

# Amphenol® High Density HDB<sup>3</sup> and HSB<sup>3</sup> Connector Series

SL-402

**HDB<sup>3</sup>**  
High Density



**Amphenol**  
Aerospace

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# BRISTLE BRUSH ADVANTAGES

## The superior choice for board level interconnects

The Bristle Brush contact has been proven in military avionics packages and meets the requirements of MIL-DTL-55302. It provides high density in tighter spacing which is a main concern for integrated electronics in aircraft systems.

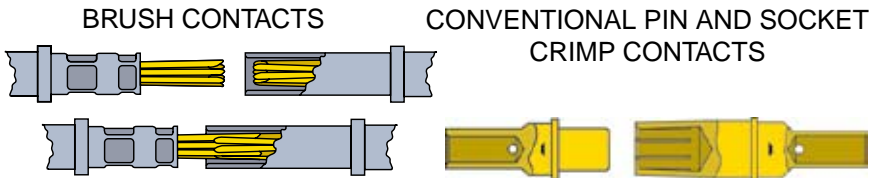
Brush vs. Conventional Contacts

### Brush Contact Innovation

- Multiple contact interfaces: Strands of high tensile strength wire are bundled together to form brush-like contacts. By intermeshing two multi-strand wire bundles, an electrical connection is made.
- Provides redundant current paths, 14-70 (point of contact) per mated contact with a gas tight junction.
- Very smooth (low friction) interface

### Conventional Pin/Socket

- Machined surface finish on both parts
- Higher friction and wear
- Limited number of contact sites



### Amphenol Brush Contact Provides:

- Low mating forces (70% to 90% lower than conventional pin and socket contacts)
- Easy mating/unmating makes high circuit counts practical (25 lbs. typical for 400 contacts)
- Multiple points of contact = superior electrical capability
  - Stable, low resistance-20milliohms max.
  - Redundant current paths
  - Proven electrical and gas tight contact sites
- Severe environment protection
- High current rating
- Long contact life (100,000 cycles of mating and unmating with out performance degradation)
- Documented intermittency-free performance - no 10 nanosecond discontinuities during 50,000,000 cycles of 0.010 displacement
- Overall cost effectiveness (life cycle cost)
- Protection against micro-arcing
- No degradation in a fretting/micro-motion environment

# HIGH DENSITY BRUSH (HDB<sup>3</sup>) SERIES

## HDB<sup>3</sup> High Density Brush Series with tighter (.070 inch X .060 inch) staggered grid spacing

This new connector series of brush connectors incorporates a higher density contact pattern and lower mated height than Amphenol's standard low mating force rectangular connectors. HDB<sup>3</sup> connectors utilize the same durable and reliable B<sup>3</sup> brush contact in a tighter .070" X .060" staggered grid pattern. They offer the advantage of higher density in a compact-height connector utilizing less board space. Styles include mother board, daughter board, input/output and stacker.



HDB<sup>3</sup> Daughter Board Connector



HDB<sup>3</sup> Mother Board Connector

## HDB<sup>3</sup> MATERIALS

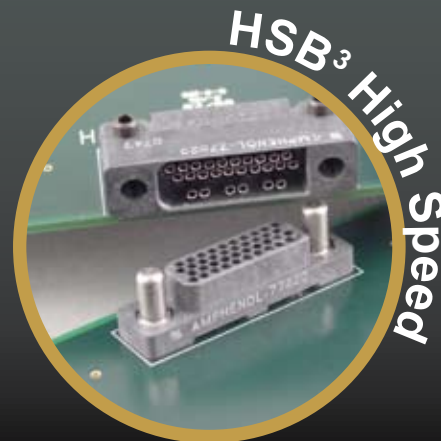
- Insulator: Liquid crystal polymer, 30% glass filled
- Contact: Wire: Beryllium copper per ASTM B197; finish is gold per ASTM B488 over nickel per AMS-QQ-N-290.
- Holder: Brass similar to UNS C33500; available finishes include gold per MIL-G-45204, tin-lead per MIL-P-81728 or tin per MIL-T-10727 (RoHS Compliant).
- Sleeve: Stainless Steel per AMS-5514, passivated IAW QQ-P-35 (Daughter Board, I/O and Stacker connector)
- Keys/Guide Pins: Stainless Steel



HDB<sup>3</sup> I/O Connector



HDB<sup>3</sup> Stacker



HDB<sup>3</sup> High Speed

# COMPARISON

## COMPARISON

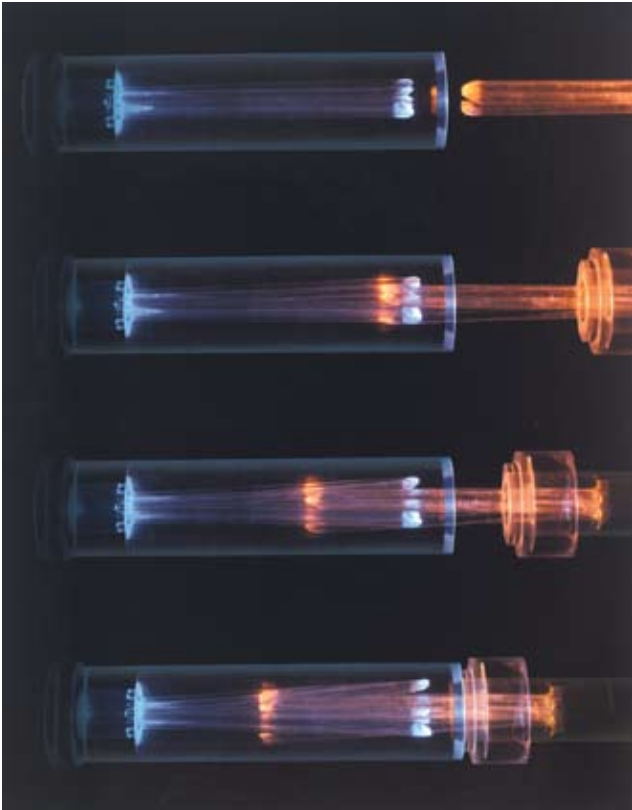
The Amphenol HDB<sup>3</sup> Connector offers advantages over competitive connectors:

- Higher density contact pattern
- Uses less board space
- Allows for shorter mated height
- Provides the durability and performance of the Brush contact
- Low cost

	Amphenol HDB <sup>3</sup>	Hypertronics HPH	Airborn RM4
Contact System	Brush	Hyperboloid	Pin & Socket
Durability, Mating Cycles	100,000	2,000	500
Contact Mating Forces, Ounces	1.5	1.5	2.5
Mother Board	.070 X .060	.075 X .075	.075 X .070
Daughter Board	.070 X .060	.075 X .100	.075 X .100
Connector Width	.350	.443	.400
Mated Height, MB to 4th row of DB	.680	.986	.915

# HDB<sup>3</sup> AND HSB<sup>3</sup> FEATURES AND BENEFITS

## PERFORMANCE



## FEATURES

### FEATURES

Polarization:	“D” shaped design
Keying:	Optional keys offer 36 unique keying combinations
Guide Pins	Optional guide pins provide additional alignment
Radial Misalignment:	Capable of correcting up to a .020” initial radial misalignment
Angular Misalignment:	Capable of mating with up to a 2° initial angular misalignment

### CONNECTOR PERFORMANCE

Durability:	100,000 mating cycles
Insertion/Extraction Force:	1.5 ounce typical per contact
Operating Temperature:	-65° to 125°C
Current Rating:	2 amperes Hot swap 1 ampere maximum (load dependent)
Insulation Resistance:	5 gigaohms minimum Dielectric Withstanding
Voltage:	750 volts, 60 hertz, rms @ Sea Level 250 volts, 60 hertz, rms @ 70,000 feet Elevation
Solderability:	MIL-STD-202, Method 208
Salt Fog:	48 Hours IAW MIL-STD-1344, method 1001, test condition B
Humidity:	IAW MIL-STD-1344, method 1002, type II
Vibration:	4 hours in each of 3 mutually perpendicular axes IAW MIL-ST 1344, method 2005, test condition V, letter H
Shock:	1 shock along each of three mutually perpendicular axes IAW MIL-STD-1344, method 2004, test condition G
Data Rate (HSB <sup>3</sup> ):	Capable of 3.125 Gbps (consult Amphenol for arrangement)

## HDB<sup>3</sup> & HSB<sup>3</sup>





# HDB<sup>3</sup> MOTHER BOARD

## HDB<sup>3</sup> MOTHER BOARD – HOW TO ORDER

- Mates with:
- Daughter Board
  - I/O
  - Stacker

	1.	2.	3.	4.	5.	6.
		Number of Contacts	Brush Wire Plating	Termination	Contact Termination Finish	Less Hardware (Purchased separately see pg 10 for hardware options)
<b>HDB-M4</b>		<b>040</b>	<b>M</b>	<b>24</b>	<b>2</b>	<b>X</b>

### 1. Connector Type

#### HDB-M4

Designates HDB<sup>3</sup> Mother Board

### 2. Number of Contacts

	Number of Contacts	Dimension A	Dimension C
<b>040</b>	40	1.375	1.075
<b>060</b>	60	1.725	1.425
<b>080</b>	80	2.075	1.775
<b>120</b>	120	1.775	2.475
<b>160</b>	160	3.475	3.175

### 3. Brush Wire Plating

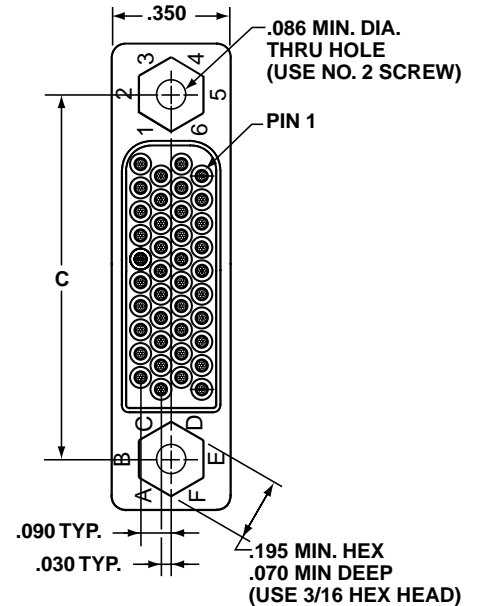
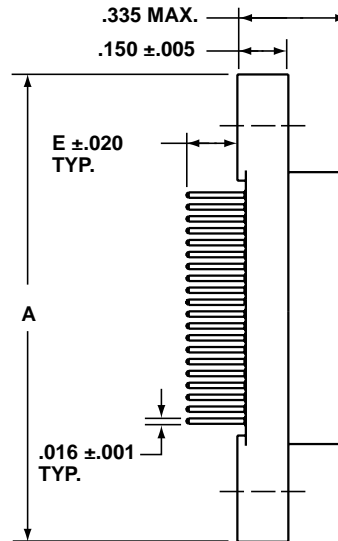
<b>M</b>	0.000050 Au Min. thick over Nickel
<b>C</b>	0.000020 Au Min. thick over Nickel

### 4. Termination

	Type	Stickout (Dim. E)
<b>22</b>	PCB, Straight, .016 Dia	0.120
<b>23</b>	PCB, Straight, .016 Dia	0.150
<b>24</b>	PCB, Straight, .016 Dia	0.180
<b>26</b>	PCB, Straight, .016 Dia	0.240
<b>28</b>	PCB, Straight, .016 Dia	0.300

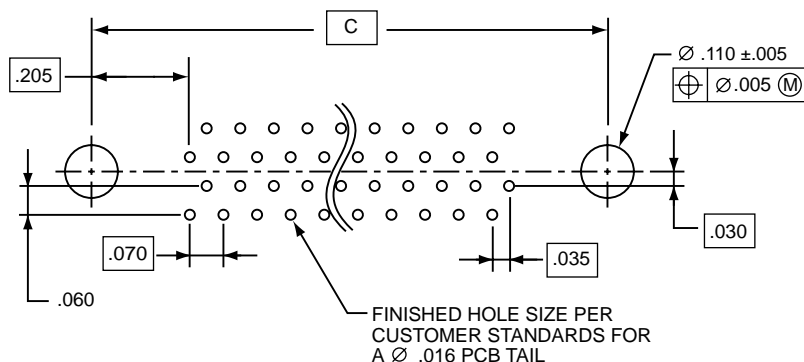
### 5. Contact Termination Finish

<b>2</b>	Gold plated in accordance with MIL-G-45204, Type II, .00030 Min. thick Gold over .000050 Min. thick Nickel
<b>5</b>	Tin plated in accordance with ASTM B545, .00010 Min. thick Matte Tin over .00010 Min. thick Nickel
<b>6</b>	Tin-Lead plated in accordance with SAE-AMS-P-81728, .00010 Min. thick Tin-Lead over .00010 Min. thick Copper



Connector Dimensions			
No. of Contacts	Contact Pattern	A	C
40	4 Row X 10	1.375	1.075
60	4 Row X 15	1.725	1.425
80	4 Row X 20	2.075	1.775
120	4 Row X 30	2.775	2.475
160	4 Row X 40	3.475	3.175

## MOTHER BOARD LAYOUT



# HDB<sup>3</sup> DAUGHTER BOARD

## HDB<sup>3</sup> DAUGHTER BOARD – HOW TO ORDER

Mates with:  
• Mother Board

	1.	2.	3.	4.	5.	6.
		Number of Contacts	Brush Wire Plating	Termination	Contact Termination Finish	Less Hardware (Purchased separately see pg 10 for hardware options)
	<b>HDB-D4</b>	<b>040</b>	<b>M</b>	<b>01</b>	<b>2</b>	<b>X</b>

### 1. Connector Type

#### HDB-D4

Designates HDB<sup>3</sup> Daughter Board

### 2. Number of Contacts

	Number of Contacts	Dimension A	Dimension C
<b>040</b>	40	1.375	1.075
<b>060</b>	60	1.725	1.425
<b>080</b>	80	2.075	1.775
<b>120</b>	120	1.775	2.475
<b>160</b>	160	3.475	3.175

### 3. Brush Wire Plating

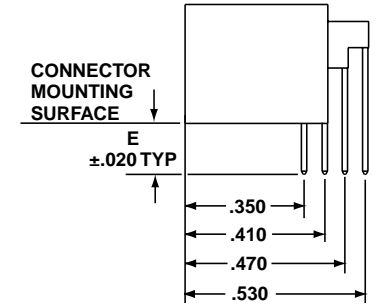
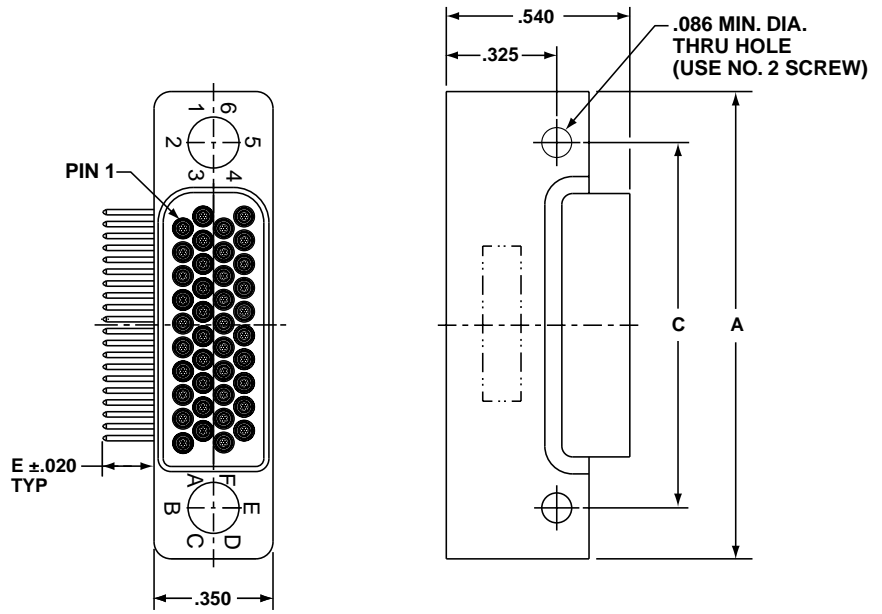
<b>M</b>	0.000050 Au Min. thick over Nickel
<b>C</b>	0.000020 Au Min. thick over Nickel

### 4. Termination

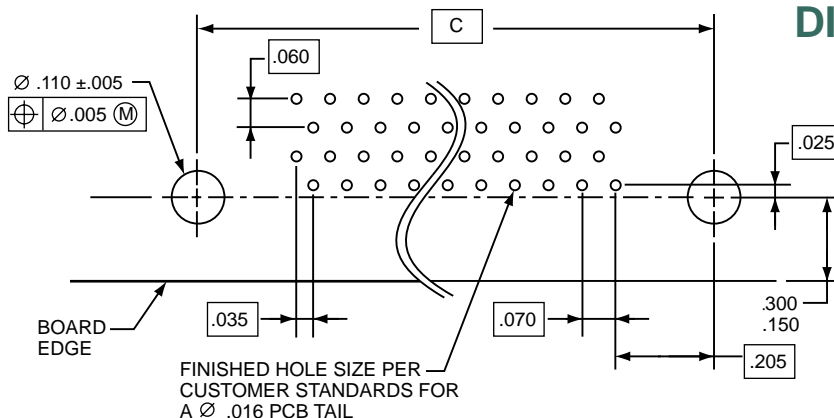
	Type	Stickout (Dim. E)
<b>01</b>	PCB, Right Angle, .016 Dia.	0.090
<b>02</b>	PCB, Right Angle, .016 Dia.	0.120
<b>03</b>	PCB, Right Angle, .016 Dia.	0.150
<b>04</b>	PCB, Right Angle, .016 Dia.	0.180
<b>06</b>	PCB, Right Angle, .016 Dia.	0.300

### 5. Contact Termination Finish

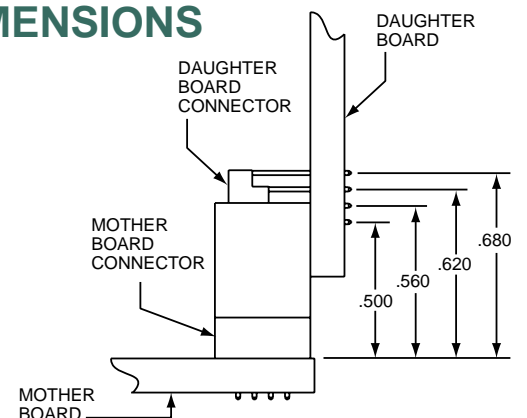
<b>2</b>	Gold plated in accordance with MIL-G-45204, Type II, .00030 Min. thick Gold over .000050 Min. thick Nickel
<b>5</b>	Tin plated in accordance with ASTM B545, .00010 Min. thick Matte Tin over .00010 Min. thick Nickel
<b>6</b>	Tin-Lead plated in accordance with SAE-AMS-P-81728, .00010 Min. thick Tin-Lead over .00010 Min. thick Copper



## DAUGHTER BOARD LAYOUT



## MATED HEIGHT DIMENSIONS



# HDB<sup>3</sup> I/O CONNECTOR

## FEATURES/BENEFITS

- For cable to cable
- Cable to board applications
- Crimp termination
- Uses wire well size 22D

I/O Connector

Mother Board

## HDB<sup>3</sup> I/O – HOW TO ORDER

Mates with:  
• Standard Mother Board

### 1. Connector Type

**HDB-D4C**

Designates HDB<sup>3</sup> I/O Connector

1.	2.	3.	4.
	Number of Contacts	Brush Wire Plating	Contact Termination Finish
<b>HDB-D4C</b>	<b>120</b>	<b>C</b>	<b>2</b>

### 2. Number of Contacts

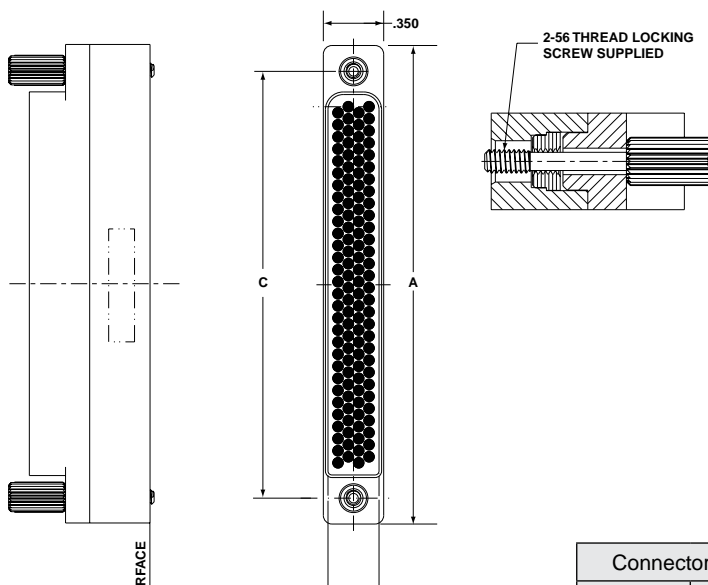
Number of Contacts	Dimension A	Dimension C
<b>040</b>	1.375	1.075
<b>060</b>	1.725	1.425
<b>080</b>	2.075	1.775
<b>120</b>	2.775	2.475
<b>160</b>	3.475	3.175

### 3. Brush Wire Plating

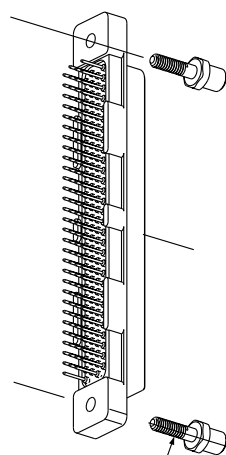
<b>M</b>	0.000050 Au Min. thick over Nickel
<b>C</b>	0.000020 Au Min. thick over Nickel

### 4. Contact Termination Finish

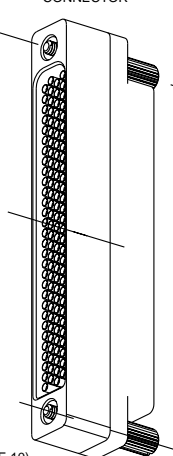
<b>2</b>	Gold plated in accordance with MIL-G-45204, Type II, .00030 Min. thick Gold over .000050 Min. thick Nickel
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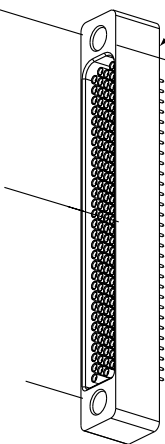
MATING MOTHER BOARD CONNECTOR



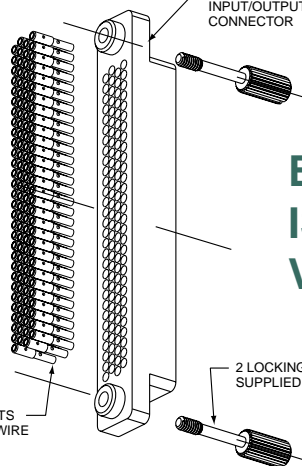
ASSEMBLED INPUT/OUTPUT CONNECTOR



FRONT HALF INPUT/OUTPUT CONNECTOR



REAR HALF INPUT/OUTPUT CONNECTOR



THREADED BOSS (2 REQUIRED FOR MOTHER BOARD CONNECTOR SEE HARDWARE ON PAGE 10)

REMOVABLE CRIMP CONTACTS FOR SIZE 22 THRU 28 GAGE WIRE

**EXPLODED ISOMETRIC VIEW**

2 LOCKING SCREWS SUPPLIED

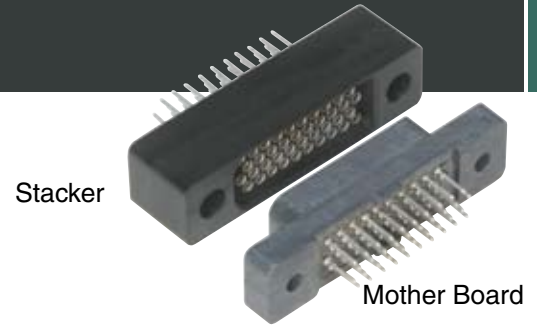
Connector Dimensions		
No. of Contacts	A	C
40	1.375	0.630
60	1.725	1.425
80	2.075	1.330
120	2.775	2.030
160	3.475	2.730



# HDB<sup>3</sup> STACKER CONNECTOR

## FEATURES/BENEFITS

- For applications that need or demand parallel boards



## STACKER CONNECTOR – HOW TO ORDER

Mates with:

- Standard Mother Board

	1.	2.	3.	4.	5.	
		Number of Contacts	Brush Wire Plating	Termination	Contact Termination Finish	Less Hardware (Purchased separately see pg 10 for hardware options)
<b>HDB-D4S</b>		<b>120</b>	<b>C</b>	<b>21</b>	<b>2</b>	<b>X</b>

### 1. Connector Type

**HDB-D4S**

Designates HDB<sup>3</sup> Stacker Connector.

### 2. Select the Number of Contacts

Number Diff Signals	Number of Contacts	Dimension A	Dimension C
<b>040</b>	40	1.375	1.075
<b>060</b>	60	1.725	1.425
<b>080</b>	80	2.075	1.775
<b>120</b>	120	2.775	2.475
<b>160</b>	160	3.475	3.175

### 3. Select a Brush Wire Plating

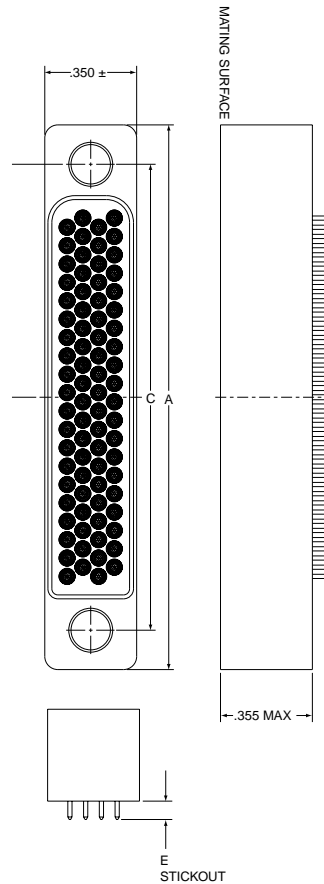
<b>M</b>	0.000050 Au Min. thick over Nickel
<b>C</b>	0.000020 Au Min. thick over Nickel

### 4. Select a Termination

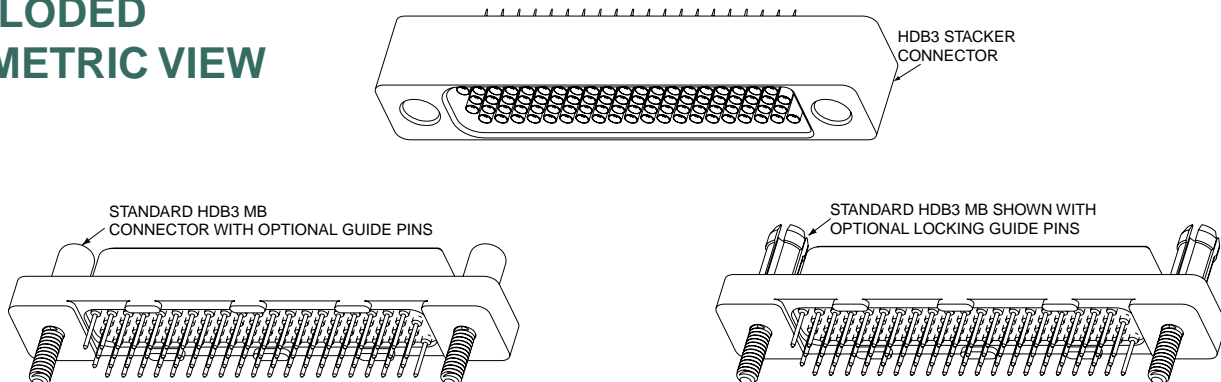
	Type	Stickout (Dim. E)
<b>21</b>	PCB, Straight, .016 Dia	0.090
<b>22</b>	PCB, Straight, .016 Dia	0.120
<b>23</b>	PCB, Straight, .016 Dia	0.150
<b>24</b>	PCB, Straight, .016 Dia	0.180
<b>28</b>	PCB, Straight, .016 Dia	0.300

### 5. Contact Termination Finish

<b>2</b>	Gold plated in accordance with MIL-G-45204, Type II, .00030 Min. thick Gold over .000050 Min. thick Nickel
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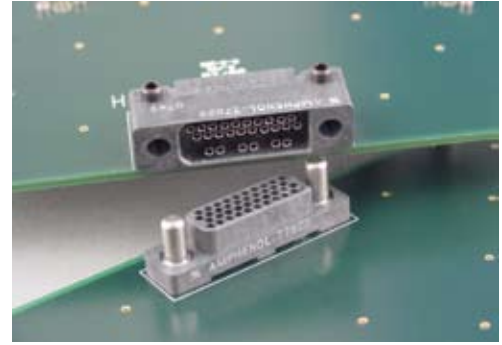
## EXPLODED ISOMETRIC VIEW



# HIGH SPEED BRUSH (HSB<sup>3</sup>) SERIES 3.125 Gb/s

## BENEFITS

- High speed configuration available that allows data rates up to 3.125 Gb/s via 100 ohm matched impedance differential pairs
  - Partially populated standard HDB<sup>3</sup> mother board & daughter board bodies
- Contact a Sales Engineer for validation results.



## MOTHER BOARD – HOW TO ORDER

Mates with:

- High Speed Daughter Board

	1.	2.	3.	4.	5.	6.	7.
	Number of Differential Pairs	Differential Signal	Brush Wire Plating	Termination	Contact Termination Finish	Less Hardware (Purchased separately see pg 10 for hardware options)	
<b>HSB-M4</b>	<b>03</b>	<b>D</b>	<b>M</b>	<b>24</b>	<b>2</b>	<b>X</b>	

### 1. Connector Type

#### HSB-M4

Designates High Speed HSB<sup>3</sup> Mother Board

### 2. Number of Contacts

Number Differential Pairs	No. Low Speed Signals	Dimension A	Dimension C
<b>03</b>	20	1.375	1.075
<b>07</b>	40	2.075	1.775
<b>10</b>	60	1.775	2.475
<b>13</b>	80	3.475	3.175

### 3. Differential Signal

<b>D</b>	Standard
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### 4. Brush Wire Plating

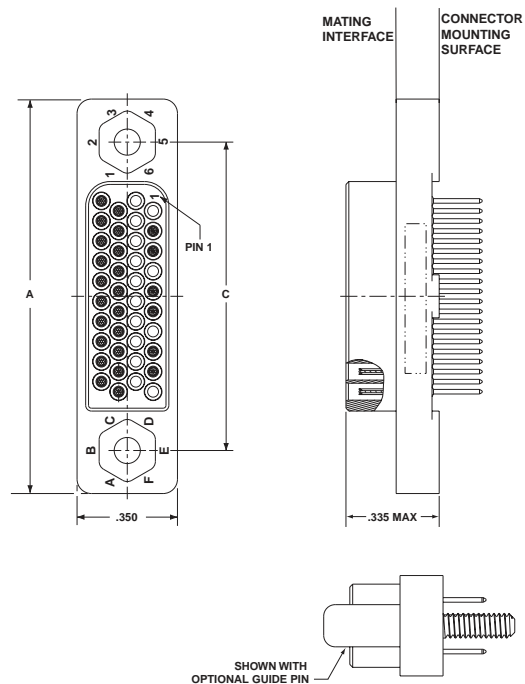
<b>M</b>	0.000050 Au Min. thick over Nickel
<b>C</b>	0.000020 Au Min. thick over Nickel

### 5. Termination

	Type	Stickout (Dim. E)
<b>22</b>	PCB, Straight, .016 Dia	0.120
<b>23</b>	PCB, Straight, .016 Dia	0.150
<b>24</b>	PCB, Straight, .016 Dia	0.180
<b>26</b>	PCB, Straight, .016 Dia	0.240
<b>28</b>	PCB, Straight, .016 Dia	0.300

### 6. Contact Termination Finish

<b>2</b>	Gold plated in accordance with MIL-G-45204, Type II, .00030 Min. thick Gold over .000050 Min. thick Nickel	
<b>5</b>	Tin plated in accordance with ASTM B545, .00010 Min. thick Matte Tin over .00010 Min. thick Nickel	
<b>6</b>	Tin-Lead plated in accordance with SAE-AMS-P-81728, .00010 Min. thick Tin-Lead over .00010 Min. thick Copper	



STANDARD HDB <sup>3</sup> Connector Dimensions		
No. of Contacts	A	C
40	1.375	0.630
80	2.075	1.330
120	2.775	2.030
160	3.475	2.730

# HIGH SPEED BRUSH (HSB<sup>3</sup>) SERIES 3.125 Gb/s

## DAUGHTER BOARD – HOW TO ORDER

Mates with:

- High Speed Mother Board

1.	2.	3.	4.	5.	6.	7.
	Number of Differential Pairs	Differential Signals	Brush Wire Plating	Termination	Contact Termination Finish	Less Hardware (Purchased separately see pg 10 for hardware options)
<b>HSB-D4</b>	<b>03</b>	<b>D</b>	<b>M</b>	<b>02</b>	<b>2</b>	<b>X</b>

### 1. Connector Type

#### HSB-D4

Designates High Speed HSB<sup>3</sup> Daughter Board

### 2. Select a Number of Contacts

Number Diff Pairs	No. Low Speed Signals	Dimension A	Dimension C
<b>03</b>	20	1.375	1.075
<b>07</b>	40	2.075	1.775
<b>10</b>	60	2.775	2.475
<b>13</b>	80	3.475	3.175

### 3. Differential Signals

<b>D</b>	Standard
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### 4. Select a Brush Wire Plating

<b>M</b>	0.000050 Au Min. thick over Nickel
<b>C</b>	0.000020 Au Min. thick over Nickel

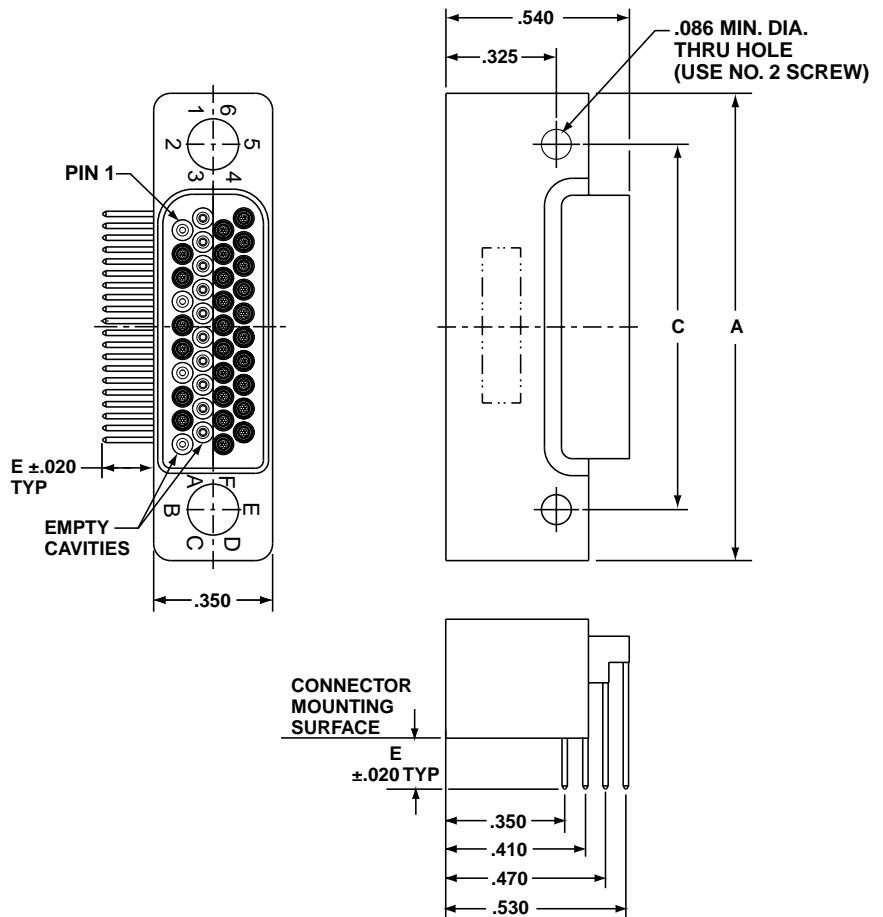
### 5. Select a Termination

	Type	Stickout (Dim. E)
<b>01</b>	PCB, Right Angle, .016 Dia	0.090
<b>02</b>	PCB, Right Angle, .016 Dia	0.120
<b>03</b>	PCB, Right Angle, .016 Dia	0.150
<b>04</b>	PCB, Right Angle, .016 Dia	0.180
<b>06</b>	PCB, Right Angle, .016 Dia	0.300

### 6. Select a Contact

#### Termination Finish

<b>2</b>	Gold plated in accordance with MIL-G-45204, Type II, .00030 Min. thick Gold over .000050 Min. thick Nickel
<b>5</b>	Tin plated in accordance with ASTM B545, .00010 Min. thick Matte Tin over .00010 Min. thick Nickel
<b>6</b>	Tin-Lead plated in accordance with SAE-AMS-P-81728, .00010 Min. thick Tin-Lead over .00010 Min. thick Copper



STANDARD HDB <sup>3</sup> Connector Dimensions		
No. of Contacts	A	C
40	1.375	0.630
80	2.075	1.330
120	2.775	2.030
160	3.475	2.730

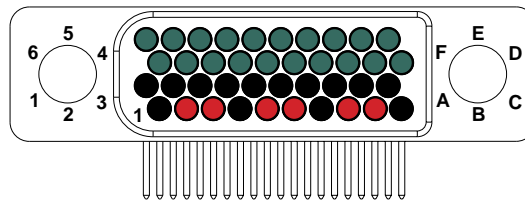
# HSB<sup>3</sup> LAYOUT

	40 Pin Body	80 Pin Body	120 Pin Body	160 Pin Body
Differential Pairs	3	7	10	13
Low Speed Signal	20	40	60	80

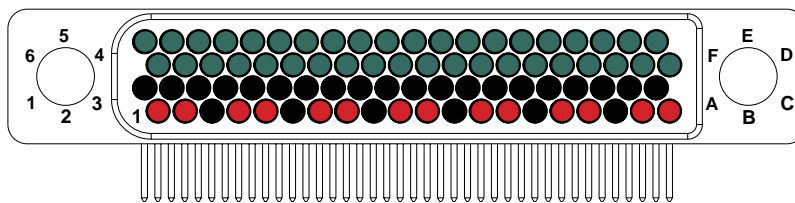
-   = 100 Ohm Differential Pair  
*(100 ohm differential contact pairs capable of 3.125 Gb/s data rates)*
-  = Empty Contact Cavity
-  = Standard Digital, low speed signal contacts

As viewed from front of daughter board connector

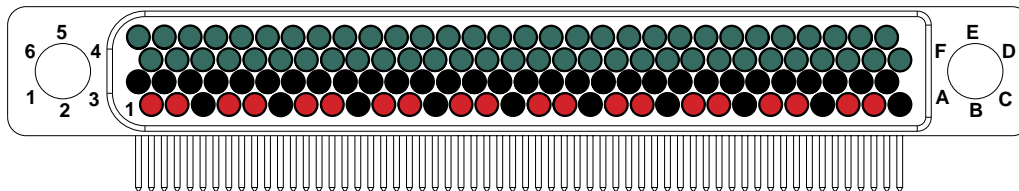
## HSB<sup>3</sup> ARRANGEMENTS



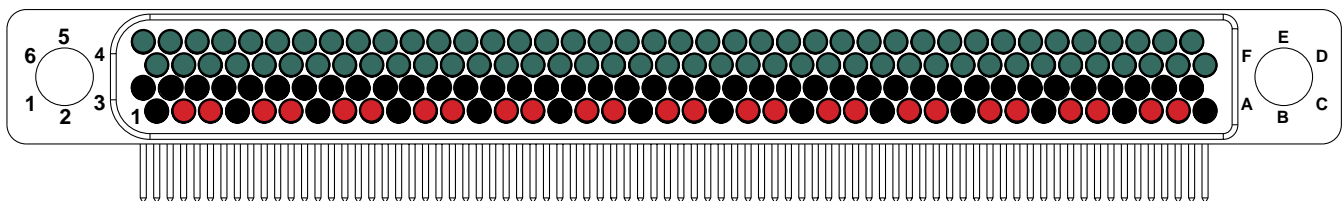
**3 Differential Pair**  
(40 Pin Body)



**7 Differential Pair**  
(80 Pin Body)



**10 Differential Pair**  
(120 Pin Body)

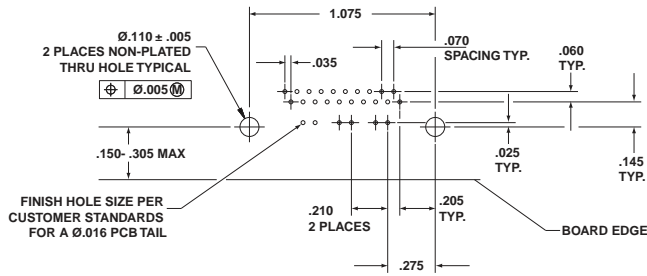


**13 Differential Pair**  
(160 Pin body)

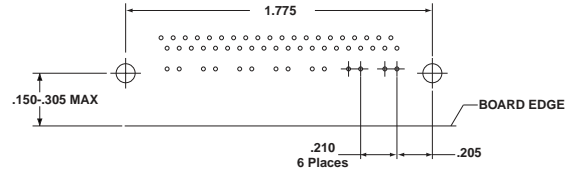
As viewed from front of daughter board connector

# HSB<sup>3</sup> RECOMMENDED BOARD LAYOUT

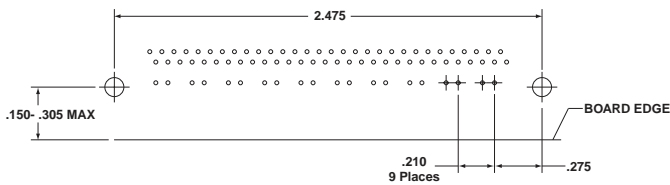
## DAUGHTER BOARD



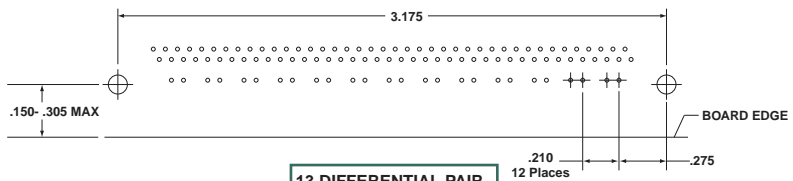
3 DIFFERENTIAL PAIR



7 DIFFERENTIAL PAIR

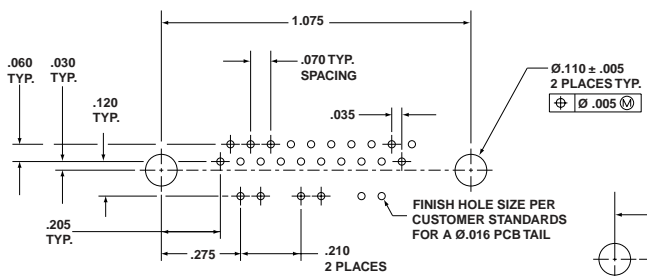


10 DIFFERENTIAL PAIR

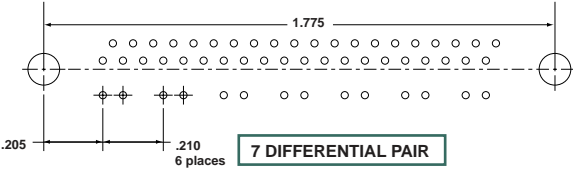


13 DIFFERENTIAL PAIR

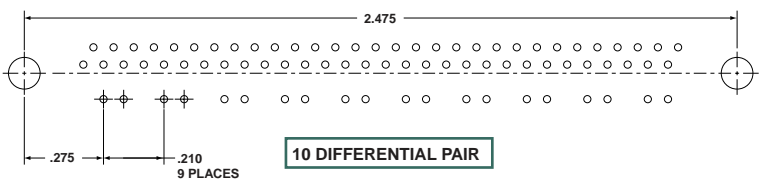
## MOTHER BOARD



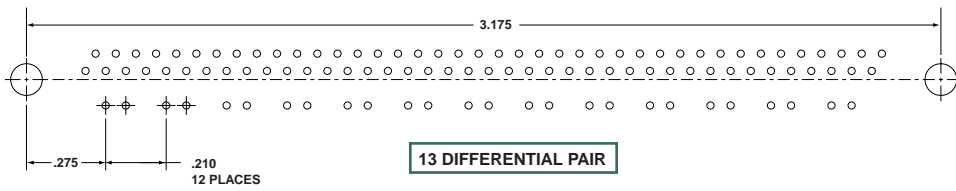
3 DIFFERENTIAL PAIR



7 DIFFERENTIAL PAIR



10 DIFFERENTIAL PAIR



13 DIFFERENTIAL PAIR



# HARDWARE FOR HDB<sup>3</sup> AND HSB<sup>3</sup> CONNECTORS

## HARDWARE FOR ALL CONFIGURATIONS (Sold Separately)



### MOTHER BOARD

PART NUMBER	TYPE	STICKOUT	
HDB-508803-001	POLARIZATION KEY (QTY 2)	0.250	
HDB-508803-002	POLARIZATION KEY (QTY 2)	0.500	
HDB-508803-003	POLARIZATION KEY (QTY 2)	0.750	
HDB-508802-001	GUIDE PIN (QTY 2)	0.250	
HDB-508802-002	GUIDE PIN (QTY 2)	0.500	
HDB-508802-003	GUIDE PIN (QTY 2)	0.750	
HDB-508808-000	THREADED BOSS (QTY 2)*	0.250	
HDB-508808-001	THREADED BOSS (QTY 2)*	0.500	
HDB-508808-002	THREADED BOSS (QTY 2)*	0.750	
HDB-508808-020	LOCKING GUIDE PIN (QTY 2)	0.250	
HDB-508808-021	LOCKING GUIDE PIN (QTY 2)	0.500	
HDB-508808-022	LOCKING GUIDE PIN (QTY 2)	0.750	

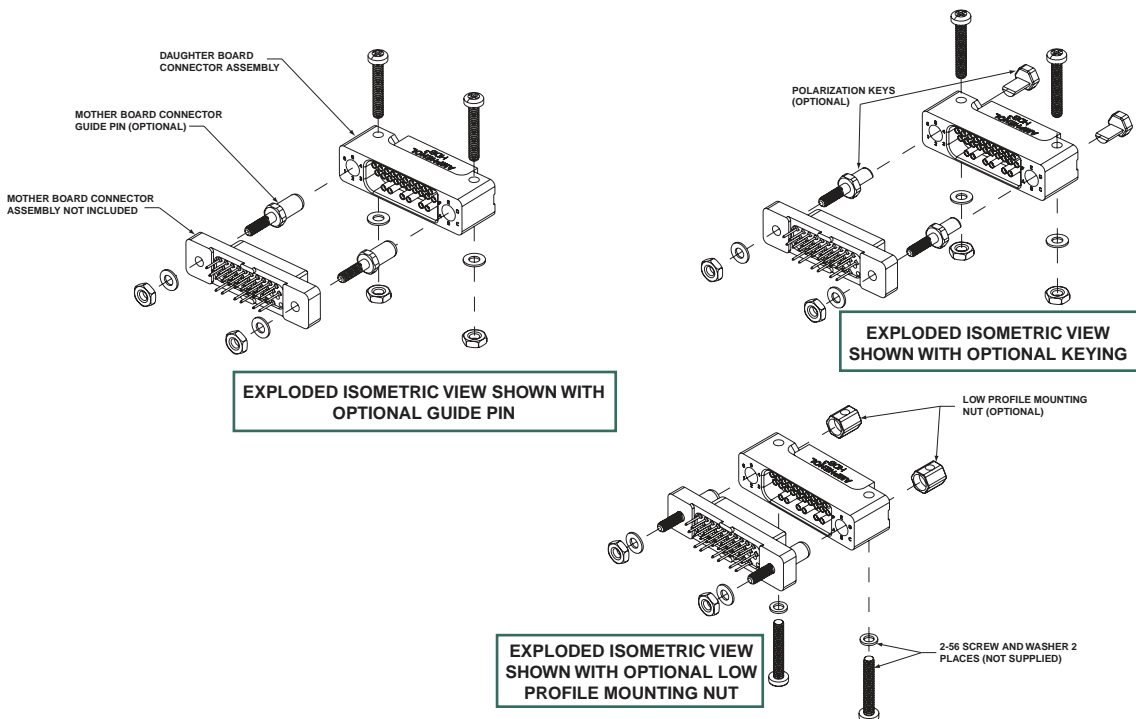
Shown with  
Mother Board  
Connector on page 5

\* Required with Mother Board only when mating to I/O Connector

### DAUGHTER BOARD

PART NUMBER	TYPE	STICKOUT	
HDB-508804-000	POLARIZATION KEY (QTY 2)	0.200	
HDB-508804-001	LOW PROFILE MOUNTING NUT (QTY 2)	0.214	

## EXPLODED ISOMETRIC VIEW



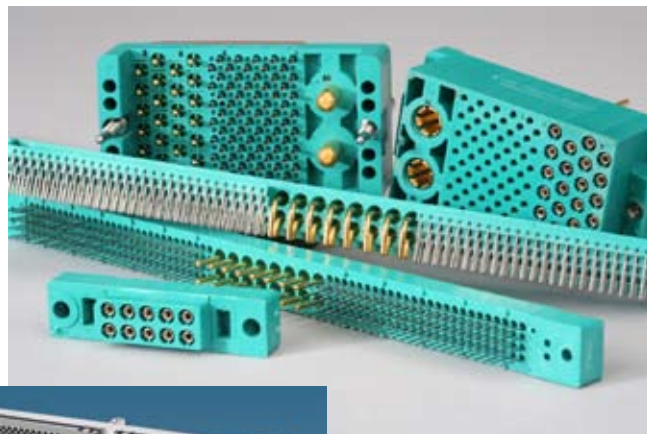


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Web: [www.amphenol-aerospace.com](http://www.amphenol-aerospace.com)

### MIL-DTL-55302 BRUSH CONTACT TECHNOLOGY - Catalog 12-035

Amphenol Bristle Brush Contact:  
Multiple Strands of High Tensile Strength  
Wires Bundled Together, Providing  
Superior Electrical Connection with  
Low Mating Force



### HIGH PERFORMANCE LINE REPLACEABLE MODULE (LRM) Catalog 12-037

Amphenol LRM Surface Mount Connectors  
meet the high density needs of today's inte-  
grated electronic modules. Design versatility  
and product reliability makes Amphenol the  
premier choice for the system designer in  
solving board interconnect requirements.



**NEW**

### MEDICAL CABLE CONNECTOR



- Utilize high performance B<sup>3</sup> brush contact
- 10 contacts per connector
- Plug – crimp removable contacts
- Receptacle – printed circuit board contacts
- Currently available in 12 colors, each with a unique keying combination (plug only, user is to provide key hole for receptacle)
- Also offered as partially populated
- Notches in plug connector to assist with over molding

Notice: Specifications are subject to change without notice. Contact your nearest Amphenol Corporation Sales Office for the latest specifications. All statements, information and data given herein are believed to be accurate and reliable but are presented without guarantee, warranty, or responsibility of any kind, expressed or implied. Statements or suggestions concerning possible use of our products are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe any patent. The user should assume that all safety measures are indicated or that other measures may not be required. Specifications are typical and may not apply to all connectors.

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