
- Coaxial contacts for cable impedance 50 Ω, 75 Ω, 95 Ω
- Power contacts current rating 10 A, 15 A, 20 A
- Fibre optic contact attenuation at 850 nm = 1,5 dB typical

Physical

As per MIL-C 28754

- Tests as per MIL-C 1344
  - damp heat method 1002
  - thermal shock method 1003
  - salt spray method 1001
  - physical shock method 2004
  - vibration method 2005
- Working temperature :
  - polyimide insulator series MIL-C 28754 - 55°C + 105°C

Materials and finishes

components	materials	finishes
Modular insulators	• polyimide 6 x 6 self extinguishing natural colour	
Male contacts	brass	• active area : gold over nickel
Female contacts	copper alloy	• termination area : tinlead over nickel
Extruded supports and back planes	aluminum alloy	• alodine 1200 clear chromate • optional black anodized
Polarizing keys • non removable male • removable male • non removable female • removable female	 stainless steel nickel copper aluminum alloy nickel copper	

8602 NAFI

Ordering information

basic series **8602 - 100 - 22 - 13 - 5 - 10 26 - 000**

number of contacts

connector type

		2 rows	3 rows	4 rows
male		22	24	26
female	with stand off	11	13	15
	without stand off	31	33	35

contact termination

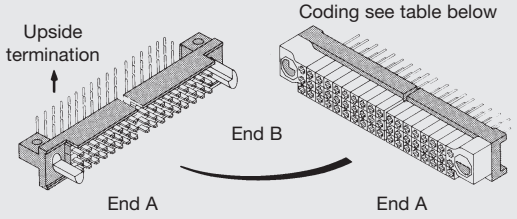
13 - angle spill Pwb (.063)
14 - straight spill Pwb (.063) to (.126)
15 - 2 wire wraps } female only contacts
25 - 3 wire wraps }
27 - flex cable spill
XX - others please consult us

contact plating

5 - standard
8 - MIL-C 28754

polarization

- fixed key guides
Coding see table below



End A - key shape
End B - key shape

Coding example

10 - End A : male D shape key orientation
26 - End B : male V shape key orientation
4040 - removable key guides
Example : 8602 - 100 - 22 - 13 - 5 - **4040** - 000

suffix

000 - standard
031 - DIN 41612 interchangeable connector
- others please consult us
008 - with fixing version

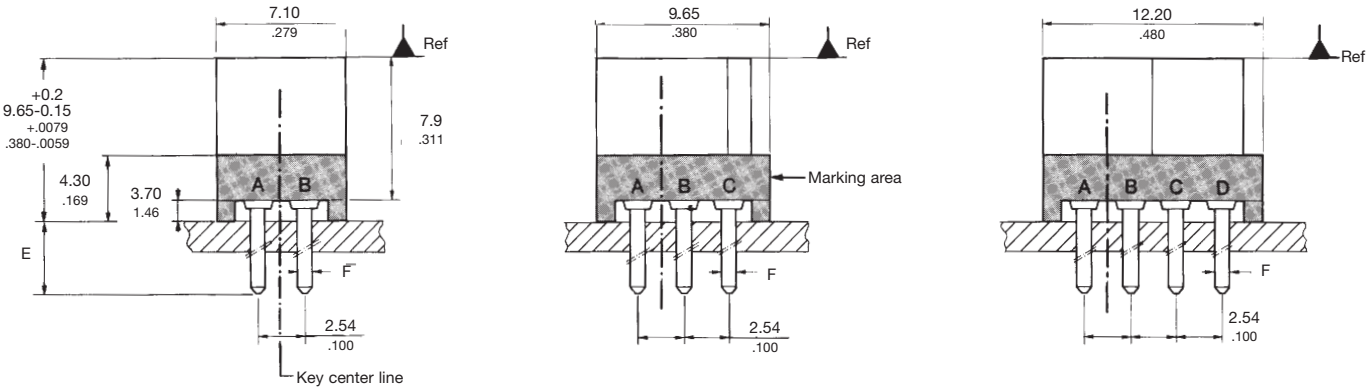
MIL key guides coding

shape	male-orientation								✶	✶	female-orientation							
D	10	11	12	13	14	15	16	17	18	18	17	16	15	14	13	12	11	10
V	20	21	22	23	24	25	26	27	28	28	27	26	25	24	23	22	21	20
O	30	30	30	30	30	30	30	30	38	38	30	30	30	30	30	30	30	30

✶ 18 - 28 - 38 are corresponding to key guides delivered separately

Female connector wire wrap or straight spill terminations

without fixing version (standard) 000 suffix

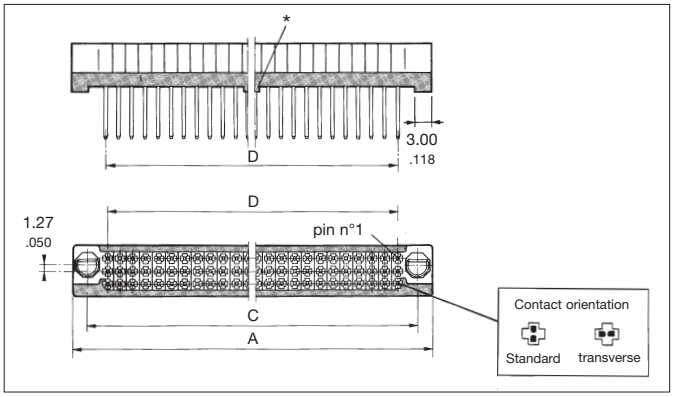


▲ Mating datum plane

* Please, consult us

Note : *A, B, C, D, row marking at the request*

straight spills			wire wraps		
PWB thickness	**E**	**FØ**	**nb wraps**	**E**	**FØ**
1.6 (.062)	*	*	1	*	*
2.4 (.095)	4.45 (.175)	0.43 (.017)	2	12.85 (.505)	0.87 (.034)
3.2 (.126)	4.45 (.175)	0.43 (.017)	3	16.05 (.632)	0.87 (.034)
-	-	-	4	*	*



formula	ex : 100 contacts / 2 rows
$D = (\frac{n}{r} - 1) \times 2,54$	$(\frac{100}{2} - 1) \times 2,54 = 124,46$
$D = (\frac{n}{r} - 1) \times (.100)$	$(\frac{100}{2} - 1) \times (.100) = (4.900)$
A = D + 13,54	124,46 + 13,54 = 138,00
A = D + (.533)	(4.900) + (.533) = (5.433)
C = D + 7,62	124,46 + 7,62 = 132,06
C = D + (.300)	(4.900) + (.300) = (5.200)

n : number of contacts
r : number of rows

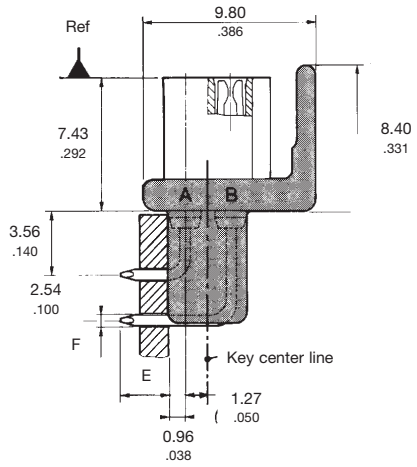
* Center mounting stand off is used only in contact arrangement over 50 per row.

with fixing version - 008 specification

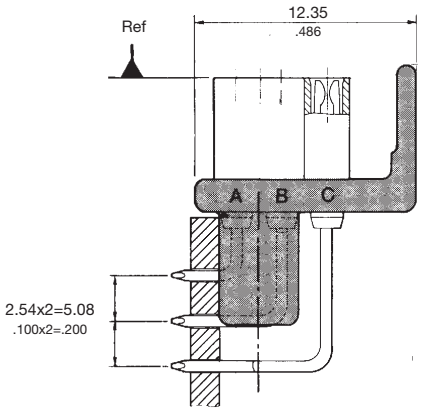
Dimensions : see male connector straight spill termination

Female connector angled spill terminations for card extender

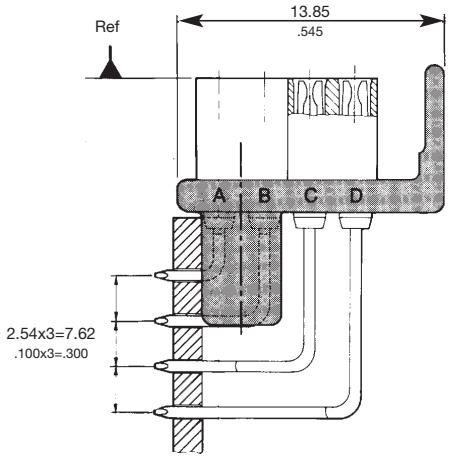
2 rows



3 rows



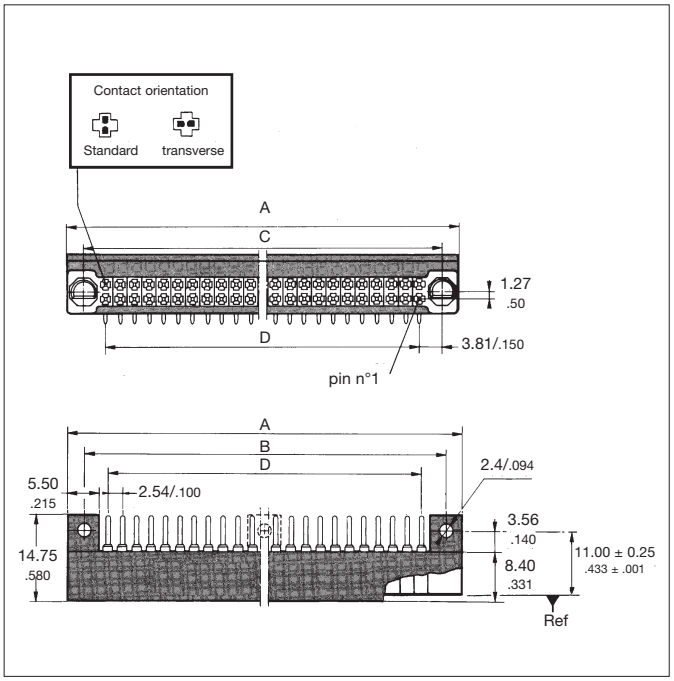
4 rows



PWB thickness	E	FØ
1,6 (.062)	2,70 (.106)	0,43 (.017)
2,4 (.095)	*	*
3,2 (.126)	*	*

Mating datum plane

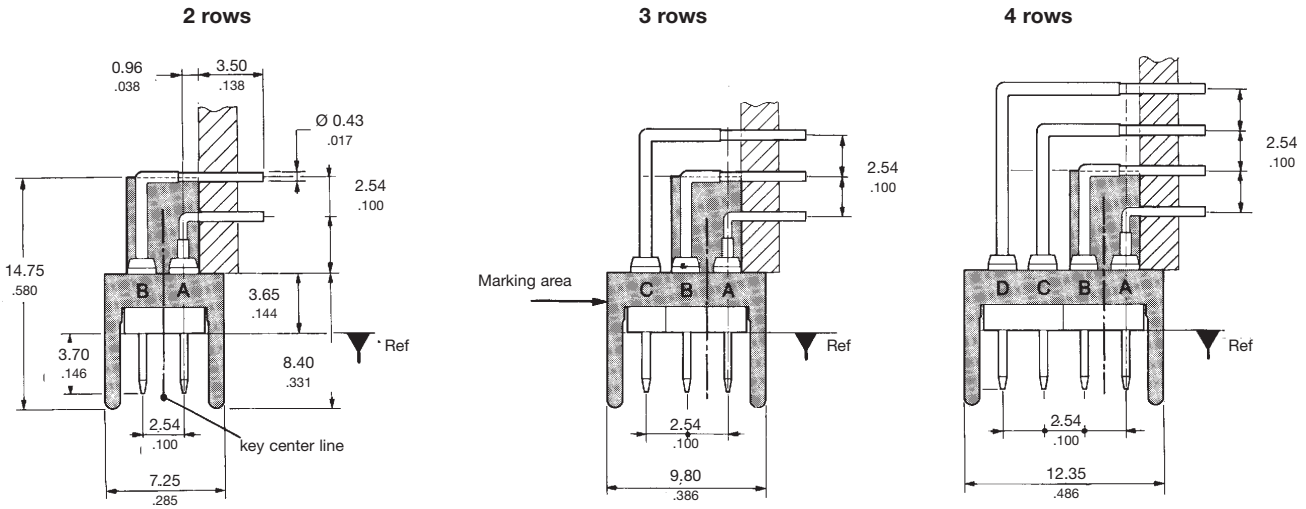
* Please, consult us



formula	ex : 100 contacts / 2 rows
$D = (\frac{n}{r} - 1) \times 2,54$	$(\frac{100}{2} - 1) \times 2,54 = 124,46$
$D = (\frac{n}{r} - 1) \times (.100)$	$(\frac{100}{2} - 1) \times (.100) = (4.900)$
A = D + 15,24	124,46 + 15,24 = 139,70
A = D + (.600)	(4.900) + (.600) = (5.500)
C = D + 7,62	124,46 + 7,62 = 132,09
C = D + (.300)	(4.900) + (.300) = (5.200)
B = D + 10,16	124,46 + 10,16 = 134,62
B = D + (.400)	(4.900) + (.400) = (5.300)

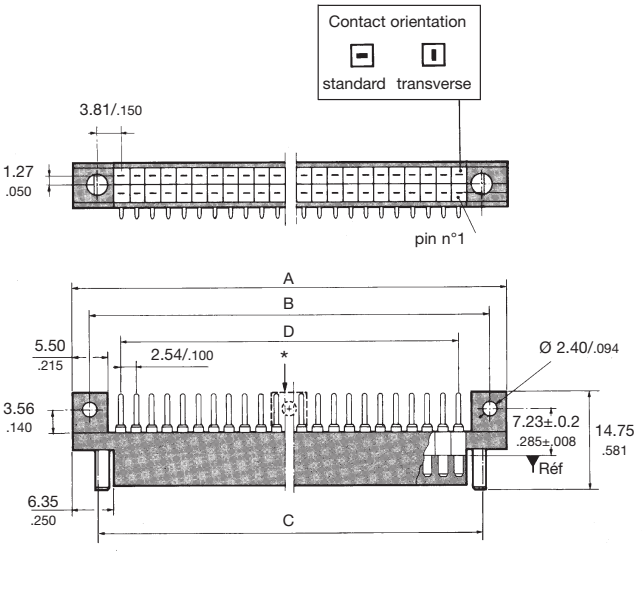
n : number of contacts
r : number of rows

Male connector angle spill terminations



Mating datum plane

Note : A, B, C, D row marking at the request



formula	ex : 100 contacts / 2 rows
$D = (\frac{n}{r} - 1) \times 2,54$	$(\frac{100}{2} - 1) \times 2,54 = 124,46$
$D = (\frac{n}{r} - 1) \times (.100)$	$(\frac{100}{2} - 1) \times (.100) = (4.900)$
A = D + 15,24	124,46 + 15,24 = 139,70
A = D + (.600)	(4.900) + (.600) = (5.500)
C = D + 7,62	124,46 + 7,62 = 132,09
C = D + (.300)	(4.900) + (.300) = (5.200)
B = D + 10,16	124,46 + 10,16 = 134,62
B = D + (.400)	(4.900) + (.400) = (5.300)

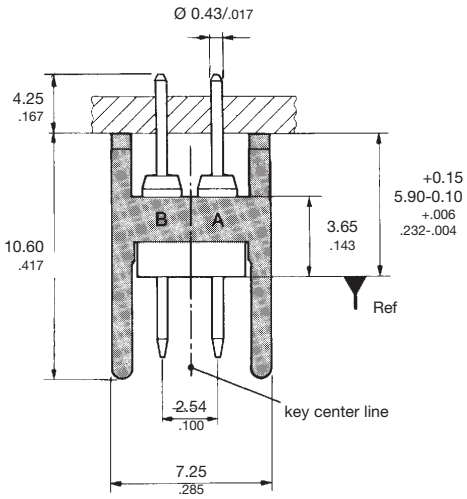
n : number of contacts
r : number of rows

* Center fixing recommended from 50 contacts per row.

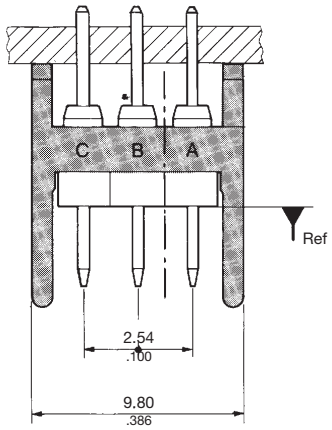
Male connector straight spill terminations

without fixing version (standard) - 000 suffix

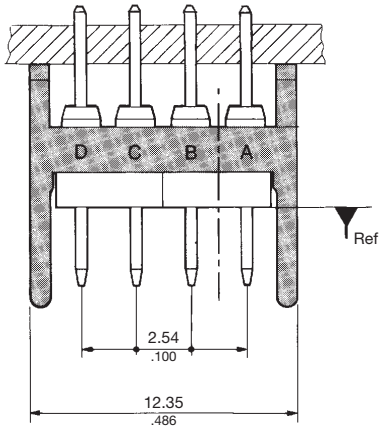
2 rows



3 rows

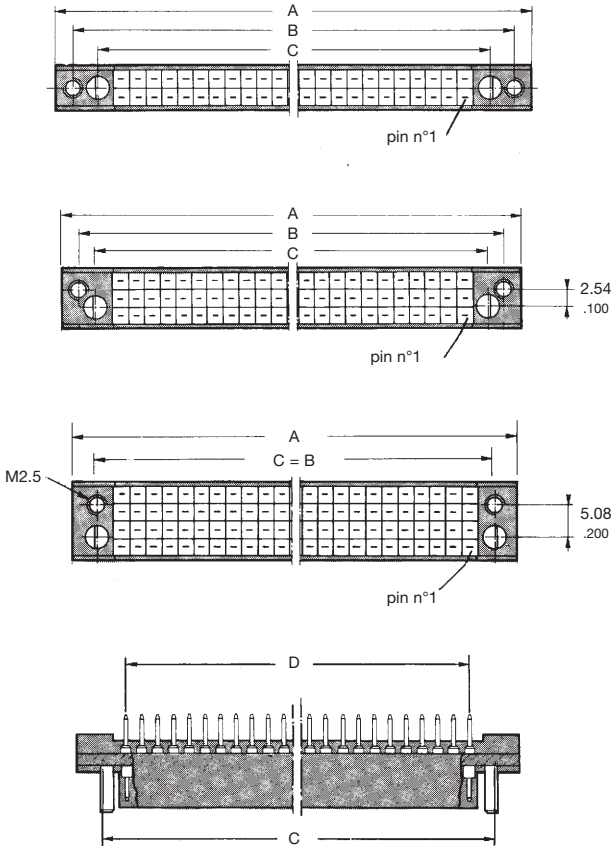


4 rows

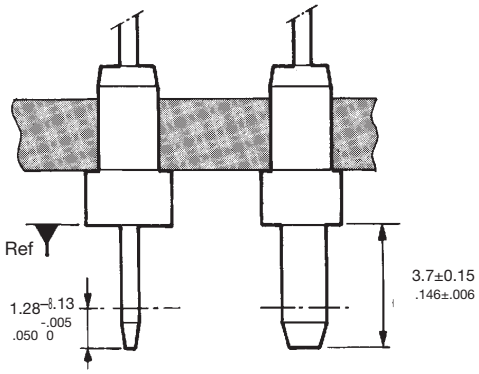


Mating datum plane

with fixing version - 008 specification



male modules details

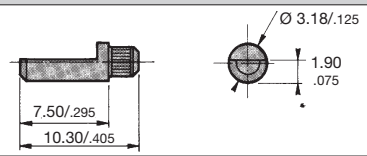
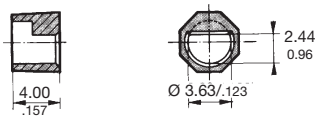
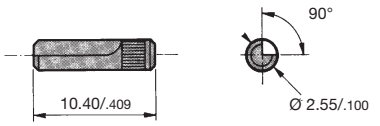
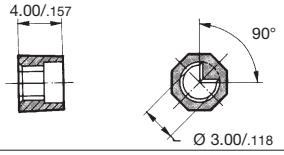
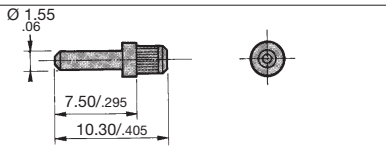
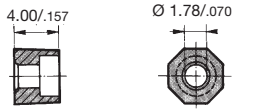


formula
$D = (\frac{n}{r} - 1) \times 2{,}54$
$D = (\frac{n}{r} - 1) \times (.100)$

n : number of contacts
r : number of rows

dimension	2 rows	3 rows	4 rows
A A	D + 20.32 D + (.800)	D + 17.78 D + (.700)	D + 15.24 D + (.600)
B B	D + 15.24 D + (.600)	D + 12.70 D + (.500)	D + 7.62 D + (.300)
C C	D + 7.62 D + (.300)	D + 7.62 D + (.300)	D + 7.62 D + (.300)

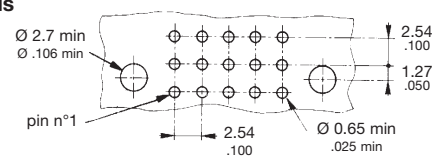
Key guides - non removable as per MIL-C 28754/24 and 39

shape	male	female
D		
V		
O		

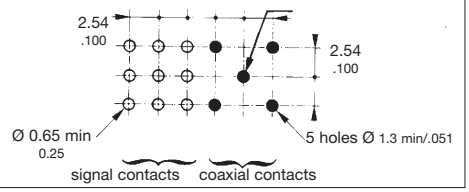
Standard polarizing keys are integrated into part-number. They are supplied installed in the orientation selected by user.
The polarizing keys may also be supplied separately (code 18, 28 or 38). Please, consult us for installation tool.

PWB pin layout

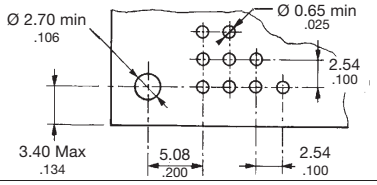
female straight spills



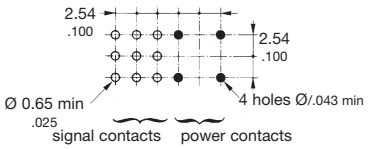
coaxial contacts



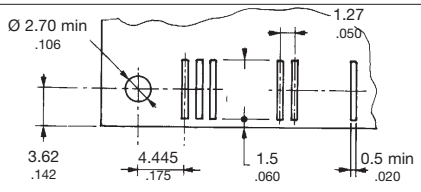
male angle spills



power contacts



flex cable

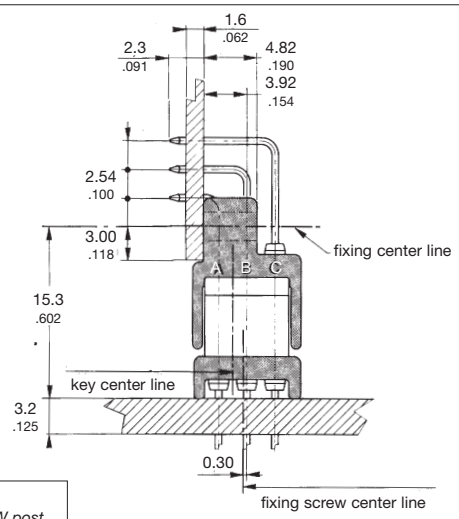


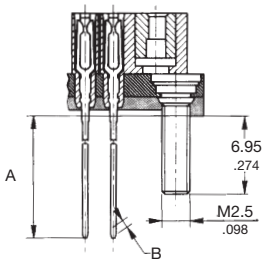
Specific versions available upon request

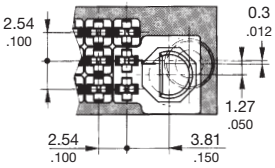
Hand tools

part number	Purpose	part number	Purpose
8602-01	contact insertion / removal W.W female contact, installed on extrusion	**8602-04**	Re-insertion Straight spill male contacts
8602-02	contact insertion / removal W.W female contact, installed on metal back-plane	**8602-05**	Installation of male polarizing keys D-shape code 18, supplied separately
8602-03	removal Male and female straight spill contacts	**8602-06**	Re-insertion Female contacts, all termination types.

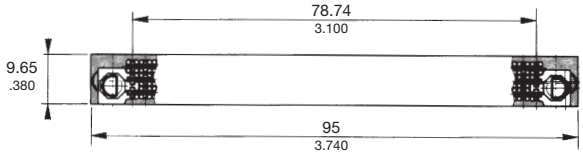
DIN 41612 interchangeable 8602 contacts

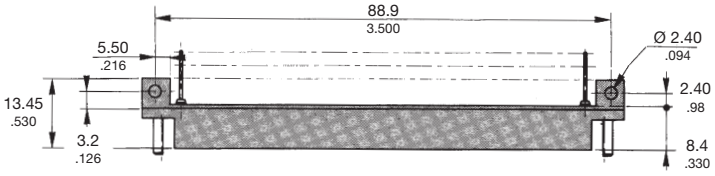






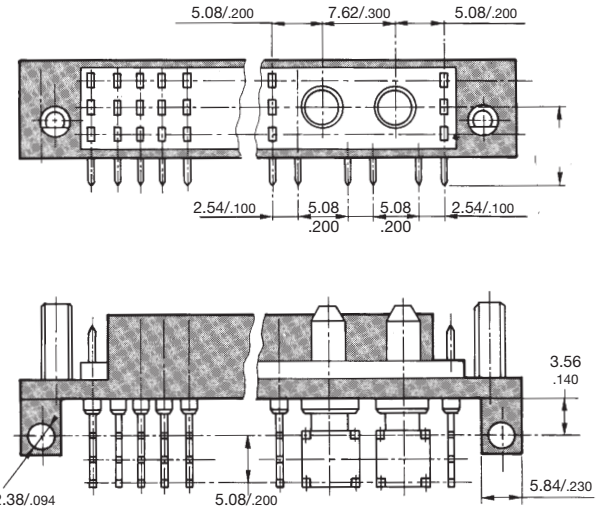
	Straight spill	*WW post*
A	5.00/.197	13.40/.527
B	Ø 0.43/.017	⍁ 0.87/.034



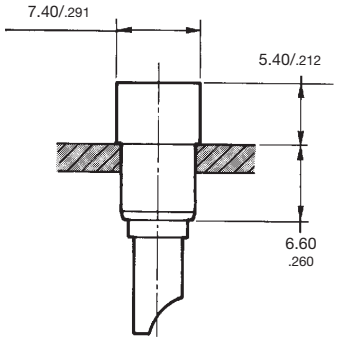


Special contacts

male contacts assembly example



female bushing



8602 NAFI

Coaxial or power contact connector part numbers

basic series	**8602**	**-**	**100**	**-**	**22**	**-**	**13**	**-**	**5**	**-**	**10**	**26**	**-**	**B**	**00**
number of signal contacts															
connectors type															
contact termination															
contact plating															
polarization															

see general ordering information page 404

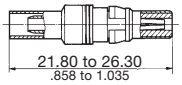
number of coax or power cavities

nbr of cavities	1	2	3	4	5	6	7	8	9	10	11	12
code	A	B	C	D	E	F	G	H	I	J	K	L

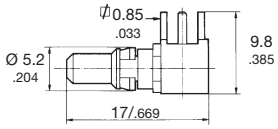
suffix

Coaxial contacts to HE 507 and KMX specifications

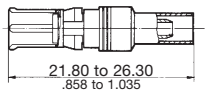
male solder termination
part number : 8602-1010



part number : 8602-1012



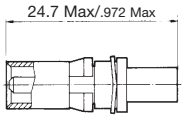
female solder termination
part number : 8602-1011



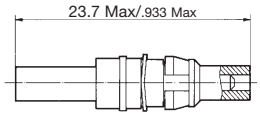
removal tool : 8630-07A

Optical fiber contacts (DIN 41626)

part number : 8012P43D168



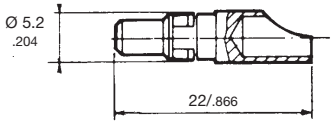
part number : 8012S43D168



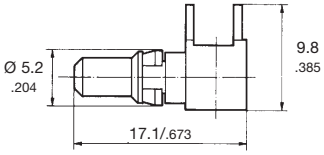
For tight jacketed cable Ø 2.7 (.106) mm fibre 100/140
Please consult us for other cables and fibers

Power contacts to HE 507 and KMX specifications

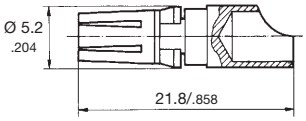
male solder termination
part number : 8602-1009



part number : 8602-1001



female solder termination
part number : 8602-1008



current : 15 A AWG 14

removal tool : 8630-07a

Others : please, consult us

8622 NAFI 2

Applications

Military airborne computer.

Standards

Description

- The NAFI 2 Series is a modular connector, available either with 8 or 4 rows of contacts, offering a very large diversity in the contact number selection, from 16 up to 556 ways. The connectors use improved miniaturized tuning-forks and blade-contacts derived from the MIL-C 28754 standard.

- One of the most interesting aspect of the new 8622 Series is the press-fit field proven technology. It provides a very low profile female connector and contributes reducing the volume and weight of the equipment and making easier backplane repair.

- The male header is available with SMT one-piece contact and flex-cable as well; both terminations are interchangeable on the daughter board.
  Male and female connectors are available also with straight solder spill or press fitted terminations for parallel cards dispositions.

- The insulator modules are provided with closed entry cavities for tuning-fork contact protection during mating operation. Both female end modules are fitted with standard signal contact and polarizing keys. The end modules are also available with AWG 16 cavities for power, coaxial or fiber optic of the MIL-C 38999 Series II crimp contacts.

Characteristics

Mechanical

- Contact insertion force per contact pair :
  - signal contacts (average) : 0.46 N
  - AWG 16 power contacts (Max) : 6.70 N
- Compliant pin retention in Pwb PTH : 25 N
- Contact life :
  - mating/unmating cycles : 500
- Minimum shortest blade contact security : 1.39 mm

Electrical

- Signal contact maximum current rating :
  - permanent : 1 A
  - during 3600 seconds : 2 A
  - during 40 seconds : 3 A
- Power contact maximum current rating :
  - permanent : 13 A
- Dielectric withstanding voltage
  - at sea level : 600 VAC
  - at an altitude of 13700 meters : 250 VAC
- Insulation resistance : 1000 MΩ
- Capacitance between contacts at 10 MHz
- With flex-cable termination : 3.5 pF
- Contact resistance Max (mated) : 30 mΩ

Physical

As per CEI 512

- Damp heat at 40°C/94% R.H (mated) : 56 days
- Thermal shocks (-55°C to +125°C) : 5 cycles
- Salt spray 5% NaCl/35°C :48 hrs
- Physical shocks in 3 directions 1/2 sine-6ms : 100 g
- Vibrations : (no discontinuity)
  - sine 10 - 2000 Hz - 15g/150 mn/axis — Satisfact.
  - random 50 - 2000 Hz - 20g - 0.2g²/Hz - 15 mn — Satisfact.
- Working temperature -55°C to + 125°C — Satisfact.
- Temperature ageing (1000 hrs) — 125°C
- Resistance at areo fluids (EN2591 a.p.C15) — Satisfact.
- Weight in grams (396 way pair) — 50grs

Materials and finishes

components	materials	finishes
modular insulators	black PPS UL94 VO autoextinguish.	
contacts flex cable extruded supports	copper alloy polyimid ana copper aluminum alloy	a.p.MIL black anodized
male polarizing pins female polarizing keys	stainless steel aluminum alloy	

Ordering information

basic series	8622	M	396	-	8	07	000

connector type
M - male
F - female

number of contacts see next page

mandatory separation dot

number of rows
- 8 or 4

contact termination style
07 - SMT one-piece contact
14 - straight solder spills
82 - press-fit

suffix
000 - standard
XXX - any particular specification

Remark : Above part-numbering system is given as an information.
Described example : 8622 M396-807000 is a 396 way 8 row standard male header with SMT terminations.
For **any particular design**, you are requested to compose your reference and consult us for getting a definitive part number and customer drawings as well.

The 8622 range

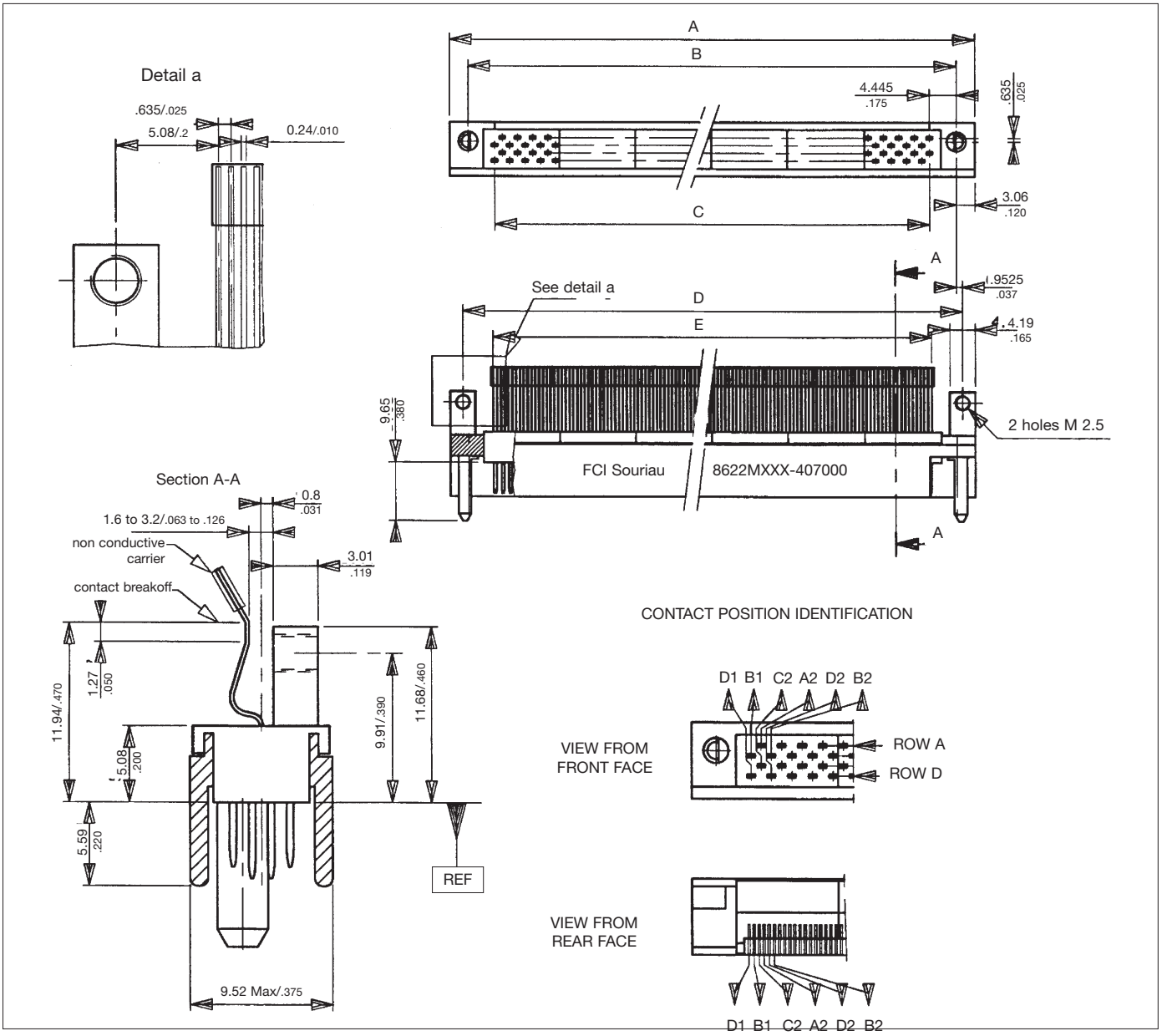
card format							connector			8 row connector (15.24 mm pitch between cards)		4 row connector (10.16 mm between cards)	
dimension	A1 / B1 SEM	single Europe	SEME	half ATR	A3 / B3 SEM	double Europe	number of fixings	number of modules	overall dimension	number of contacts			
										8 rows populated	6 rows populated	4 rows populated	2 rows populated
								2	36.60 1.441	76	56	36	16
								3	49.30 1.941	116	86	56	26
69.90 2.752								4	62.00 2.441	156	116	76	36
							2	5	74.70 2.941	196	146	96	46
100.00 3.937							fixings	6	87.40 3.441	236	176	116	56
								7	100.10 3.941	276	206	136	66
								8	112.80 4.441	316	236	156	76
								9	125.50 4.941	356	266	176	86
149.30 5.878								10	138.20 5.441	396	296	196	96
164.00 6.457								11	159.80 6.291	436	326	216	106
							3	12	172.50 6.791	476	356	236	116
222.00 8.740							fixings	13	185.20 7.291	516	386	256	126
233.00 9.173								14	197.90 7.791	556	416	276	136

The 8622 connector series covers a large range of card formats, from the smallest SEM A1/B1 up to the 233 mm long DOUBLE EUROPE style. In accordance with the number of modules, the above table shows the overall dimensions of the connector. The shortest connector is composed of at least 2 modules. The longest, fitted with 14 modules, offers 556 contacts in a 197.90 mm length only.
From 2 to 10 modules, the male header is fastened on to the daughter card by 2 fixing points. Over 10 modules, a third center fixing is necessary.

Above table displays the connector flexibility. As an example, the connector ranges from 76 to 556 contacts for 8 row cavities totally equipped with their contacts. The same 8 row modules may be underloaded in 6 rows only. In that case, the connector ranges from 56 to 416 contacts. On the same way, a 4 row module connector fully equipped offers 36 to 276 contacts and only 16 to 136 as partially populated.

Male header dimensions

4 row connector with SMT terminations



For typical Pwb foot-print, page 515 - Dimension 11.94 (.42) depends on Pwb thickness (please, consult us)

dimension formula		
	example : 196 ways N = 10 modules	**dimensions**
C	21.59 + 12.7 x (N - 2) .850 .500	123.19 4.850
A	C + 15.01 . 591	138.20 5.441
B	C + 8.89 . 350	132.08 5.200
D	C + 10.79 . 429	133.98 5.275
E	C + 0.63 . 025	123.82 4.875

typical 196 ways part number
8622 M 196-407000

Number of fixings :

Over 10 modules, a third fixing is necessary.

C dimension is then increased of 8.89 mm (.350).

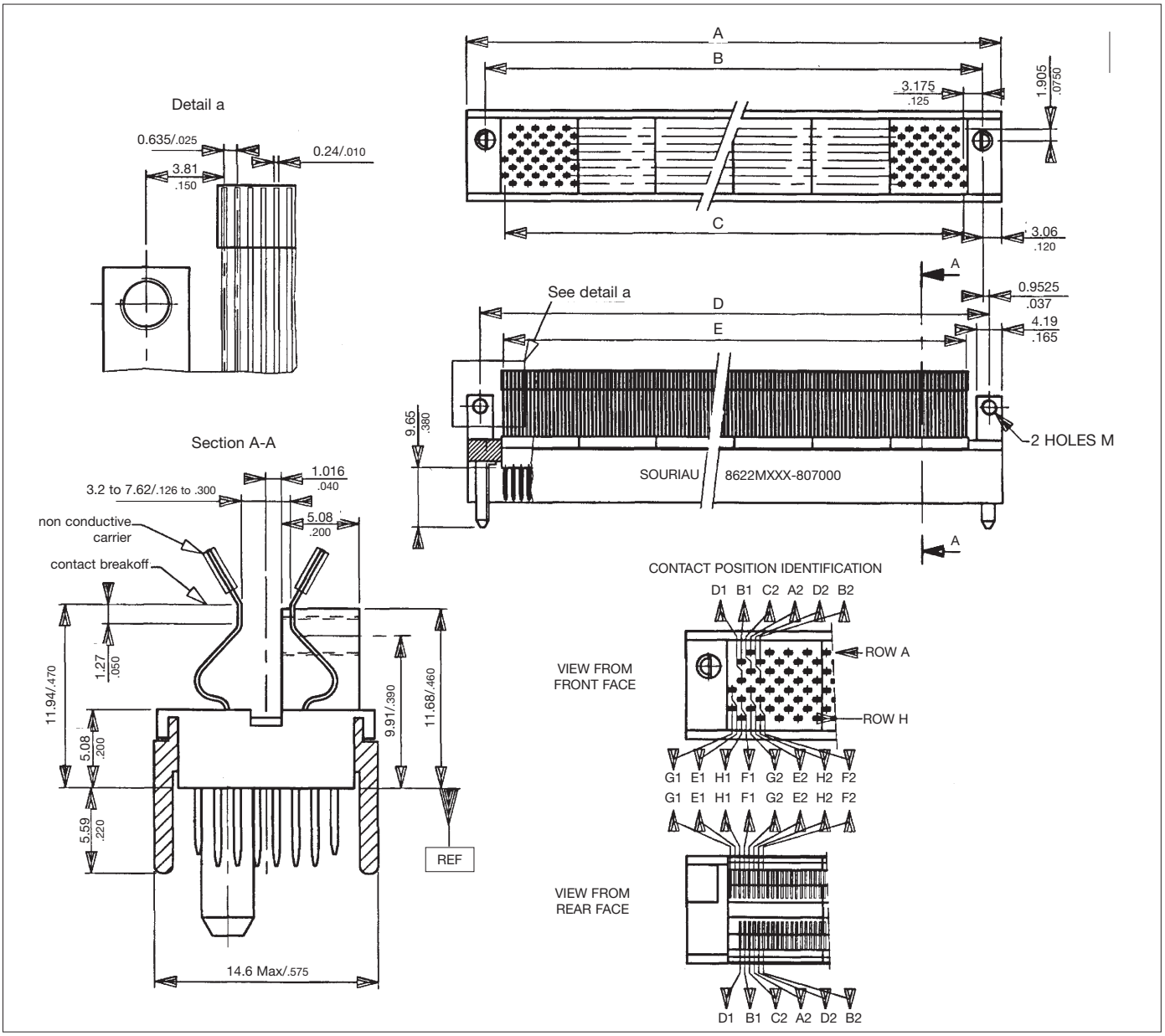
As an example, a 216 way connector, composed of 11 modules, has a length :

C = 30.48 + 12.7 x 9 = 144.78 mm

1.200 + 0.500 x 9 = 5.700 inch

Male header dimensions

8 row connector with SMT terminations



For typical Pwb foot-print, page 515 - Dimension 11.94 (.470) depends on Pwb thickness (please, consult us)

dimension formula		
	example : 396 ways N = 10 modules	**dimensions**
C	24.13 + 12.7 x (N - 2) .950 .500	125.73 4.950
A	C + 12.47 .491	138.20 5.441
B	C + 6.35 .250	132.08 5.200
D	C + 8.25 .325	133.98 5.275
E	C + 0.63 .025	126.36 4.975

typical 396 ways part number
8622 M 396-807000

Number of fixings :

Over 10 modules, a third fixing is necessary.

C dimension is then increased of 8.89 mm (.350).

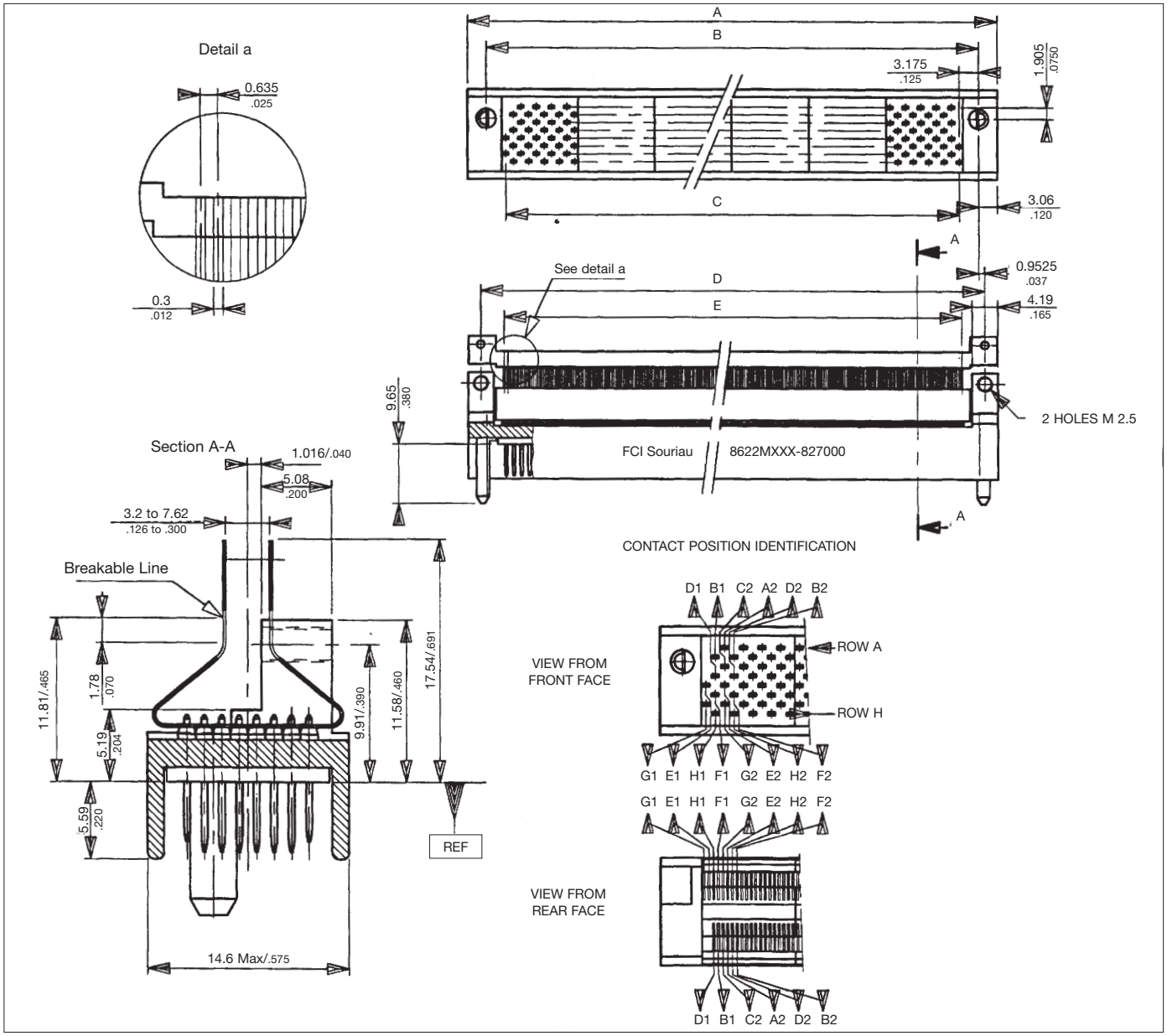
As an example, a 436 way connector, composed of 11 modules, has a length :

C = 24.13 + 8.89 + 12.7 x 9 = 147.32 mm

C = .950 + .350 + .500 x 9 = 5.800

Male header dimensions

8 row connector with flex cable termination (available for 396 ways connector only)



Above drawing is available for a 396 way connector. For any other arrangement, please consult us.
Dimension 11.81/1.465 depends on Pwb thickness.

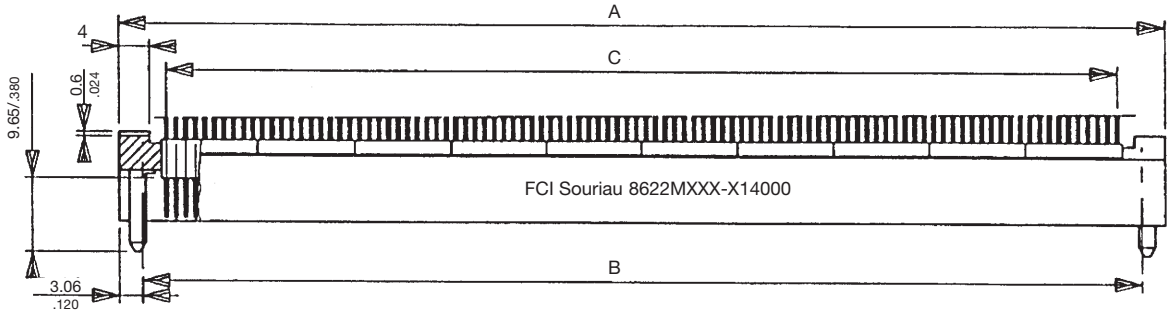
dimension formula		
	example : 396 ways N = 10 modules	**dimensions**
C	24.13 + 12.7 x (N - 2) .950 .500	125.73 4.950
A	C + 12.47 .491	138.20 5.441
B	C + 6.35 .250	132.08 5.200
D	C + 8.25 .325	133.98 5.275
E	C + 0.63 .025	126.36 4.975

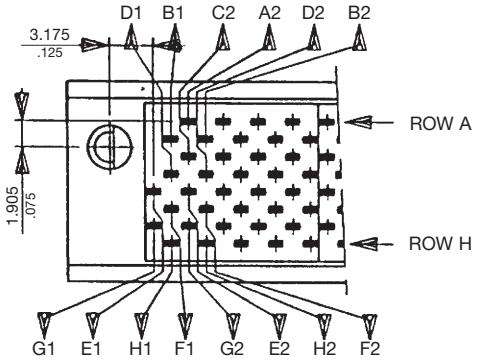
typical 396 ways part number
8622 M 396-827000

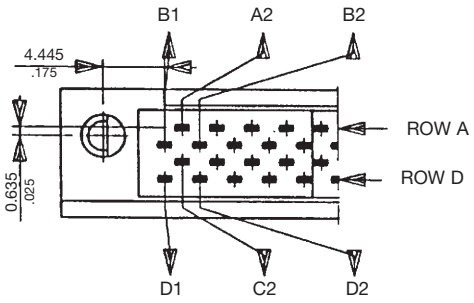
Number of fixings :
Over 10 modules, a third fixing is necessary.
C dimension is then increased of 8.89 mm (.350).
As an example, a 436 way connector, composed of 11 modules, has a length :
C = 24.13 + 8.89 + 12.7 x 9 = 147.32 mm
C = .950 + .350 + .500 x 9 = 5.800 inch

Male header dimensions

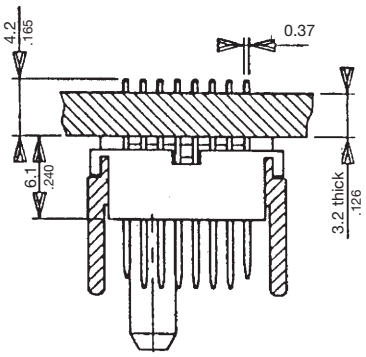
4 and 8 row connector, solder spills or press-fit and WW terminations



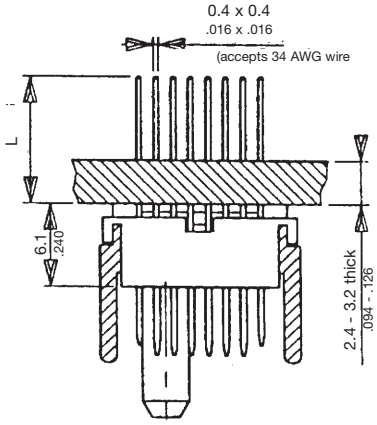




solder spills



press-fit & WW



For typical Pwb foot print, see next page. Consult us for all orders.

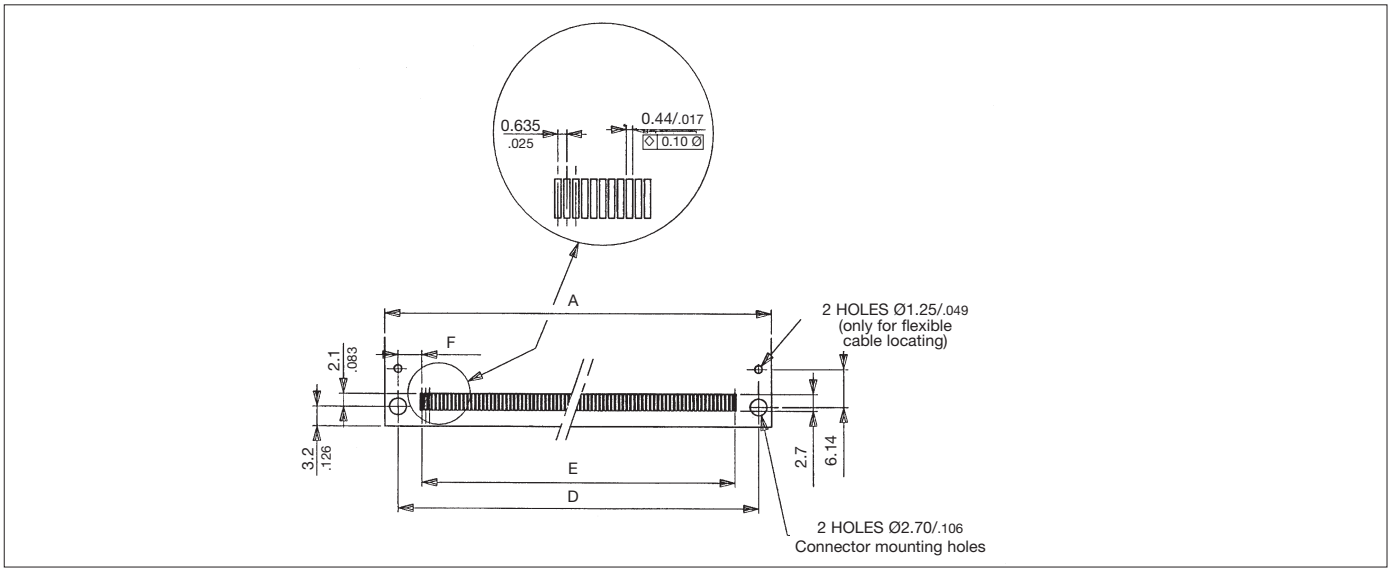
dimension formula (N = 10 modules)				
	8 rows		4 rows	
	formula	example 396	formula	example 196
C	24.13 + 12.7 x (N - 2) .950 .500	125.73 4.950	21.59 + 12.7 x (N-2) .850 .500	123.19 4.850
A	C + 12.47 .491	138.20 5.441	C + 15.01 .591	138.20 5.441
B	C + 6.35 .250	132.08 5.200	C + 8.89 .350	132.08 5.200

extensions length (L)	
nbr of wraps	L
3	10.16 .400
2	7.34 .289
1	5.59 .220
0	4.05 .159

Above table, is given for 10 modules, add 8.89 mm/.350 to C dimension.

Male header dimensions

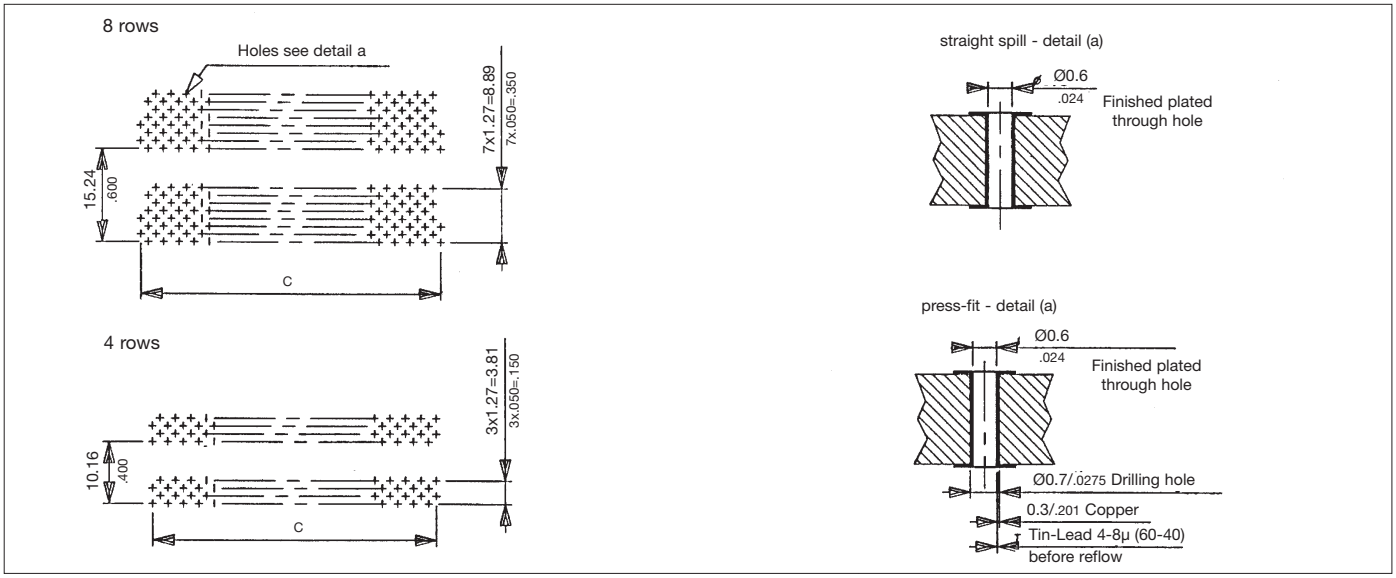
4 and 8 row connectors typical Pwb foot-print



dimension formula (N = 10 modules)				
	8 rows		4 rows	
	formula	example 396	formula	example 196
C	24.13 + 12.7 x (N - 2) .950 .500	125.73/4.950	21.59 + 12.7 x (N - 2) .850 .500	123.19/4.850
A	C + 12.47/.461	138.20/5.441	C + 15.01/.591	138.20/5.441
D	C + 8.25/.325	133.98/5.275	C + 10.79/.429	133.98/5.275
E	C + 0.63/.025	126.36/4.975	C + 0.63/.025	123.82/4.875
F	3.81/.150	3.81/.150	5.08/.200	5.08/.200

Above table, is given for 10 modules or less, over 10 modules, add 8.89 mm/.350 to C dimension.

4 and 8 row, straight solder spill or press-fit and WW Pwb foot-print



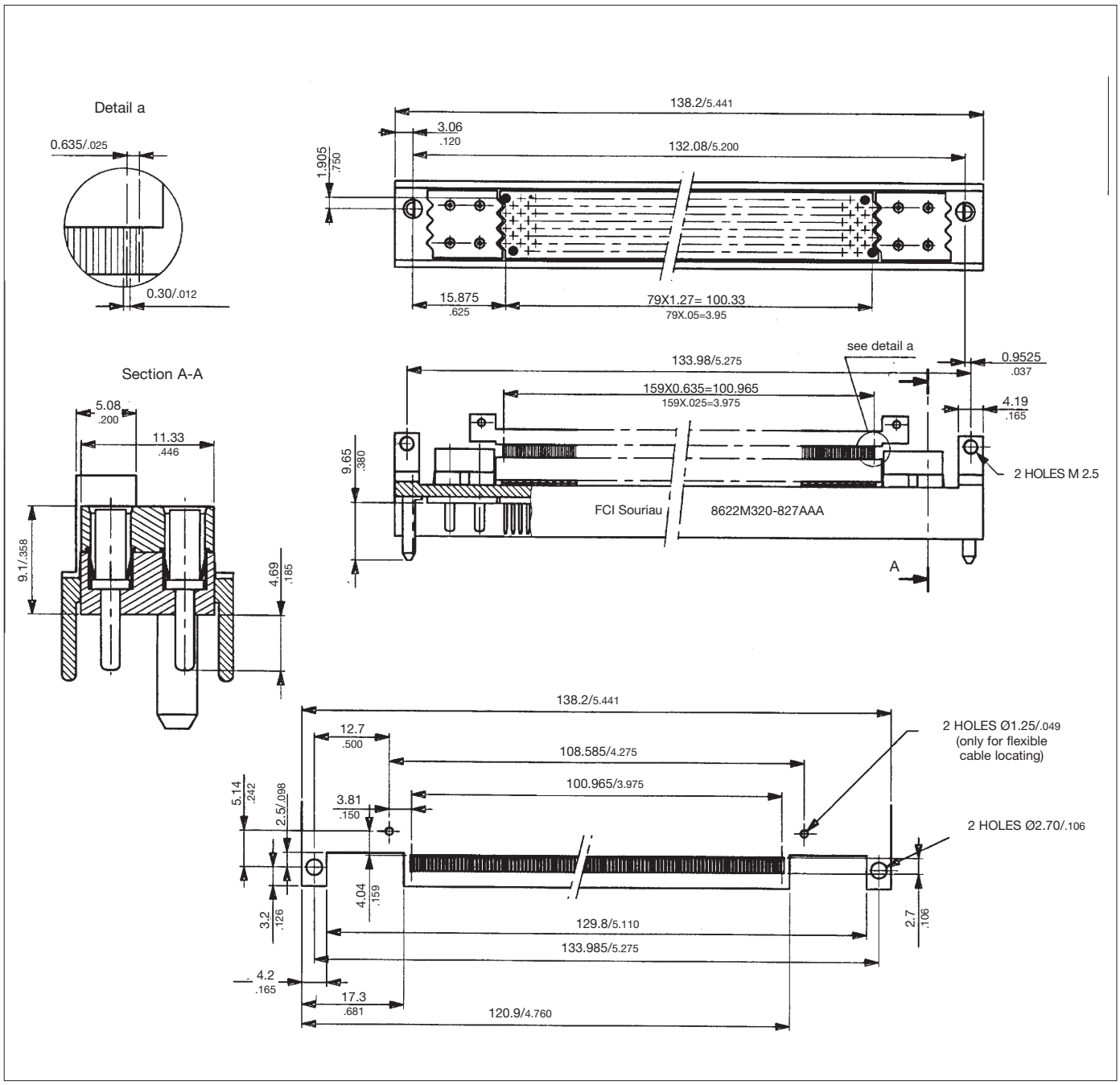
dimension formula (N = 10 modules)				
	8 rows		4 rows	
	formula	example 396	formula	example 196
C	24.13 + 12.7 x (N - 2) .950 + .500 X (N - 2)	125.73 4.953	21.59 + 12.7 x (N - 2) .850 + .500 X (N - 2)	123.19 4.850

Above table, is given for 10 modules or less, over 10 modules, add 8.89 mm/.350 to C dimension.

Male header dimensions

Mixed signal and size-16 contacts

The 8 row end insulator modules are available either with 40 signal or 4 size 16 cavities for power, coaxial or fiber optic contacts. The AWG 16 contacts are ordered and delivered separately. The following example shows a 8 row, 320 signal and 8 power contacts. Please, consult us for any other configuration.

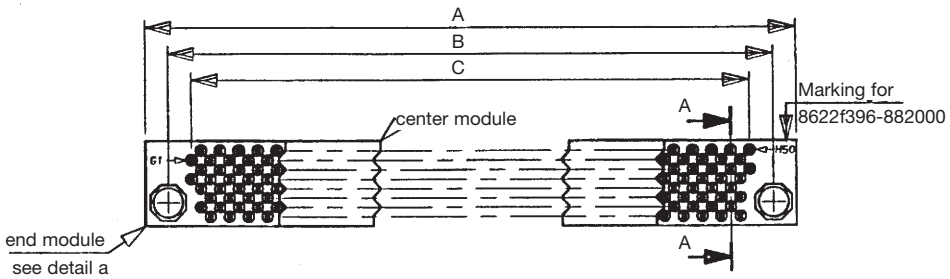


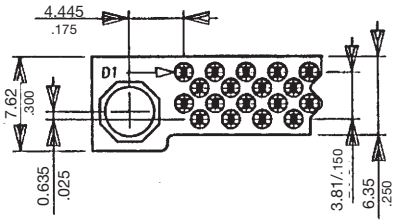
AWG 16 contact part number		
sex of contact	**power contacts**	**coaxial contact**
pin	M39029/58-364	M39029/76-A

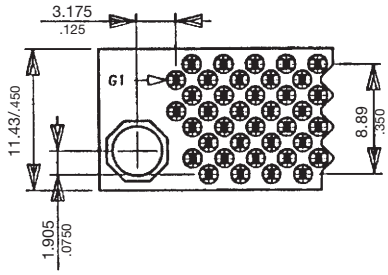
320 + 8 connector part number
8622 M320-827xxx*
*TBD

Female receptacle dimensions

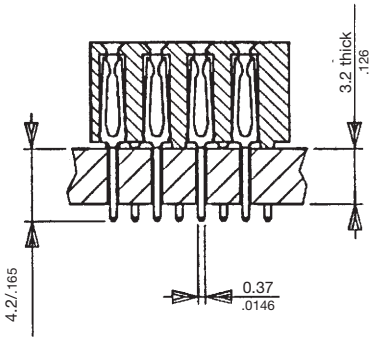
4 and 8 row, solder spills or press-fit and wire-wrap terminations

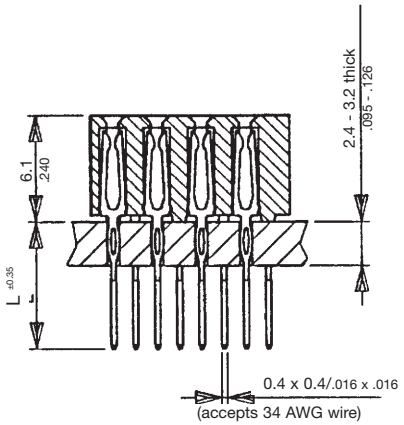






extensions length (L)		
termination style	**nbr of wraps**	**L**
83	3	10.16 .400
82	2	7.34 .289
81	1	5.59 .220
84	0	4.05 .159





For typical Pwb foot print, see next page.

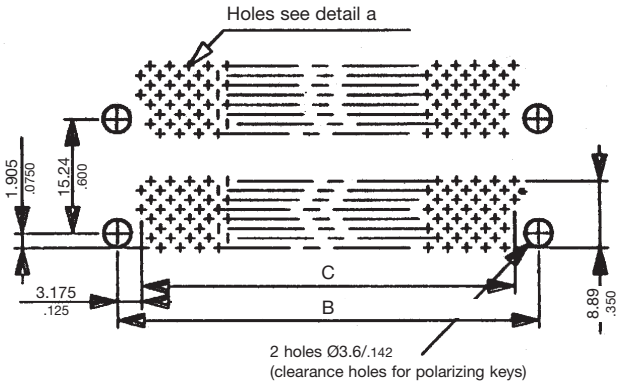
dimension formula (N = 10 modules)					part numbers	
	8 rows		4 rows		**396 way press fit**	8622F396-882000
	formula	**example 396**	**formula**	**example 196**	**396 way solder spills**	8622F396-814000
C	24.13 + 12.7 x (N - 2) .950 .500	125.73 4.950	21.59 + 12.7 x (N - 2) .850 .500	123.19 4.850		
A	C + 12.47 .491	138.20 5.441	C + 15.01 1 .591	38.20 5.441	**196 way press fit**	8622F196-482000
B	C + 6.35 .250	132.08 5.200	C + 8.89 .350	132.08 5.200	**196 way solder spills**	8622F196-41400

Above table, is given for 10 modules or less. Over 10 modules, add 8.89 mm/.350 to C dimension.

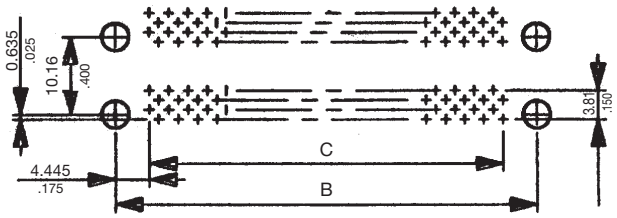
Female receptacle dimensions

4 and 8 row connector with solder spills or press-fit Pwb foot-print

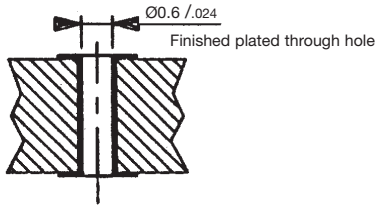
– 8 rows



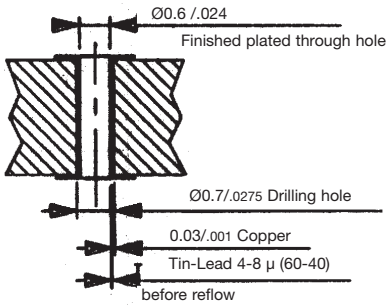
– 4 rows



Detail a (straight spill)



Detail a (press fit)



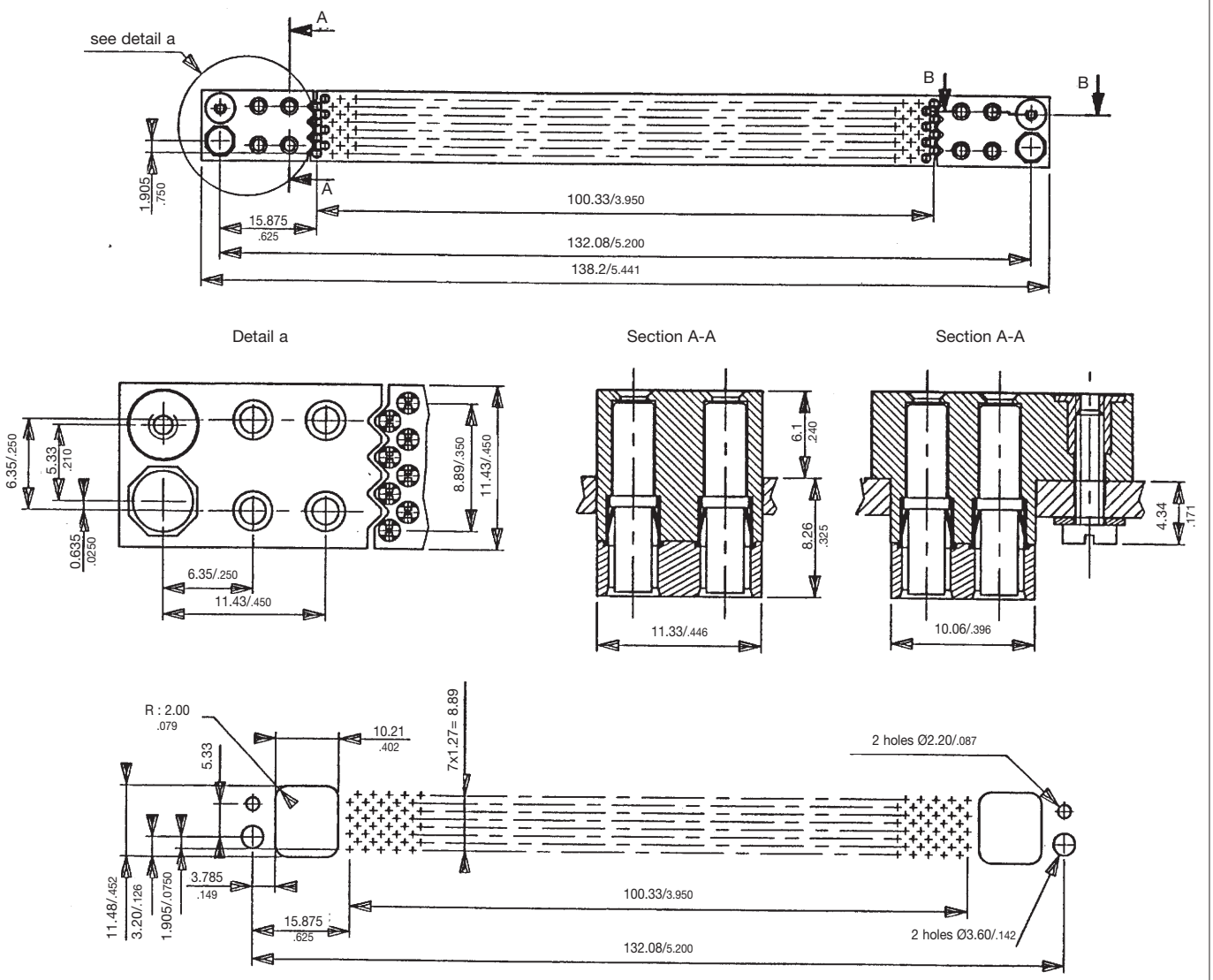
dimension formula (N = 10 modules)				
	8 rows		4 rows	
	formula	example 396	formula	example 196
C	24.13 + 12.7 x (N - 2) .950 .500	125.73 4.950	21.59 + 12.7 x (N - 2) .850 .500	123.19 4.850
B	C + 6.35 .250	132.08 5.200	C + 8.89 .350	132.08 5.200

Above table is given for 10 modules or less. Over 10 modules, add 8.89 mm/.350 to C dimension.

Female receptacle dimensions

Mixed signal and size 16 contacts

The 8 row end insulator modules are available either with 40 signal or 4 size 16 cavities for power, coaxial or fiber optic contacts. The AWG 16 contacts are ordered and delivered separately. The following example shows a 8 row, 320 signal and 8 power contacts. Please, consult us for any other configuration.



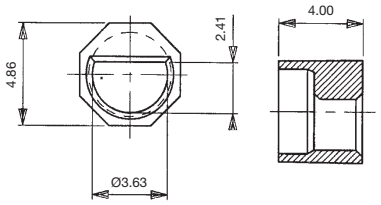
AWG 16 contact part number		
sex of contacts	**power contacts**	**coaxial contacts**
socket	M39029/57-358	M39029/78-B

(320 + 8) connector part number
8622 F320-882xxx**
**TBD

Polarizing and coding devices

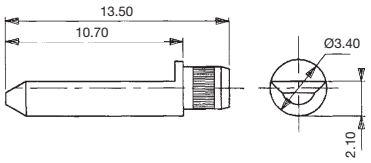
Male and female connectors are equipped with D shaped polarizing devices of the standard NAFI connectors. Coding key and pin, in any cases, are delivered loose, in bags of 10 units. The female receptacle is fitted with octogonal keys cavities built in both end modules. The male header is always fitted with coding pins holes.

Coding key
The key meet the MIL 28754/39B specification. It is hand positionned and jammed with an hand tool (see page 21)



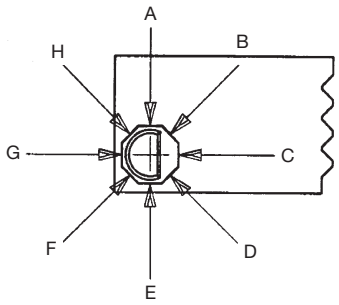
Part number : 8602-9303A SP10

Coding pin
The pin are installed by customer in their selected angular orientation with an hand tool (see page 21)



Part number : 8622-9007SP10

Polarization
Besides example is shown in position C.



Tooling

Female press-fit receptacle

The mother board is generally supplied completely assembled and tested by Souriau under customer specifications.
In some particular applications, the customer is able to assemble himself the press-fit receptacles on its own backplane.

In any cases, please, contact us for any information.

Coding devices settlement

Coding pins settlement demands recommanded special hand tools :

	part number
Male pin	8622-1000
Female key	8622-1001
Hand press and rest	8622-1002

Female contact repair kit

The press-fit contacts into the board may be removed 3 times from the card (for repair purposes for example) this operation is handled with the following hand tool :

part number
8622-1003

Female contact press-fitting hand-tool

This tool is composed of a X-Y indexed table bench and insertion head as well.

part number
8622-1004

Male header soldering on the daughter board

Depending on the required termination style (Flex-cable or one-piece SMT contacts).
On request, a special soldering recommandation sheet is available. Please, consult us.