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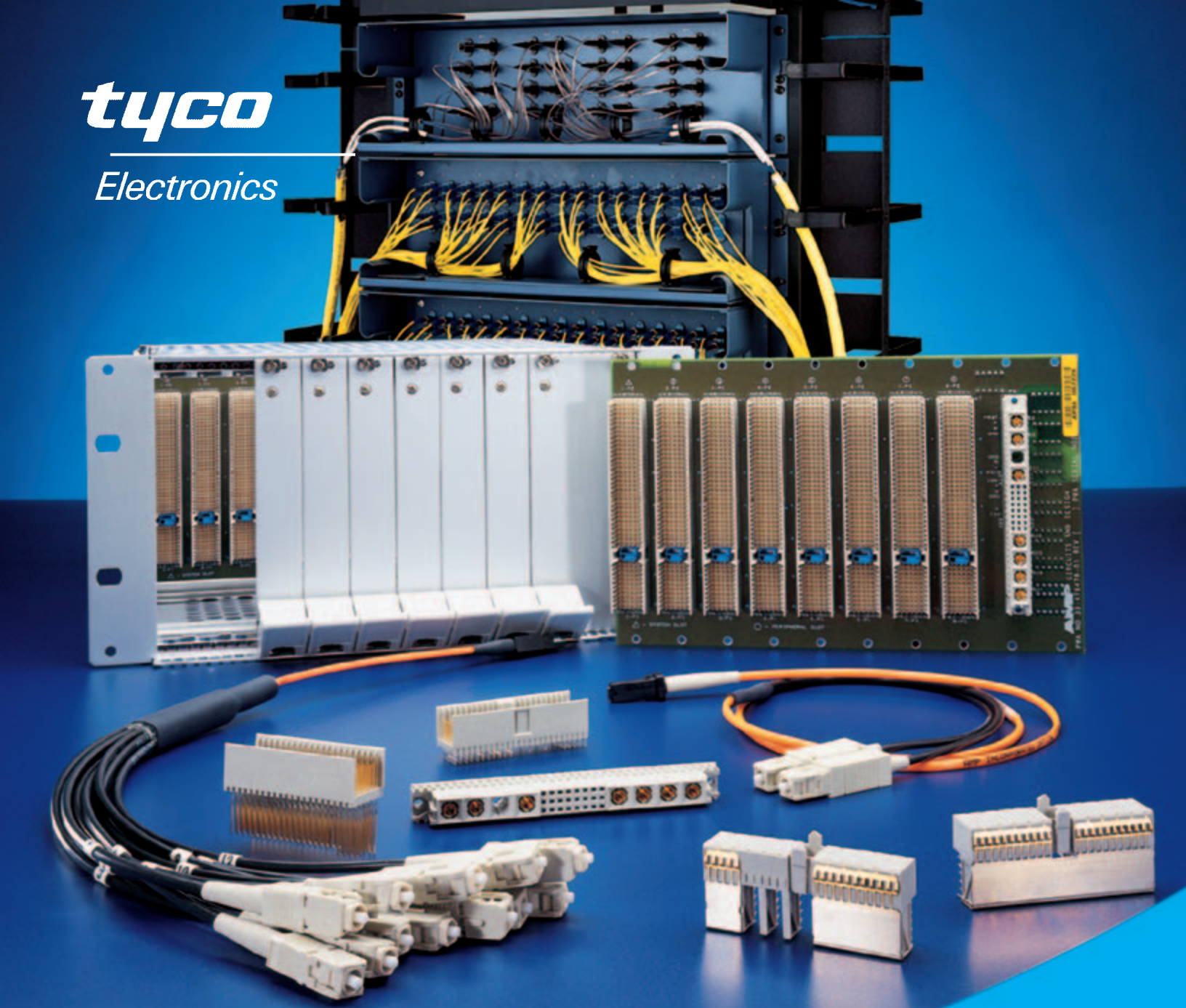

AMP Z-PACK 2mm HM Hard Metric Interconnection System

AMP

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m	=	meter
cm	=	centimeter
mm	=	millimeter
µm	=	micrometer
N	=	Newton
kg	=	kilogram
g	=	gram
C	=	Celsius

Technical documents

Product Specifications

108-19082	5 row board-to-board Connections
108-1622	8 row board-to-board Connections
108-19107	LF Cable Connectors
108-19108	HF Cable Connectors
108-1651	Universal Power Module

Application Specifications

114-19029	Standard board-to-board
114-19036	Ground Return Shields
114-19039	LF Cable Connector
114-1103	Universal Power Module

Electrical Performance Reports

65721	5 row Connector
65722	5+2 row Connector
889065	8 row Connector
889066	8+2 row Connector

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See inside back cover for Global Contacts and phone numbers.

Product Outline and Table of Contents

Product Facts

- **High Density System with Small Real Estate on Backplane and Daughtercard**
- **Extensive Range of Signal, Power, Coaxial, and Fiber Board-to-Board and Cable-to-Board Connections.**
- **Hard Metric 2mm Pitch in Accordance with IEC 917 and IEC 61076-4-101**
- **Modular Units give Flexible Configuration**
- **Special Versions for VME64 Extensions and CompactPCI**
- **Signal Contact Rating 1.5a Fully Energized**
- **Universal Power Module rated at 7.8A / line, 23.4A fully energized**
- **All Lines Impedance Controlled to 50ohm (Single Ended) and 100ohm (Differential) nominal**
- **Safe Design, complies with IEC950 in Mated Condition; Universal Power Module is Safe in Unmated Condition**
- **Several Performance Levels for Board and Cable Connectors with Unshielded and Shielded Versions**
- **Corruption-proof sequencing- Signal Contact Levels exceed Maximum Tolerance of Backplane Distortion and Warpage (ref. Hard Metric Equipment Practice)**
- **Mismatching Keys Block Mating before any Contact Touch**
- **Backplane thickness range 1.4 - 5.6 [.055 - .220]**
- **Daughtercard Thickness Range of 1.4 - 4.3 [.055 - .169] (3.5 [.138] max. with Lower Shields)**
- **Small Press Fit Board Hole allows Maximum Track Width and Minimum Signal Corruption**
- **Versions comply with Bellcore Central Office Environment and Uncontrolled Environment**
- **Single- and Multi-line Models Available or Tyco Electronics Circuits & Design can build a System to your Specification**

Product Outline

The AMP Z-PACK 2mm HM Hard Metric connector system is designed to meet the current and future needs of telecommunication, computer and instrumentation applications giving excellent electrical and mechanical characteristics at an economical price. It is a high performance, high density system with flexible configuration which offers upgradeability. The connector system is fully supported by Tyco Electronics spice models to guarantee choosing the right product to match the application.

Z-PACK 2mm HM connectors comply with the requirements of IEC 917 and IEC 61076-4-101 and valuable product extensions provide great flexibility in the range of applications. The system can provide the following options:

- Backplane and daughtercard connections in standard and reverse sex.
- Parallel daughtercard connection.
- Midplane connections in both planar and cross connect configuration.
- Cable connections for backplane rear and front of daughtercards.
- Extender card connections.

These variations can be arranged for signal contacts, and for backplanes, power, coax and fiber optic cable and board connections.

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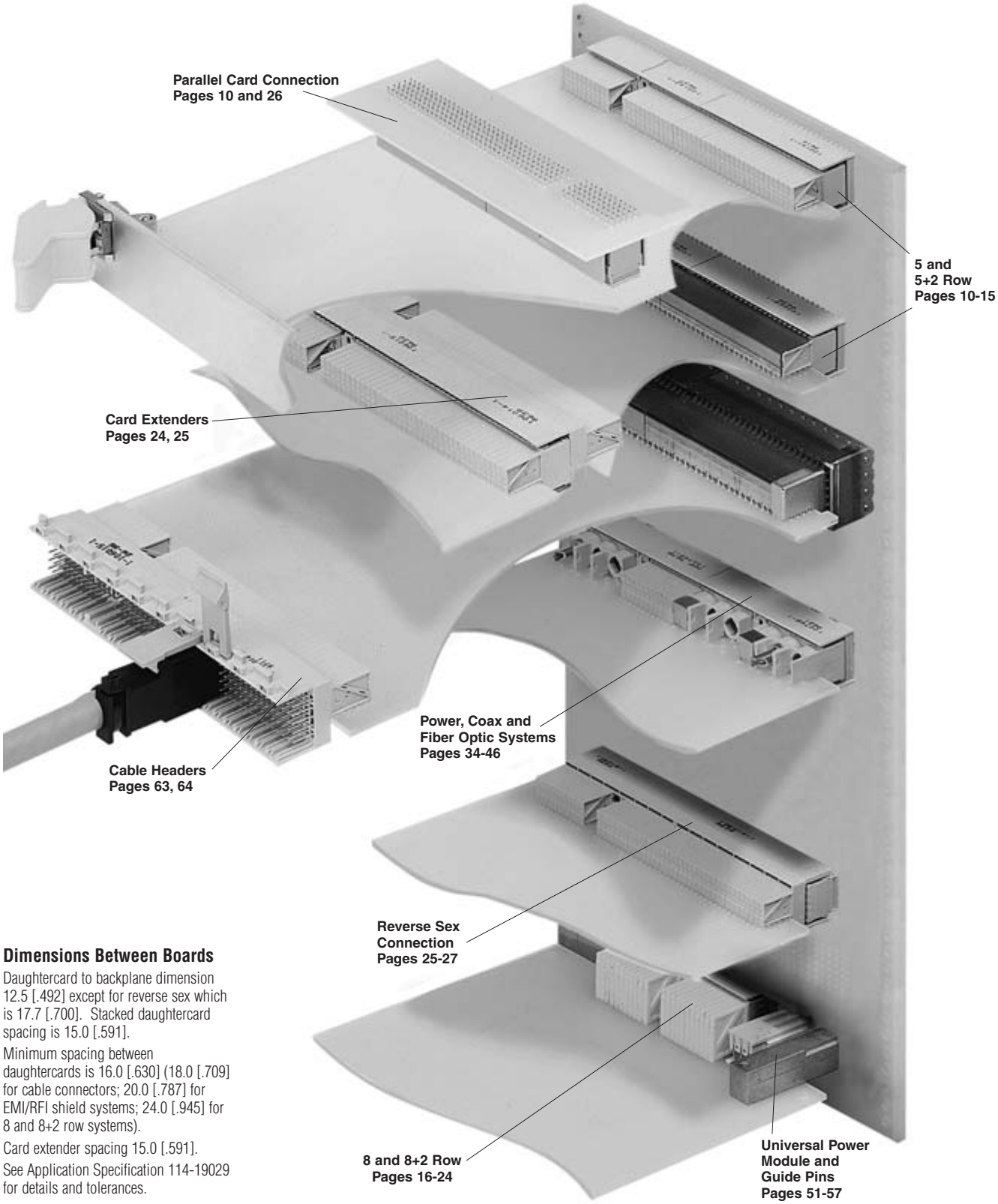
System Options — Front



Dimensions Between Boards

Daughtercard to backplane dimension 12.5 [.492] except for reverse sex which is 17.7 [.700]. Stacked daughtercard spacing is 15.0 [.591].

Minimum spacing between daughtercards is 16.0 [.630] (18.0 [.709] for cable connectors; 20.0 [.787] for EMI/RFI shield systems; 24.0 [.945] for 8 and 8+2 row systems).

Card extender spacing 15.0 [.591].

See Application Specification 114-19029 for details and tolerances.

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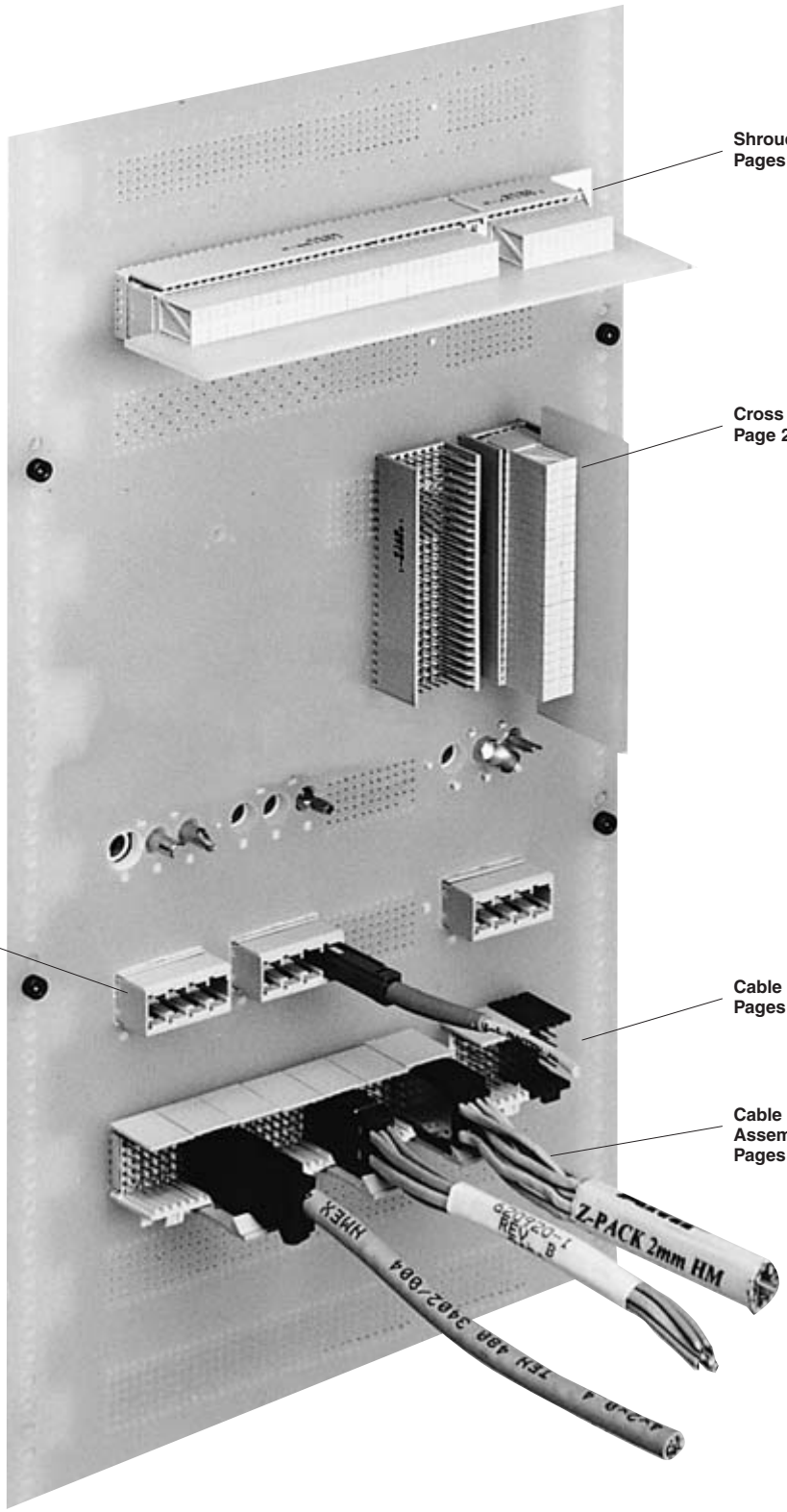
System Options — Rear



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Product Characteristics and System Features

Product Characteristics

Electronic developments are increasing the demands on system performance, and connectors can no longer be considered as discrete components but as part of a total electrical/electronic design. These aspects can include the following:

Higher pin count within tight space constraints.

With 25 and 40 signal pins per cm of 5 row and 8 row connectors respectively, high densities can be achieved, or low signal to ground ratios specified within tight space constraints.

Minimum reflections
Matched impedance between cables, connectors and systems give low reflections at interfaces. This is achieved with overmolded receptacle contacts which give impedances close to the values of printed circuit boards, maximizing effective signal strength.

Reduced crosstalk
Crosstalk can be minimized by selective use of ground pins between signals, which can be augmented by the use of ground return shields. Reduced cross talk versions of the receptacle connector provide partial shielding between columns.

Shielding
Upper and/or lower ground return shields are used with 5+2 and 8+2 row headers to improve signal integrity. EMI / RFI shields are available to totally enclose 5 row connectors to give maximum immunity from, and minimum emission of, radiated noise.

Reduced Skew
The design of right angle connectors achieves very low skew between longest and shortest contact and board paths, corrected for board effects. The actual value varies between 5 row and 8 row types.

Fiber Optic Connections
As well as the normal power and coaxial DIN contacts, either DIN fiber optic or AMP MSC fiber optic connectors can be included in backplane systems for high speed data transfer without risk of corruption.

Upgradeability
The system is upgradeable to give enhanced performance as system demands increase. This allows economical selection of components initially with enhanced version selectable as performance levels increase without a major change in connector design or board layout. Tyco Electronics recommends that board layouts include ground return shield holes for future-proofing.

System Features

Termination
All versions use AMP ACTION PIN press fit contacts, giving high retention force termination conforming to IEC 352-5.

Pin Headers
Contact pins are available to give three mating levels on the front face with standard 3.7 [.146] tail, suitable for boards from 1.4 to 4.3 [.055 - .169] thick. Feedthrough vertical headers offer three levels of mating to rear of backplane for midplane and cable connection with special twisted pins used for cross connect applications. A wide variety of standard product exists which offer economy and short lead times, but any variation of selective load can be offered.

Receptacle Assemblies
Receptacle assemblies employ a 'chiclet' assembly principle allowing a variety of selective loading and providing the ability to fit reduced cross talk shields. Enhanced versions are prefitted with upper shields, with lower shields applied separately as required.

Power Connection
Universal Power Module Connectors are press fit three position connectors with the option of three levels of sequencing and 23A rating.

Alternatively, DIN contacts can be used in type L ,M and N housings with contact rating up to 40A and first make/last break option. Variations of cable-to-board, board-to-board and cable-to-cable are offered.

Coaxial Connection
DIN coax contacts can be fitted to type L, M and N housings in cable and board mount versions.

Fiber Optic Connections
DIN style contacts can be fitted to housings as above or higher density AMP MSC contacts to MSC housings.

Spice Models
To achieve optimum performance and cost, it is essential to accurately match connector and system parameters. Where customers wish to carry out their own analysis, Tyco Electronics offers single and multi-line models for many connector styles. Please ask for details of the packages available.

Modelling Support
Tyco Electronics offers a structured approach to the design and evaluation of packaging and interconnection systems, including a full range of electrical and mechanical support functions.

Using accurate device models, our capabilities include high speed signal propagation analysis using SPICE modelling, and simulation of interconnections and backplane designs. Complete power distribution and thermal analysis can also be included.

System Manufacture
Tyco Electronics Circuits and Packaging Division specializes in the design and manufacture of high performance backplanes and subsidiary boards. They will design backplanes and boards to meet your performance criteria, bringing their experience and tools to enhance your design. Ask Tyco Electronics for further details.

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Electrical Characteristics

Electrical Characteristics, Typical

AMP Z-PACK 2mm HM Connector System offers considerable benefits in performance over other 2.00 [.079] systems. Tests have shown values for inductance, capacitive loading and propagation delay to be 18%, 13% and 18% lower respectively than other 5 row systems.

Electrical characteristics, Typical.

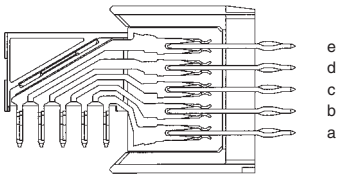
Signal Pin rating, all contacts loaded	1.5a @ 70°C [158°F]		
Nominal resistance	<13.5mOhm		
Creepage/clearance	</=0.8mm		
Propagation delay, corrected for board effects (5 row)	104ps		
Signal/ground ratio	4:1	1:1	Differential Pair
Impedance	50-58	49-55	86-89
Backward x-talk, row to row	4-10		2-3
" " column to column	<3	<1	<1
" " diagonal	<2	<<1	<<1

These values apply at 333ps rise time (10%-90%).
These values have been obtained with 5 row connectors; similar improvements are obtained with 8 row versions.
See page 41 for Z-PACK 2mm HM Connector Optical Performance.

Shield Types and Selection

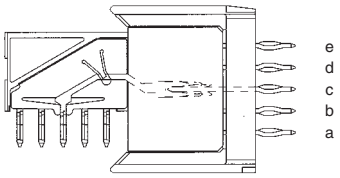
Standard Version

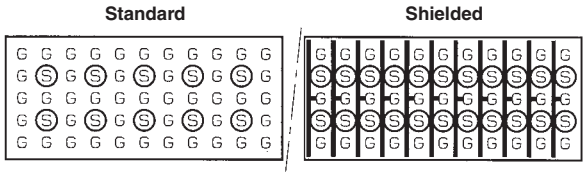
5 row version gives 250 contacts/100 [3.937], suitable for rise times down to 100ps with cross talk <5% using a 4:1 signal/ground ratio (50 signal/100mm)



Reduced Cross Talk Version

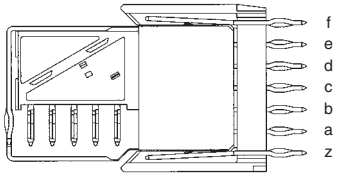
Metal shield grounded to row c and to the board (optional) reduces cross talk in the d and e contacts by 25% to the level of a and b. Allows increase in density to 100 signals/100 [3.937].

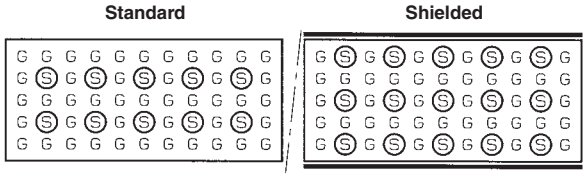




Ground Return Shields

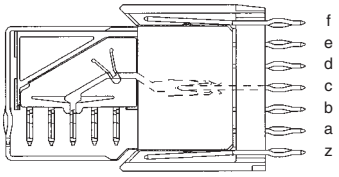
Performance is enhanced suitable for rise times down to 250ps by using extra pin rows mating to shields on the receptacle. Allows an increase in density to 75 signal/100 [3.937], reduces cross talk by 30% and reduces single ended impedance peaks in rows a and e.

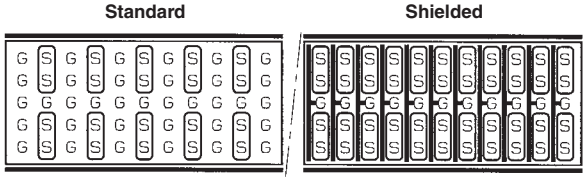




Ground Return and Reduced X-talk Shields

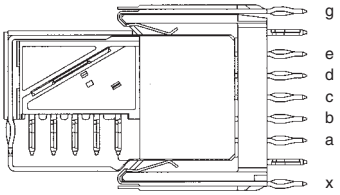
Increase performance to sub-nanosecond rise times. When used with differential pairs, improves cross talk by 30%, lowers impedance peaks and reduces propagation delay by 10%

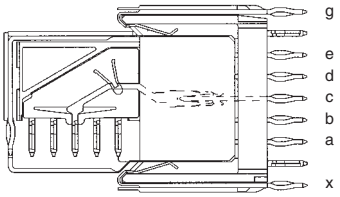




EMI/RFI Shields

These shields, used with end caps, totally enclose the connector and reduce radiation by 20-30dB over the 100MHz-1GHz range. These shields can be used with reduced cross talk shields as shown in the lower view.





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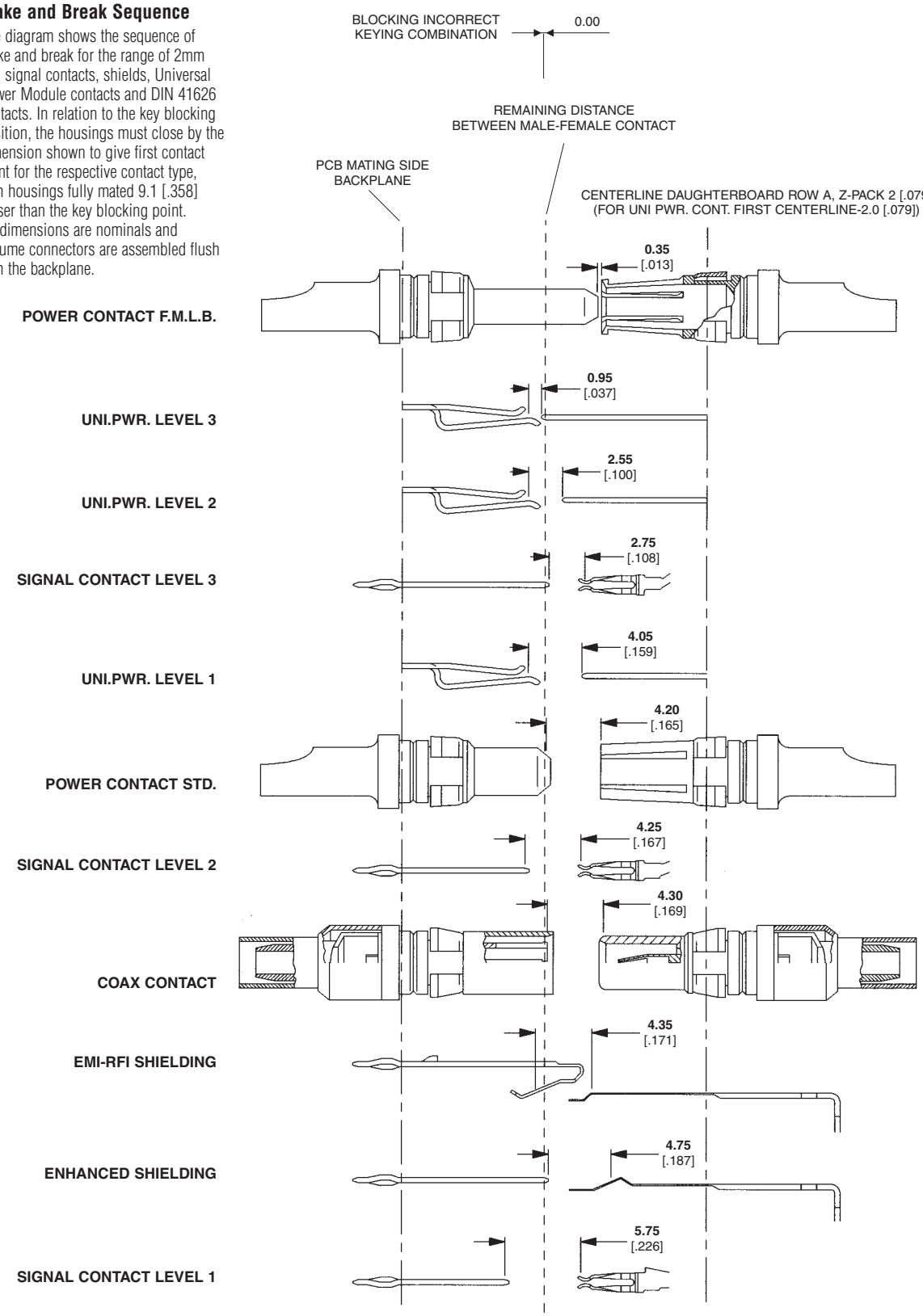
Contact Make and Break Sequence

Make and Break Sequence

The diagram shows the sequence of make and break for the range of 2mm HM signal contacts, shields, Universal Power Module contacts and DIN 41626 contacts. In relation to the key blocking position, the housings must close by the dimension shown to give first contact point for the respective contact type, with housings fully mated 9.1 [.358] closer than the key blocking point. All dimensions are nominals and assume connectors are assembled flush with the backplane.



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Connector Configurations

Connector Stacking

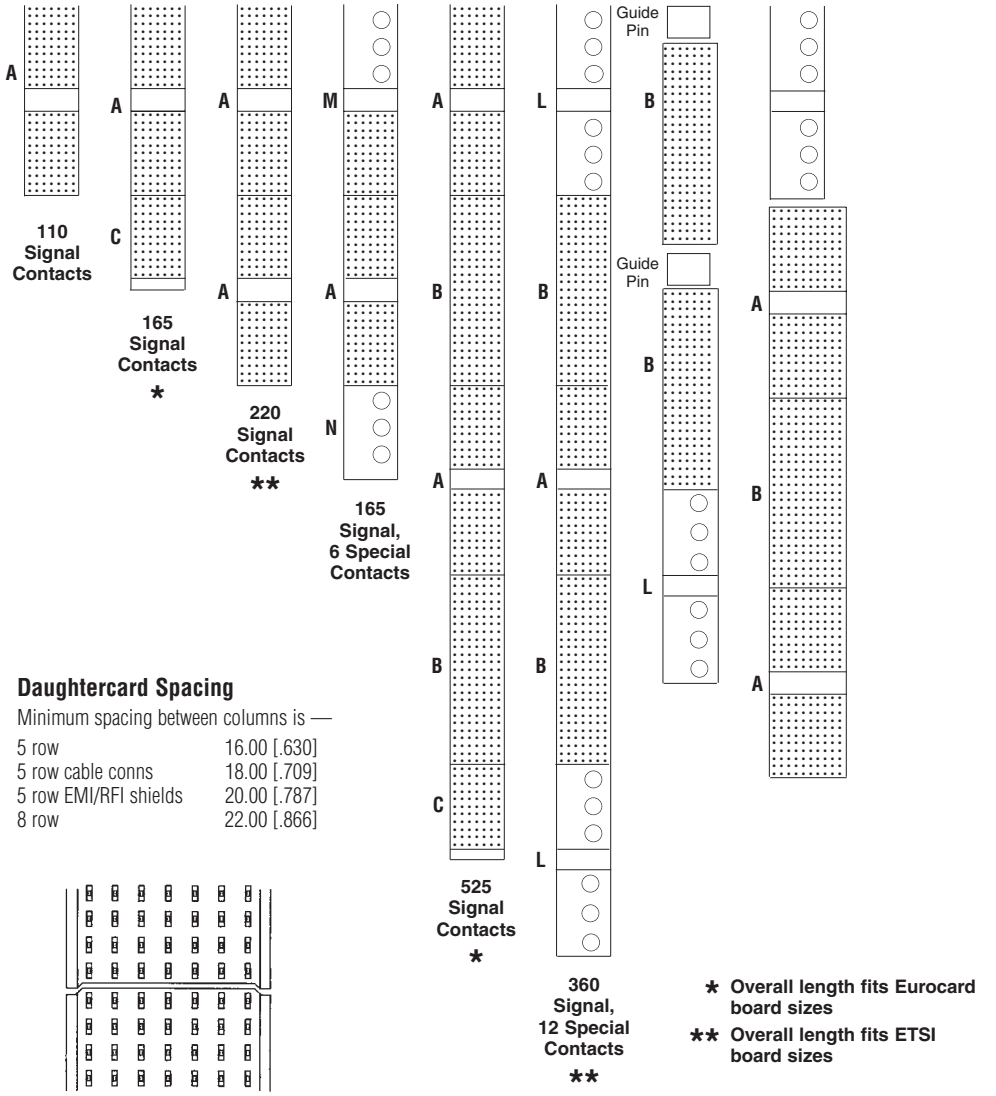
Connectors can be stacked together without change of contact pitch ensuring that the end features shown below nest together.

Guiding features are provided to align connector pairs and avoid contact damage. IEC 61076-4-101 dictates that connectors are end stacked as shown in the adjacent first five columns, with B modules located between modules with location/guiding features. An alternative guiding device can be used instead, such as the guide pin (page 55).

Types C and N are intended for use at a column end.

Universal Power Module connectors can be located at any position. Special arrangements must be made when stacking 8 row to 5 row.

The diagrams show typical arrangements but others are possible.



* Overall length fits Eurocard board sizes

** Overall length fits ETSI board sizes

Daughtercard Spacing

Minimum spacing between columns is —

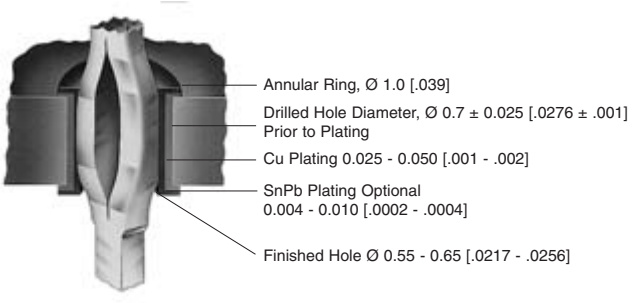
5 row	16.00 [.630]
5 row cable conns	18.00 [.709]
5 row EMI/RFI shields	20.00 [.787]
8 row	22.00 [.866]

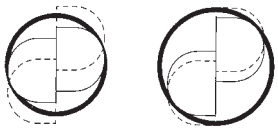
ACTION PIN Contacts

Details of the pcb hole size and finish apply to all ACTION PIN contacts. IEC 61076-4-101 specifies true position of holes to within 0.1 [.004]. For feedthrough posts, true position within 0.05 [.002] to minimize out-of-position post tips could be used.

A new contact can be inserted into the same hole three times without damage should repair or replacement be necessary.

AMP ACTION PIN Press-fit Contact Interconnection





Min. Hole ø 0.55 [.0217]

Max. Hole ø 0.65 [.0256]

Two spring members compress to different degrees to accommodate hole tolerances max. diagonal 0.84 [.033] dia.

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Vertical Male Connector, 5 Row, Types A, B and C

Vertical Male Connectors

Types A,B and C male connectors will mate with right angle female and vertical female connectors shown on pages 13 and 27 respectively.

5 Row Versions

Type A has 110 signal pins with center guiding and keying facility. Type B has 125 signal pins and Type C has 55 signal pins and guiding features. All are end stackable without change in contact pitch according to the chart on page 9.

5+2 Row Versions

For use with females with ground return shields and contacts in rows z and f in addition to those above.

Short Tail Versions

Standard versions have contact option A in rows a-e with option C in rows z and f on 5+2 row versions.

Feedthrough Versions

For midplane and rear cable connection. 5 row versions mate with unshielded female connectors and 5 row cable connectors. 5+2 row versions mate with female connectors having ground return shields or 5+2 row shielded cable connectors. Standard versions use contact options K and T instead of A and C.

Mylar tail guides can be fitted to feedthrough posts to aid assembly to the board.

For versions other than those shown, refer to page 47 which gives access to other sizes and loading patterns.

End caps are available for use with special versions of types A and B connectors. Consult Tyco Electronics.

Performance Data pages 6-7.

Materials and Finish

Glass filled polyester housing, gray, UL94 V-0 rated

Phosphor-bronze signal contacts

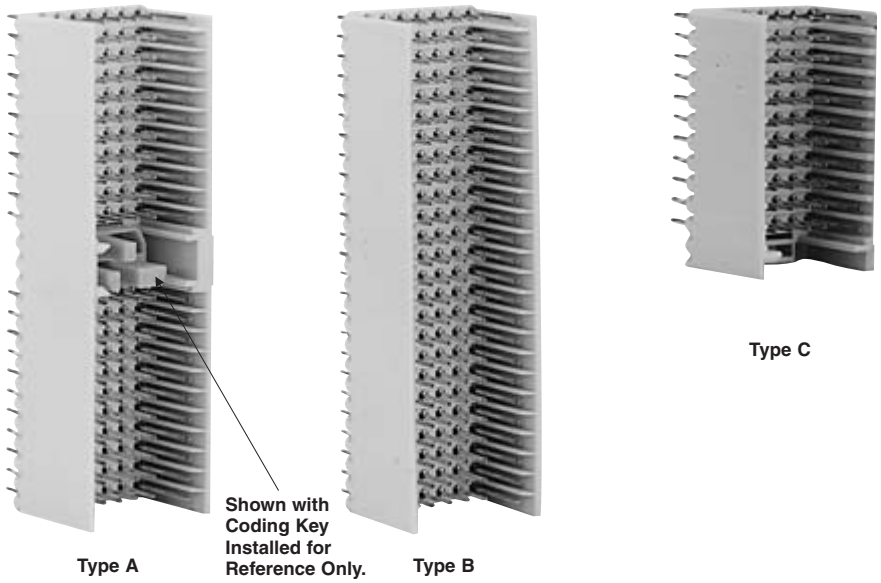
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

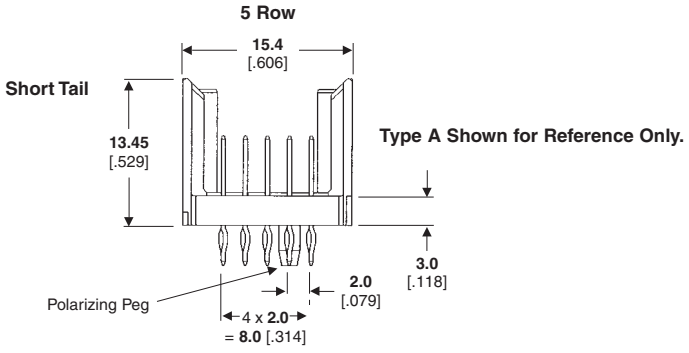
ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

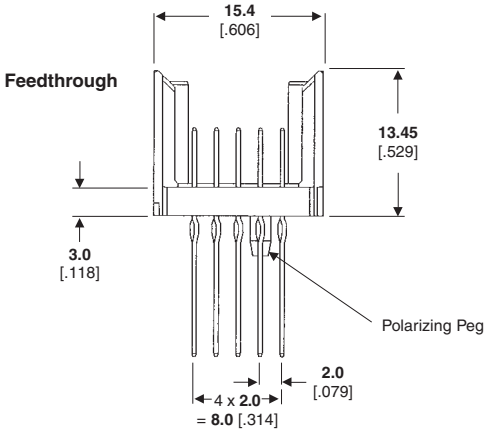
Coding keys for type A page 47.

Board layout page 69 for guidance only.

Protection covers available see page 33.







Description	Part Numbers			
	Short Tail		Feedthrough	
	5 Row	5+2 Row	5 Row	5+2 Row
Type A (with locating peg)	100143-1	100668-1	106164-1	106509-1
Type B (25)	100141-1	100669-1	106165-1	106510-1
Type B (19)	1392175-1	352869-1	—	—
Type B (22)	352639-1	352638-1	—	—
Type C	100159-1	106081-1	106303-1	188637-1

For VME64 and C-PCI versions, see page 48.

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Japan: 81-44-844-8013
UK: 44-141-810-8967

Vertical Male Connector, 5 Row, Type A/B

Type A/B Vertical Male Connector

Type A/B male connectors will mate with Type A/B right angle female connectors shown on page 15.

5 Row Version

Type A/B connector offers the guidance ability similar to the Type A connector but also utilizes the center three columns for additional signal pin capability which are not found in the Type A connector.

Available in the Type A/B connector are 95 signal pins, 110 signal pins and 125 signal pins. All are end stackable without change of contact pitch according to the chart on page 9.

5+2 Row Versions

For use with females with ground return shields and contacts in rows z and f in addition to those above.

Short Tail Versions

Standard versions have contact option A in rows a-e with option C in rows z and f on 5+2 row versions.

Feedthrough Versions

For midplane connection, 5 row versions mate with standard 5 row Type A/B female connectors and 5+2 row versions mate with Type A/B female connectors having ground return shields. Standard versions use contact options K and T instead of A and C.

Mylar tail guides can be fitted to feedthrough posts to aid assembly to the board.

Materials and Finish

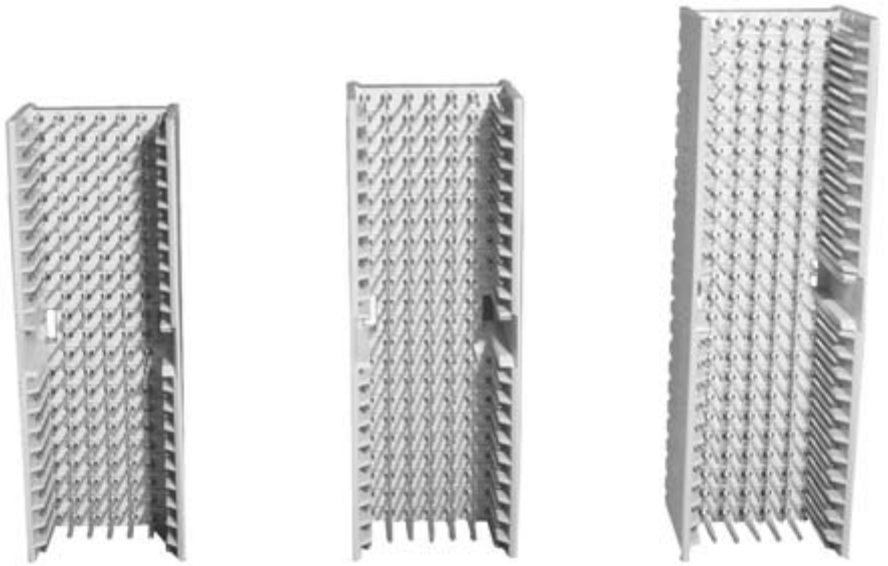
Glass filled polyester housing, gray UL94 V-0 rated

Phosphor-bronze signal contacts

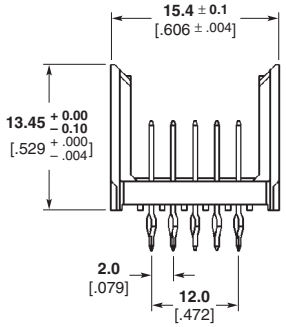
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

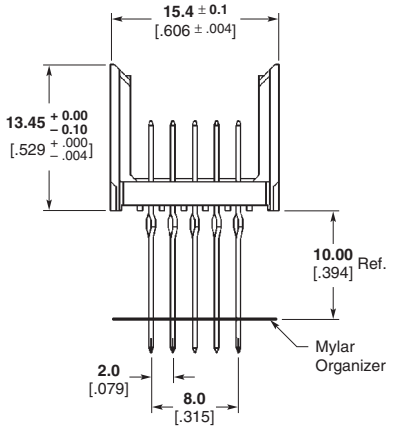
Board layout (see Customer Print).



Type A/B Short Tail



Type A/B Feedthrough



Description	Part Numbers			
	Short Tail		Feedthrough	
	5 Row	5+2 Row	5 Row	5+2 Row
Type A/B (25)	646731-1	646529-1	646938-1	646535-1
Type A/B (22)	646737-1	646533-1	646949-1	646735-1
Type A/B (19)	646948-1	646530-1	646950-1	646732-1

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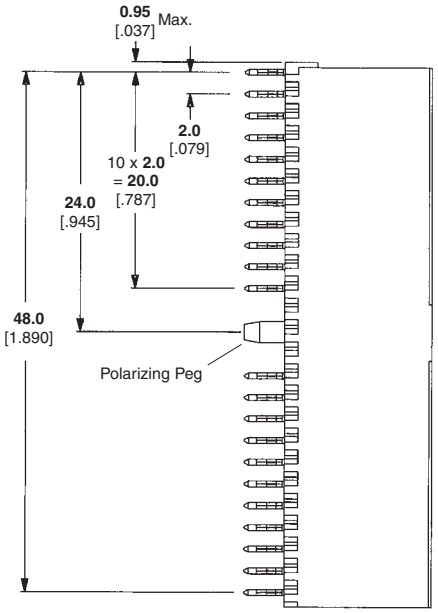
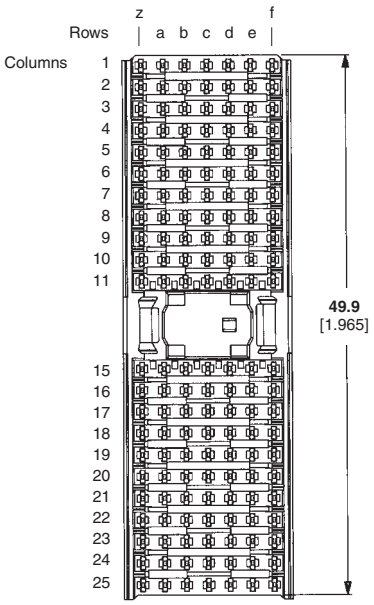
Japan: 81-44-844-8013
UK: 44-141-810-8967

Vertical Male Connector, 5 Row, Types A, B and C (Continued)

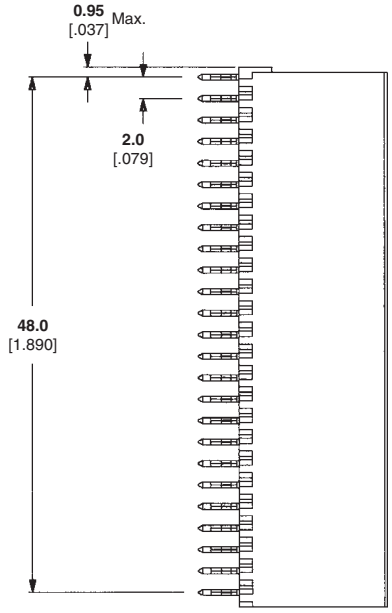
Short Tail Version Shown

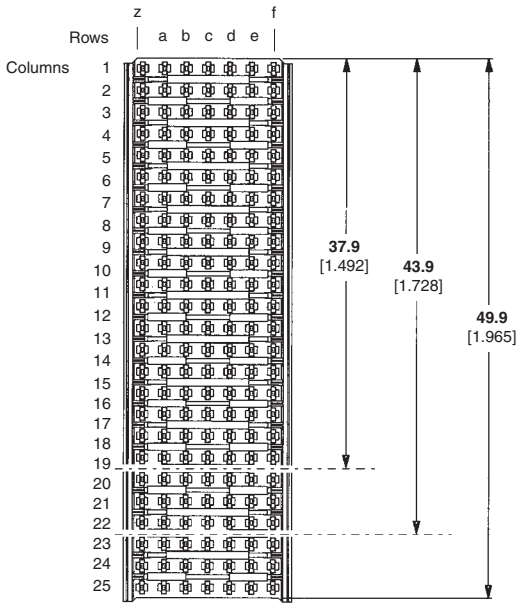
Type A



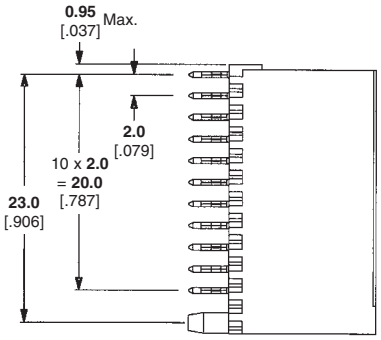


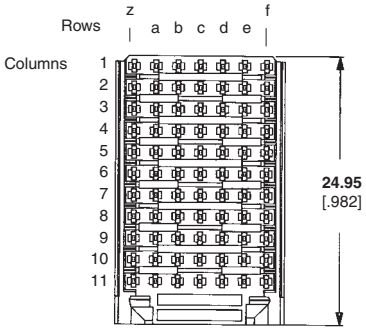
Type B





Type C





Catalog 65911
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Right Angle Female Connectors, 5 Row, Types A, B and C

Right Angle Female Connectors

Types A, B and C female connectors will mate with respective vertical and right angle male connectors and with shrouds shown on pages 10 and 29.

Type A has 110 contacts with center guiding and keying facility, type B has 125 contacts and type C has 55 contacts with end guiding feature. All are end stackable without change of contact pitch according to the chart on page 9.

Four levels of performance are offered; standard, reduced crosstalk, ground return shield and reduced crosstalk + ground return shields. Upper ground return shields are pre-fitted to receptacles; lower shields are supplied and fitted separately as required. 5+2 male connectors are used with ground return shield versions.

For versions other than those shown, refer to page 47 which gives access to other sizes and loading patterns.

Performance Data pages 6-7.

Materials and Finish

Glass filled polyester housing, gray, UL94 V-0 rated

Phosphor-bronze signal contacts

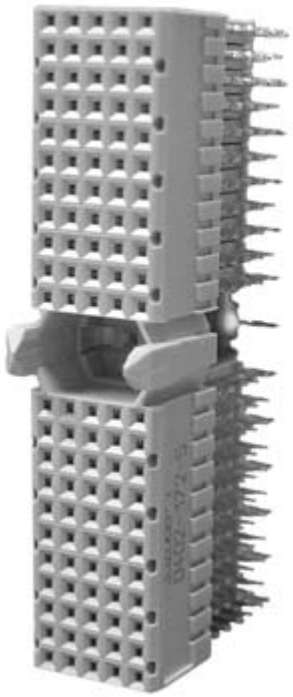
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

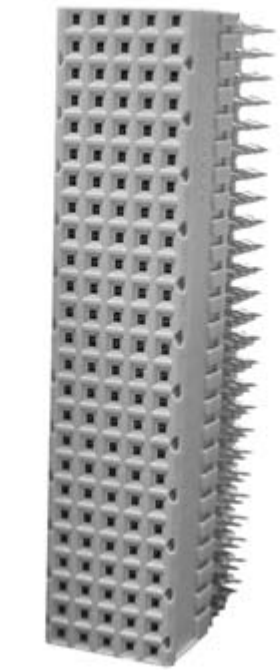
Coding keys for type A page 47.

Board layout page 69 for guidance only.

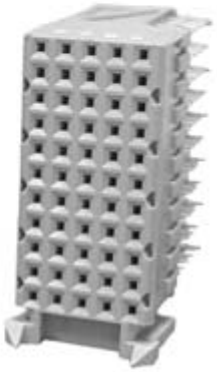
Daughtercard thickness range of 1.4 - 4.3 [.055 - .169] (3.5 [.138] max with lower shield).



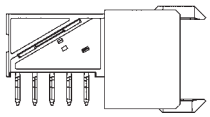
Standard Version



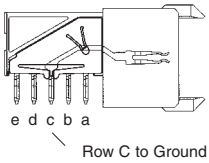
Reduced Crosstalk Version



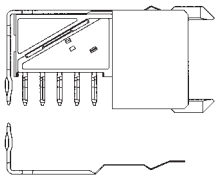
With Upper Shield Attached



Lower Shields

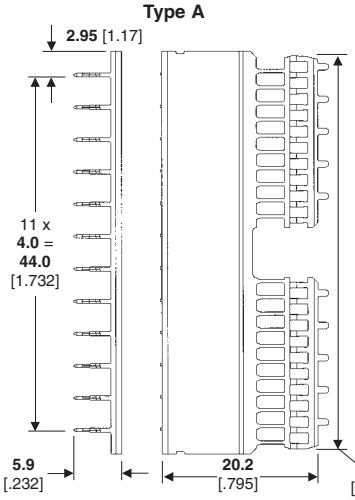


Type B

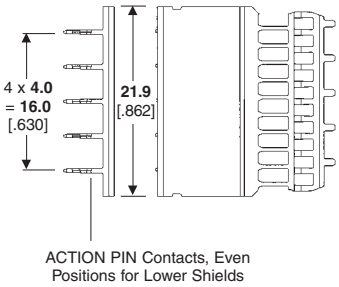


Separate Lower shield

Type A



Type C



Description	Part Numbers				
	Standard	Standard with Upper Shield	Reduced Cross Talk	Reduced Cross Talk with Upper Shield	Lower Shield
Type A	100147-1	352068-1	100623-1	352344-1	338108-2
Type B	100145-1	352069-1	100624-1	352345-1	338110-2
Type B (22)	188836-1	352152-1	—	1345007-1	352468-2
Type B (19)	352009-1	352171-1	—	1345008-1	352029-2
Type C	100161-1	352115-1	188224-1	352346-1	352112-2

For VME64 and C-PCI versions, see page 48.

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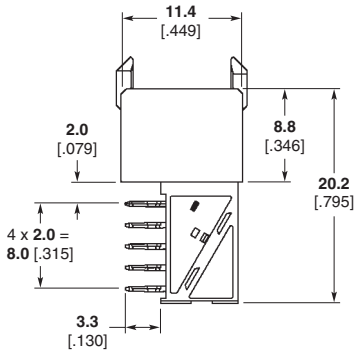
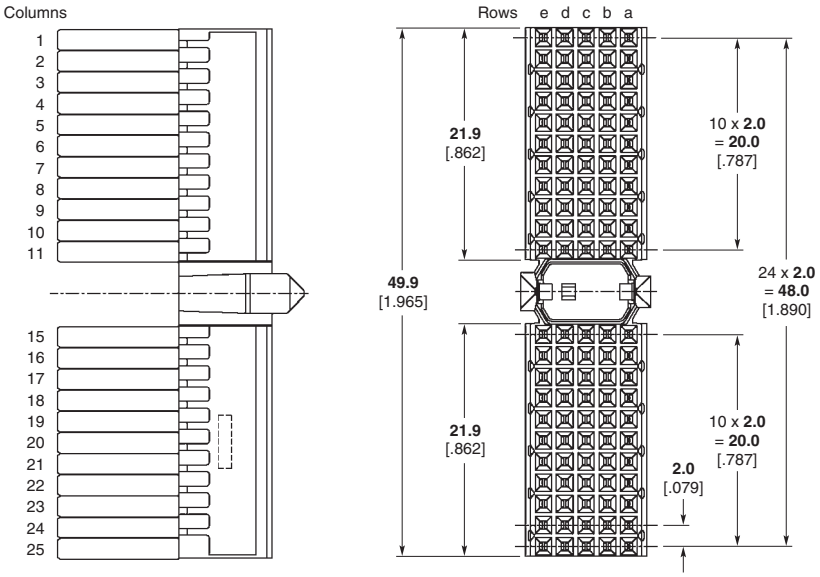
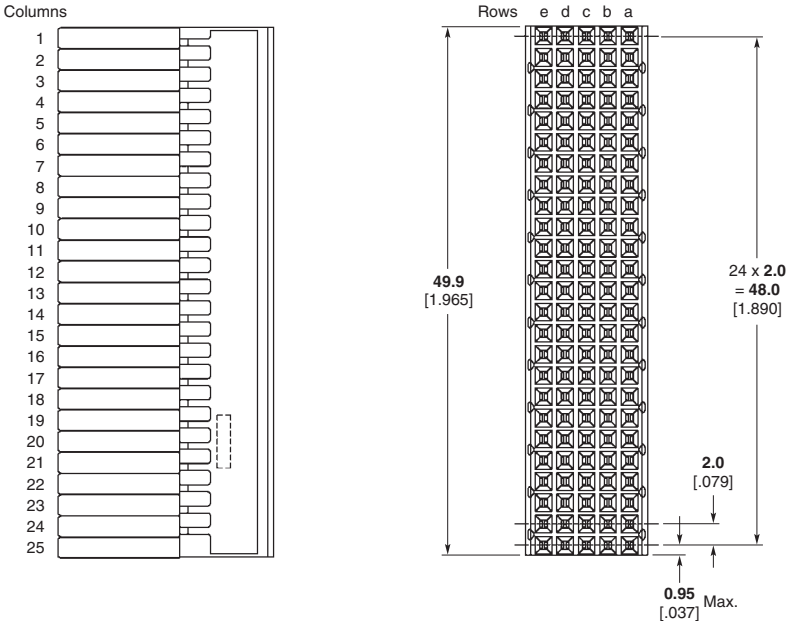
Right Angle Female Connectors, 5 Row, Types A, B and C (Continued)



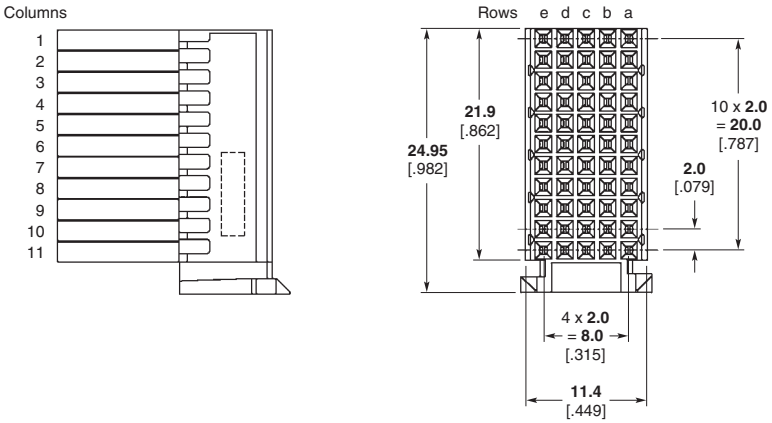
Type A



Type B



Type C



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UK: 44-141-810-8967

Right Angle Female Connectors, 5 Row, Type A/B

Type A/B Female Connectors

Type A/B female connector will mate with respective vertical male connector as shown on page 11.

Type A/B connector offers the guidance ability similar to the Type A connector but also utilizes the center three columns for additional signal pin capability which are not found in the Type A connector.

Available in the Type A/B connector are 95 contacts, 110 contacts and 125 contacts. All are end stackable without change of contact pitch according to the chart on page 9.

Two levels of performance are offered; standard and with upper ground return shields. Upper ground shields are pre-fitted to receptacles. 5+2 male connectors are used with ground return shield versions.

Performance Data pages 6-7.

Material and Finish

Glass filled polyester housing, gray, UL94 V-0 rated

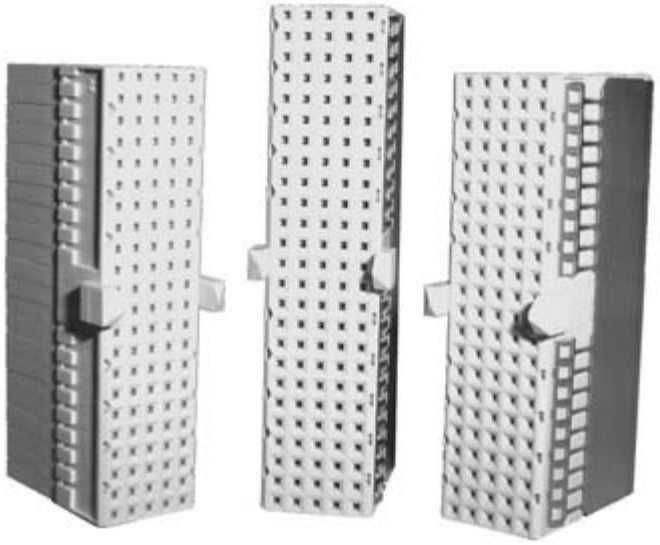
Phosphor-bronze signal contacts

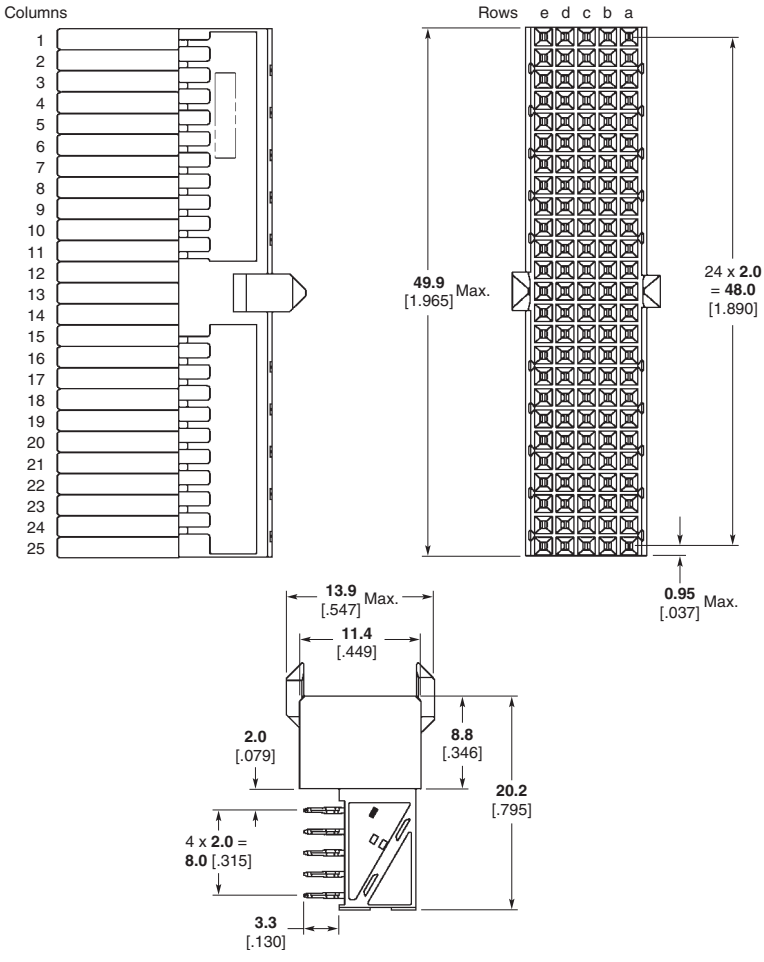
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Board layout (see Customer Print).

Daughtercard thickness range of 1.4 - 4.3 [.055 - .169].





Description	Part Numbers	
	Standard	Standard with Upper Shield
Type A/B (25)	646574-1	646547-1
Type A/B (22)	646573-1	646489-1
Type A/B (19)	646572-1	646488-1

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Vertical Male Connectors, 8 Row, Types D, E and F

Vertical Male Connectors

Types D, E and F mate with respective right angle receptacle connectors shown on page 19.

8 row Versions

For use with unshielded female connectors. Type D has 176 signal pins with center guiding and keying facility, and type E has 200 signal pins and type F has 88 signal pins. They are stackable without change of contact pitch according to the chart on page 71.

8+2 Row Versions

For use with females with ground return shields and have contacts in rows z and i in addition to those above.

Short Tail Versions

Standard versions have contact option A in rows a-h with option C in rows z and i on 8+2 row versions.

Feedthrough Versions

For midplane connection, 8 row versions mate with standard 8 row female connectors and 8+2 row versions mate with female connectors having ground return shields. Standard versions use contact options K and T instead of A and C.

For versions other than those shown, refer to page 47 which gives access to other sizes and loading patterns.

Guide pin Part No. 532808-1 may be used with type D male connectors to give early alignment.

Performance Data pages 6-7.

Materials and Finish

Glass filled polyester housing, gray, UL94 V-0 rated

Phosphor-bronze signal contacts

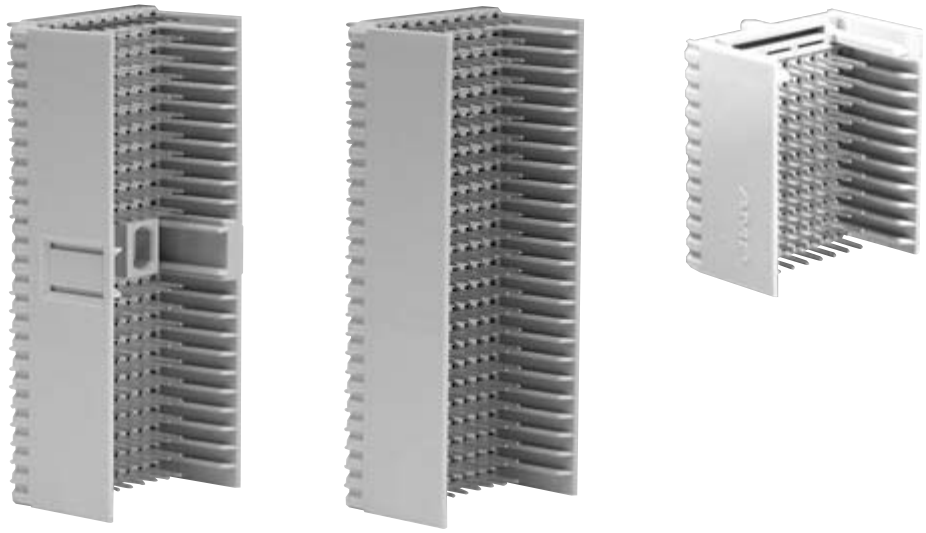
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

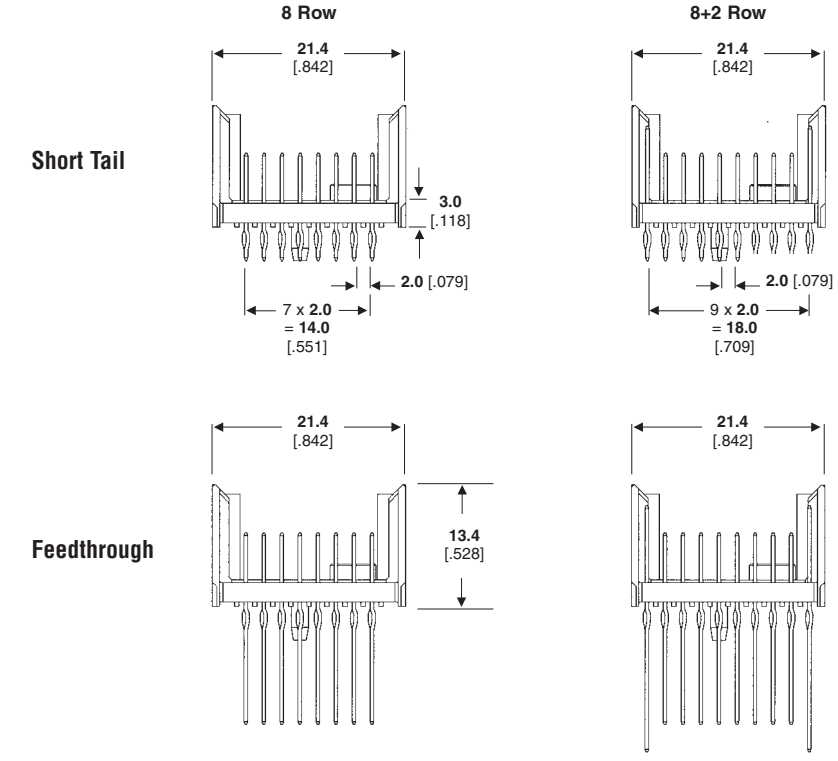
ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Coding keys for type D page 47.

Board layout page 71 for guidance only.

Protection Covers available, see page 33.



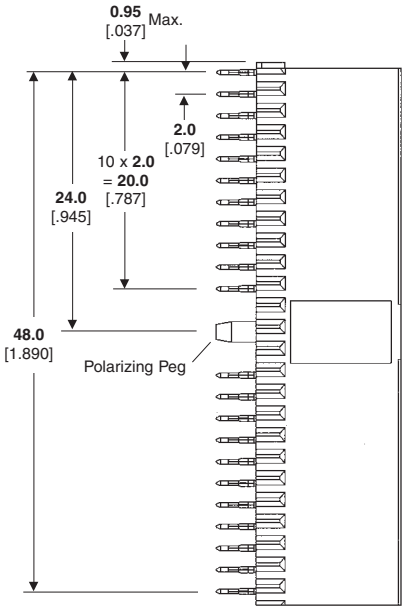


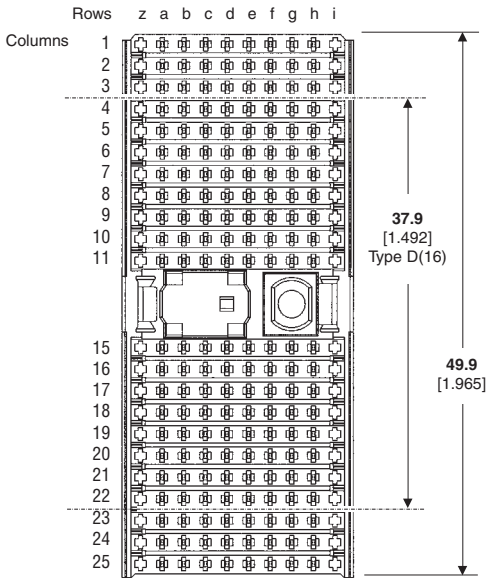
Description	Part Numbers			
	Short Tail		Feedthrough	
	8 Row	8+2 Row	8 Row	8+2 Row
Type D	646346-1	646356-1	646372-1	646375-1
Type D (16 column, 128 position)	646362-1	—	—	—
Type E	646347-1	646357-1	646373-1	646376-1
Type F	646457-1	646513-1	646514-1	646515-1

Vertical Male Connectors, 8 Row, Types D, E and F

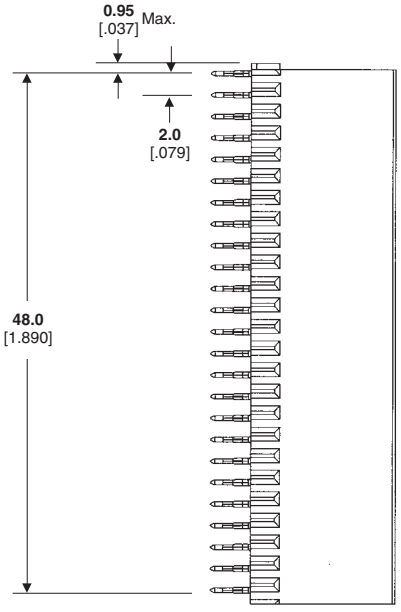
Short Tail Versions Shown

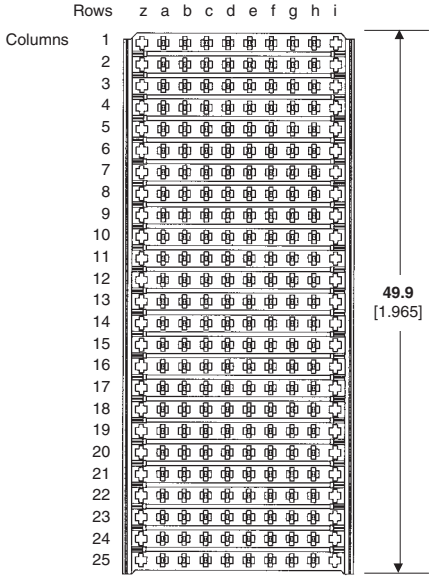
Type D



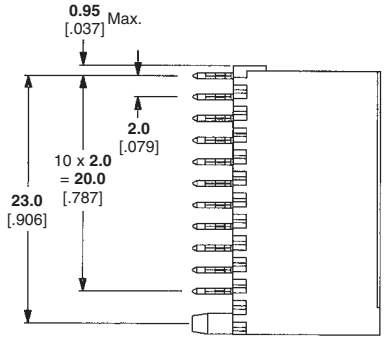


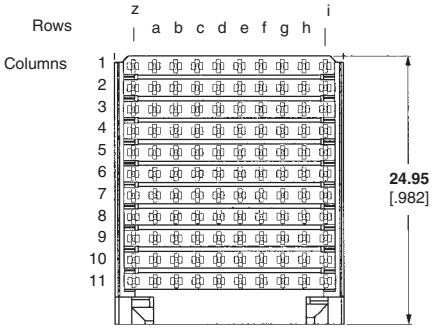
Type E





Type F





Catalog 65911
Revised 7-05

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Dimensions are in millimeters and inches unless otherwise specified. Values in brackets are standard equivalents.

Dimensions are shown for reference purposes only. Specifications subject to change.

USA: 1-800-522-6752
Canada: 1-905-470-4425
Mexico: 01-800-733-8926
C. America: 52-55-5-729-0425

South America: 55-11-3611-1514
Hong Kong: 852-2735-1628
Japan: 81-44-844-8013
UK: 44-141-810-8967

Vertical Male Connectors, 8 Row, Type D/E

Type D/E Vertical Male Connector

Type D/E male connectors will mate with Type D/E right angle female connectors shown on page 21.

8 row Version

Type D/E connector offers the guidance ability similar to the Type D connector but also utilizes the center three columns for additional signal pin capability which are not found in the Type D connector.

Available in the Type D/E connector are 200 signal pins which are end stackable without change of contact pitch according to the chart on page 9.

8+2 Row Versions

For use with females with ground return shields and contacts in rows z and i in addition to those above.

Short Tail Versions

Standard versions have contact option A in rows a-h with option C in rows z and i on 8+2 row versions.

Feedthrough Versions

For midplane connection, 8 row versions mate with standard 8 row Type D/E female connectors and 8+2 row versions mate with Type D/E female connectors having ground return shields. Standard versions use contact options K and T instead of A and C.

Mylar tail guides clan be fitted to feedthrough posts to aid assembly to the board.

Materials and Finish

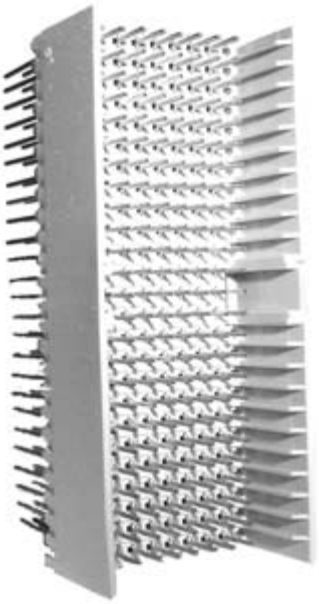
Glass filled polyester housing, gray, UL94 V-0 rated

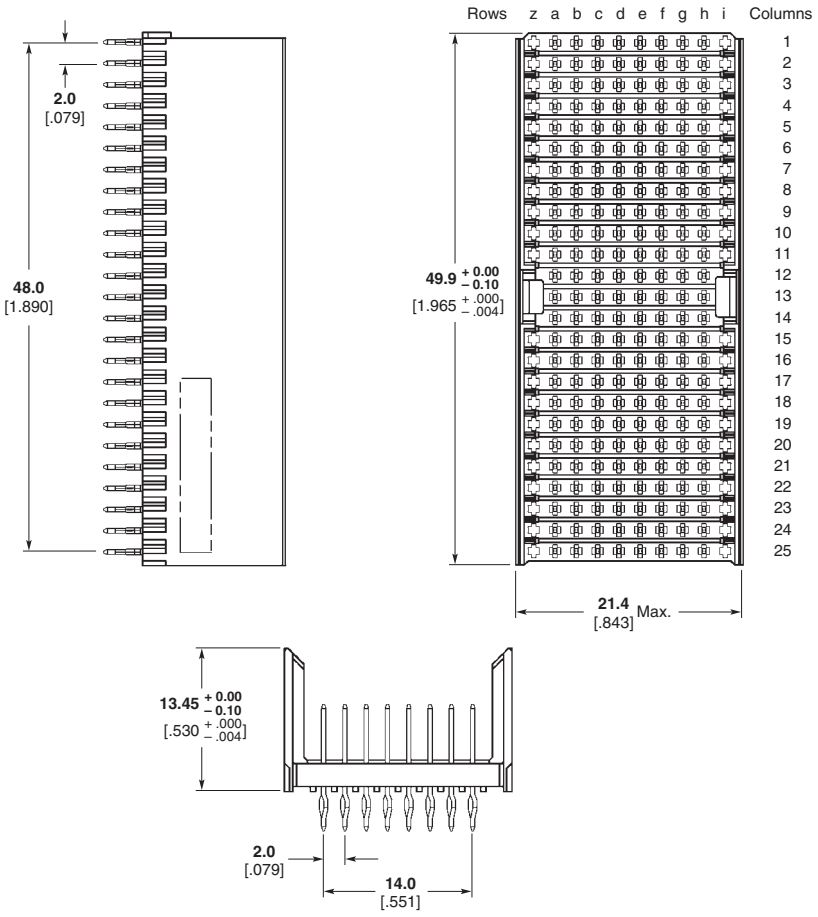
Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Board layout (see Customer Print).





Description	Part Numbers			
	Short Tail		Feedthrough	
	8 Row	8+2 Row	8 Row	8+2 Row
Type D/E	646729-1	646951-1	646952-1	646953-1

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Right Angle Female Connectors, 8 Row, Types D, E and F

Right Angle Female Connectors

Types D, E and F female connectors will mate with respective vertical male connectors shown on page 16.

Type D has 176 contacts with center guiding and keying facility and type E has 200 contacts and Type F has 88 contacts. Connectors are end stackable without change of contact pitch according to the chart on page 9. Two levels of performance are offered; standard and ground return shield versions. Upper ground return shields are pre-fitted to receptacles; lower shields are supplied and fitted separately as required. 8+2 male connectors are used with ground return shield versions.

For versions other than those shown, which gives access to other sizes and loading patterns, consult Tyco Electronics.

Performance Data pages 6-7.

Materials and Finish

Glass filled polyester + LCP housing, gray, UL94 V-0 rated

Phosphor-bronze signal contacts

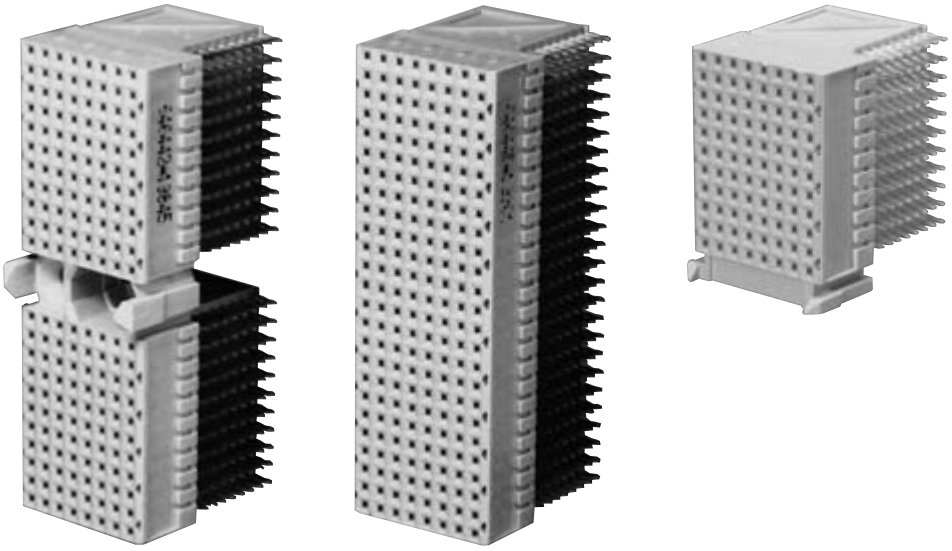
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

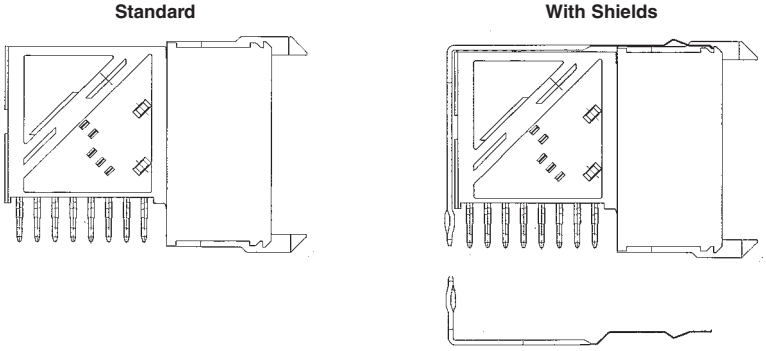
ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Coding Keys for Type A page 47.

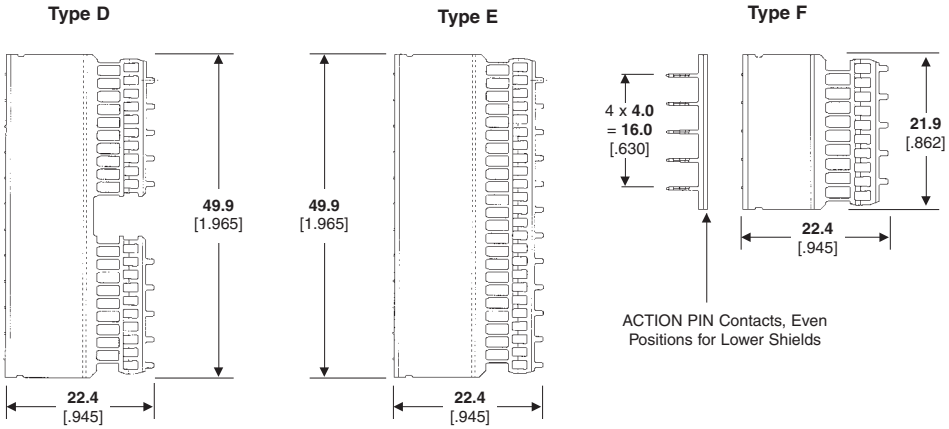
Board layout page 71, for guidance only.

Daughtercard thickness range of 1.4 - 4.3 [.055 - .169] (3.5 [.138] max. with lower shield)





Shields



Description	Part Numbers		
	Standard	Standard with Upper Shield	Lower Shield
Type D	646442-1	646486-1	646428-1
Type D (16)	646447-1	—	—
Type E	646445-1	646487-1	646430-1
Type F	646446-1	646492-1	646493-1

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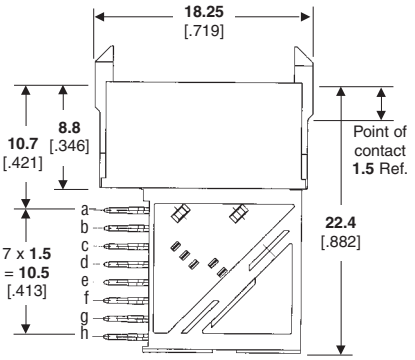
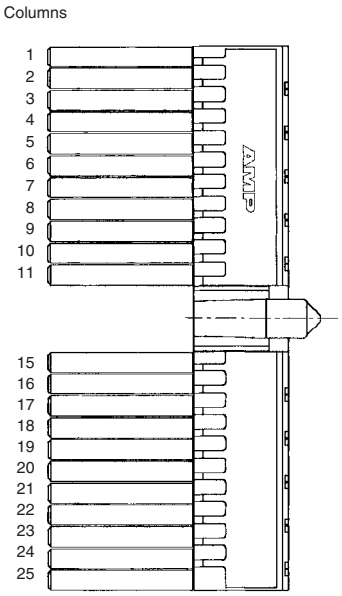
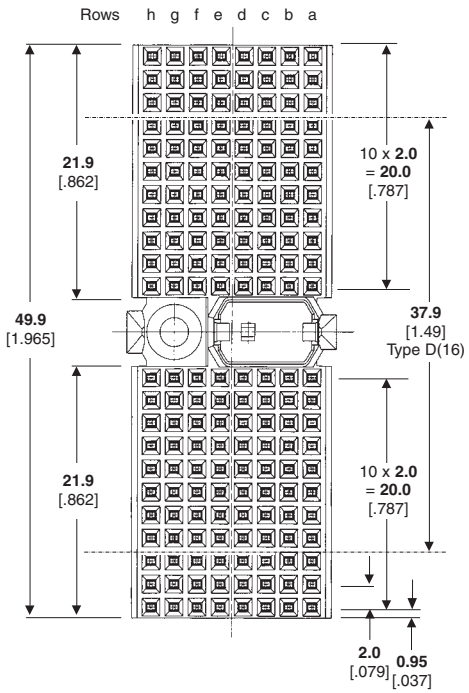
Japan: 81-44-844-8013
UK: 44-141-810-8967

Right Angle Female Connectors, 8 Row, Types D, E and F (Continued)



Type D





Materials and Finish

Glass filled polyester housing, gray, UL94 V-0 rated

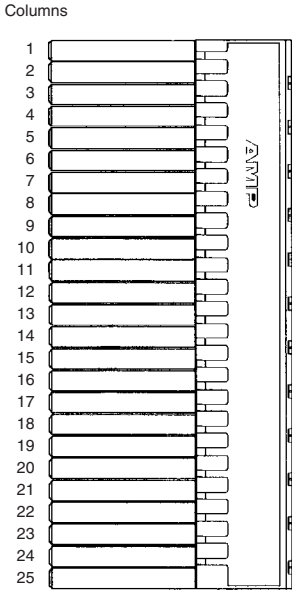
Phosphor-bronze signal contacts

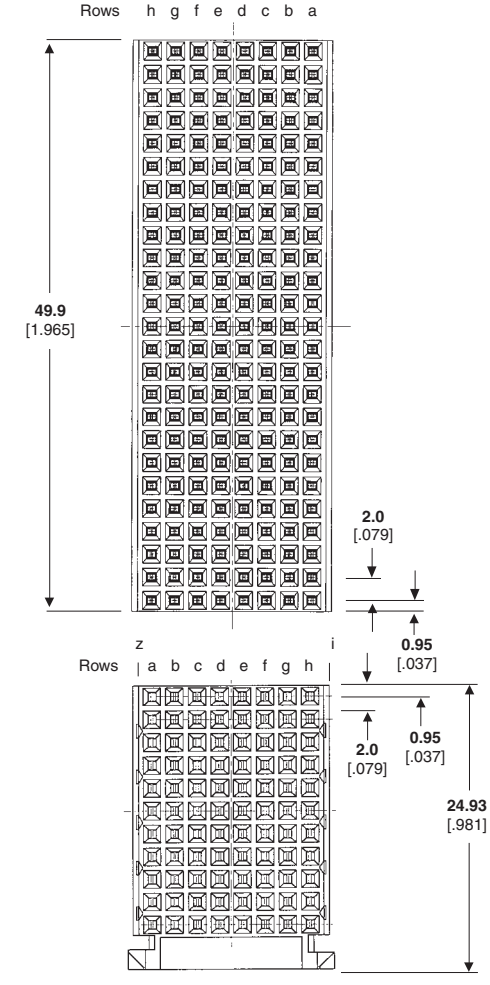
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

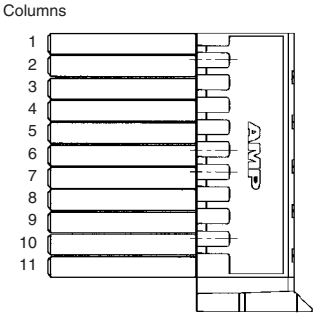
Daughtercard thickness range of 1.4 - 4.3 [.055 - .169].

Type E





Type F



Catalog 65911
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UK: 44-141-810-8967

Right Angle Female Connectors, 8 Row, Type D/E

Type D/E Female Connectors

Type D/E female connector will mate with respective vertical male connector as shown on page 18.

Type D/E connector offers the guidance ability similar to the Type D connector but also utilizes the center three columns for additional signal pin capability which are not found in the Type D connector.

Available in the Type D/E connector are 200 contacts. All are end stackable without change of contact pitch according to the chart on page 9.

Two levels of performance are offered; standard and with upper ground return shields. Upper ground shields are prefitted to receptacles. 8+2 male connectors are used with ground return shield versions.

Performance Data pages 6-7.

Materials and Finish

Glass filled polyester housing, gray, UL94 V-0 rated

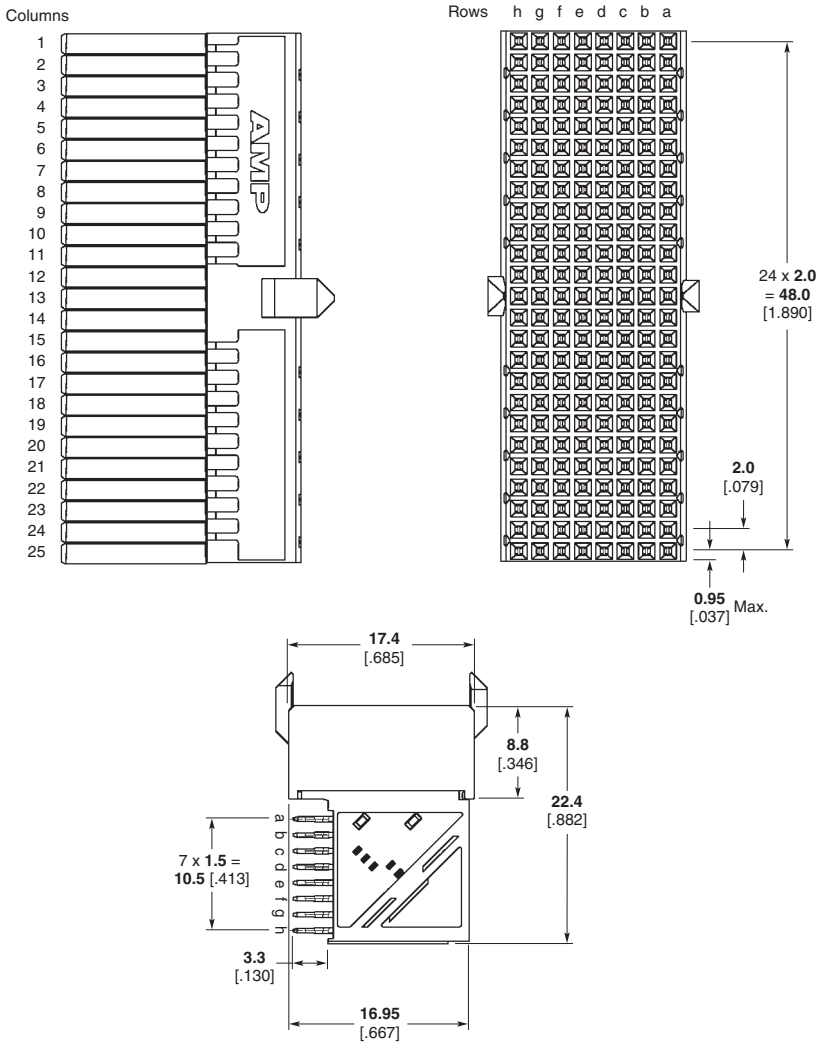
Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb
over 1.3µm [.000050] Ni

Board layout (see Customer Print)

Daughtercard thickness range of 1.4 - 4.3 [.055 - .169]



Description	Part Numbers	
	Standard	Standard with Upper Shield
Type D/E	646728-1	646759-1

Catalog 65911
Revised 7-05

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4 & 4+1 Row Slim Connectors

4 & 4+1 Row Slim Connectors

A newly designed Z-PACK 2mm HM 4 row & 4+1 row slim version of the Z-PACK Hard Metric (HM) 5 row standard backplane connector.

Application

This Z-PACK 2mm HM 4 row & 4+1 row slim connector is specifically designed to extend the Z-PACK 2mm Hard Metric standard connector product line. The connector enables the usage of Hard Metric practice in Telecommunications and Computer systems, as well as instrumentation applications with slot spacing as narrow as 15mm, giving excellent performance and mechanical characteristics at an economical price.

Product Facts

- Z-PACK 2mm HM 4 & 4+1 row slim version of HM 5 row standard connector
- Designed specifically to fit into a 15mm slot spacing and wider
- Designed in accordance with IEC 917-2-2 and IEC 61076-4-101 specifications
- Modular connector with basic module size of 50mm built in 2mm square grid
- Safe Design, complies with IEC950 in mated condition
- 1.4mm (55 mil) minimum backplane thickness
- 1.4 to 2mm (55 – 80 mil) daughtercard thickness range
- Supports applications at data rates up to 2.5 Gb/s (differential signaling) with edge rates of 100 psec., and 1:1 signal to ground ratio (10 pair/20mm), and up to 1.5 Gb/s (differential signaling) under same conditions but with 3:1 signal to ground ratio (15 pair/20mm)

Description	Part Number
Right Angle Receptacle 4 row Type A/B with upper shield	1612872-1
Vertical Header 4+1 row Type A/B (122 pos.)	1612877-1
Right Angle Receptacle 4 row Type A/B	1612913-1
Vertical Header 4 row Type A/B (100 pos.)	1674156-1
Insertion Tools	
Vertical Header	1-715836-1
Right Angle Receptacle	1596463-1

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Hong Kong: 852-2735-1628
Japan: 81-44-844-8013
UK: 44-141-810-8967

4 & 4+1 Row Slim Connectors (Continued)

Product Dimensions

Typical Electrical Properties

Flexible Pin Assignment for Differential Pair

—Max. Noise at 100ps Edge Rate

(AA)S — G = 1:1 Across the Column

Suitable for Data Rate — 2.5 Gb/s and up

Near End Noise — 3.4%

Far End Noise — 1.4%

(BB) S — G = 1:1 in Column

Suitable for Data Rate — 2.5 Gb/s and up

Near End Noise — 1.8%

Far End Noise — < 1%

(CC) S — G = 3:1

Suitable for Data Rate — 1.5 Gb/s

Near End Noise — 6.4%

Far End Noise — < 1%

Flexible Pin Assignment for Single Ended

—Max. Noise at 500ps Edge Rate

S — G = 1:1

Frequency — 200MHz (Max 400 Mb/s)

Near End Noise — 4.0%

Far End Noise — 1.2%

Technical Documents

Focus on Global Standards Consortium

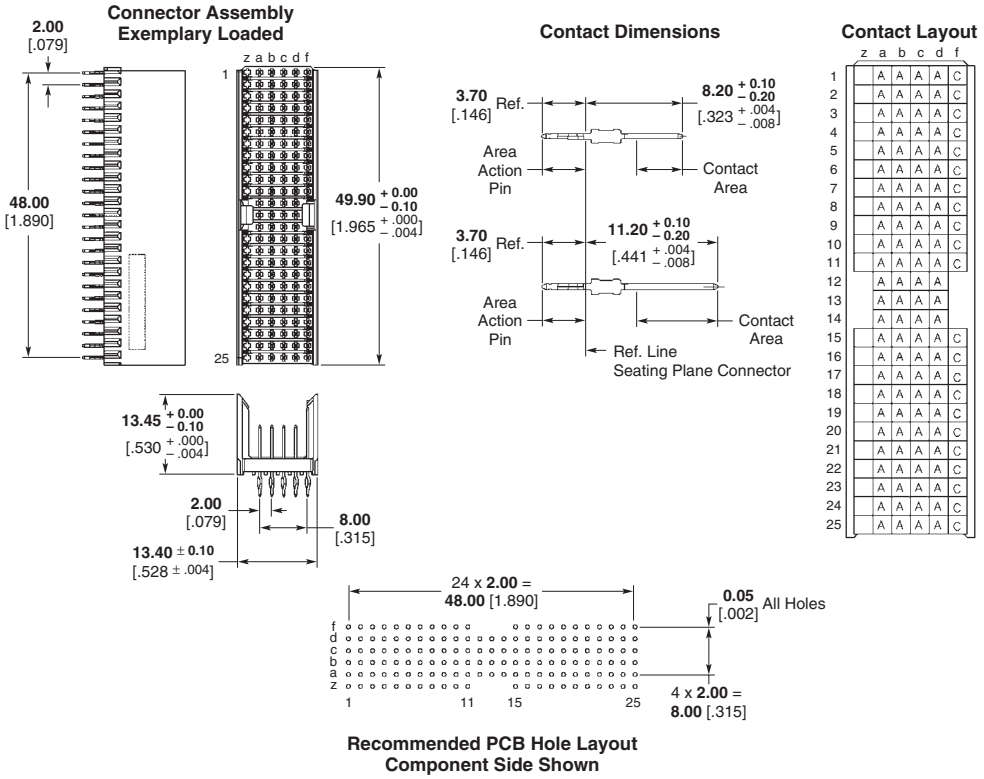
Base Station

OBSAI (Open Base Station Architecture Initiative) Established in Oct/02: http://www.obsai.org/index.asp)Nokia/Samsung/LG/Hyundai/Syscom/ZTE

E-PON (Ethernet Passive Optical Network)

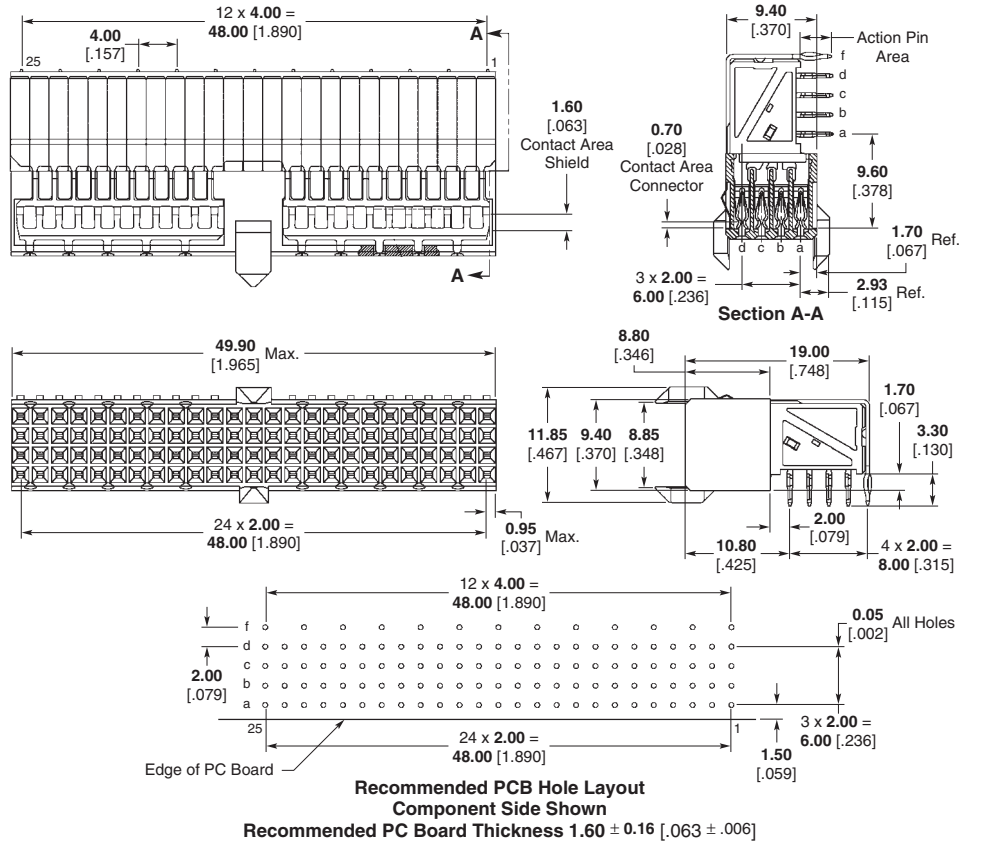
Not Standards yet but some Ad-hoc level working group in IEEE802.3 http://www.ieee802.org/3/efm/baseline/index.html

Vertical Header



Recommended PCB Hole Layout
Component Side Shown

Right Angle Receptacle



Recommended PCB Hole Layout
Component Side Shown
Recommended PC Board Thickness 1.60 ± 0.16 [.063 ± .006]

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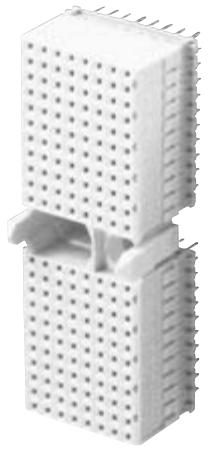
Vertical Female Connectors, 8 Row, Types D, E, and F



Type D Shown

Vertical Female Connector

Type D, E, and F mate with respective vertical male connectors shown on page 18. They are used in stacking applications offering high density in a limited space.

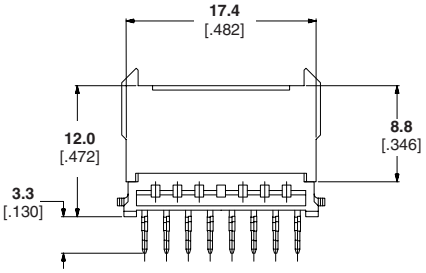
Materials and Finish

Glass filled polyester housing, gray, UL94 V-O rated

Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

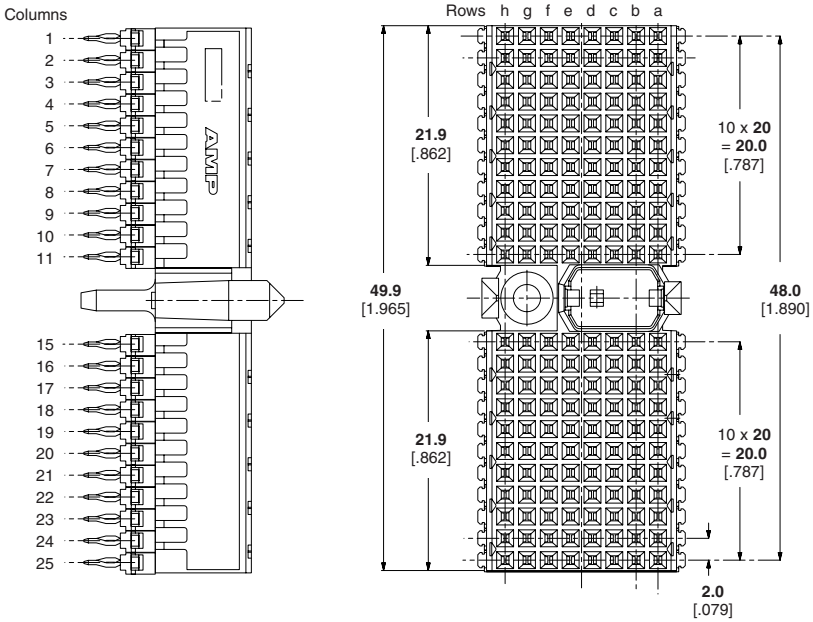
ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni



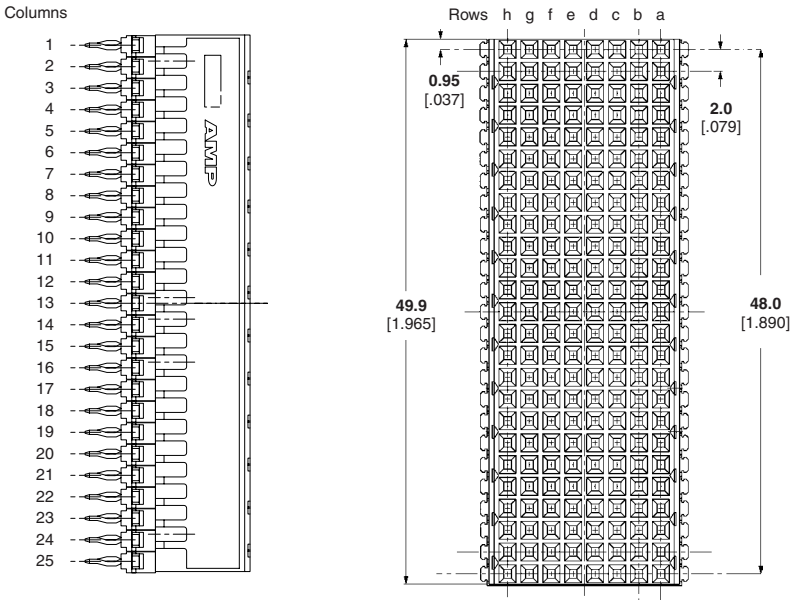
Type F Shown

Description	Part Numbers
Type D	646538-1
Type E	646539-1
Type F	646540-1
Type D/E	646773-1

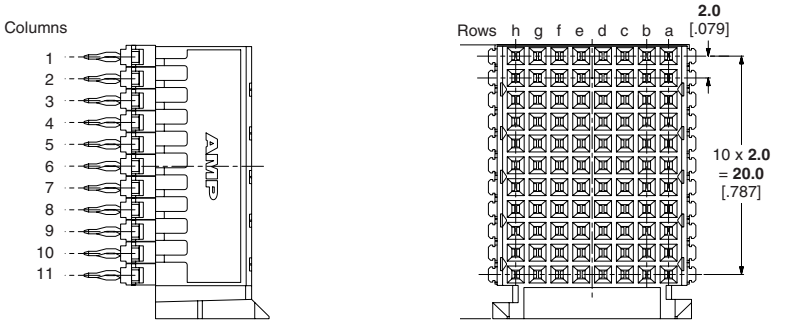
Type D



Type E



Type F



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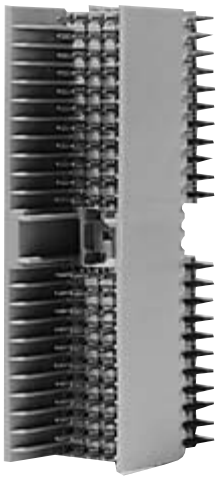
Right Angle Male Connectors, Type A, B, C



Right Angle Male Connector

Used for card extender and reverse sex daughter-to-backplane application

Types A, B and C connectors mate with respective right angle female connectors for card extenders and with vertical female connectors for reverse sex connection. Refer to pages 13 and 27.

Type A has 110 contacts with center guiding and keying facility; Type B has 125 contacts and Type C has 55 contacts with guiding feature. Standard versions have pins with mating level 1; see page 47 for other options.

Two performance levels are available; standard and reduced crosstalk

Performance Data pages 6-7.

Materials and Finish

Glass filled polyester housing, gray, UL94 V-0 rated

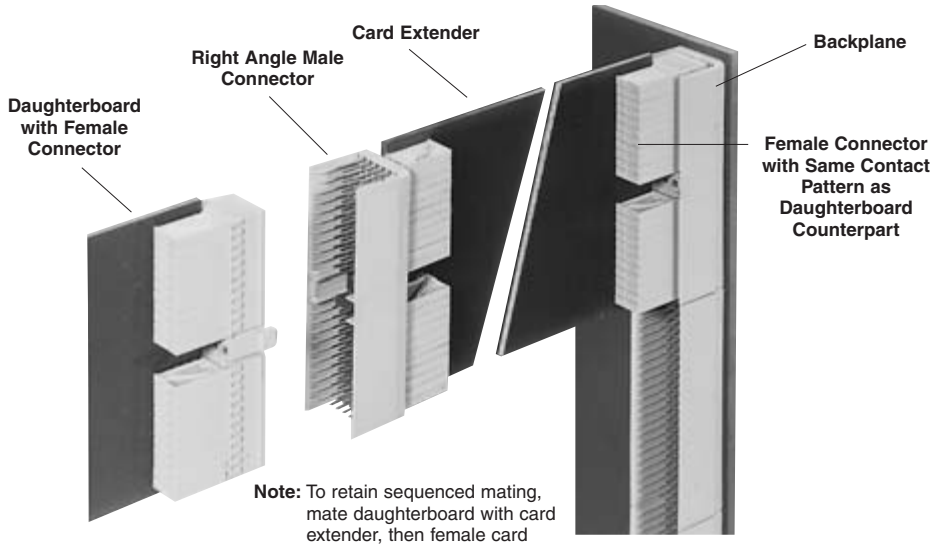
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Coding keys for type A page 47.

Board layout page 69 for guidance only.

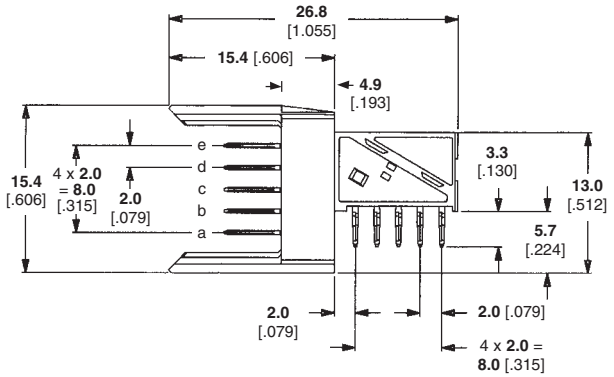
Arrangement



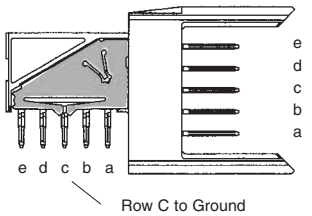
Note: To retain sequenced mating, mate daughterboard with card extender, then female card extender connector with male on backplane.

Side Elevation

Standard Version



Reduced crosstalk version.
Same dimensions as standard version. Consult Tyco Electronics.



Description	Part Numbers	
	Standard	Reduced Crosstalk
Type A	106015-1	352271-1
Type B	106014-1	352272-1
Type B 22col	352131-1	—
Type B 19col	352406-1	—
Type C	106012-1	352273-1

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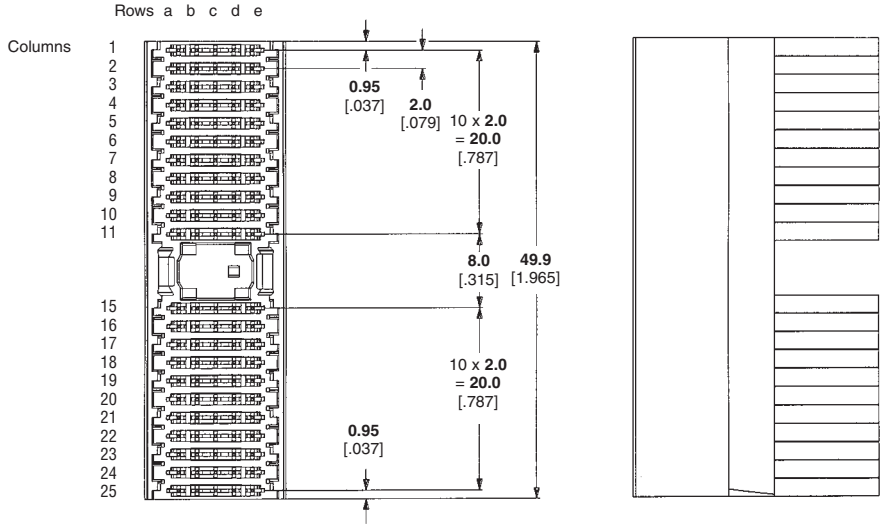
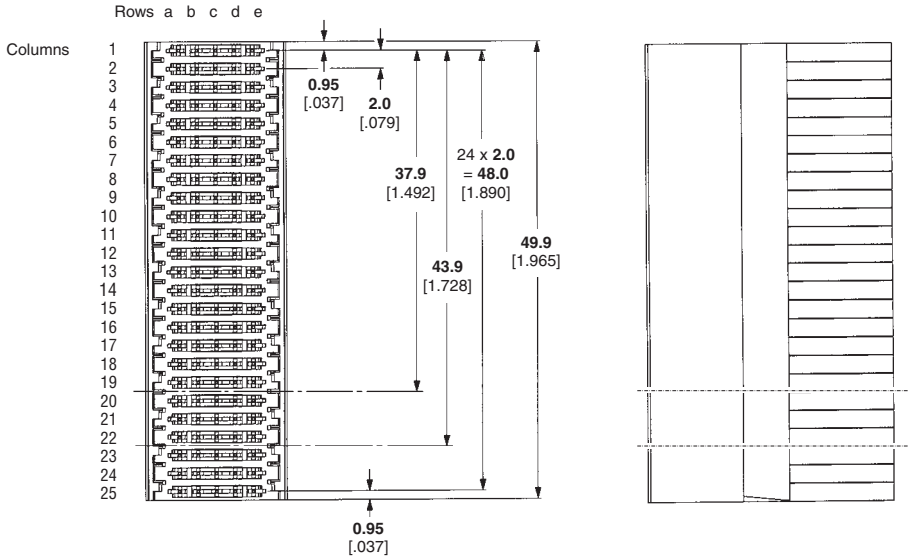
Right Angle Male Connectors, Type A, B, C (Continued)

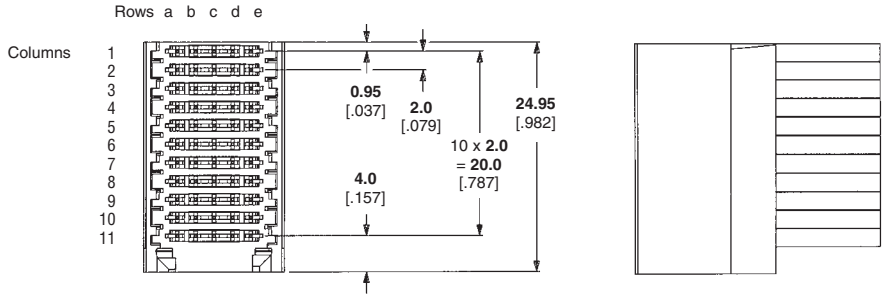
Type A, 110 Signal Pins, 50mm Module



Type B, 125 Signal Pins, 50mm Module



Type C, 55 Signal Pins, 25mm Module



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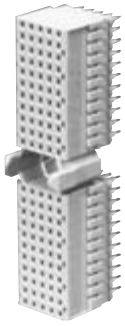
Vertical Female Connectors, 5 Row, Types A, B, and C



Vertical Female Connectors

Types A, B and C mate with respective right angle and vertical male connectors shown on pages 10 and 25.

Type A has 110 contacts and center keying and guiding. Type B has 125 contacts and Type C has 55 contacts with guiding feature. All are stackable without change in contact pitch according to the chart on page 9.

Limited other contact patterns are available; see page 47.

Performance Data pages 6-7.

Materials and Finish

Glass filled polyester housing.

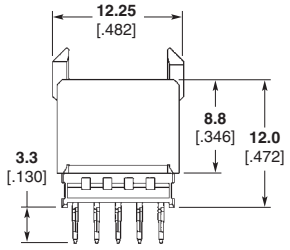
Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

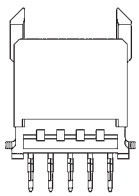
ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Coding keys for type A page 47.

Board layout page 69 for guidance only.

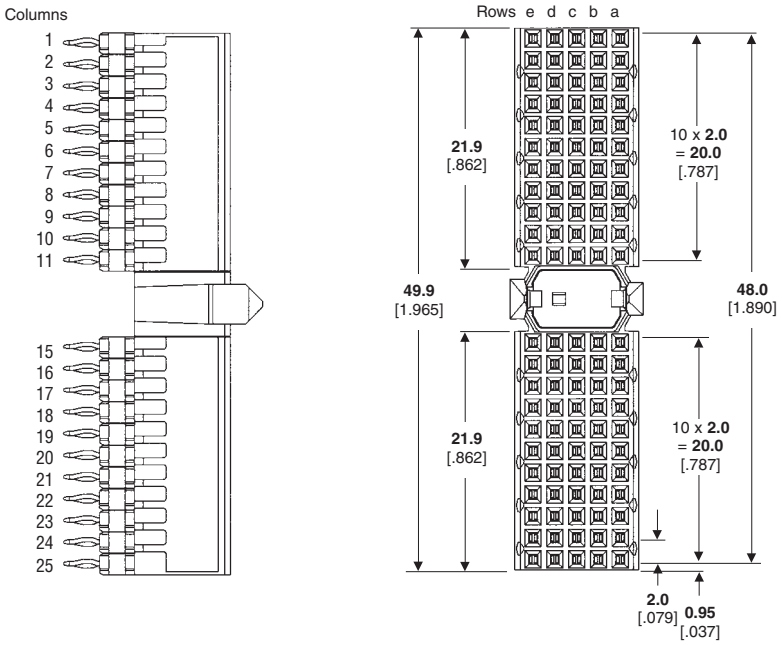


Type A shown

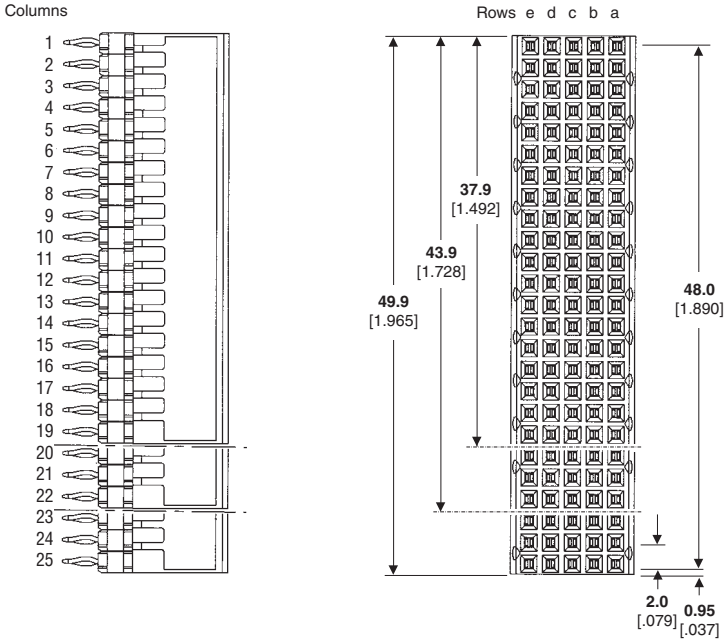


Optional Configuration

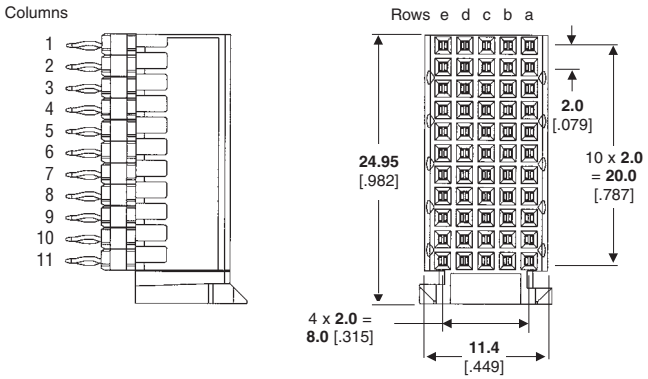
Type A



Type B



Type C



Description	Part Numbers
Type A (without locating peg)	106773-1
Type A (with locating peg)	352457-1
Type B	106774-1
Type B 22 col	352268-1
Type B 19 col	352269-1
Type C	106775-1

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Midplane Board-to-Board Arrangements

Midplane Connection

Daughterboards can be connected to either side of a backplane in parallel, asymmetric parallel and cross connect configuration. Vertical male connectors with feedthrough pins are used with shrouds and spacers.

Feedthrough pins can be in 5, 5+2, 8 or 8+2 row configuration. Spacers are selected according to backplane thickness to give the required resultant post mating level. See page 31.

Optional one piece shrouds available. See page 32.

Daughtercard connectors are the same for front and rear using types A, B, C, D, E and F.

Parallel Connection

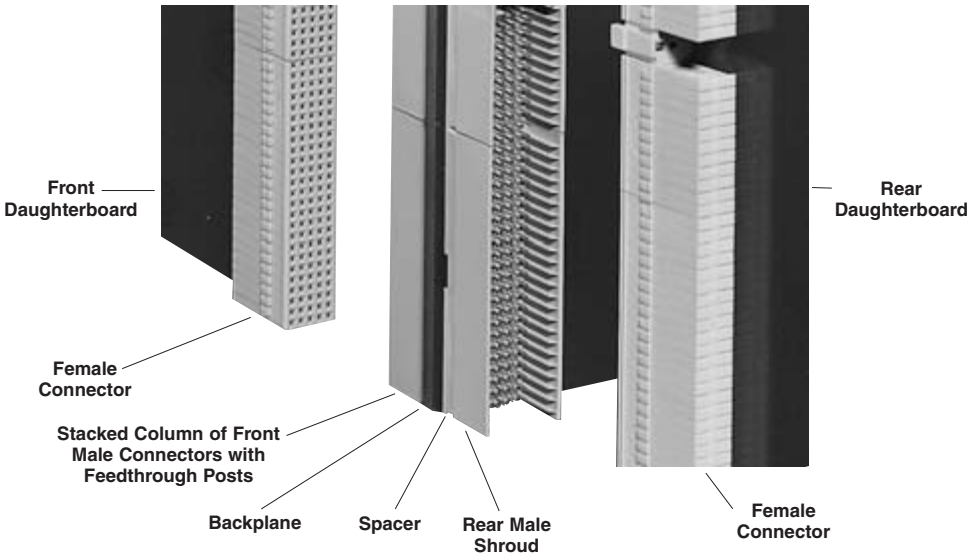
Parallel connection can be symmetric, where the daughtercards are the same way up, or asymmetric, where they are reversed. Column numbers are reversed on the backplane rear with symmetric orientation.

Cross Connect

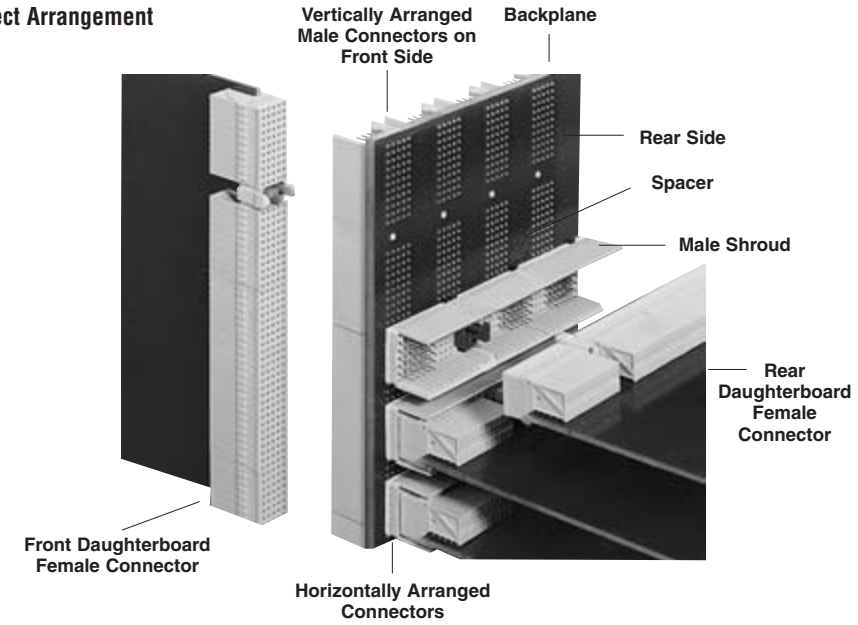
Cross connect can be configured with spacers and shrouds as above giving a matrix of pins where male connectors and shrouds coincide, or selective loaded male connectors can be used at the rear, with empty positions to allow for feedthrough posts from the front. Post options U,V,or X must be used. When male connectors are used front and rear, spacers cannot be used to adjust post lengths.

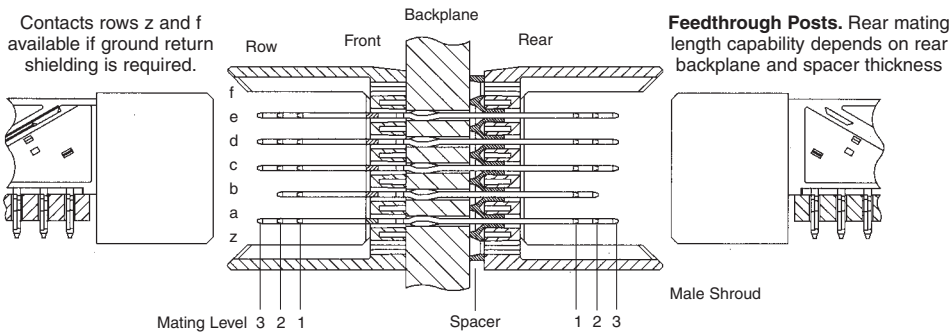
All arrangements can use receptacles with ground return shields. Consult Tyco Electronics if EMI/RFI shielding is required.

Vertical Board Arrangement, shown with symmetrical daughterboards



Cross-connect Arrangement





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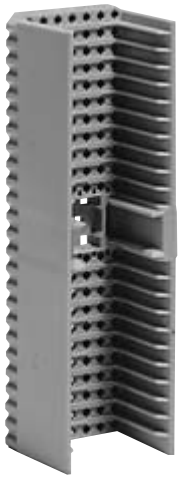
Male Shrouds (ZIF Style)



ZIF Shrouds

Zero insertion force shrouds are used with spacers which have two functions.

- Allows the shroud to fit over the pins without scratching the surface, yet retain the shroud when pressed in position.
- Compensate for differing backplane thicknesses to provide required pin mating levels.

Spacers are fitted to shrouds and then assembled to the pins.

Clamping is effected by pressing the shroud with a male insertion tool.

5 row shrouds are suitable for 5 or 5+2 rows of pins; likewise 8 row shrouds are suitable for 8 or 8+2 rows.

Performance data pages 6-7.

Materials

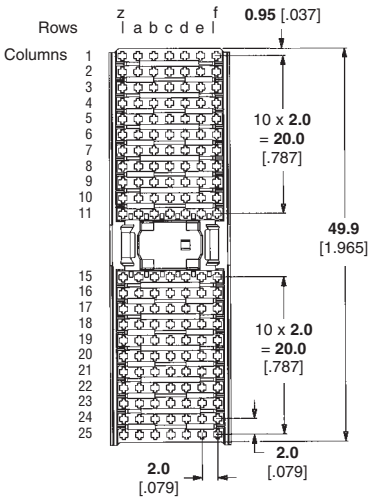
Glass filled polyester housing, gray, UL94 V-0 rated

Coding Keys for type A page 47.

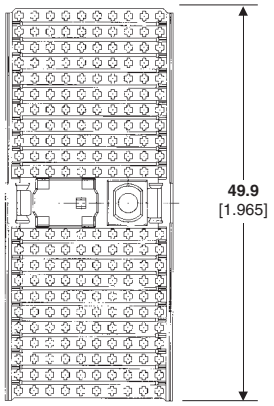
Shroud Type	Part Numbers
A	106137-2
B	106138-2
19 col B	352011-2
22 col B	352130-2
C	106182-2
D	646370-1
E	646345-1

5 row **8 row**

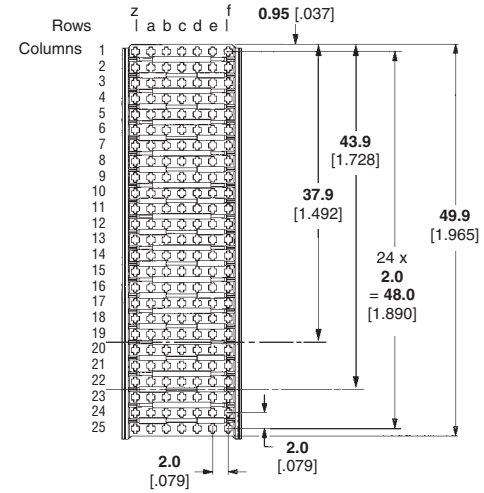
Type A



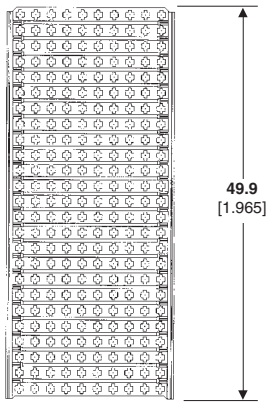
Type D



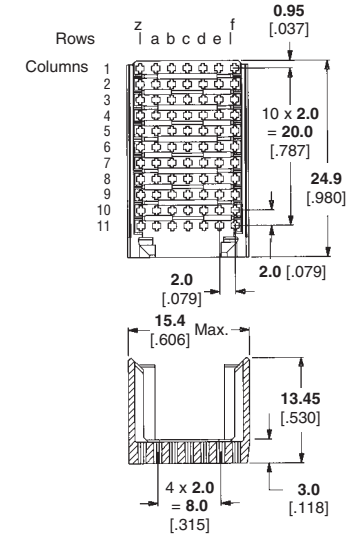
Type B

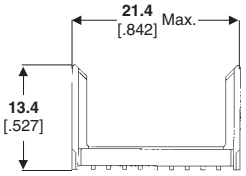


Type E



Type C





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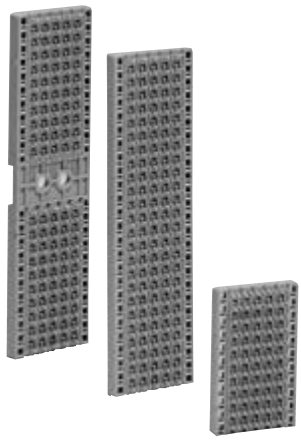
Spacers for Type A, B, and C Male ZIF Shrouds



Spacers

Spacers are available to suit the shrouds on the page opposite in various thicknesses to compensate for a range of backplane thicknesses.

The sum of backplane and spacer thickness could be 4.7 [.185], which would give pin mating levels equivalent to those of a pin header, but users should study the conditions overleaf in view of large backplane thickness tolerances.

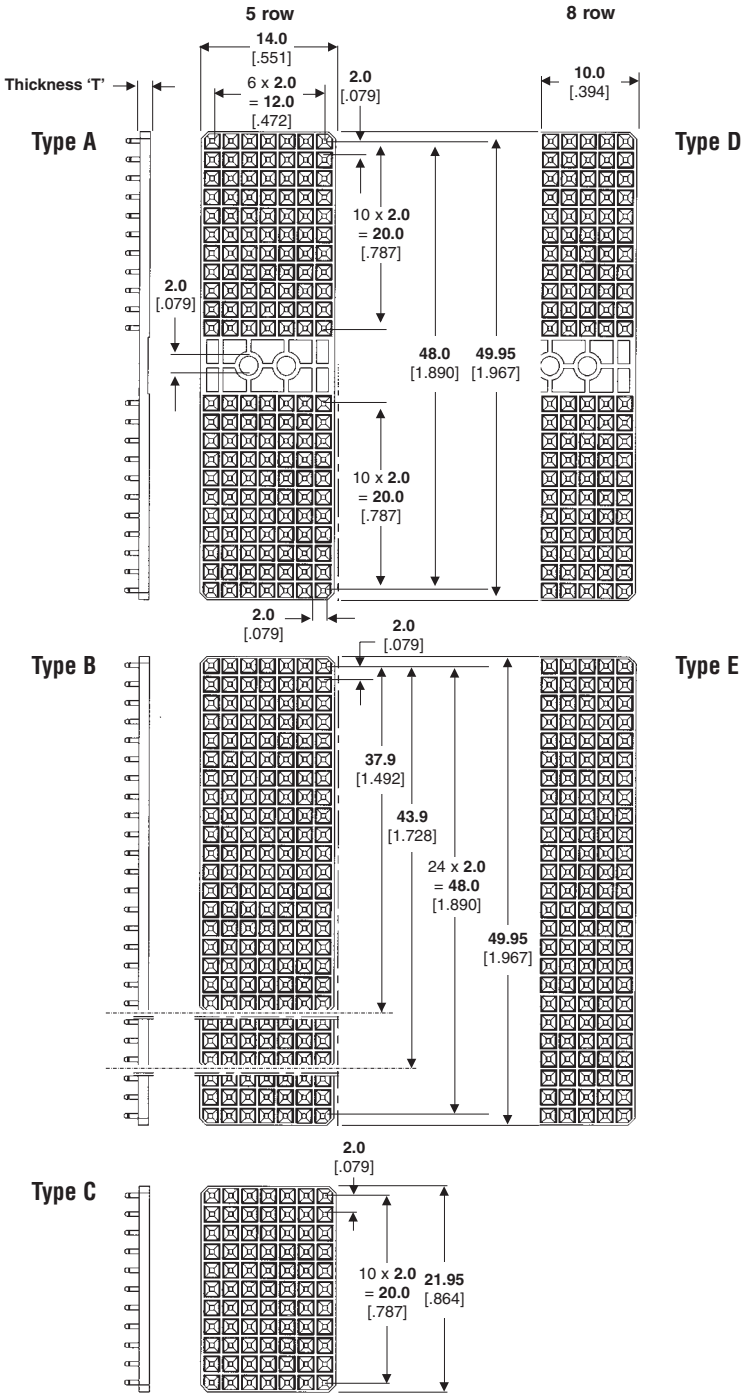
If this dimension cannot be met, use the data overleaf to select pin lengths to compensate for thicker or thinner backplane/spacer combinations.

Spacers are assembled to shrouds before fitting over pins, and then pressed down using a male insertion tool. The tapered projections grip the pins and help to ensure true positioning of the pin tips.

Note: Two spacers are used for each 8 row shroud

Materials

Polyester, gray, UL94 V-0 rated.



Spacer Type 'T'	0.9 [.035]	1.1 [.043]	1.3 [.051]	1.5 [.059]	1.7 [.067]	1.9 [.075]
A	106457-2	106457-3	106457-4	106457-5	106457-6	106457-7
B	106458-2	106458-3	106458-4	106458-5	106458-6	106458-7
19 col B	352012-2	352012-3	352012-4	352012-5	352012-6	352012-7
22 col B	352129-2	352129-3	352129-4	352129-5	352129-6	352129-7
C	100773-2	100773-3	100773-4	100773-5	100773-6	100773-7
D*	646386-1	646386-2	646386-3	646386-4	646386-5	646386-6
E*	646387-1	646387-2	646387-3	646387-4	646387-5	646387-6

* Two spacers per shroud

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Spacer Selection

Spacer Selection

For midplane arrangements, it is generally a requirement to have the same contact sequencing on the front and rear of the backplane.

This can be achieved using the chart below. A simple solution would be to select a spacer such that the combined backplane and spacer thickness have a maximum thickness of 4.7 [.185] using pins having the same mating level front and rear (see page 66).

If this is not possible, then sequenced mating can still be achieved using other pin versions, with either longer or shorter tail lengths according to the backplane thickness, but three mating levels will not be achievable.

The following limits of exposed post length should be adhered to:

- Minimum 5.3 [.209]
- Maximum 8.3 [.327] except post which mates with right angle female connector row b, which must be 6.8 [.268] max.
- These dimensions are different from those given elsewhere in this catalog because they allow for component tolerances in deriving the resultant post length.
- Backplane tolerances are not included.

Example

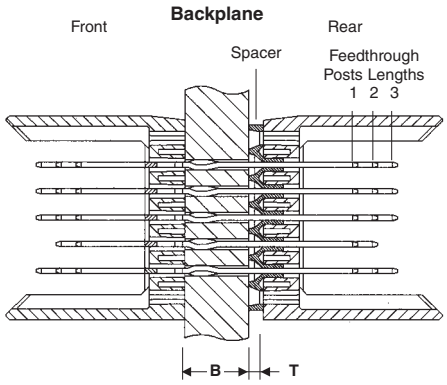
Backplane thickness = 3.0 [.118] and three levels of mating are required. Backplane thickness tolerances are generally +/-10%, giving a maximum value of 3.3 [.130].

From the chart, three mating levels are achieved on the line where b + t = 4.7 [.185], and the pins can be selected from K, L or M for post length 5.3 [.209], N, P, or Q for post length 6.8 [.268] and R, S or T for post length 8.3 [.327], dependent on the front pin length required. Note that posts longer than 6.8 [.268] cannot be mated to row b on right angle receptacles See page 66.

If b + t = 4.7 [.185] and the backplane thickness b = 3.3 [.118], required spacer t must be 1.4 [.055] thick. Select the spacer which is this thickness or the next thinner one. The next value below this is 1.3 [.051].

With minimum backplane thickness of 2.7 [.106] and spacer of 1.3 [.051], b + t min. is 4.0 [.157], which satisfies the minimum value conditions.

Referring to page 30, the required spacer for an A type shroud would be part number 106457-4.



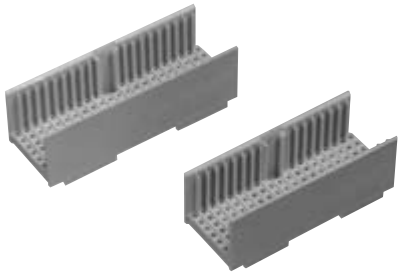
Ideal Spacer/Board Combinations

PC Board Thickness (B)	Contact Tail Length	Spacer Thickness (T)	Mating Level	Pin Length
1.5 [.059]	**13.0** [.512]	**1.7** [.067]	2	**6.85** [.270]
	14.5 [.571]	**1.7** [.067]	3	**8.35** [.329]
1.7 [.067]	**13.0** [.512]	**1.5** [.059]	3	**6.85** [.270]
	14.5 [.571]	**1.5** [.059]	3	**8.35** [.329]
1.9 [.075]	**13.0** [.512]	**1.3** [.051]	2	**6.85** [.270]
	14.5 [.571]	**1.3** [.051]	3	**8.35** [.329]
2.1 [.083]	**13.0** [.512]	**1.1** [.043]	2	**6.85** [.270]
	14.5 [.571]	**1.1** [.043]	3	**8.35** [.329]
2.3 [.091]	**13.0** [.512]	**0.9** [.035]	2	**6.85** [.270]
	14.5 [.571]	**0.9** [.035]	3	**8.35** [.329]
2.8 [.110]	**13.0** [.512]	**1.9** [.075]	1	**5.35** [.211]
	14.5 [.571]	**1.9** [.075]	2	**6.85** [.270]
	16.0 [.630]	**1.9** [.075]	3	**8.35** [.329]
3.0 [.118]	**13.0** [.512]	**1.7** [.067]	1	**5.35** [.211]
	14.5 [.571]	**1.7** [.067]	2	**6.85** [.270]
	16.0 [.630]	**1.7** [.067]	3	**8.35** [.329]
3.2 [.126]	**13.0** [.512]	**1.5** [.059]	1	**5.35** [.211]
	14.5 [.571]	**1.5** [.059]	2	**6.85** [.270]
	16.0 [.630]	**1.5** [.059]	3	**8.35** [.329]
3.4 [.134]	**13.0** [.512]	**1.3** [.051]	1	**5.35** [.211]
	14.5 [.571]	**1.3** [.051]	2	**6.85** [.270]
	16.0 [.630]	**1.3** [.051]	3	**8.35** [.329]
3.6 [.142]	**13.0** [.512]	**1.1** [.043]	1	**5.35** [.211]
	14.5 [.571]	**1.1** [.043]	2	**6.85** [.270]
	16.0 [.630]	**1.1** [.043]	3	**8.35** [.329]
3.8 [.150]	**13.0** [.512]	**0.9** [.035]	1	**5.35** [.211]
	14.5 [.571]	**0.9** [.035]	2	**6.85** [.270]
	16.0 [.630]	**0.9** [.035]	3	**8.35** [.329]
4.3 [.169]	**14.5** [.571]	**1.9** [.075]	1	**5.35** [.211]
	16.0 [.630]	**1.9** [.075]	2	**6.85** [.270]
4.5 [.177]	**14.5** [.571]	**1.7** [.067]	1	**5.35** [.211]
	16.0 [.630]	**1.7** [.067]	2	**6.85** [.270]
4.7 [.185]	**14.5** [.571]	**1.5** [.059]	1	**5.35** [.211]
	16.0 [.630]	**1.5** [.059]	2	**6.85** [.270]
4.9 [.193]	**14.5** [.571]	**1.3** [.051]	1	**5.35** [.211]
	16.0 [.630]	**1.3** [.051]	2	**6.85** [.270]
5.1 [.201]	**14.5** [.571]	**1.1** [.043]	1	**5.35** [.211]
	16.0 [.630]	**1.1** [.043]	2	**6.85** [.270]
5.3 [.209]	**14.5** [.571]	**0.9** [.035]	1	**5.35** [.211]
	16.0 [.630]	**0.9** [.035]	2	**6.85** [.270]
5.8 [.228]	**16.0** [.630]	**1.9** [.075]	1	**5.35** [.211]
6.0 [.236]	**16.0** [.630]	**1.7** [.067]	1	**5.35** [.211]
6.2 [.244]	**16.0** [.630]	**1.5** [.059]	1	**5.35** [.211]
6.4 [.252]	**16.0** [.630]	**1.3** [.051]	1	**5.35** [.211]
6.6 [.260]	**16.0** [.630]	**1.1** [.043]	1	**5.35** [.211]
6.8 [.268]	**16.0** [.630]	**0.9** [.035]	1	**5.35** [.211]
7.0 [.275]	**16.0** [.630]	**0.7** [.027]	1	**5.35** [.211]

One Piece Shrouds

Type A, B, C, D, E or F Shrouds

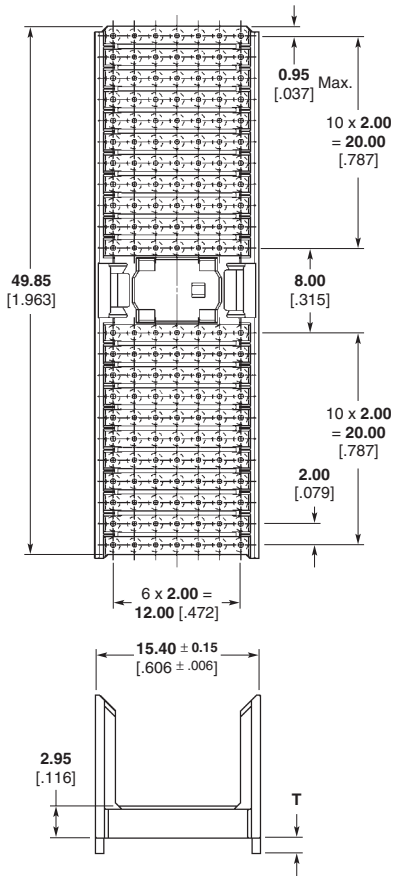
One piece shrouds can be used with several backplane thicknesses to provide required pin mating levels (see chart for options available). The single piece design also provides a reduced part count, lower applied cost solution.



Type AB Shrouds

Type AB shrouds require male feed thru connectors with short tail or vacant ground pin positions in the guide feature locations.

Type B **5 row**



Shroud Type 'T'	0 [.000]	.9 [.035]	1.1 [.043]	1.3 [.051]	1.5 [.059]	1.7 [.067]	1.9 [.075]	2.1 [.080]
A	646478-1	646478-2	646478-3	646478-4	646478-5	646478-6	646478-7	—
B	646479-1	646479-2	646479-3	646479-4	646479-5	646479-6	646479-7	—
C	646480-1	646480-2	646480-3	646480-4	646480-5	646480-6	646480-7	—
B (19)	646481-1	646481-2	646481-3	646481-4	646481-5	646481-6	646481-7	—
B (22)	646482-1	646482-2	646482-3	646482-4	646482-5	646482-6	646482-7	—
AB (19)	646483-1	646483-2	646483-3	646483-4	646483-5	646483-6	646483-7	—
AB (22)	646484-1	646484-2	646484-3	646484-4	646484-5	646484-6	646484-7	—
AB (25)	646576-1	646576-2	646576-3	646576-4	646576-5	646576-6	646576-7	—
D	646476-1	646476-2	646476-3	646476-4	646476-5	646476-6	646476-7	—
E	646477-1	646477-2	646477-3	646477-4	646477-5	646477-6	646477-7	—
F	646525-1	646525-2	646525-3	646525-4	646525-5	646525-6	646525-7	—
DE	646726-1	646726-2	646726-3	646726-4	646726-5	646726-6	646726-7	646726-8

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Japan: 81-44-844-8013
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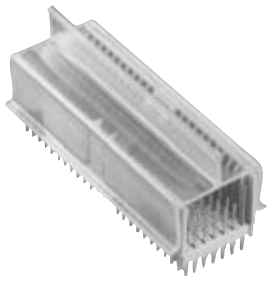
Male Pin Protection Covers



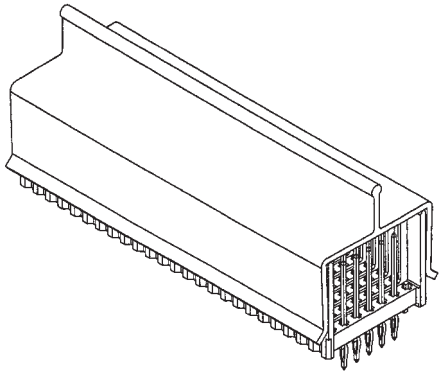
New male pin protection covers are now available for all vertical male and right angle male connectors. These covers prevent the exposed pin fields from being damaged (e.g. bent, broken), until the connector is mated. The covers easily slide over the outside housing of the connector and can easily be removed. No tooling is necessary.

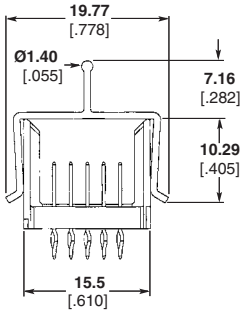
Sizes are available for 5/5+2 and 8/8+2 row male connectors (Types A-F).

Material

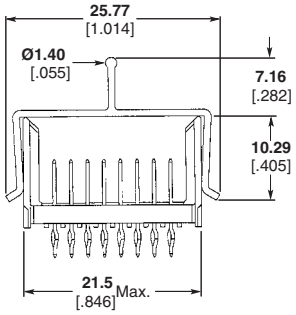
Polycarbonate, color—clear

Used with male connectors.

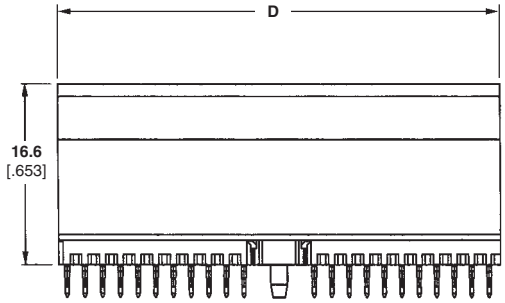




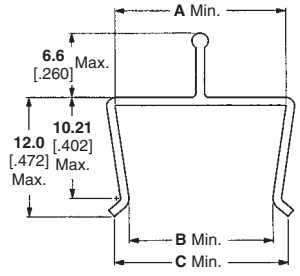
5 Row



8 Row



Cover shown on A & D module for reference only.



Type	Dimensions				Part Number
	A	B	C	D	
A,B	**15.75** .620	**13.28** .523	**17.27** .679	**49.23** 1.938	646502-1
C	**15.75** .620	**13.28** .523	**17.27** .679	**23.97** .943	646502-3
D,E	**21.74** .855	**19.28** .759	**23.27** .916	**49.23** 1.938	646502-2
F	**21.74** .855	**19.28** .759	**23.27** .916	**23.97** .943	646502-4

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UK: 44-141-810-8967

Types L, M and N Backplane Connectors with DIN Cavities

DIN Contacts

DIN contacts can be fitted to types L, M and N male and female housings. These housings have 3 or 6 4.8 [.189] diameter cavities for high current, coaxial or fiber optic contacts conforming to DIN 41626.

Male housings are press fit polarized to backplanes.

Contacts for these housings are shown on pages 38 and 39.

Standard Type M housings have option A contacts loaded in columns a to e, with option C used in rows z and f of 5+2 row versions. Feedthrough pins are option K. Other arrangements can be provided; refer to page 47 for other contact patterns. Variations not listed should be specified using the pin specifications on page 66 and chart on page 71.

Performance Data pages 6-7, also refer to DIN specifications.

Materials and Finish

Glass filled polyester housing.

Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

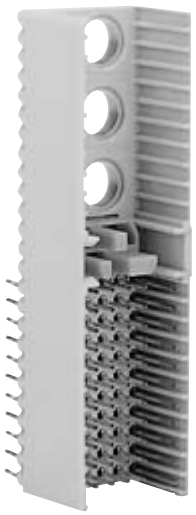
ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Coding Keys for type L & M, page 47.

Board layout page 71 for guidance only.

Special Version of type L is available for vertical press fit coax contacts

Type L
6 DIN Cavities



Type M
55 Signal Contacts and
3 DIN Cavities

Type N
3 DIN Cavities

Type L, M, N connectors with DIN contact cavities for high current, coaxial and fiber optic connections

Plastic modules provide press-fit-polarized assembly on backplanes. Cavities allow connectors to be loaded in any position with high current, coaxial or fiber optic contacts as per DIN 41626.

Illustration shows Type L connector, top to bottom:

- High current cable contact (2x). Also available for backplane soldered connection. First make-last break versions can be provided for high current contacts.
- Fiber optic plug for cable-to-cable connection (2x).
- Coaxial cable contact (2x).

Description	Part Numbers	
	Cable & Panel	Flush Board*
Type L	100745-1	646704-1*
Type M 5 row short tail	100749-1	646709-1*
Type M 5+2 row short tail	352049-1	646730-1*
Type M 5 row feed through	106326-1	646886-1*
Type N	100751-1	646703-1*
Type N Right Angle	—	646858-1*

*All connectors accept cable or board mount contacts.

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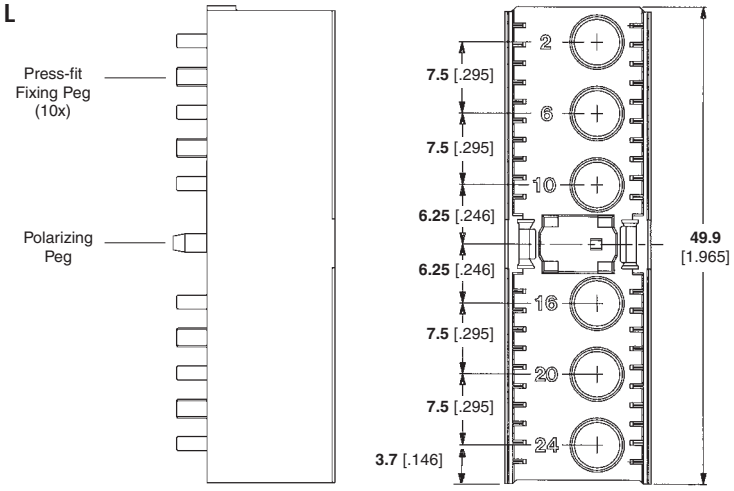
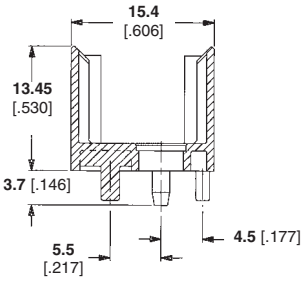
Types L, M and N Backplane Connectors with DIN Cavities (Continued)

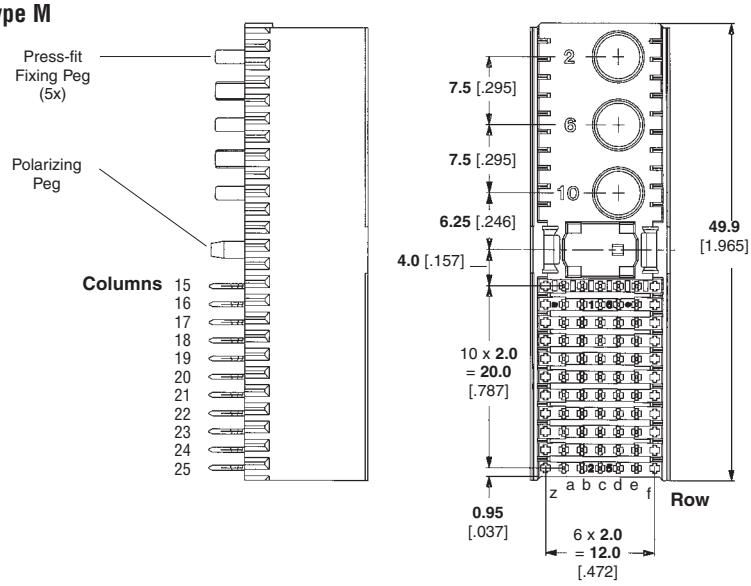
Type L

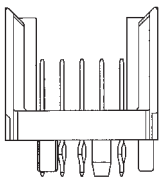




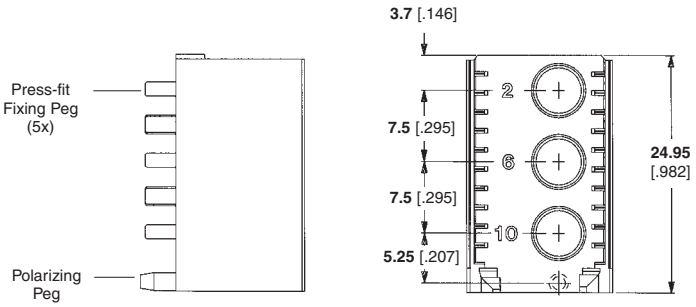
Section of All DIN Cavities

Type M





Type N



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Types L, M and N Daughterboard Connectors with DIN Cavities

DIN Contacts

DIN contacts can be fitted to types L, M and N male and female housings. These housings have 3 or 6 4.8 [.189] diameter cavities for high current, coaxial or fiber optic contacts conforming to DIN 41626.

Female housings are press fit to the daughtercards.

Contacts for these housings are shown on pages 38 and 39.

Performance Data pages 6-7, also refer to DIN specifications.

Materials and Finish

Glass filled polyester housing, gray, UL94 V-O rated.

Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

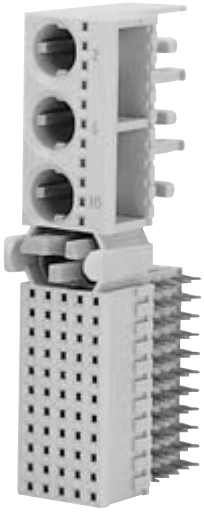
ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

Coding Keys for type L & M, page 47.

Board layout page 71 for guidance only.

Note:
Housings should be reamed to accept DIN Fiber Optic Contacts. Use Tyco Electronics tool pn 434779-1 to ream the cavities. Fiber Optic Contacts are available from specialist manufacturers.

Type L
6 DIN Cavities



Type M
55 Signal Contacts and
3 DIN Cavities

Type N
3 DIN Cavities

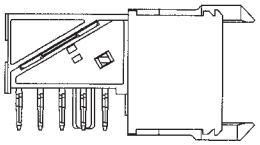
Type L, M, N Connectors with DIN contact cavities for high current, coaxial and fiber optic connections

Plastic modules provide press-fit, polarized assembly onto free boards. Cavities accept high current, coaxial or fiber optic contacts as per DIN 41626.

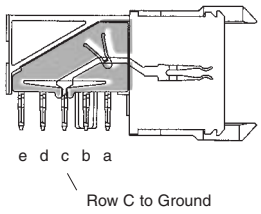
Illustration left, shows Type L connector, top to bottom:

- high current contact, to-board
- high current contact, to-cable
- fiber optic contact
- fiber optic contact
- coaxial contact, to-cable
- coaxial contact, to-board

Standard Version



Reduced Crosstalk Version



Description	Cable & Panel Part Numbers
Type L	100746-1
Type M	100750-1
Type M Reduced Crosstalk	188215-1
Type M with upper Ground Return Shield fitted	352177-1
Type M Reduced Crosstalk with Upper Shield	352380-1
Type M lower Ground Return Shield	352112-2
Type N	100752-1

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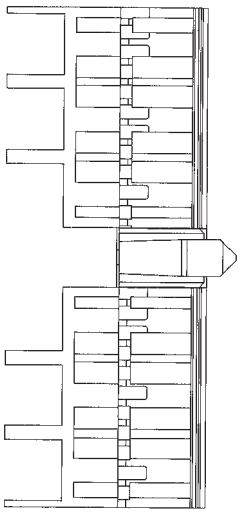
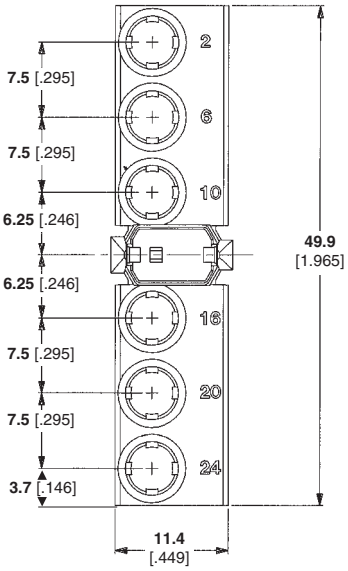
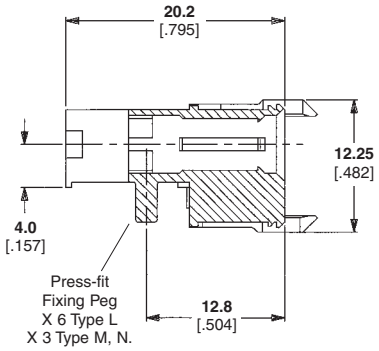
Types L, M and N Daughterboard Connectors with DIN Cavities (Continued)

Type L

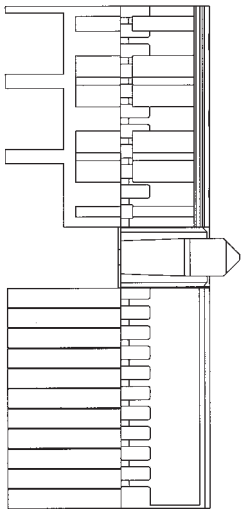






Section of All DIN Cavities.

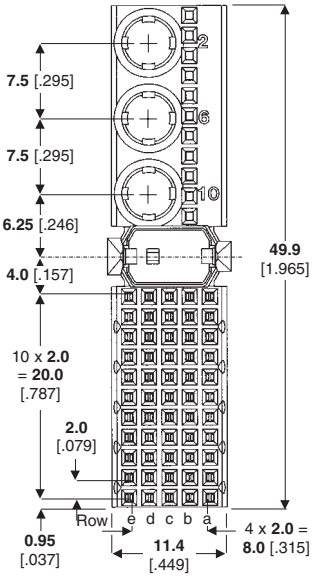
Type M

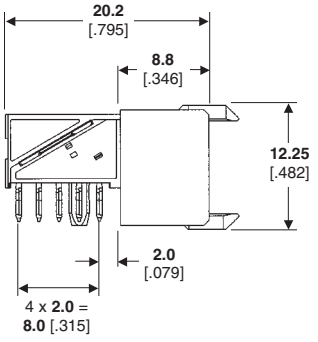


Columns

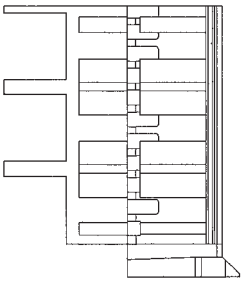
15
16
17
18
19
20
21
22
23
24
25

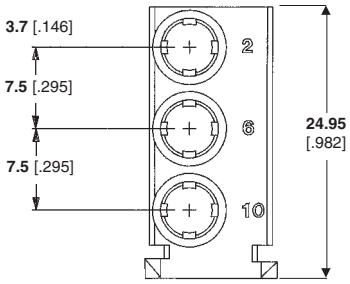
Signal Contacts





Type N





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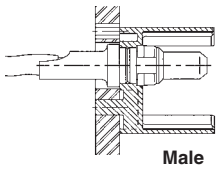
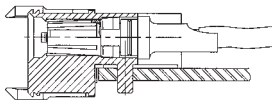
High Current Contacts for Type L, M and N Connectors

Contacts in accordance with DIN 41626, for Ø4.8 [.189] Cavities

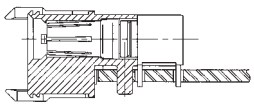
For Type L, M and N modules, available for cable and solder terminations. Contact Tyco Electronics for press fit versions.



Male



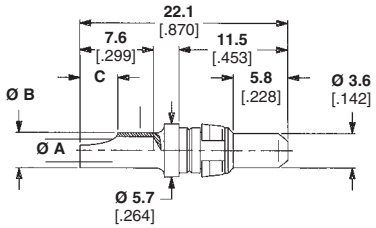
Female, Cable

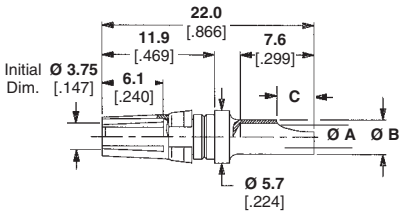


Female with Solder Pins

Pin and Socket Contacts for Cable Termination

Solder versions shown.





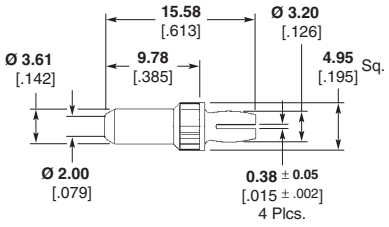
Current Rating	Solder Part Numbers		Solder Dimensions			Crimp Part Numbers		Crimp Dimensions	
	Pin	Socket	A	B	C	Pin	Socket	A	B
40A	1393589-1	1393589-7	**4.7** [.185]	**5.7** [.224]	**5.0** [.197]	148430-1	148432-1	**.181** [.007]	**.230** [.009]
30A	—	—	—	—	—	148406-1	148357-1	**.136** [.005]	**.185** [.007]
20A	1393589-3	1393589-9	**2.7** [.106]	**3.8** [.150]	**4.0** [.157]	148248-1	148221-1	**2.54** [.100]	**3.8** [.149]
10A	1393589-5	1-1393589-1	**1.6** [.063]	**2.7** [.106]	**3.0** [.118]	148407-1	148410-1	**.067** [.003]	**.102** [.004]

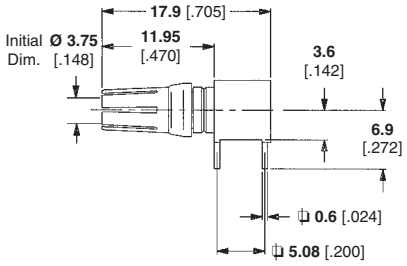
Board-to-Board Mounting

Pin Contact
Part Number **148546-1**

Socket Contact
Part Number **148513-2**

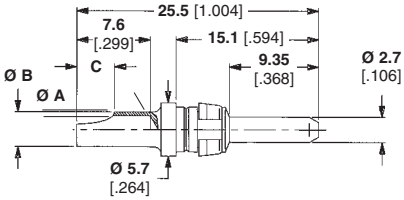
Current Rating — up to 25A dependent on copper thickness or wire cross section.

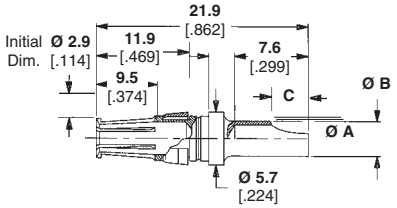




First Make/Last Break Pin and Socket Contacts for Cable Termination

Solder versions shown.





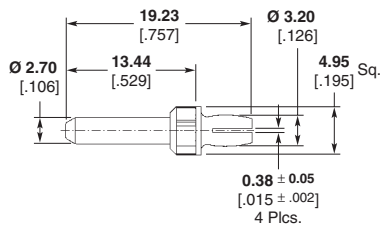
Current Rating	Solder Part Numbers		Solder Dimensions			Crimp Part Numbers		Crimp Dimensions	
	Pin	Socket	A	B	C	Pin	Socket	A	B
40A	100072-1	100084-1	**4.7** [.185]	**5.7** [.224]	**5.0** [.197]	148431-1	148433-1	**.181** [.007]	**.230** [.009]
30A	—	—	—	—	—	148408-1	148358-1	**.136** [.005]	**.185** [.007]
20A	100073-1	100085-1	**2.7** [.106]	**3.8** [.150]	**4.0** [.157]	148249-1	148250-1	**2.54** [.100]	**3.8** [.149]
10A	3-1393589-5	1-1393589-4	**1.6** [.063]	**2.7** [.106]	**3.0** [.118]	148409-1	148410-1	**.067** [.002]	**.102** [.004]

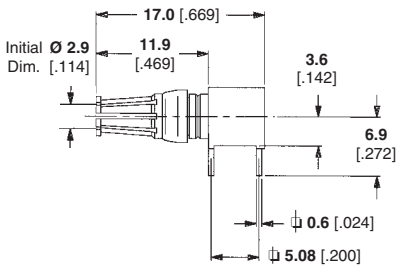
First Make/Last Break Pin and Socket Contacts for Board-to-Board Mounting

Pin Contact
Part Number **148547-1**

Socket Contact
Part Number **2-1393589-7**

Current Rating — up to 25A dependent on copper thickness or wire cross section.





Catalog 65911
Revised 7-05

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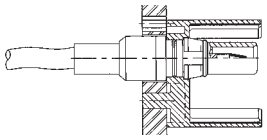
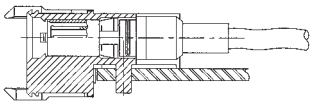
Coaxial Contacts for Type L, M and N Connectors

Contacts in accordance with DIN 41626 for Ø4.8 [.189] Cavities

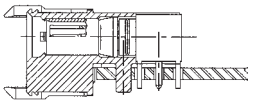
For Type L, M and N modules, available for cable and solder terminations.



Jack Contact



Plug Contact



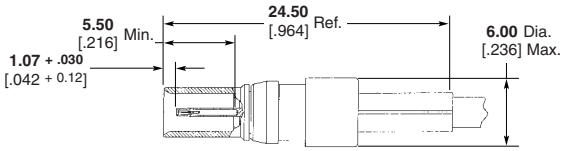
Plug Contact with Solder Pins

Type C Coax, Standard DIN Contacts

DIN 41626 Socket Contacts

Crimp, Straight Cable Mount, RG179

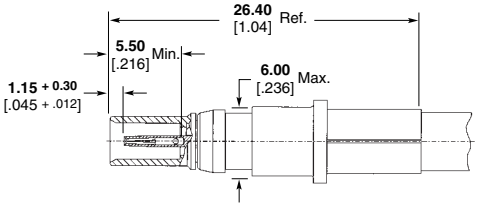
75 Ohm
Eurocard or 2mm HM



Part Number 148254-1

Crimp, Straight Cable Mount, RG142

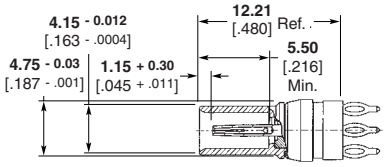
50 Ohm
Eurocard or 2mm HM

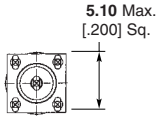


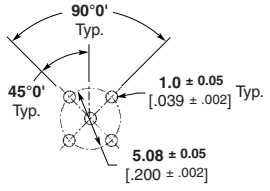
Part Number 148338-4

Vertical PC Board Mount, Compliant

50 Ohm
2mm HM







Part Number 148385-1
Recommended PC Board Layout

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Revised 7-05

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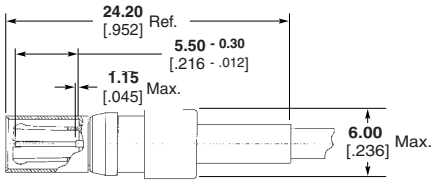
UK: 44-141-810-8967

Type C Coax, Standard DIN Contacts (Continued)

DIN 41626 Pin Contacts

Crimp, Straight Cable Mount, RG179

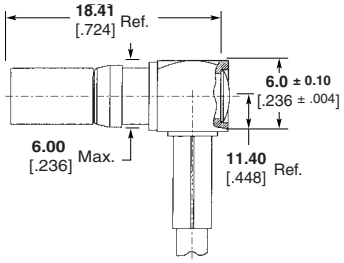
75 Ohm
Eurocard or 2mm HM



Part Number 148253-1

Right Angle Cable Mount, RG316

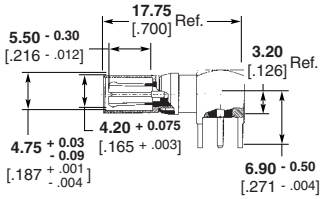
50 Ohm
Eurocard or 2mm HM

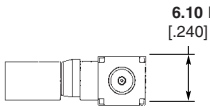


Part Number 148342-1

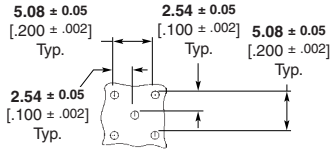
Right Angle PC Board Mount, Solder

50 Ohm
2mm HM





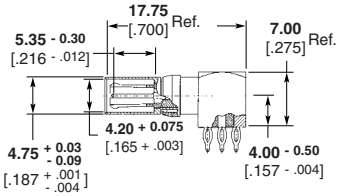
Part Number 1-1393662-2

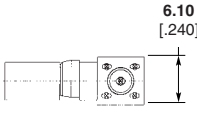


Recommended PC Board Layout

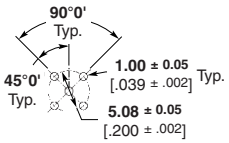
Right Angle PC Board Mount, Compliant

50 Ohm
2mm HM





Part Number 148386-1



Recommended PC Board Layout

Catalog 65911
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Japan: 81-44-844-8013
UK: 44-141-810-8967

Type L-MSC, M-MSC & M-MSC-rev Male Connector, for MSC Fiber Optic Plugs and Signal Contacts

AMP Mini-SC (MSC) Housings

MSC fiber optic system provides increased density compared with DIN fiber optic contacts. Contacts float within the housing and are self aligning, and apply no force to the backplane. These housings mate with those shown on page 43.

MSC series housings provide 4 or 8 cavities for these connectors. M-MSC and M-MSC reverse have 55 signal contacts and 4 fiber optic cavities; L-MSC have 8 fiber optic cavities. Housings are press fitted to boards before installing fiber contacts.

Male connectors have sleeves fitted to the cavities which align the contacts, but they can be omitted from any cavity for economy. Retro fitting is possible.

Standard versions have alignment sleeves fitted to all MSC cavities.

M-MSC and M-MSC rev have 55 option A signal contacts.

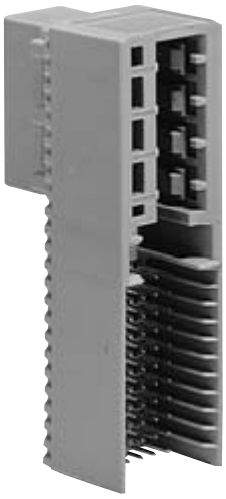
Other signal contact arrangements are possible, see page 47 for available versions. Use the chart on page 67 if your needs cannot be met from these.

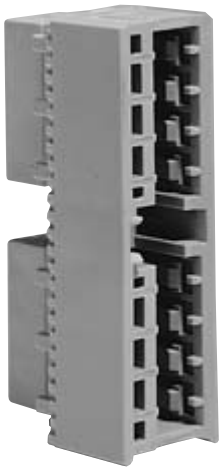
Performance Data pages 6-7.

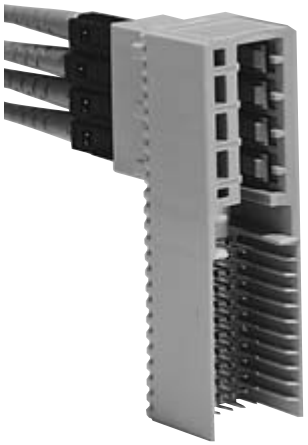
Materials and Finish

Glass filled polyester housing, gray, UL94 V-0 rated.
Phosphor-bronze signal contacts
Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni.

MSC Cable Plug, see page 45.
Board layout page 72 for guidance only.





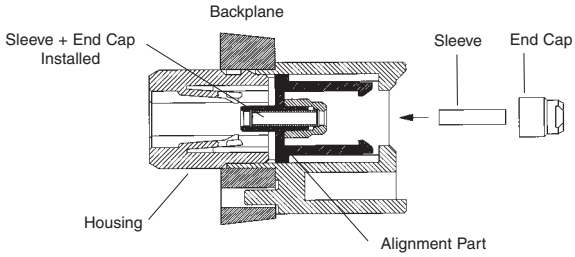


Type M-MSC, M-MSC-rev and L-MSC, 50mm Modules for AMP MSC Miniature Fiber Optic Plugs

These modules provide 4 and 8 cavities for AMP MSC fiber optic plugs, bringing increased density of connections, also zero force on backplane when fully mated.

Type M-MSC, illustrated, and M-MSC-rev have 4 cavities for MSC fiber optic plugs, with 55 signal contact positions. Type L-MSC, has 8 cavities.

All Types have polarized guide lugs; coding keys cannot be used.



Sleeve Part Number 106854-1
End Cap Part Number 106855-1

Assembly on backplane showing location of sleeve, for aligning MSC fiber optic plug ferrules, and end cap.

Sleeves and end caps are available for retrofitting to housing cavities.

Z-PACK MSC Typical Optical Performance

Parameter	Singlemode	Multimode
Insertion Loss	<0.5 dB	<0.3 dB
Random Mated Pair Loss	<1.0 dB	<0.7 dB
Tuned Mated Pair Loss	<0.6 dB	<0.7 dB
Mated Return Loss	>65dB (APC)	>35dB (PC)
Operating Temp.	-20/+70° Celsius [-68/+158°F]	Same
Cable Pull Force	>70N 2.0mm cable	Same
Mechanical Endurance	500 Mating/dematings	Same

Part Numbers	
Standard	
Type L-MSC	106743-1
Type M-MSC	106745-1
Type M-MSC rev	106747-1

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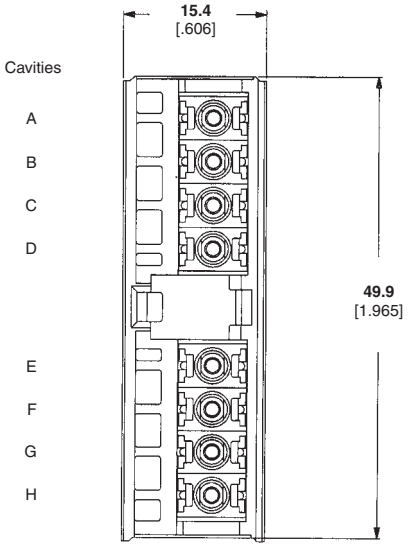
UK: 44-141-810-8967

Type L-MSC, M-MSC & M-MSC-rev Male Connector, for MSC Fiber Optic Plugs and Signal Contacts (Continued)

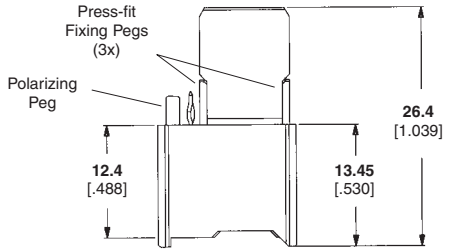
Type L-MSC



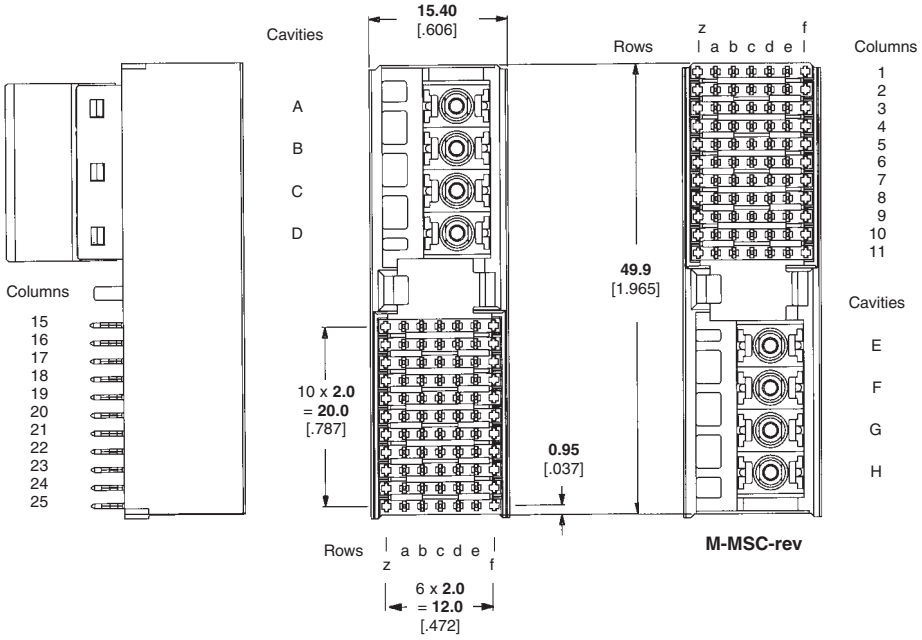
Type M-MSC

Type M-MSC-rev

Same as M-MSC, with signal contacts in columns 1 ... 11 as shown below.



End View of Type M-MSC



M-MSC-rev

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Type L-MSC, M-MSC & M-MSC-rev Female Connector, for MSC Fiber Optic Plugs and Signal Contacts

AMP MSC Housings

MSC fiber optic system provides increased density compared with DIN fiber optic contacts. Contacts float within the housing and are self aligning, and apply no force to the backplane. These housings mate with those shown on page 41.

MSC series housings provide 4 or 8 cavities for these connectors. M-MSC and M-MSC reverse have 55 receptacle contacts and 4 fiber optic cavities; L-MSC have 8 fiber optic cavities. Housings are press fitted to boards before installing fiber contacts.

Limited other receptacle contact arrangements are possible, see page 47 for available versions. Use the chart on page 67 if your needs cannot be met from these.

Performance Data pages 6-7.

Materials and Finish

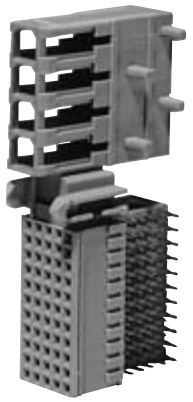
Glass filled polyester housing, gray, UL94 V-0 rated.

Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

MSC Board Plug, see page 46.

Board layout page 72 for guidance only.



Type M-MSC, M-MSC-rev and L-MSC, 50mm Modules for AMP MSC Miniature Fiber Optic Plugs

These modules provide 4 and 8 cavities for AMP MSC fiber optic plugs, bringing increased density of connections, also zero force on backplane when fully mated.

Type M-MSC and M-MSC-rev have 4 cavities for MSC fiber optic plugs, with 55 signal contact positions. Type L-MSC, illustrated, has 8 cavities.

All Types have polarized guide lugs; coding keys cannot be used.

Part Numbers	
Standard	
Type L-MSC	106744-1
Type M-MSC	106746-1
Type M-MSC reverse	106748-1

For Reduced Crosstalk, Consult Tyco Electronics

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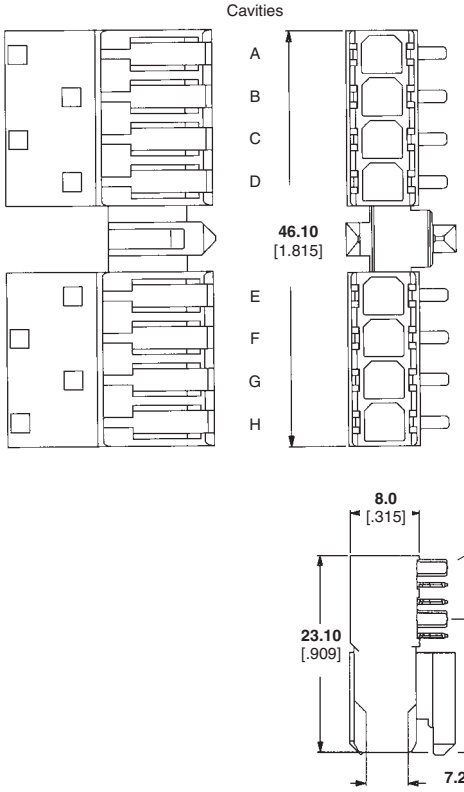
Japan: 81-44-844-8013
UK: 44-141-810-8967

Type L-MSC, M-MSC & M-MSC-rev Female Connector, for MSC Fiber Optic Plugs and Signal Contacts (Continued)

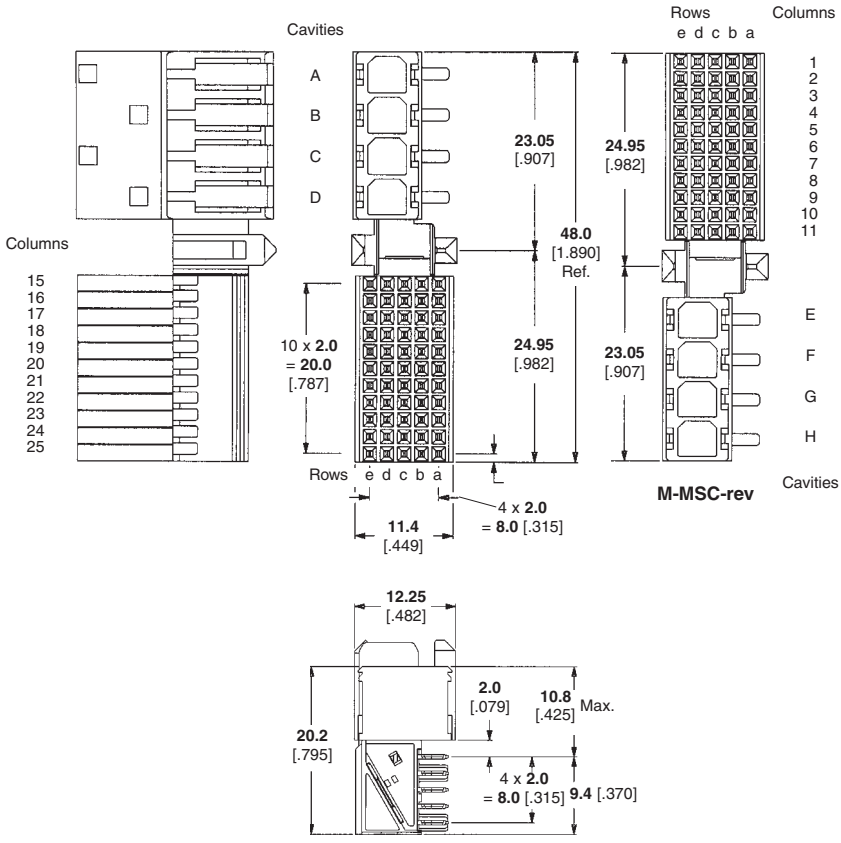
Type L-MSC



Type M-MSC

Type M-MSC-rev

Same as M-MSC, with signal contacts in columns 1 ... 11 as shown below.



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Japan: 81-44-844-8013
UK: 44-141-810-8967

Fiber Optic Contacts for MSC Cavities

Miniaturized Plugs for Type M-MSC, M-MSC-rev and L-MSC Connectors

Developed for the Z-PACK 2mm HM System, these fiber optic plugs are now offered as an industry standard.

AMP MSC plugs provide single or multi-mode performance comparable with standard Ø4.8 [.189] contacts.

System Benefits

AMP MSC fiber optic plugs provide important advantages for systems incorporating opto-electronic circuitry. Principal benefits are:

- Increased fiber optic circuit density; 4.7 [.185] pitch gives 1 extra line per 25 [.984] module length, compared with DIN 41626 contacts.
- Zero force on backplane when connector is fully mated.
- Standard, constant fiber optic plug mating force during full 2.5 [.098] float.
- Full 2 [.079] misalignment capture during mating.
- Full 2.5 [.098] tolerance on insertion depth.
- PC or APC end face finish for single mode.
- Factory prepared plugs with fiber optic cable lengths as required.
- Economy; unused connector cavities can be easily retrofitted with alignment sleeves.
- M-MSC, M-MSC-rev and L-MSC connectors can be stacked in columns with other types.

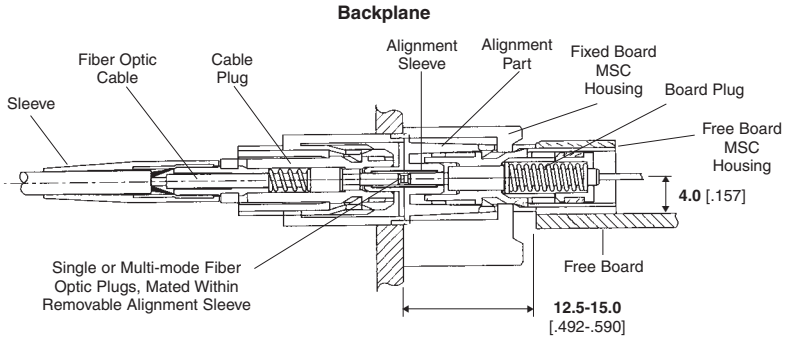
Performance Specification

Attenuation, (method 7)		
Single mode	typ. 0.25db	
Multimode	typ. 0.3db	
Repeatability	0.2db	
Return loss,	PC	≥40db
	APC mated	≥60db
Operating temperature		-20°C +70°C
Strain relief, cable		70N

Design according to IEC 874-1 and/or CECC 86000.

Environmental category 20/70/21.

Protective cover for fiber optic contacts Part Number 233212-1.



Fully mated connector

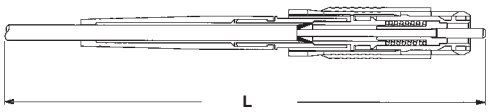
When cable and board plugs are inserted into their respective housings, flexible molded-in latches ensure firm retention. The fiber optic plugs with prepared ferrules are spring loaded.

Mating. Engagement of the free board MSC connector with the fixed board MSC connector, opens the alignment part which closes when the fiber optic ferrule is within the alignment sleeve. Further forward movement brings the mated ferrules under constant pressure from their respective springs.

During engagement, a sequence of latches on the fixed board housing and plug allows the board plugs to 'float' within the fully mated connector, so removing the contact force from the backplane.

Withdrawal of individual boards causes the latching sequence to reverse. Plugs can be individually removed from mated housings.

MSC Cable Plug, for backplane housing



Complete Assembly on SM* fiber optic LDS (Light Duty Single) cable to length specified by customer

Mode	Ferrule Finish	Fiber Size	Cable Type	Cable Ø	Part Number	Cable Length L
Single	PC	—	Single Lead	**2.0** [.079]	106781-1	**1.0m** [39.37″]
Single	PC	—	Pigtail	**2.0** [.079]	106749-1	**1.0m** [39.37″]
Single	APC	—	Single Lead	**2.0** [.079]	106888-1	**1.0m** [39.37″]
Single	APC	—	Pigtail	**2.0** [.079]	106750-1	**1.0m** [39.37″]
Multi	—	50/125	Single Lead	**2.0** [.079]	1206073-1	**1.0m** [39.37″]
Multi	—	50/125	Pigtail	**2.0** [.079]	1206074-1	**1.0m** [39.37″]
Multi	—	62.5/125	Single Lead	**2.0** [.079]	1206075-1	**1.0m** [39.37″]
Multi	—	62.5/125	Pigtail	**2.0** [.079]	1206076-1	**1.0m** [39.37″]

For other lengths, consult Tyco Electronics.
For completion of free cable end with any Tyco Electronics fiber optic contact, consult Tyco Electronics.

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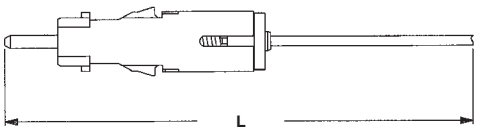
Fiber Optic Contacts for MSC Cavities (Continued)

**MSC Board Plug,
for Female Housing**

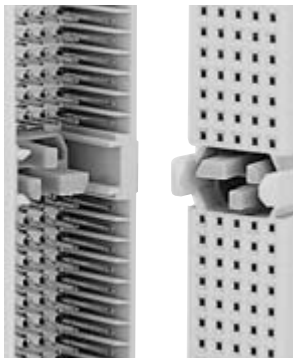


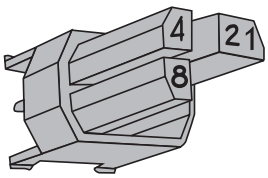
Complete Assembly, on SM* buffered fiber optic cable, Standard length 1m [39.37″]

Mode	Ferrule Finish	Fiber Size	Cable Type	Cable Ø	Part Number	Cable Length L
Single	PC	—	Pigtail	**0.9** [.035]	106751-1	**1.0m** [39.37″]
Single	APC	—	Pigtail	**0.9** [.035]	106752-1	**1.0m** [39.37″]
Multi	—	50/125	Pigtail	**0.9** [.035]	1206077-1	**1.0m** [39.37″]
Multi	—	62.5/125	Pigtail	**0.9** [.035]	1206078-1	**1.0m** [39.37″]

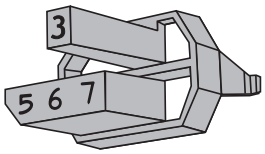
For other lengths, consult Tyco Electronics.
For completion of free cable end with any Tyco Electronics fiber optic contact, consult Tyco Electronics.

Coding Keys and Contact Loading Variants





Key for Male Connectors



Key for Female Connectors

Coding key sets with combinations of matching colors and complementary numbering

Used in Type A, D, L and M male and female connectors and shrouds.

Male and female keys are polarized for male and female housing multi-purpose centers; unambiguous keying is by combination of color and code numbered posts.

Keys are inserted from the mating faces of male and female housings, retained by foot clips snap-fitting into housing slots. Removal from the front is possible whenever required.

Material

Glassfilled Polyimide 6.6.

Key Insertion Tool

Part Number **352999-1**

Color	RAL[1] Number	For Male Connector		For Female Connector	
		Code No.	Key Part No.	Code No.	Key Part No.
Nut brown	8011	1236	100525-3	4578	100526-3
† Strawberry red	3018	1248	100525-9	3567	100526-9
Blue lilac	4005	1356	2-100525-0	2478	2-100526-0
• Brilliant blue	5007	1567	3-100525-2	2348	3-100526-2
Reseda green	6011	2578	5-100525-4	1346	5-100526-4
* Cadmium yellow	1021	3456	5-100525-6	1278	5-100526-6
Slate gray	7015	3467	5-100525-9	1258	5-100526-9
Steel blue	5011	3478	6-100525-1	1256	6-100526-1
Pastel orange	2003	3568	6-100525-3	1247	6-100526-3
Ochre yellow	1024	4678	6-100525-9	1235	6-100526-9

[1] RAL is a Trademark of the Central Organization for product assurance in Germany.
Note: The color/code no. combinations, listed above, follow IEC 61076-4-101 recommendations. Other versions are available, see drawings.
• For CompactPC1 5.0V
* For CompactPC1 3.3V
† For CompactPCI Telephony
Rating: UL94 HB

Contact Loading Variants

For contact loading variants of Z-PACK 2mm HM connectors, refer to the appropriate instruction sheet shown here. These sheets can be obtained from Tyco Electronics and allow you to select an existing contact loading to suit your requirements. Should a suitable loading not be available, special loading patterns can be specified using the chart on page 67.

Instruction Sheet Numbers

Description	5 Row	5+2 Row	5 row feedthrough	5+2 feedthrough	8 and 8+2 row
Type A Male	411-19410	411-19412	411-19411	411-19413	Consult Tyco Electronics
Type B Male	411-19414	411-19416	411-19415	411-19417	
Type C Male	411-19418	411-19420	411-19419	411-19421	
Type B 22 Column Male			411-19425		
Type B 19 Column Male			411-19426		
Type M Male			411-19422		
Type M-MSC and Rev Male			411-19423		
Right Angle Male, all types			411-19428		
Right Angle Female, all types			411-19429		

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CompactPCI and VME 64

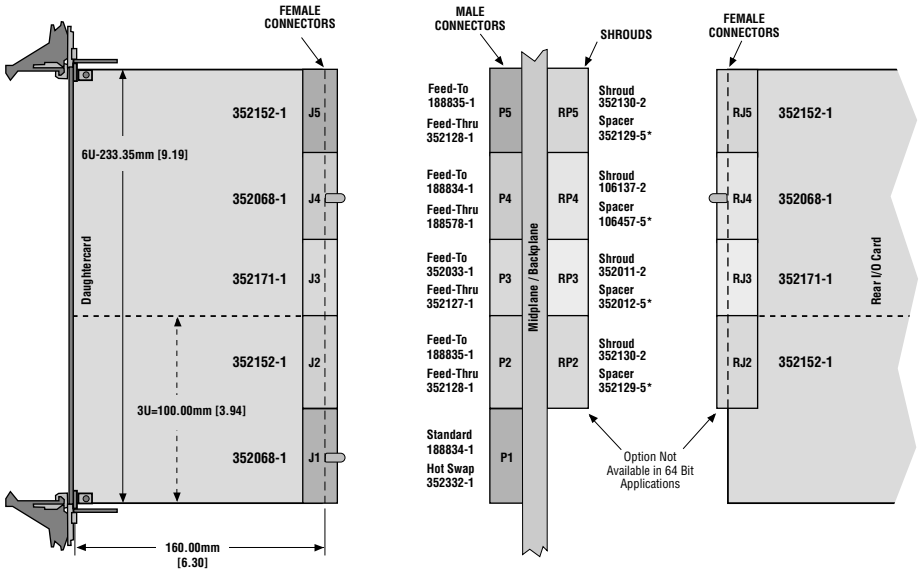
CompactPCI and VME 64 Extensions

AMP Z-PACK 2mm HM shielded connectors have been chosen for the interconnection of both CompactPCI and VME 64 Extensions because of high density, sequencing levels and profile compatibility with IEC Eurocard connectors. CompactPCI 32 bit and 64 bit on 3U cards (P1-2/J1-2) and on 6U cards (P1-5/J1-5) use standard and special length connectors, with one of these also being used between the two Eurocard connectors J1/P1 and J2/P2 on VME 64 Extensions.

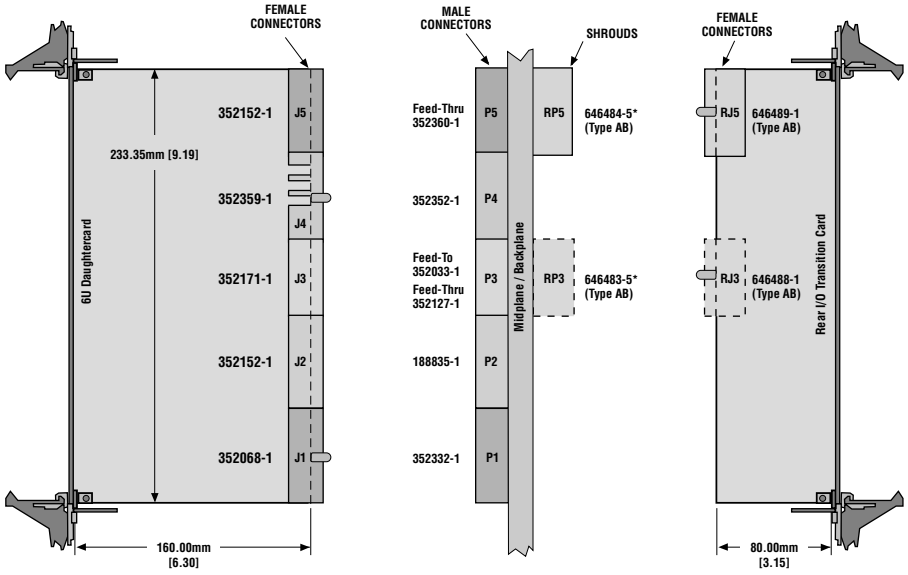
Backplane and daughtercard connectors for single side or midplane applications are listed, the latter using corresponding one piece shrouds or separate spacers and shrouds for the backplane rear. Standard AMP HM cable connectors can be used with appropriate shrouds.

Vertical receptacles allow the use of mezzanine cards to extend or increase card application flexibility.

Standard and Hot Swap



Computer Telephony

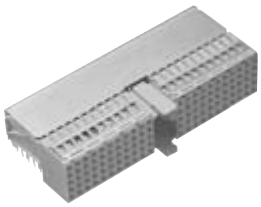


VME 64 Extension Components	Part Numbers
Backplane Connectors (P0 & P3)	
19 column type B header	352033-1
19 column type B header, midplane	352127-1
ZIF Shroud for above	352011-2
Spacer for ZIF Shroud above	352012-x
One Piece Shroud for above	646481-x
Cable Shroud	352673-2
Spacer	352012-x
Daughtercard Connectors (J0 & J3)	
19 col type B shielded receptacle	352171-1
19 col type B vertical receptacle	352269-1

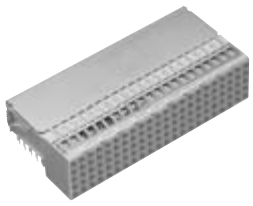
Reference CompactPCI Designer's Guide #1307224 for more detail.
x = Part Number Stand Off Height. See page 31.

CompactPCI is a trademark of PICMG-PCI Industrial Computer Manufacturers Group Incorporated.

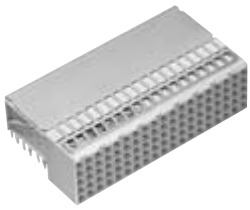
CompactPCI Connectors: At a Glance



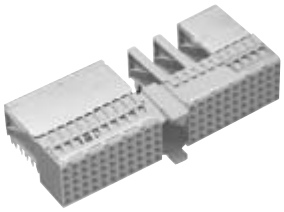
J1/J4 Type A Right Angle Female with Shield
- 110 signal contacts
- Length 49.9 [1.964]
- Integrated pre-alignment and polarizing guide lug
- Daughtercard applications
- Part Number 352068-1



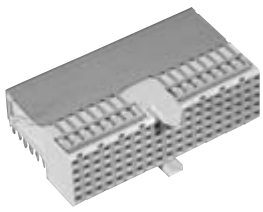
J2/J5 Type B Right Angle Female with Shield
- 110 signal contacts
- Length 43.9 [1.728]
- Daughtercard applications
- Part Number 352152-1



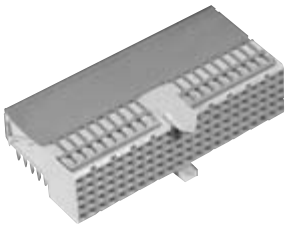
J3 Type B Right Angle Female with Shield
- 95 signal contacts
- Length 37.9 [1.492]
- Daughtercard applications
- Part Number 352171-1



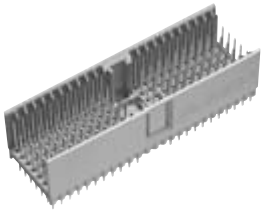
J4 Type A Right Angle Female (Select Load) with Segmented Shield (Computer Telephony)
- 90 signal contacts
- Length 49.9 [1.964]
- Daughtercard applications
- Part Number 352359-1



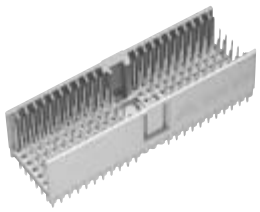
RJ3 Type AB Right Angle Female with Shield
- 95 signal contacts
- Length 37.9 [1.492]
- Rear Transition Card applications
- Part Number 646488-1



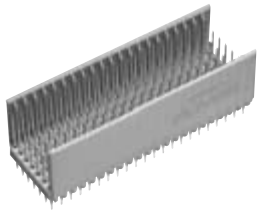
RJ5 Type AB Right Angle Female with Shield
- 110 signal contacts
- Length 43.9 [1.728]
- Rear Transition Card applications
- Part Number 646489-1



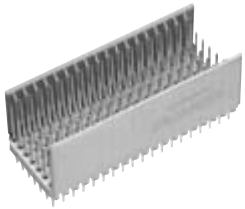
P1/P4 Type A Vertical Male Feed-To
- 110 signal contacts
- Length 49.9 [1.964]
- Integrated pre-alignment and polarizing guide features
- Backplane applications
- Part Number 188834-1



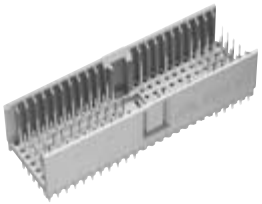
P1 Type A Vertical Male Feed-To (Hot Swap)
- 110 signal contacts
- Length 49.9 [1.964]
- Integrated pre-alignment and polarizing guide features
- Backplane applications
- Part Number 352332-1



P2/P5 Type B Vertical Male Feed-To
- 110 signal contacts
- Length 43.9 [1.728]
- Backplane applications
- Part Number 188835-1



P3 Type B Vertical Male Feed-To
- 95 signal contacts
- Length 37.9 [1.492]
- Backplane applications
- Part Number 352033-1



P4 Type A Vertical Male Header Feed-To (Computer Telephony)
- 84 signal contacts
- Length 49.9 [1.964]
- Integrated pre-alignment and polarizing guide features
- Backplane applications
- Part Number 352352-1

See CompactPCI Designer's Guide #1307224 for additional information.

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CompactPCI Connectors: At a Glance (Continued)

P2/P5 Type AB Vertical Male Feed-Thru

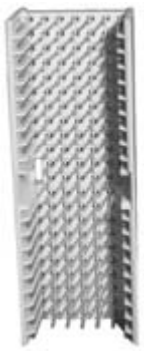
- 110 signal contacts
- Length 43.9 [1.728]
- Mid-plane applications
- Part Number 646735-1, 646736-1 (use with type AB shroud)

P3 Type AB Vertical Male Feed-Thru

- 95 signal contacts
- Length 37.9 [1.492]
- Mid-plane applications
- Part Number 646732-1, 646734-1 (use with type AB shroud)

P2/P5 Type AB Vertical Male Feed-To

- 110 signal contacts
- Length 43.9 [1.728]
- Backplane applications
- Part Number 646533-1, 646534-1



P3 Type AB Vertical Male Feed-To

- 95 signal contacts
- Length 37.9 [1.492]
- Backplane applications
- Part Number 646530-1, 646532-1

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Universal Power Module — Vertical Receptacle

The Tyco Electronics Universal Power Module is a three position, modular, Hard Metric board-to-board power connector designed to be compatible with Z-PACK 2mm HM Connectors. The design is in an "inverse-sex" orientation and the vertical receptacle module meets the IEC 950 safety requirements for finger probe protection.

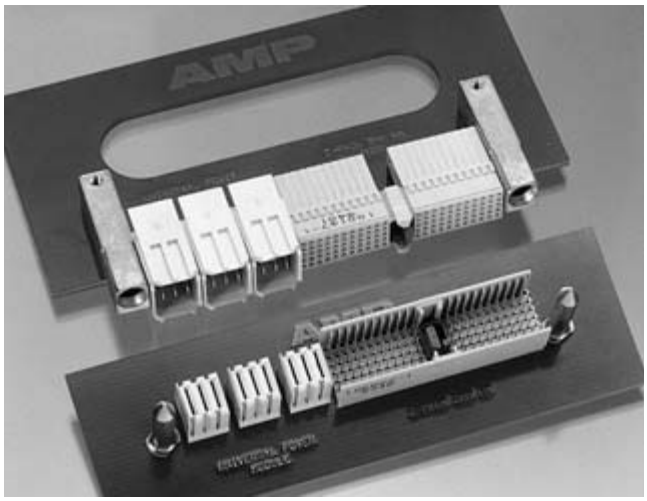
Both the headers and receptacle utilize AMP ACTION PIN press-fit leads for ease of assembly onto printed circuit boards. Additionally, the vertical receptacle leads are polarized to allow only one orientation onto the printed circuit board, eliminating the possibility of reverse placement.

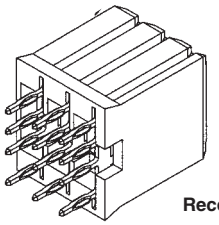
The Universal Power Module is compatible with a wide variety of other Tyco Electronics board-to-board connectors including Z-PACK Stripline 100, AMP-HDI, TBC, TBC Plus and Eurocard connectors.

The housing is a high temperature thermoplastic, and the phosphor bronze contacts are gold-over-nickel plated on the mating surfaces. The modules are rated to carry a maximum of 23.5 amperes or 7.8 amperes per contact, fully energized for up to 250 mating cycles.

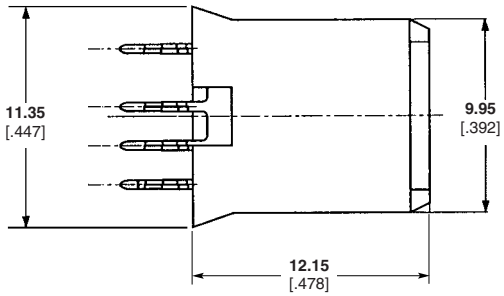
The right angle header contacts are available with sequenced lengths for "make-first/break-last" applications.

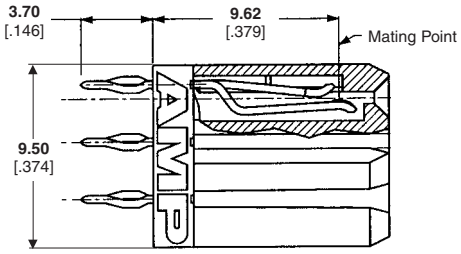
Generous alignment features designed into the housings and optional guide pins and receptacles make the Tyco Electronics Universal Power Module ideal for "blind mating" applications.

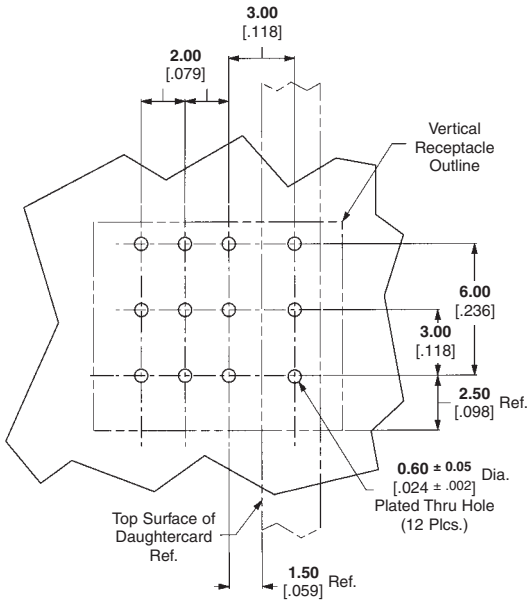




Receptacle







Recommended PC Board Hole Layout

Description	Position Loaded	Part Numbers
Vertical Receptacle	ABC	223955-2
	AC	223984-1

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UK: 44-141-810-8967

Universal Power Module — Right Angle Header

Material and Finish

Housing — Valox, natural color, UL94 V-0 Rated

Contacts — Phosphor bronze, plated 0.00127 [.000050] min. gold in mating area, 0.00050 [.000020] min. tin-lead on ACTION PIN Contact post area, with entire contact underplated 0.00127 [.000050] min. nickel

Note: Contact lubrication with Bellcore approved lubricant

Related Product Data

Guiding Hardware (Optional) — page 54.

Application Tooling —

Header
Seating Tool, 224441-1
Board Support Fixture, 224442-1.

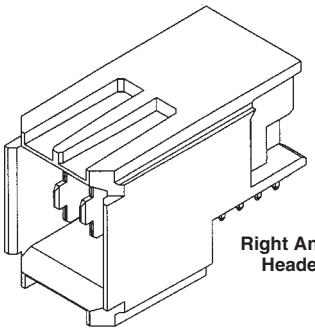
Receptacle
Seating Tool, 224421-1
Board Support Fixture, 217602-1.

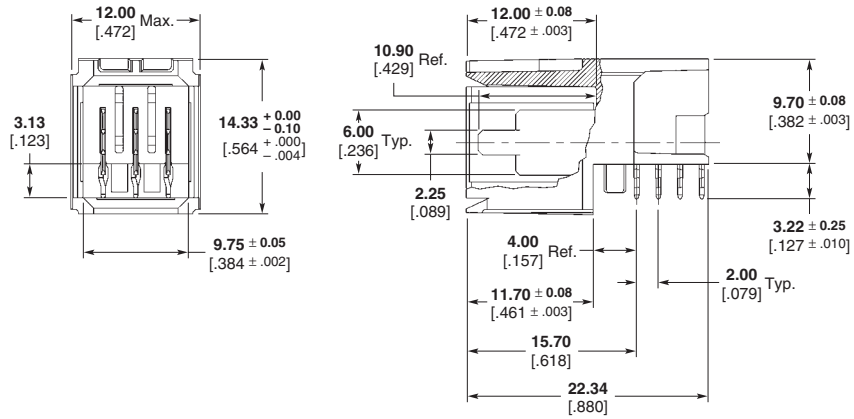
Technical Documents

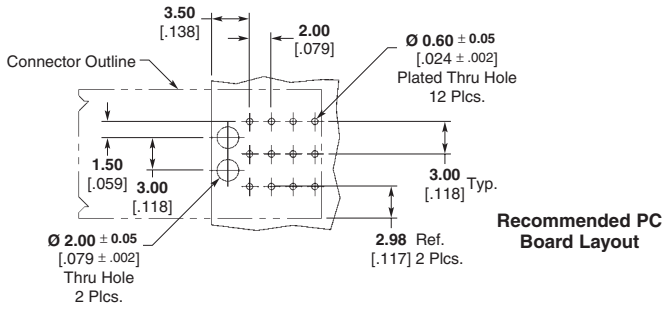
Product Specification
108-1651

Application Specification
114-1103

Instruction Sheet
408-4169 (Receptacle Seating Tool 224421-1)







Recommended PC Board Layout

Part Number	Position A	Position B	Position C
120912-1	**7.68** [.302]	**9.30** [.366]	**10.90** [.429]
120914-1	**9.30** [.366]	—	**7.68** [.302]
223938-1	**7.68** [.302]	**10.90** [.429]	**10.90** [.429]
223961-1	**10.90** [.429]	**10.90** [.429]	**10.90** [.429]
223962-1	**10.90** [.429]	**9.30** [.366]	**10.90** [.429]
223963-1	**9.30** [.429]	**10.90** [.429]	**9.30** [.366]
223964-1	**9.30** [.366]	**10.90** [.429]	**7.68** [.302]
223965-1	**9.30** [.366]	**7.68** [.302]	**9.30** [.366]
223967-1	**9.30** [.366]	**9.30** [.366]	**9.30** [.366]
223968-1	**10.90** [.429]	**9.30** [.366]	**9.30** [.366]
223970-1	**10.90** [.429]	**7.68** [.302]	**7.68** [.302]
223971-1	**10.90** [.429]	**7.68** [.302]	**9.30** [.366]
223972-1	**10.90** [.429]	**7.68** [.302]	**10.90** [.429]
223974-1	**7.68** [.302]	**7.68** [.302]	**7.68** [.302]
223975-1	**9.30** [.366]	—	**9.30** [.366]
223980-1	**7.68** [.302]	**7.68** [.302]	**9.30** [.366]
223981-1	**9.30** [.366]	**9.30** [.366]	**7.68** [.302]
223983-1	**7.68** [.302]	**9.30** [.366]	**7.68** [.302]
223989-1	**9.30** [.366]	**9.30** [.366]	**10.90** [.429]
223990-1	**9.30** [.366]	**7.68** [.302]	**8.28** [.326]
223991-1	**7.68** [.302]	**10.90** [.429]	**7.68** [.302]

Catalog 65911
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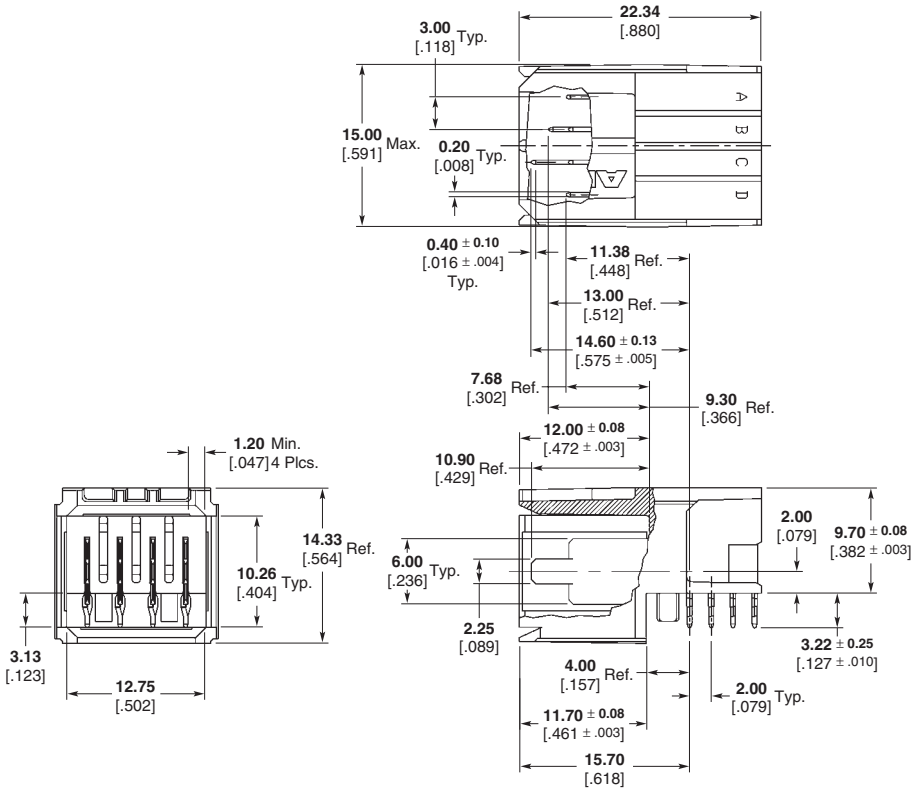
Hong Kong: 852-2735-1628
Japan: 81-44-844-8013
UK: 44-141-810-8967

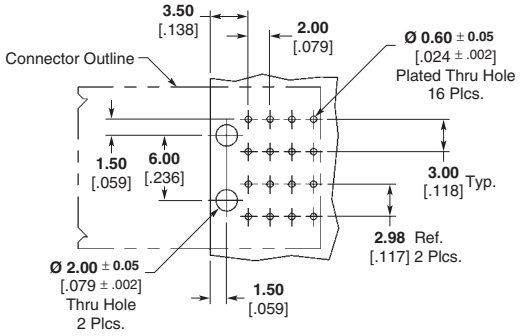
Expanded Universal Power Module Headers

Material and Finish

Housing — Polyester, gray

Contacts — Phosphor bronze, plated 0.00127 [.000050] min. gold in mating area, 0.00054 [.000021] min. tin-lead on ACTION PIN post area, with entire contact underplated 0.00127 [.000050] min. nickel





Recommended PC Board Layout

Part Number	Positions	All Contacts
646954-1	4	**10.90** [.429]
646955-1	5	**10.90** [.429]
646956-1	6	**10.90** [.429]
646957-1	7	**10.90** [.429]
646958-1	8	**10.90** [.429]
646959-1	9	**10.90** [.429]
646960-1	10	**10.90** [.429]
646961-1	11	**10.90** [.429]
223996-1	12	**10.90** [.429]

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Power and Guide Hardware

Expanded Universal Power Module Vertical Receptacles

Material and Finish

Housing — Polyester, gray

Contact — Copper alloy, plated 0.00127 [.000050] min. gold in mating area, 0.00050 [.000020] min. tin-lead on ACTION PIN Post area, with entire contact underplated 0.00127 [.000050] min. nickel

Related Product Data

Guiding Hardware (Optional) — pages 58-60

Application Tooling

Header
Seating Tool, 224441-1
Board Support Fixture, 224442-1

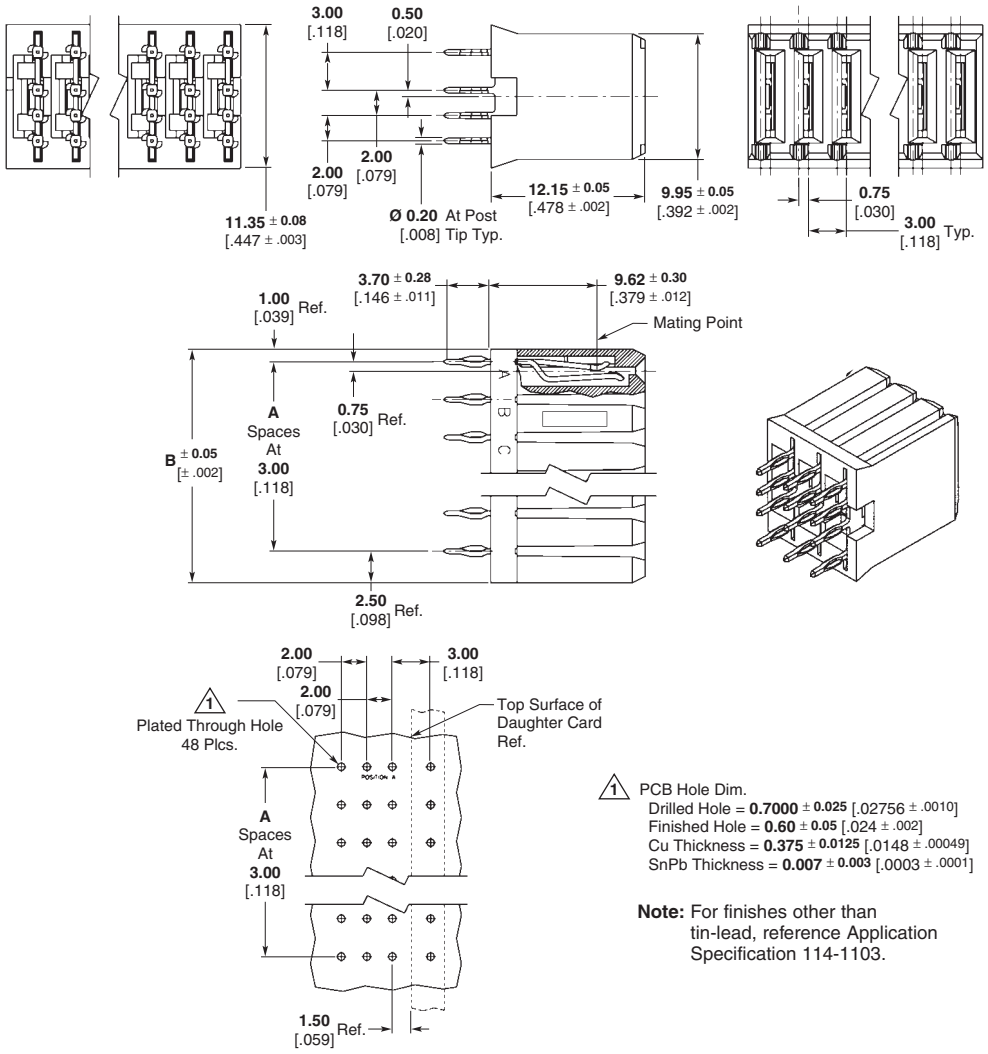
Receptacle
Seating Tool, 224421-1
Board Support Fixture, 217602-1

Technical Documents

Product Specification
108-1651

Application Specification
114-1103

Tyco Electronics Instruction Sheet
408-4169 (Receptacle Seating Tool 224421-1)



Recommended PCB Hole Layout

1 PCB Hole Dim.
Drilled Hole = **0.7000** ± **0.025** [.02756 ± .0010]
Finished Hole = **0.60** ± **0.05** [.024 ± .002]
Cu Thickness = **0.375** ± **0.0125** [.0148 ± .00049]
SnPb Thickness = **0.007** ± **0.003** [.0003 ± .0001]

Note: For finishes other than tin-lead, reference Application Specification 114-1103.

Position	A	B Ref.	Standard *10A Part Number	High Current *15A Part Number
4	3	**12.50** .492	223995-1	120953-1
5	4	**15.50** .610	223995-2	120953-2
6	5	**18.50** .728	223995-3	120953-3
7	6	**21.50** .846	223995-4	120953-4
8	7	**24.50** .965	223995-5	120953-5

*Reference Product Specification 108-1651.

Note: For additional Power Module options reference Catalog 1773096, "Power Connectors and Interconnection Systems," or contact your Tyco Electronics Sales Representative.

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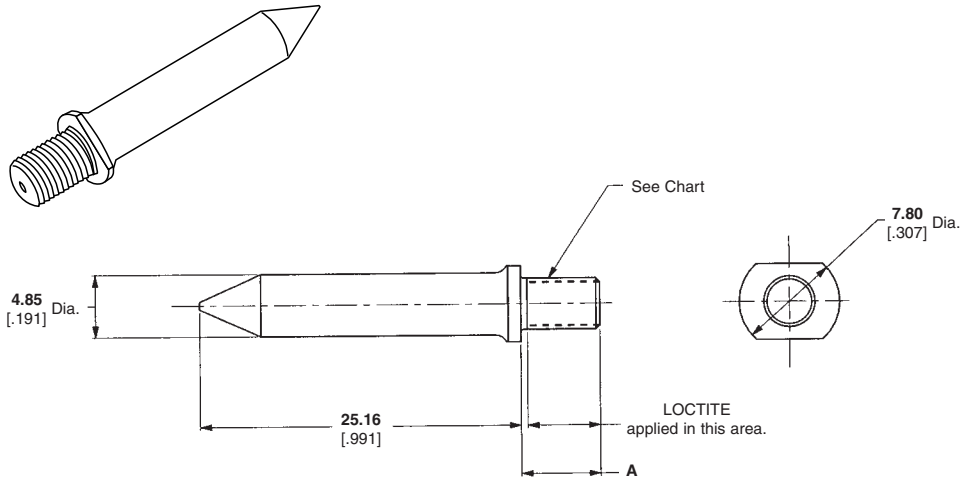
Guiding Hardware – Unkeyed

Guide Pin

Material and Finish
Passivated stainless steel
Part Number **223956-1**



A	Thread	Part Numbers
7.5 [.295]	M4 × .7-6g	223982-1*
9.2 [.362]	M4 × .7-6g	223969-7
12.7 [.500]	8-32 UNC-2A	223969-4
12.7 [.500]	M4 × .7-6g	223969-1
6.2 [.244]	M4 × .7-6g	223956-1

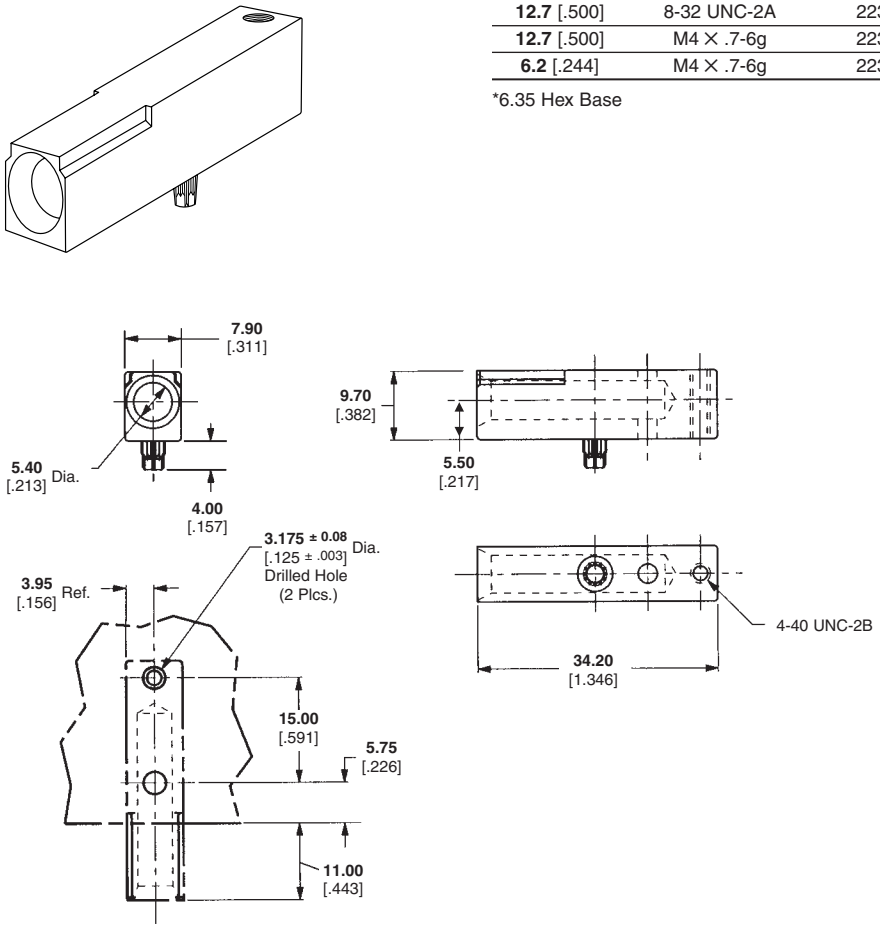
*6.35 Hex Base

Female Guide Module

Material and Finish
Zinc alloy, chromate conversion coated

Related Product Data
Application Tooling
Seating Tool, 224440-1
Board Support Fixture, 217603-1

Technical Documents
Product Specification
108-1651
Application Specification
114-1103
Part Number **223957-1 (as shown)**
Part Number **223979-1 (dual alignment posts)**



Recommended PC Board Hole Layout

LOCTITE is a trademark of Henkel Corp.

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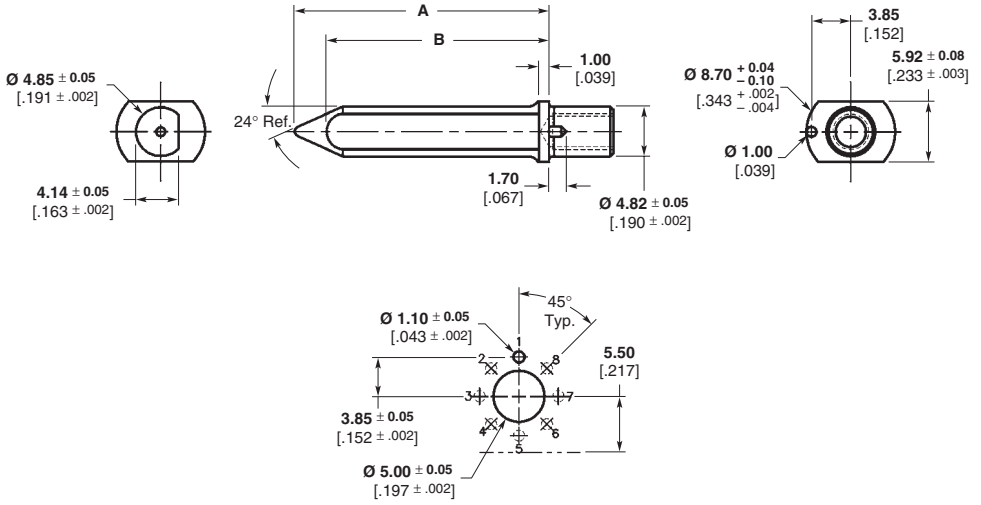
Guiding Hardware – Keyed

Guide Pin, Universal Power Module

Material and Finish

Zinc Alloy Die Casting,
Chromate Conversion Coating Finish

Part Number	Dim. A	Dim. B
223985-1	**25.16** .990	**20.39** .802
223985-3	**29.00** 1.141	**24.23** .953



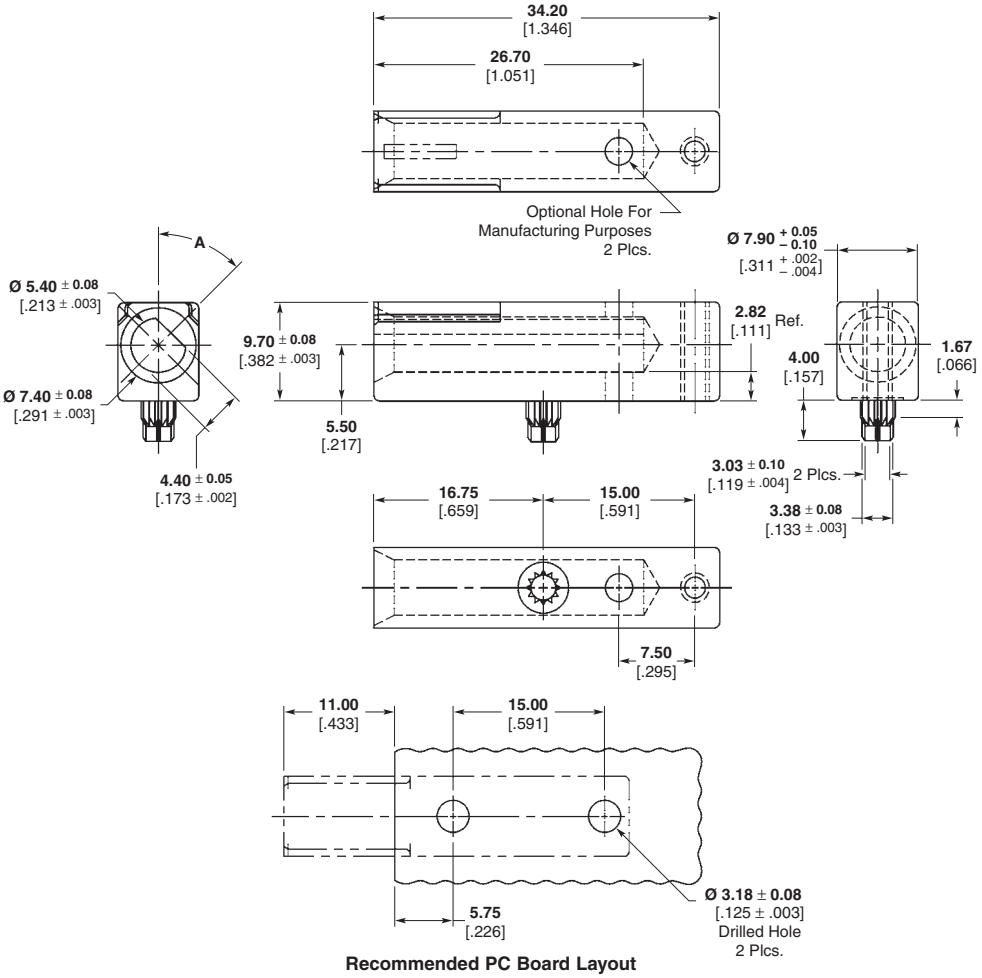
Recommended PC Board Layout (Position Shown Used With Part Number 223986-1)

Module, Female, Universal Power Module

Material and Finish

Zinc Alloy Die Casting,
Chromate Conversion Coating Surface Finish

Part Number	Dim. A
223986-1	0°
223986-2	45°
223986-3	90°
223986-4	135°
223986-5	180°
223986-6	225°
223986-7	270°
223986-8	315°



Recommended PC Board Layout

Catalog 65911
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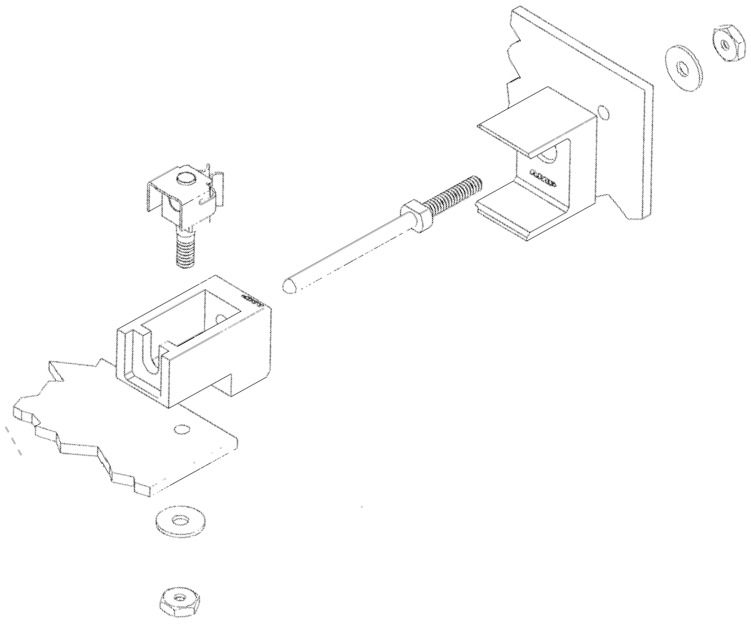
Guiding Hardware

Static Discharge Guide Pins

Ground connection and guidance can be combined using this system which can be used instead of the guide pins shown on page 54. The contacts have a rating of 10A and give a make/break position 12 [.472] in advance of level 3 signal contacts.

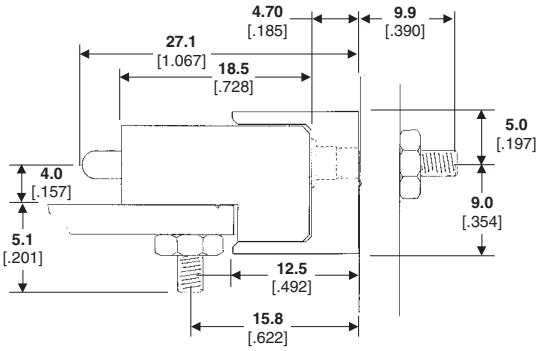
Alternative pin lengths are possible and the pin contact housing can be omitted if desired.

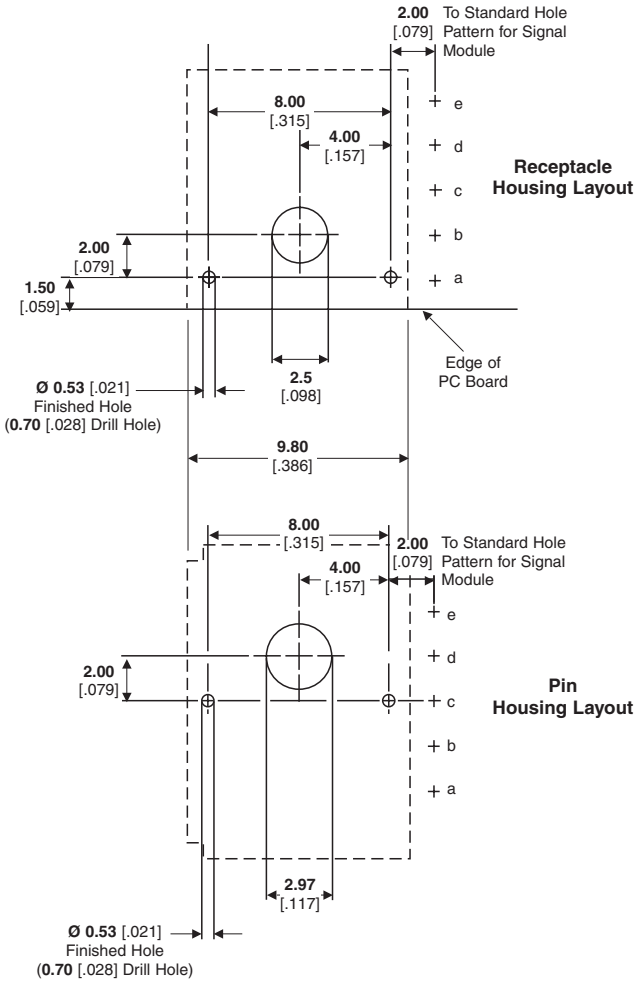


Materials and Finish

Housings — Glass filled polyester gray, UL94 V-0 rating

Contacts —
Pin — Brass
Receptacle — Copper alloy
Plating — 0.8µm [.000030] Au over 1.3µm [.000050] Ni





Description	Part Numbers
Pin Contact	532828-5
Pin Contact Housing	646274-1
Receptacle Contact	533065-6
Rec Contact Housing	646273-1
Nut	21124-4
Washer	986794-1

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Cable Connectors and Lead Assemblies

Tyco Electronics Cable Connectors

The Tyco Electronics range of Hard Metric 2mm [.079] cable connectors and cable assemblies provides circuit designers with a great flexibility in choice of cable types and termination styles.

All types of connectors are end stackable although one pin column is missed with field installable types. This enables high densities of connections using cables from unshielded single wires through to miniature coaxial cable.

Pin Headers

Cables can be connected to boards both perpendicular and parallel using feedthrough pin headers and cable shrouds for rear of backplanes, or using stand-alone Right Angle or vertical headers.

Sequenced mating can be arranged with all of these options, see detail on page 66.

All cables are retained by using snap latches on the male part, these being ordered separately and fitted where required.

Specification

Connector type	Field Installable	Unshielded	Shielded
Sizes	5x2 and 5x4	5x1	5+2 x 1
End Stackable	n	y	y
Field Terminable	y	n	n
Polarized	y	y	y
Contact			
Centers	2mm Matrix		
Style	Twin Beam		
Contact Rows	5	5	5+2
Termination	IDC	Tyco Electronics Terminated	
Material	Phosphor Bronze		
Plating	0.8µm Au over 1.3µm Ni		
Mating Pin Lengths	5.3 - 8.3 mm		
Current Rating	Dependent on Wire Section, 1.5a max		
Housing			
Housing Material	LCP, Black	Thermoplastic, Black	
Cover Material	PBT, Black		
UL 94 Rating	UL 94 V-0		
Strain Relief	Cable Tie	Overmolded	
Cable Assemblies			
Cable Types	Discrete	Shielded or Unshielded Twisted Pair; Shielded or Unshielded Flat Pair 50Ω or 75Ω Twin Coax etc	
Wire Sizes	0.25-0.4/0.4-0.5mm 30-26AWG/26-24AWG		
Insulation Dia.	1.0mm Max.		

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Cable Connector Mating Arrangements

Tyco Electronics provides a full range of components for the backplane and daughterboard mating arrangements shown here.

Midplane

Feedthrough posts from the front male connector, in conjunction with male shrouds, create the male counterpart for polarized mating with cable connectors.

Male Shrouds come in three lengths for end-to-end stacking and use snap latches for firm retention of cable connector housings.

Shrouds are assembled over the feedthrough posts, gripping their sides to ensure rigid location during normal mating/withdrawal of cable connectors.

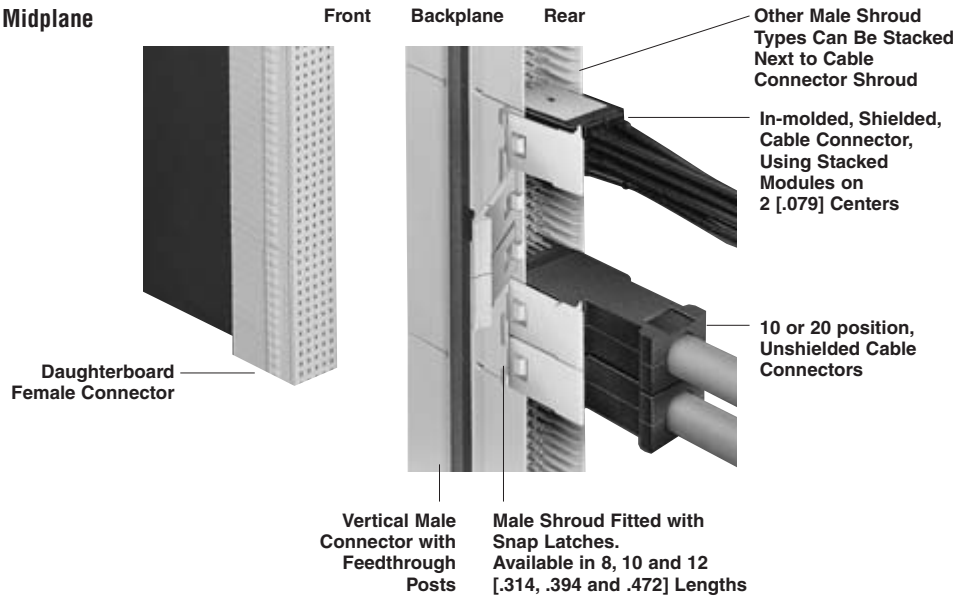
Spacers

Spacers are available to increase the range of backplane thicknesses possible with sequenced make first and break last. The combined thickness range is 1.65 [.065] to 7.7 [.303], although thicker combinations are possible with reduced function. Consult Tyco Electronics.

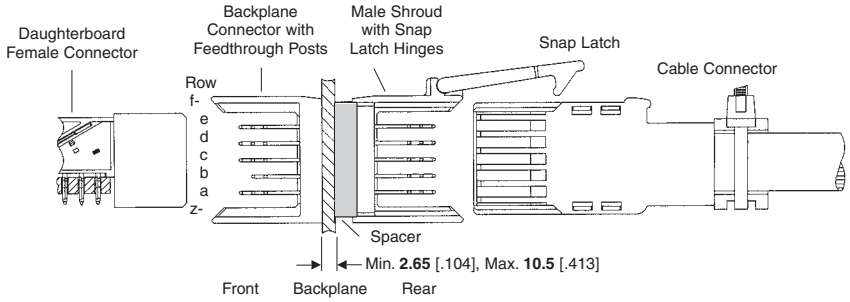
Cable Headers

Vertical and Right Angle cable headers are available with polarizing features. Vertical headers can be fitted with 5 or 5+2 rows of pins for use with shielded connectors. Right Angle versions can be specified with reduced cross talk shields.

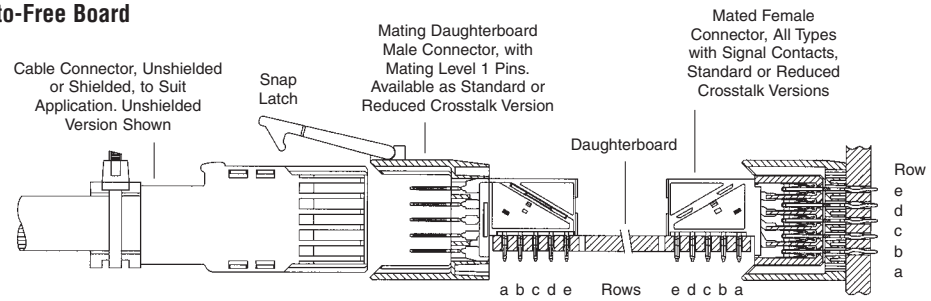
Midplane



Midplane Male Shrouds, without stand-off for PC Board Thickness, min. 2.6 [.104]



Cable-to-Free Board



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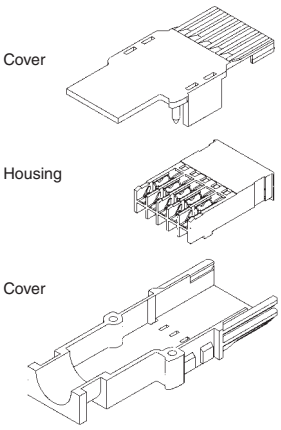
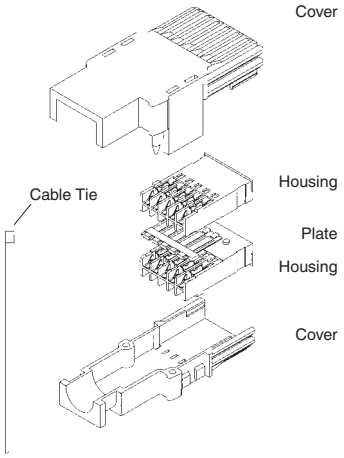
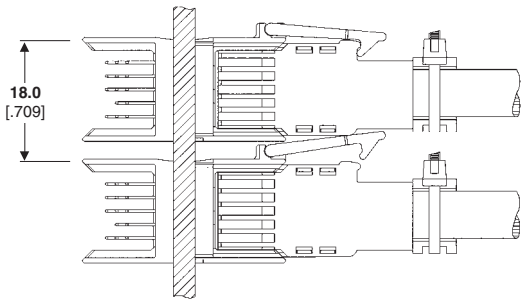
10 and 20 Position Connectors, with IDC Terminations

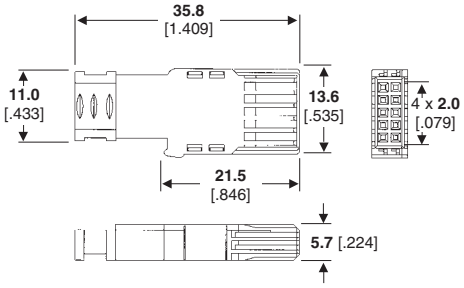
10 Positions, Unshielded

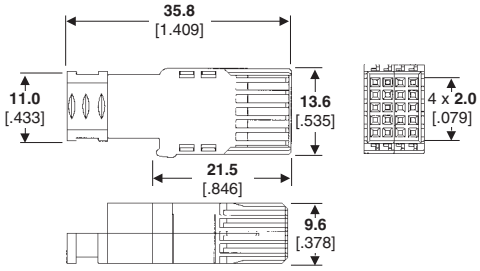


20 Positions, Unshielded









Cable Connector Kits

Unshielded cable connector kits are available in 10 and 20 position sizes. They are suitable for field installation using hand tools and for in-plant assembly using either hand or semi-automatic tooling.

Both methods allow for un-terminated contacts in random positions.

The contact design features double IDC slots with crimp insulation support. Additional outer jacket support is provided by a cable clamp applied round the rear of the cover.

Two versions are available to suit wire ranges from AWG 30-26 and AWG 26-24.

Tooling

Hand Tool Part Number 734690-1

MT-Matic Bench Terminator
Part Number 1-876095-8

Cable Connector Mating

Covers are polarized to prevent inversed mating. Keying is not provided to allow flexibility of position in mating to headers. These connectors will not stack end-to-end without loss of one contact column.

Lead Assemblies

Tyco Electronics can provide lead assemblies to your specification, fully tested and ready for use. A variety of cables can be used.

Row Spacing

Minimum pitch of connector columns is 18mm to allow for operation of the latch.

Materials

Housing — Liquid Crystalline Polymer, Black

Cover — Polybutalene Terephthalate, Black

Wire Size		Insulation Max.Ø	Part Numbers	
AWG	mm²		10 Position	20 Position
Field Installable Kits, Single Item				
30-26	0.25-0.40	**1.0** [.039]	352167-1	352168-1
26-24	0.40-0.50	**1.0** [.039]	352167-2	352168-2
Field Installable Kits, 50 Items, Bulk Package				
30-26	0.25-0.40	**1.0** [.039]	1-352167-1	1-352168-1
26-24	0.40-0.50	**1.0** [.039]	1-352167-2	1-352168-2

Cable Connector Lead Assembly Produced to customer requirements, consult Tyco Electronics

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Lead Assemblies, with 5 Position Shielded and Unshielded Cable Connector Modules

Cable Assemblies Produced by Tyco Electronics to Customer Specifications

- Standard cable offering for unshielded (see below)
- Custom cable offering for unshielded (see your Local Representative)
- Custom cable offering for shielded (see your Local Representative)

Connector Style

Cable assemblies can be produced with connectors having two different performance levels, 5 row unshielded and 5+2 shielded. Shielded versions have shields between each column connected to row c and to z and f. Although these can be used with 5 row male connectors, better performance is obtained with 5+2 row.

Cable Assembly Types

Standard assemblies are listed below having flat twin cables with common grounds to row c.

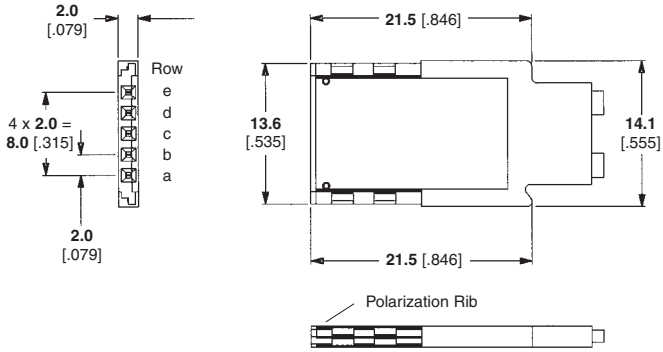
Other configurations can be made to your specification; contact Tyco Electronics.

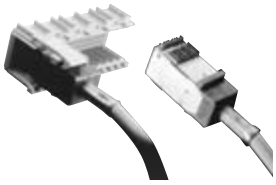
Polarization

All cable connectors are polarized at every position. All male connectors, except Right Angle, are also polarized every position. Right Angle male connectors are polarized every other position.

Basic Module

Figure 1





EMI Shielded Cable Connectors

Position	Part Numbers
10	953383-1
20	953384-1
30	953385-1
40	953386-1

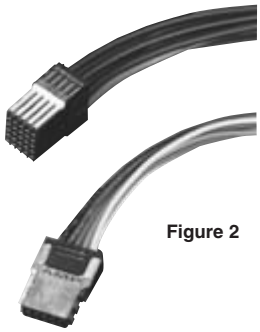
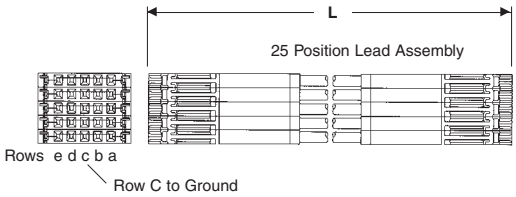


Figure 2

Example of Lead Assembly Stacking



Part Numbers (Figure 1)

Modules Length L (Meters)	1 x (5 + 2)		2 x (5 + 2)		3 x (5 + 2)		4 x (5 + 2)		5 x (5 + 2)		6 x (5 + 2)	
	Straight	Cross Over	Straight	Cross Over	Straight	Cross Over	Straight	Cross Over	Straight	Cross Over	Straight	Cross Over
0.5	188956-8	352041-8	188680-8	352199-8	188681-8	352200-8	188682-8	352096-8	188683-8	352196-8	188684-8	352121-8
1.0	188956-7	352041-7	188680-7	352199-7	188681-7	352200-7	188682-7	352096-7	188683-7	352196-7	188684-7	352121-7
1.5	188956-5	352041-5	188680-5	352199-5	188681-5	352200-5	188682-5	352096-5	188683-5	352196-5	188684-5	352121-5
2.0	188956-6	352041-6	188680-6	352199-6	188681-6	352200-6	188682-6	352096-6	188683-6	352196-6	188684-6	352121-6
3.0	188956-1	352041-1	188680-1	352199-1	188681-1	352200-1	188682-1	352096-1	188683-1	352196-1	188684-1	352121-1
5.0	188956-3	352041-3	188680-3	352199-3	188681-3	352200-3	188682-3	352096-3	188683-3	352196-3	188684-3	352121-3
10.0	188956-4	352041-4	188680-4	352199-4	188681-4	352200-4	188682-4	352096-4	188683-4	352196-4	188684-4	352121-4

Notes: Mentioned Part Numbers have cable 100 Ohm differential pair. Other lengths on request. Also available with 50 Ohm coax cable, 1 up to 5 loaded signal contacts. See figure 1.

Part Numbers (Figure 2)

2mm [.079] HM Cable Assemblies, Unshielded Connectors, Shielded Flat Twin Cable, Row c to Ground

Modules Length (Meters)	1 x 5	2 x 5	3 x 5	4 x 5	5 x 5	6 x 5	7 x 5	8 x 5	9 x 5	10 x 5	11 x 5	22 x 5
1.0	621275-1	621408-1	621409-3	621410-4	621411-3	621720-2	636207-1	621412-4	636171-1	636208-1	636209-1	636210-1
1.5	621275-6	621408-2	621409-2	621410-1	621411-1	621720-3	636207-2	621412-2	636171-2	636208-2	636209-2	636210-2
2.0	621275-2	621408-3	621409-4	621410-5	621411-4	621720-4	636207-3	621412-5	636171-3	636208-3	636209-3	636210-3
3.0	621275-3	621408-4	621409-1	621410-3	621411-2	621720-5	636207-4	621412-6	636171-4	636208-4	636209-4	636210-4
5.0	621275-5	620889-1	620888-1	621891-1	621411-5	621720-6	636207-5	621412-7	636171-5	636208-5	636209-5	636210-5
10.0	621275-7	620889-2	620888-2	621891-2	620892-1	621720-7	636207-6	621412-8	636171-6	636208-6	636209-6	636210-6

See figure 2.

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Male Cable Connector Shrouds

Zero Insertion Force (ZIF) Cable Shrouds

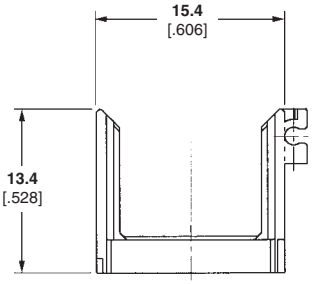
ZIF shrouds are used with 5 row and 5+2 row feed-through male connectors to allow cables to be connected to the rear of the backplane.

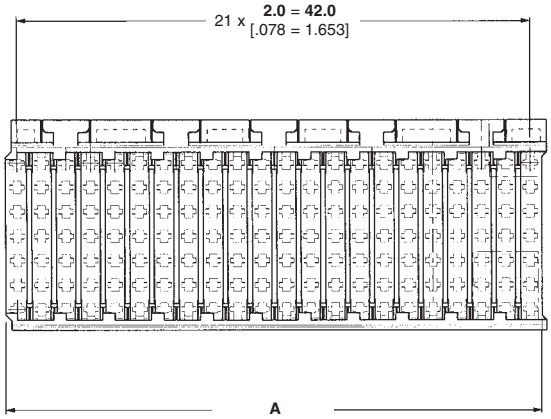
Separate variable thickness spacers are available (see page 30) to compensate for a range of backplane thicknesses. Spacers are assembled to shrouds before fitting over pins, and then pressed down using a male insertion tool.

Material

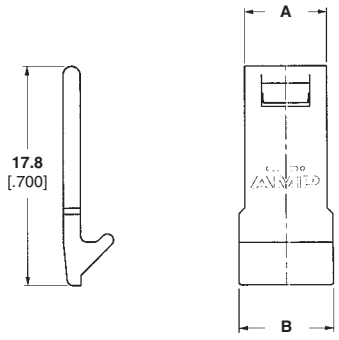
Shroud and Snap Latch — Glass filled polyester, gray; rating, UL94 V-0

Type	Part Number	Dim. Length
A or B	352601-2	**49.90** 1.96
B (22)	352672-2	**43.90** 1.73
B (19)	352673-2	**37.90** 1.49
B (11)	352674-2	**21.90** 0.86





Latches



Positions	Part Number	Dim. A Length	Dim. B Length
4	352706-2	**7.8** 0.29	**6.8** 0.26
5	352706-1	**9.8** 0.38	**8.8** 0.34

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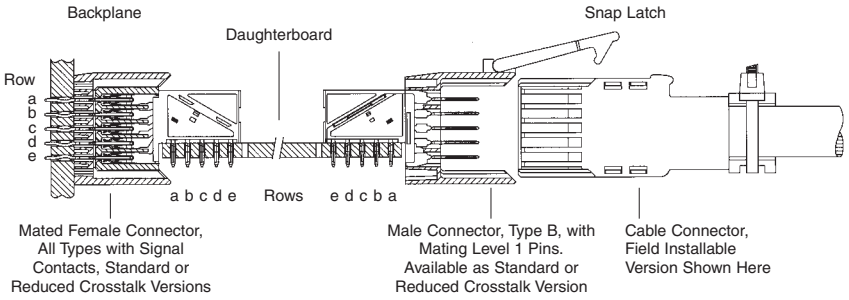
Male Connectors, Cable-to-Board



Vertical and Right Angle Cable Headers

Cable connectors can be supplied to give perpendicular or in-line connection to the printed circuit board. Typical applications for vertical headers are for the rear of backplanes and for Right Angle connectors, the outer edge of daughtercards.

Vertical headers can be loaded with 5 rows of contacts for connection to unshielded cable assemblies, or with 7 rows for connection to shielded assemblies.

Right Angle headers can be supplied with optional reduced cross talk shields.

All have polarizing ribs to ensure correct cable connector position.

Contact Tyco Electronics for ground return shields for Right Angle connectors.

Performance Data pages 6-7.

Materials and Finish:

Glass filled polyester housing, gray, UL94 V-O rated.

Phosphor-bronze signal contacts

Contact area 0.8µm [.000030] Au over 1.3µm [.000050] Ni

ACTION PIN Contact 0.5µm [.000020] Sn/Pb over 1.3µm [.000050] Ni

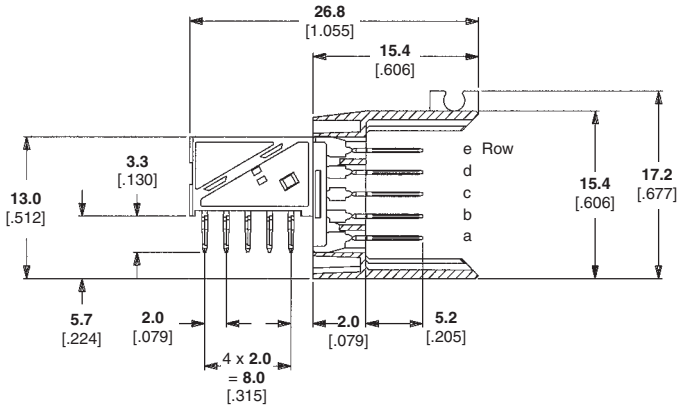
Snap Latches

Part Number **620729-1**, 5 Column

Part Number **620729-2**, 4 Column

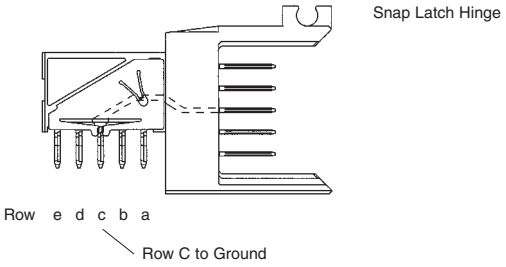
4 or 5 pos latches should be specified according to cable connector location and size.

Standard Version



Reduced Crosstalk Version

Same dimensions as standard version



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Male Connectors, Cable-to-Board (Continued)

Assembly on Free Board

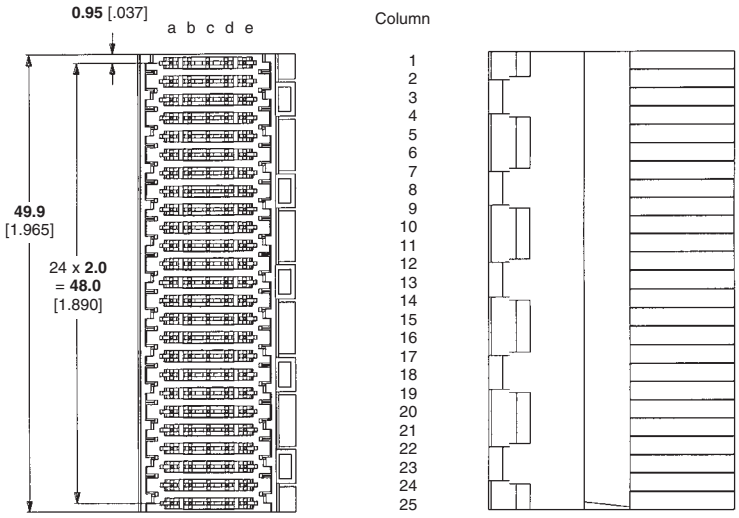
Contacts have ACTION PIN posts for firm retention, same as free board female connectors.

Type B, Right Angle Male Connector

Version	Part Number
Standard	1-106014-1
Reduced Crosstalk	1-352272-1

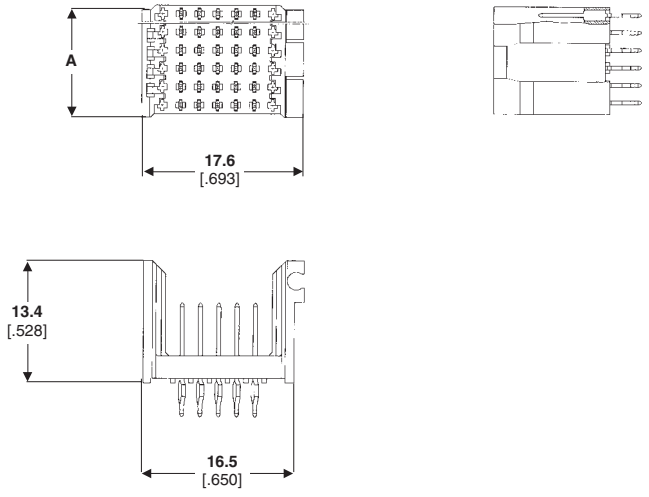
Type A and C versions also available, contact Tyco Electronics.

Type B, 125 Signal Pins, 50 [1.968] Module



Vertical Male Connector

Note: Housing is black



No. of Columns	Part Numbers	Dim. A
4	636120-1	7.88 .310
5	636120-2	9.88 .388
6	636120-3	11.88 .468

Other sizes in planning

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Dimensions and Tolerances

Coordination dimensions and tolerances

The accompanying diagrams show the depth dimensions used in the equipment practice, used for both 2 and 2.5 [.079 and .098] systems, and allowable tolerances for subrack and backplane bending.

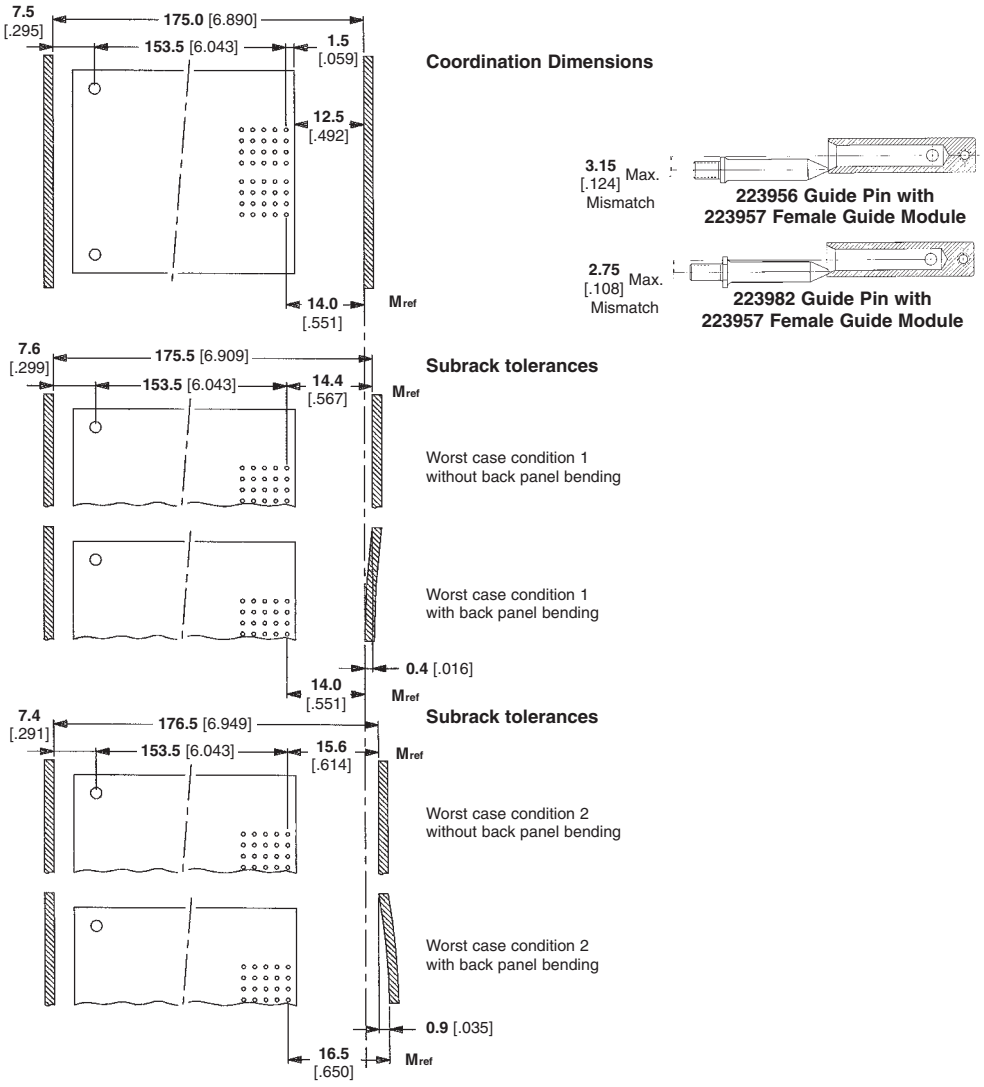
Coordination Dimension M_{ref}

As defined in the DIN 43356 and IEEE 1301 Hard Metric equipment practices for the 2.5mm system, and used in IEC 61076-4-101, the dimension **M_{ref}** is the range for free board engagement with the backplane.

The specified contact mating must be maintained on a mated pair of connectors, within the range of **M** = 14 to 16.5 [.551 to .650] for the shortest mating level 1.

For mating levels 2 and 3 the contact ranges are 14 to 18 [.551 to .709] and 14 to 19.5 [.551 to .768].

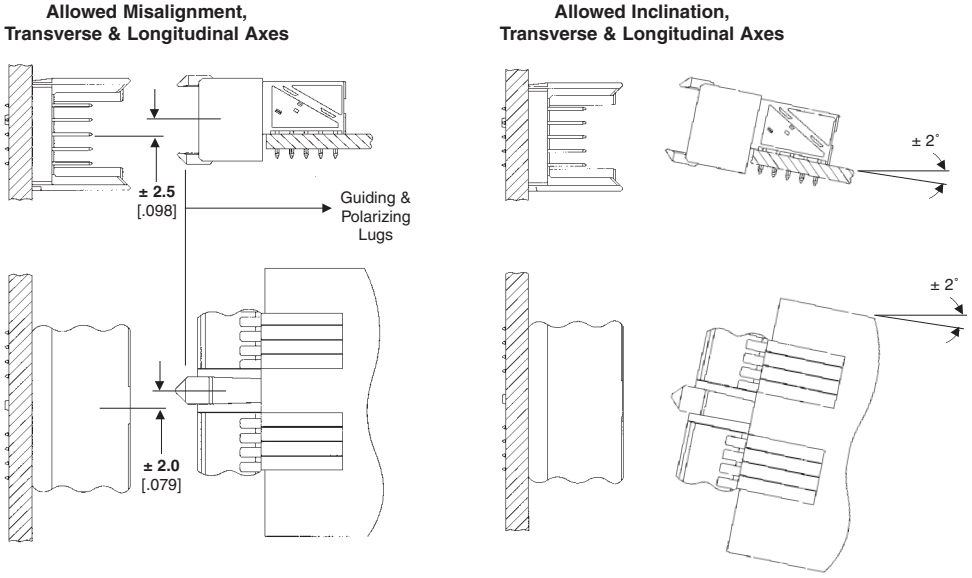
See page 67 for further details on AMP Z-PACK 2mm HM contact mating levels.



Misalignment and inclination tolerances

Guiding and polarizing lugs of Type A, M and L connectors, also at ends of Type C and N, allow the mating tolerances shown here.

Tolerances apply only when guide lugs are separated by only one Type B module without lugs.



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Dimensions

Fixed Board Male Connectors

Type A, B, C, M, M-MSC and M-MSC-rev. fixed board male connectors have signal contact positions identified by row letters and column numbers, shown right, viewed toward the frontside of the backplane.

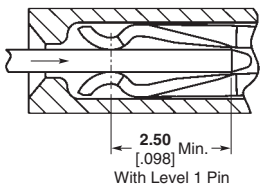
Contact positions can be filled or left unfilled, as required, for a customer's circuit arrangement. Contact pins for each position can be specified from any of the options shown below, excepting:

- Rows **z** and **f**, for ground return shield contacts only, must always be level 3.
- Row **b** is not available for level 3 (length 11.2 [.441])contacts when mating with a right angle female connector.
- For rear board cable connectors, use posts providing rear mating length 1 after allowing for board thickness, unless sequenced mating is required. Consult the chart page 66.

Use the codes A-V to specify front/rear contact for each position on the special option chart, page 67.

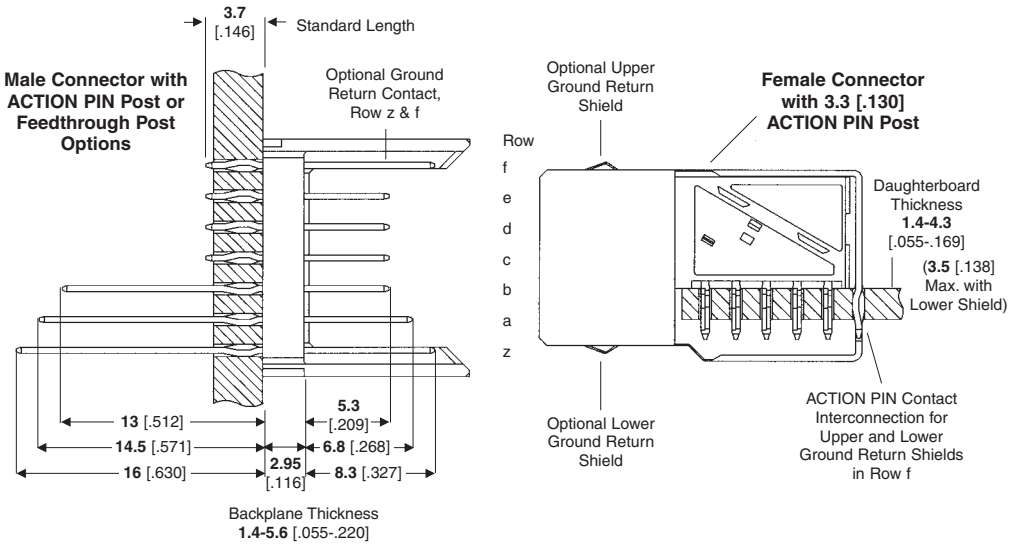
Midplane Cross-connect Applications

Cross-connections, require the feedthrough posts to be rotated 90°, so that the mating surface aligns with the female receptacle spring beams.



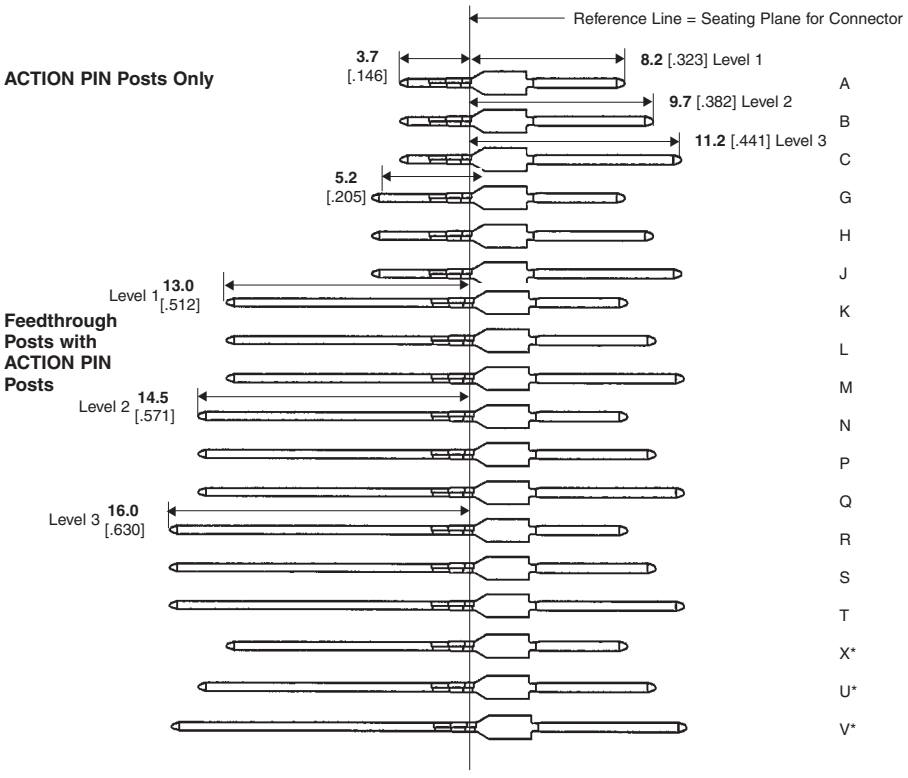
Contact Range

Connector Types



Male Pin Options

Rear Style	REAR Contact Dimensions	FRONT	Specify by Code



* X, U, V are only used for cross connect applications. Not all versions are tooled.

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Customer Specification for Signal Pin Arrangement and MSC Plug Cavities

Please make a photocopy of this page for marking up the specification.

Fill in chart below with contact type designation (see guide) required in each position. Unfilled positions to be left blank.

Customer: .....

Prepared by: ..... **Dept:** .....

Date: ..... **Order no. reference, if available:** .....

Select Male Conn. Type: A B C D E F M-MSC M-MSC-rev, Vertical/Right Angle

MSC Male Connector Fiber Optic Cavities Type (circle letter): M-MSC M-MSC-rev L-MSC

Notes

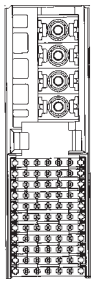
(1) Ground return shield contacts only, level 3 (length 11.2 [.441]) required. z+f for 5+2 row, z+i for 8+2 row

(2) Not available for level 3 contacts when mating with 5 row or 8 row right angle female connector.

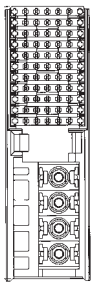
MSC Connectors, see below

Circle cavity positions to be filled with sleeve and end cap.

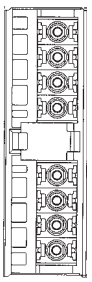
M-MSC

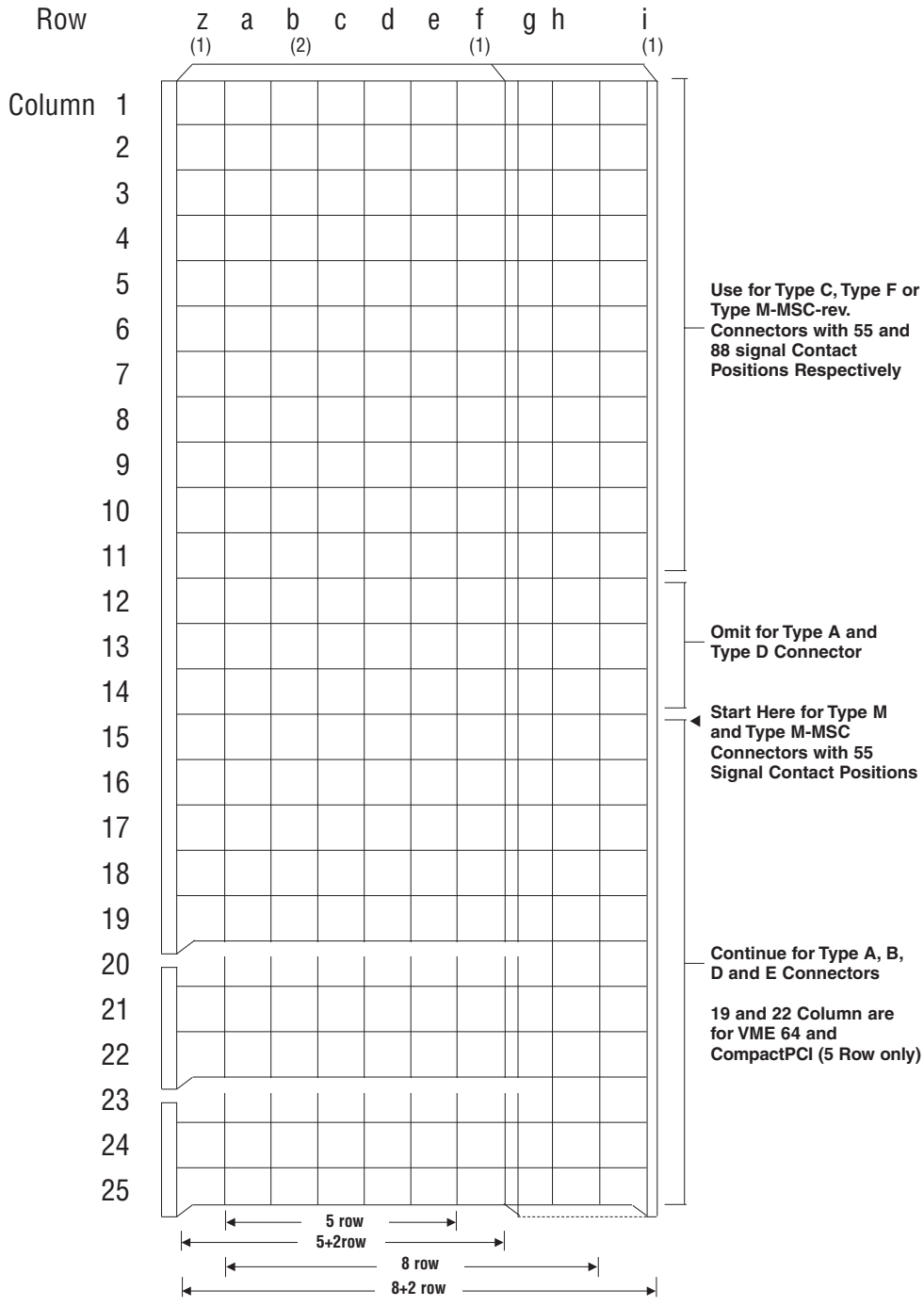


M-MSC-rev



L-MSC





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Engineering Notes

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PC Board Layout for 5/5+2 row Type A, B, C, Connectors and Ground Return Shields

General Information

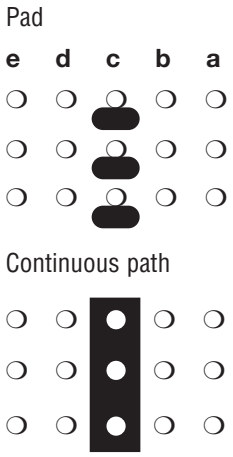
Layouts show connectors in a typical stacking arrangement on a 2 x 2 [.079 x .079] grid, with optional holes for ground return shields.

Card extender or cable connector and vertical female connectors use the same 5 row (a to e) layouts; ground return shields are not used with these types.

Right Angle Connectors

Standard Version uses the board layout as illustrated, right.

Reduced Crosstalk Version, with metal plates between columns of contacts, requires an additional pad (2.0 x 1.0 [.079 x .039]), or continuous path, connected via row **c**, to the system ground. Examples are shown below:



Symbols

Plated Through Holes:

✛ Signal Contacts.

❍ Row **f** odd numbers for upper ground return shield.

● Row **f** even numbers for lower ground return shield.

✖ Backplane rows **z** and **f**.

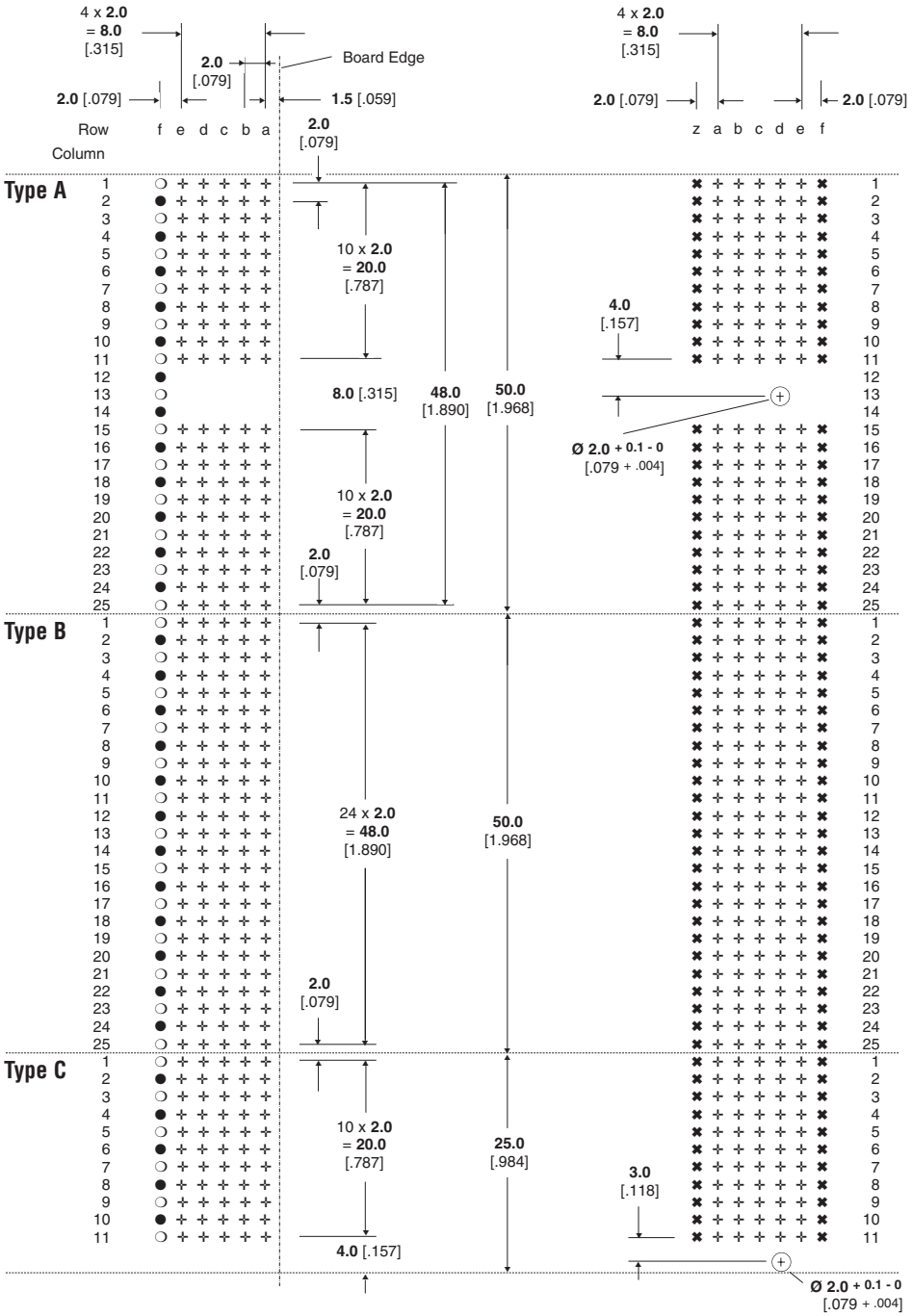
Non-plated Through Holes:

⊕ **Ø 2.0 + 0.1 -0** [.079 + .004] polarizing, location peg hole for press fit.

Right Angle
Male and Female Connector
Component Side

Note: For guidance only. Consult customer drawings for production layouts

Vertical
Male and Female Connector
Front Side



See page 9 for details of plated through holes.

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PC Board Layout for Type L, M, N Connectors

General Information

Layouts show Type M, L, N connectors, for DIN contacts, in a typical stacking arrangement, including signal contacts on a 2 x 2 [.079 x .079] grid, with optional ground return shielding.

Female Connector

Standard and Reduced Crosstalk versions, see examples on page 63.

Symbols

Plated Through Holes:

✛ Signal Contacts.

❍ Row **f** odd numbers for upper ground return shield.

● Row **f** even numbers for lower ground return shield.

✖ Backplane rows **z** and **f** for ground return shield contacts.

⊕ **1.3 + 0.1 - 0** [.051 + .004] plated through holes for board mount DIN high current or coaxial contacts. To be omitted for cable contacts.

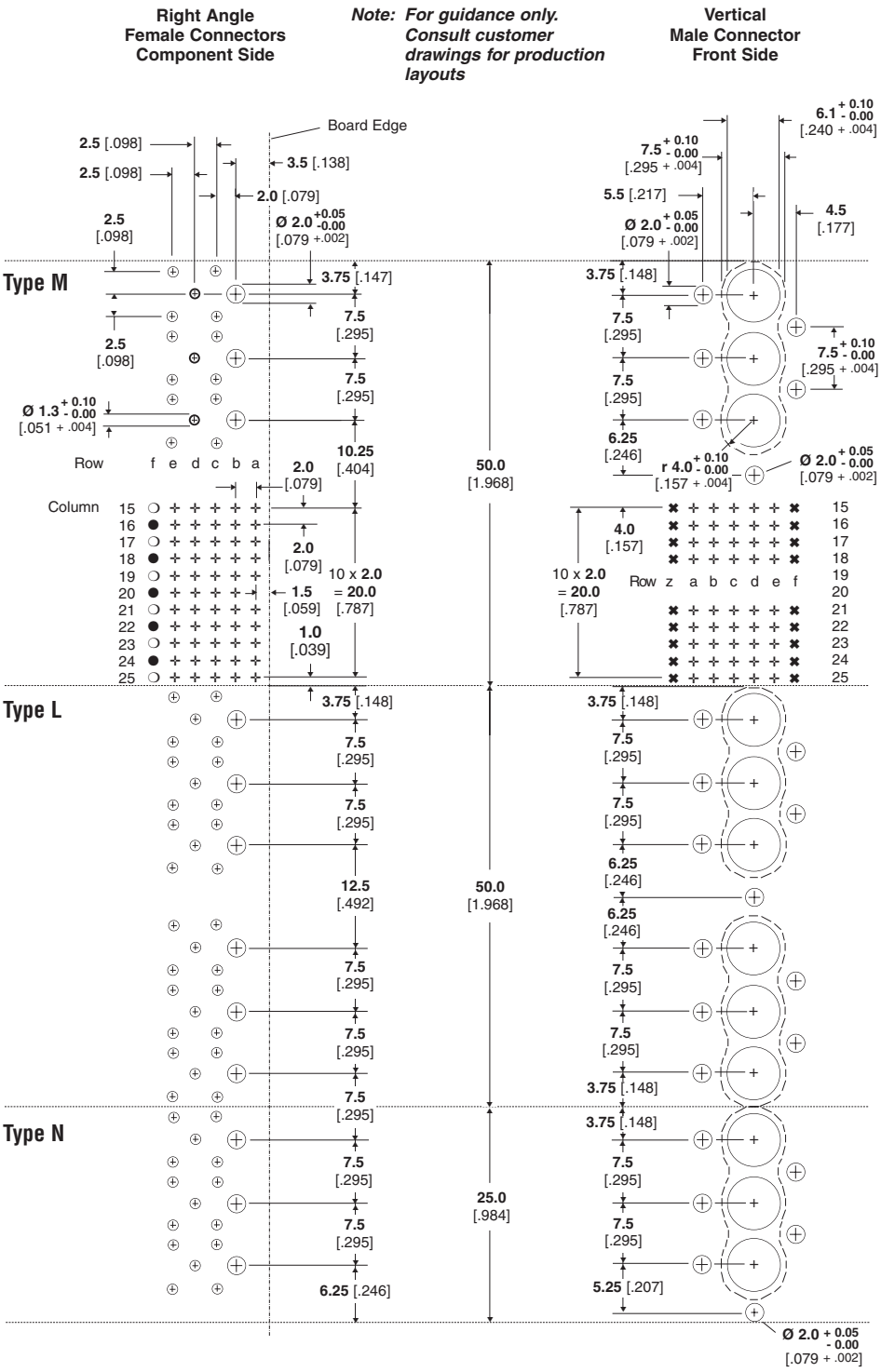
Non-plated Through Holes:

⊕ **Ø 2.0 + 0.05 -0** [.079 + .002] polarizing, location peg hole for press fit.

6.1 + 0.1 - 0 [.240 + .004] hole in fixed board, for DIN high current and coaxial contacts.*

Optional cutout, used for DIN fiber optic contacts.*

* For reference only, please refer to Power or Coax Contact customer drawing for correct hole pattern.



Note: ⊕ Only required for coaxial/omitted for power.

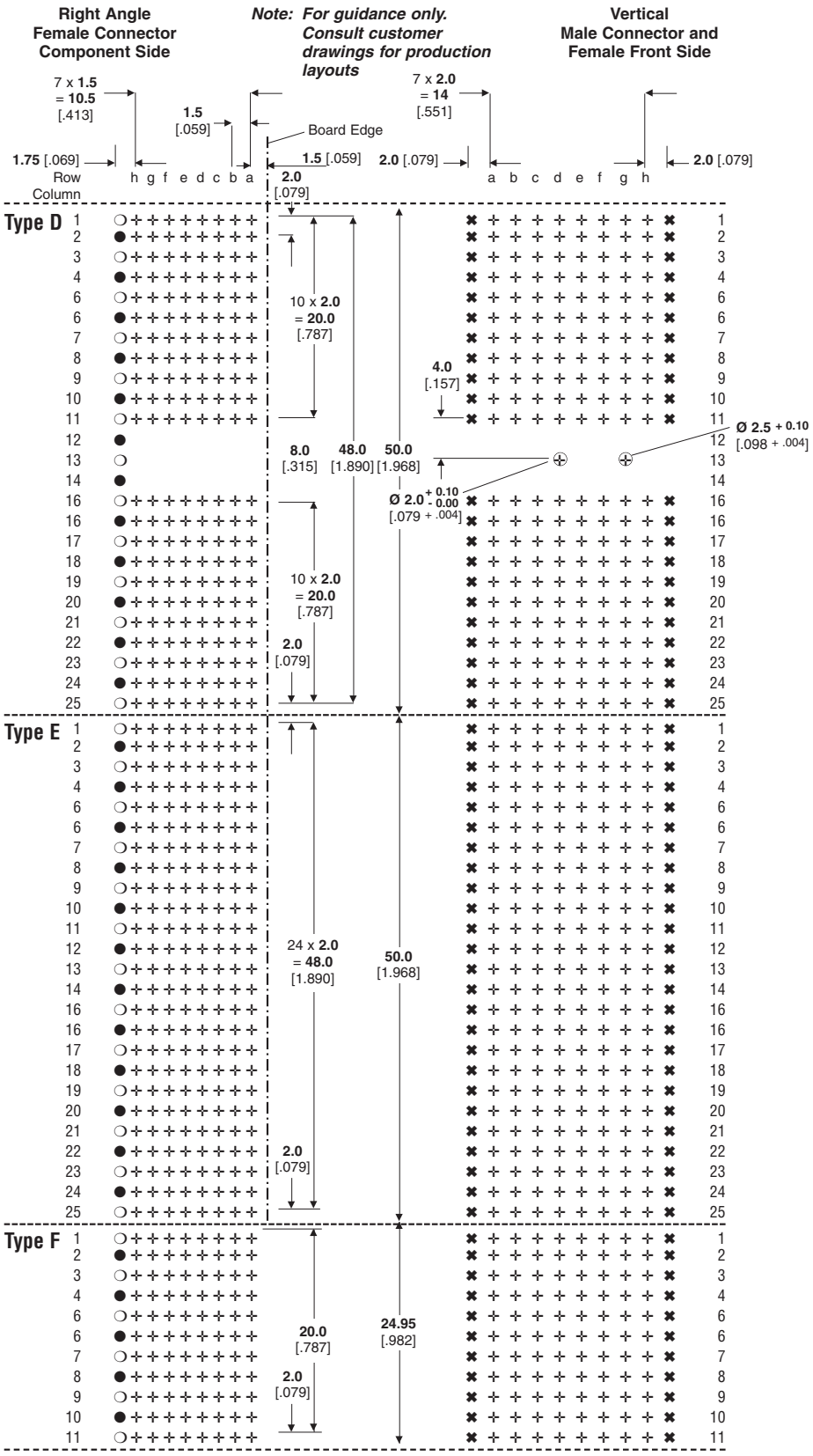
See page 9 for details of plated through holes.

PC Board Layout for Type D, E, F Connectors & Ground Return Shields

General Information

Layouts show connectors in a typical stacking arrangement with optional holes for ground return shields.

Pin headers have a 2.0 x 2.0 [.079 x .079] grid. Receptacles have a 2.0 x 1.5 [.079 x .059] grid for signal contacts with ground return shields spaced 1.75 [.069] from row **h**.



Symbols

Plated Through Holes:

✛ Signal Contacts.

Non-plated Through Holes:

⊕ **Ø 2.0 + 0.1 - 0** [.079 + .004] polarizing, location peg hole for press fit.

See page 9 for details of plated through holes.

Catalog 65911
Revised 7-05

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Canada: 1-905-470-4425
Mexico: 01-800-733-8926
C. America: 52-55-5-729-0425

South America: 55-11-3611-1514
Hong Kong: 852-2735-1628
Japan: 81-44-844-8013
UK: 44-141-810-8967

PC Board Layout for Type M-MSC-rev, L-MSC Connectors

General Information

Layouts show MSC fiber optic connectors in a typical stacking arrangement, including signal contacts on a 2 x 2 [.079 x .079] grid, with optional ground return shielding.

Female Connector

Standard and Reduced Crosstalk versions, see examples on page 66.

Symbols

Plated Through Holes:

✛ Signal Contacts.

❍ Row **f** odd numbers for upper ground return shield.

● Row **f** even numbers for lower ground return shield.

✖ Backplane rows **z** and **f** for ground return shield contacts.

Non-plated Through Holes:

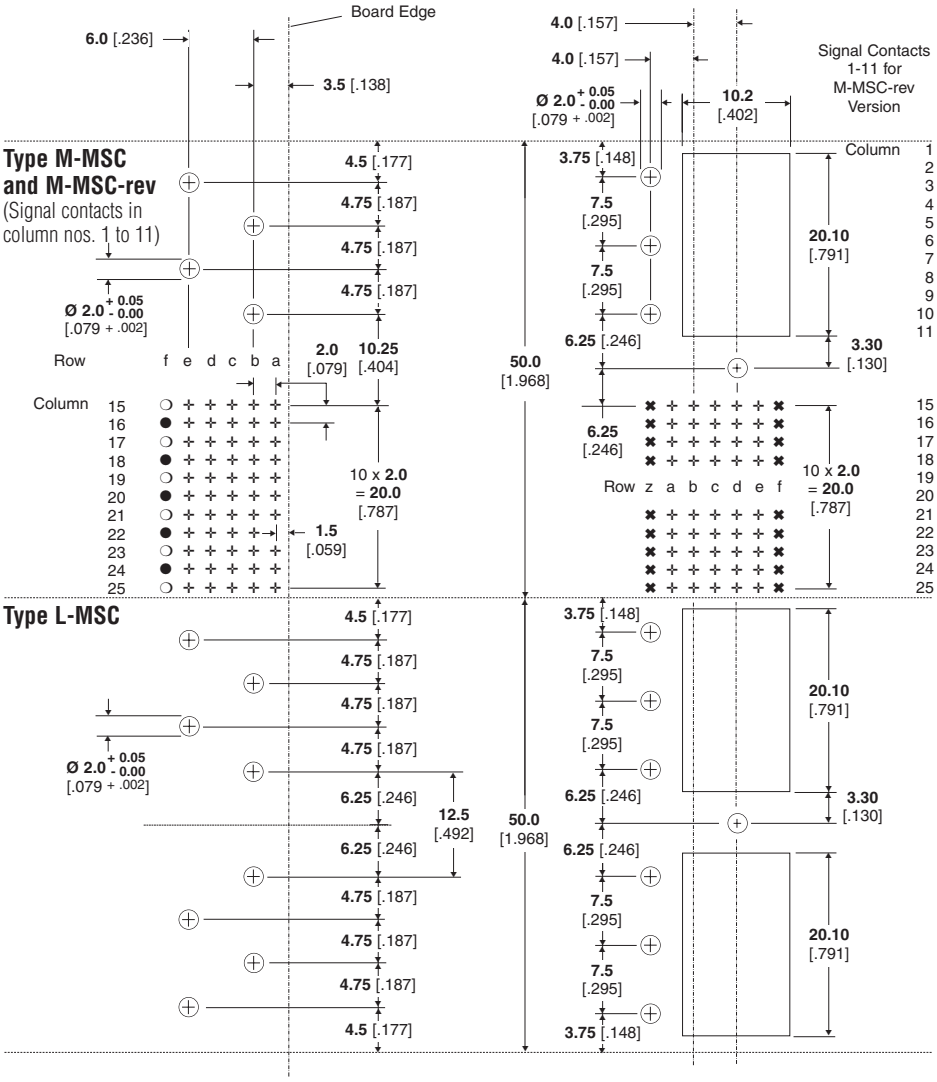
⊕ **Ø 2.0 + 0.05 -0** [.079 + .002] polarizing, location peg hole for press fit.

□ Cutout.

Right Angle Female Connector Component Side

Note: For guidance only. Consult customer drawings for production layouts

Vertical Male Connector



See page 9 for details of plated through holes.

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Connector Insertion Tooling — "Flat Rock Style"

There are two styles of connector insertion tooling available to suit different production needs.

- "Flat Rock" — tools are fitted to the connector and as such they are independent of insertion machine type or manufacturer. They are suitable for multiple connector insertion when used with a high force insertion machine.
- Quick Change — inserts are attached to the Tyco Electronics insertion machine. Adapters for other insertion machine manufacturers are possible.

All insertion machines can be supplied to suit local power supply conditions. The manual arbor frame is recommended for repair tasks.

Pneumatic and Hydraulic "Flat Rock" Seating Machines

These machines are used with the tooling on page 75. They allow the fitting of multiple connectors per cycle, up to the limit of the machine capacity, and can be used with a variety of Tyco Electronics connectors.

SM-3 Machine

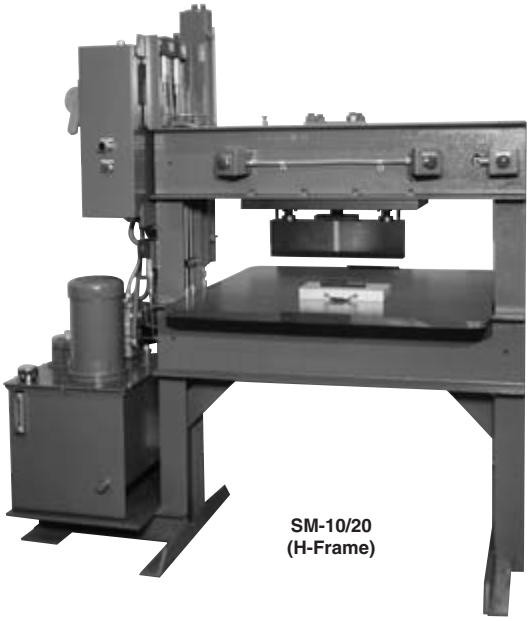
Part Number 814700-2 (European CE Approved)
814700-5

- Air powered bench machine
- Capacity of 26 700 N [6000 lb] (adequate for individual Z-PACK 2mm HM modules)
- Pressure response mode
- Cycle time is approximately 4 seconds
- Accommodates printed circuit boards up to 508 [20"] wide.
- Customer Manual 409-5626

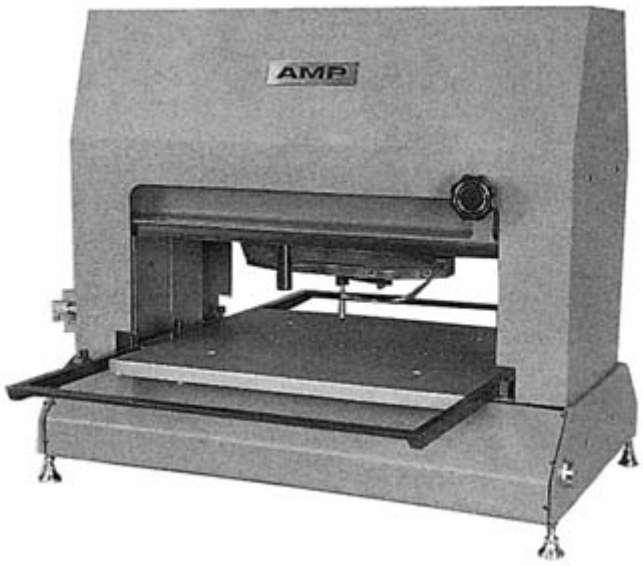
SM-10/20 Machine

Part Number 803880-6

- Electric hydraulically-powered
- Capacity (selectable): 178 000 N [40 000 lb] or 89 000 N [20 000 lb]
- Accommodates printed circuit boards up to 711 [28"] wide



SM-10/20 (H-Frame)



SM-3

Catalog 65911
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Connector Insertion Tooling — "Flat Rock Style" (Continued)

Female Connector Insertion

Same tooling used for unshielded right angle female and unshielded right angle male connectors.

Male Connector Insertion

Tooling is used for both male connectors and male shrouds in midplane arrangements.

Upper Insertion Tool

Exchangeable inserts to suit connector types; many inserts can be used for several applications.

Bar stock with a flat surface large enough to cover the top surface of right angle connectors and capable of exerting 67 N per pin.

Tooling for 5+2 row pin headers will also assemble 5 row headers, similarly tooling for 8+2 row pin headers will also assemble 8 row headers.

PC Board Support Anvils

For all connectors, board supports will be needed to allow the contact tails to pass freely into and through the board. Instruction sheets detail those supports.

Rear Shrouds

Shrouds used for mid-plane or cable connection to backplane rear are fitted to the feedthrough posts and pressed into position using the same tooling as for male connectors.

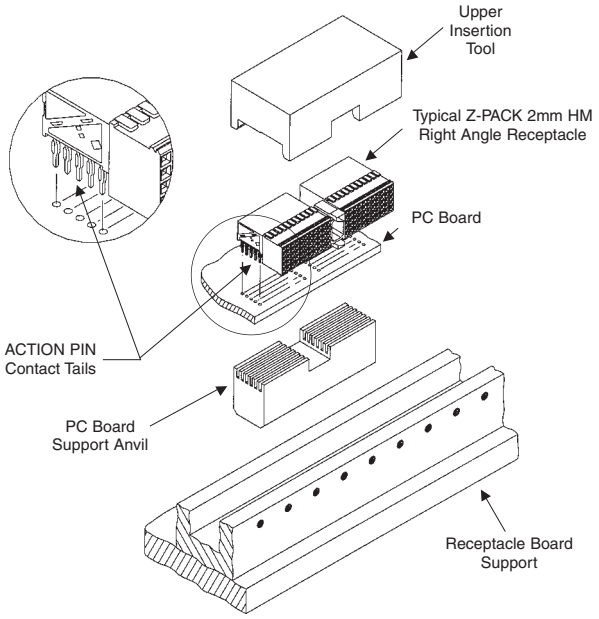
Shields

EMI/RFI shields and lower ground return shields are fitted over the connector after it is fitted to the board.

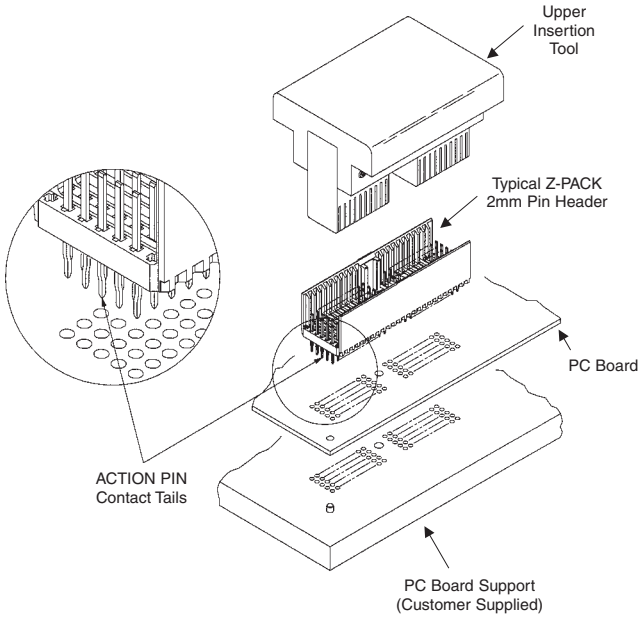
Instruction Sheets

For details of all the above, refer to the appropriate instruction sheet listed on page 75.

Female Connector Insertion



Male Connector Insertion



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UK: 44-141-810-8967

Connector Insertion Tooling — "Flat Rock Style" (Continued)

Description	Part Number		Instruction Sheet Number
	Upper Insertion Tooling	Support Tooling	
Instruction sheet summary (with insertion information for most 2mm HM components	—	—	411-19305
Upper and Lower Adapters for Tyco Electronics insertion machines. For all types	—	679980-1/2/3	408-4038
Vertical Males			
5/5+2 row, Type A	90753-1	†	408-9912
5/5+2 row, Type B	90755-1	†	408-9914
5/5+2 row, Type B (19 columns)	90755-3	†	—
5/5+2 row, Type B (22 columns)	90755-2	†	—
5/5+2 row, Type C	90757-1	†	408-9916
5/5+2 row, Type A/B	91346-1	†	408-9912
5/5+2 row, Type A/B (19 columns)	91346-3	†	408-9912
5/5+2 row, Type A/B (22 columns)	91346-2	†	408-9912
8/8+2 row, Type D	224671-2	†	408-4281
8/8+2 row, Type E	224668-2	†	408-4282
8/8+2 row, Type F	224668-3	†	408-4282
8/8+2 row, Type D/E	91345-1	†	408-4281
Right Angle Females - Unshielded			
Type A	122559-1	122561-1	408-4216
Type B	122559-1	122561-1	408-4216
Type C	122559-1	122561-1*	408-4216
Type A/B	122559-1	122561-1	408-4216
Type D	318866-1	318867-1	408-4304
Type E	318866-1	318867-1	408-4304
Type F	91326-1	318867-1*	408-4304
Type D/E	318866-1	318867-1	408-4304
Right Angle Females - Shielded			
Type A (except TDM J4)	122562-1	122561-1	408-4382
Type A for TDM J4	91316-1	—	—
Type B	122562-1	122561-1	408-4382
Type B (19 columns)	122562-1	122561-1*	408-4382
Type B (22 columns)	122562-1	122561-1*	408-4382
Type C	122562-1	122561-1*	408-4382
Type A/B	122562-1	122561-1	408-4382
Type A/B (19 columns)	122562-1*	122561-1*	408-4382
Type A/B (22 columns)	122562-1*	122561-1*	408-4382
Type D	318868-1	318867-1	408-4430
Type E	318868-1	318867-1	408-4430
Type F	91327-1	318867-1	408-4430
Type D/E	318868-1	318867-1	408-4430
Lower Shields			
Type A and B, Right Angle Female	122563-1	122562-1	408-4383
Type C and M, Right Angle Female	122563-1	122562-1	408-4383
Type A/B, Right Angle Female	122563-1	122562-1	408-4383
Type D and E, Right Angle Female	318869-1	318868-1	408-4429
Type F, Right Angle Female	318869-1	318868-1	408-4429
Type D/E, Right Angle Female	318869-1	318868-1	408-4429
Right Angle Males			
Type A	—	122561-1	408-4216
Type B	—	122561-1	408-4216
Type B (22 columns)	—	122561-1*	408-4216
Type B (19 columns)	—	122561-1*	408-4216
Type C	—	122561-1*	408-4216
Type D	—	—	—
Type E	—	—	—
Vertical Females			
Type A	—	122561-1	—
Type B	—	122561-1	—
Type B (22 columns)	—	122561-1*	—
Type B (19 columns)	—	122561-1*	—
Type C	—	122561-1*	—
Type D	—	—	—
Type E	—	—	—
Shrouds & Spacers			
Type A Shroud and Spacer	90753-1	90753-1	408-9912
Type A, One Piece Shroud	90753-1	90753-1	408-9912
Type B Shroud and Spacer	90755-1	90755-1	408-9914
Type B (19 columns)	90755-3	90755-3	408-9914
Type B (22 columns)	90755-2	90755-3	408-9914
Type B, One Piece Shroud	90755-1	90755-1	408-9914
Type AB, One Piece Shroud (19 columns)	—	90753-1	408-9912
Type AB, One Piece shroud (22 columns)	—	90753-1	408-991
Type C Shroud and Spacer	90757-1	90757-1	408-9916
Type C, One Piece Shroud	90757-1	90757-1	408-9916
Type D Shroud and Spacer	224671-2	—	408-4281
Type D/E, One Piece Shroud	224671-2	—	408-4281
Type E Shroud and Spacer	224668-2	—	408-4282
Type E, One Piece Shroud	224668-2	—	408-4282
Type F, One Piece Shroud	224668-3	—	408-4282
Universal Power Module			
Right Angle Male	224441-1	224442-1	408-4280
Vertical Female	224421-1	217602-1	408-4169

* Tool length exceeds connector length; check that tool does not interfere with other components

† Customer Supplied

Contact Tyco Electronics Tooling Assistance Center at 1-800-722-1111 if tooling is not indicated.

Instruction Sheet

Repair Tool Part Number 354687-1
IS 408-9979

Type D, E One Piece Shroud Tool Part Number 224671-2
IS 408-4281

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UK: 44-141-810-8967

Connector Insertion Tooling — Quick Change

There are two styles of connector insertion tooling available to suit different production needs.

- **Quick Change — inserts are attached to the insertion machine**
- **"Flat Rock" — tools are fitted to the connector and are suitable for multiple connector insertion when used with a high force insertion machine**

All insertion machines can be supplied to suit local power supply conditions. The manual hand tool is recommended for repair tasks.

Quick Change

This tooling is designed so that it can be fitted to the machines. These tools allow the sequential fitting of connectors to the board by selection of the appropriate inserts. Fitting to other types of machines is possible by selecting adapters without the upper and lower adapter bars.

ICIM (Intelligent Connector Insertion Machine)
Part Number 67941-☐

- Capacity of 27 500 N [6180 lb] with 5 bar air supply
- Force and stroke control (compensates for printed circuit board thickness)
- Fitted with an inhibitor (detects if the X-Y table is not aligned correctly)
- Detects faulty connector insertion
- X-Y tables optional
- Actual dash (-) number depends on voltage needed
- See catalog 889943 for more details

Pneumatic Insertion Machine
Part Number 677420-1

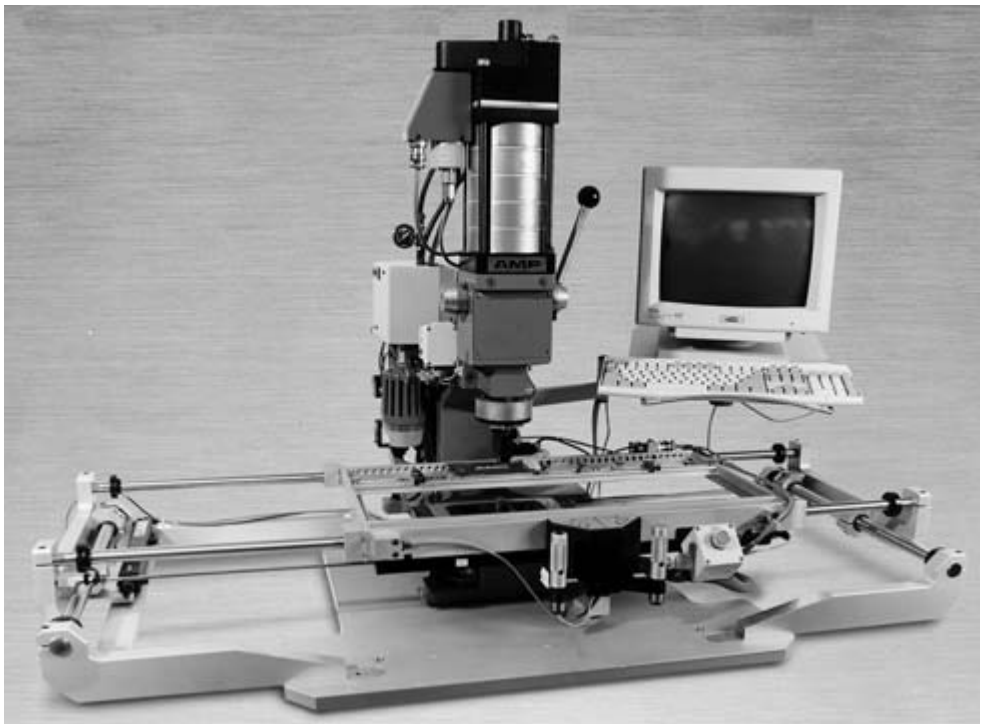
- Controllable insertion force from 0.5-25 000 N [.1-5620 lb]
- 250 [9.843] throat depth
- Moveable lower tool holder
- Manual X-Y table with adjustable stops
- Recommended for high volume production of backplanes and daughtercards
- See catalog 889943 for more details

Pneumatic Insertion Machine (with circuit board support platform)
Part Number 677427-2

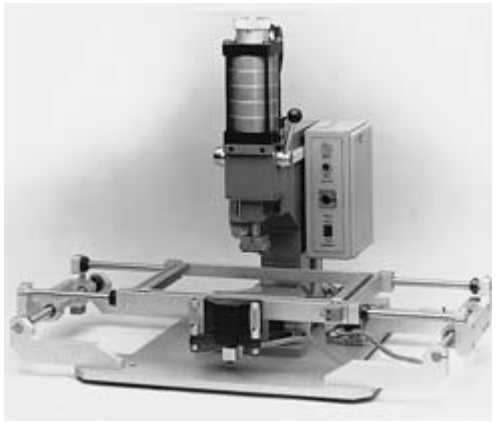
- Similar to Pneumatic Insertion Machine Part Number 677420-1 (above)
- X-Y table replaced with a circuit board support platform
- See catalog 889943 for more details

Manual Hand Tool
Part Number — 677430-2

- Insertion force 15 000 N [3370 lb]
- 125 [4.921] throat depth
- Fixed lower tooling and board support
- Low volume production
- Prototyping
- Use with repair tools

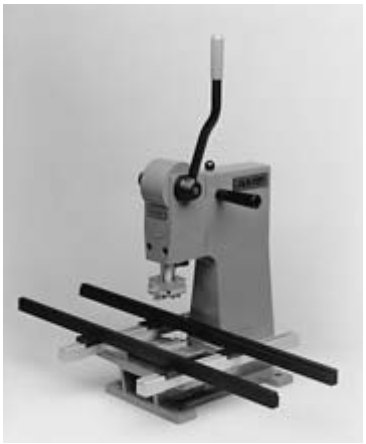


ICIM (Intelligent Connector Insertion Machine)



Pneumatic Insertion Machine

Pneumatic Insertion Machine (with Circuit Board Support Platform)



Hand Tool

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Connector Insertion Tooling – Quick Change (Continued)

Description	Part Number: Insertion Tooling	Part Number: Support Tooling	Instruction Sheet
Instruction sheet summary (with insertion information for most 2mm HM components			411-19305
Upper and lower adapters for AMP insertion machines.			411-19306
For all types except L, M, N, L-MSC and M-MSC		679980-1/2/3	408-4038
Vertical Males			
5/5+2 row, Type A	438001-1	438051-1	411-19312
5/5+2 row, Type B	438002-1	438051-1	411-19313
5/5+2 row, Type B (19 columns)	438002-2	438051-4	411-19313
5/5+2 row, Type B (22 columns)	438002-3	438051-6	411-19313
5/5+2 row, Type C	438003-1	438051-2	411-19314
8/8+2 row, Type D	438051-2	438051-3	411-19432
8/8+2 row, Type E	439491-1	438051-3	411-19432
8/8+2 row, Type F			
Type L	438001-1	438056-1	411-19315
L-MSC	438014-1	438056-1	411-19318
Type M	438001-1	438057-1	411-19316
M-MSC	438015-1	438057-1	411-19319
M-MSC reverse	438015-1	438057-1	411-19320
Type N	438003-1	438056-2	411-19317
Right Angle Females - Unshielded			
Type A	438031-1	438051-1	411-19324
Type B	438031-1	438051-1	411-19325
Type C	438032-1	438051-2	411-19326
Type L	438031-1	438052-1	411-19327
L-MSC	438070-1	438056-1	411-19330
Type M	438031-1	438054-1	411-19328
M-MSC	438072-1	438057-1	411-19331
M-MSC reverse	438071-1	438057-1	411-19332
Type N	438032-1	438052-2	411-19329
Right Angle Females - Shielded			
Type A (except TDM J4)	438036-1	438051-1	411-19334
Type A for TDM J4	1115335-1	438051-1	411-19334
Type B	436036-1	438051-1	411-19334
Type B (19 columns)	438036-2	438051-4	411-19437
Type B (22 columns)	438036-3	438051-6	411-19437
Type AB (19 columns)	438036-2	438051-4	411-19437
Type AB (22 columns)	438036-3	438051-6	411-19437
Type C	438037-1	438051-2	411-19437
Type D	439491-1	438051-7	411-19351
Type E	439491-1	438051-7	411-19434
Lower Shields			
Type A and B, Right Angle Female	438041-†	438053-1	411-19335
Type C and M, Right Angle Female	438042-†	438053-2	411-19352

Description	Part Number: Insertion Tooling	Part Number: Support Tooling	Instruction Sheet
Right Angle Males			
Type A	438031-1	438051-1	411-19344
Type B	438031-1	438051-1	411-19345
Type B (22 columns)	438036-2	438051-4	411-19345
Type B (19 columns)	438036-3	438051-6	411-19345
Type C	438032-1	438051-2	411-19346
Vertical Females			
Type A	438076-1	438051-1	411-19377
Type B	438076-1	438051-1	411-19377
Type B (22 columns)	438076-1*	438051-4	411-19377
Type B (19 columns)	438076-1*	438051-6	411-19377
Type C	438077-1	438051-2	411-19377
Shrouds & Spacers			
Type A Shroud and Spacer	438001-1	438058-1	411*19337
Type B Shroud and Spacer	438002-1	438058-1	411-19338
Type B (19 column)	438002-3	438058-1*	411-19338
Type B (22 column)	438002-2	438058-1*	411-19338
Type B, One Piece Shroud	438002-1	438058-1	—
Type C Shroud and Spacer	438003-1	438058-1	411-19339
Type C, One Piece Shroud	438003-1	438058-1	—
EMI/RFI Shields			
EMI/RFI Right Angle Female, Upper	438036-1	438051-1	411-19334
EMI/RFI Right Angle Female , Lower	438041-†	438053-1	411-19335
EMI/RFI Right Angle Female, Closing	438023-1	438051-2	411-19336
EMI/RFI Vertical Male, Sides	438020-1	438051-1	411-19322
EMI/RFI Vertical Male, Closing	438021-1	438051-2	411-19323

-† Part number suffix depends on application. See instruction sheet for details
*Tool length exceeds connector length; check that tool does not interfere with other components

Contact Tyco Electronics Tooling Assistance Center at 1-800-722-1111 if tooling is not indicated.

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Non-RoHS to RoHS Compliant Part Number Cross Reference

Non-RoHS Part No.	RoHS Compliant Part No.
21124-4	521124-4
100072-1	5100072-1
100073-1	5100073-1
100084-1	5100084-1
100085-1	5100085-1
100141-1	5100141-1
100143-1	5100143-1
100145-1	5100145-1
100147-1	5100147-1
100159-1	5100159-1
100161-1	5100161-1
100525-3	5100525-3
100525-9	5100525-9
2-100525-0	2-5100525-0
3-100525-2	3-5100525-2
5-100525-4	5-5100525-4
5-100525-6	5-5100525-6
5-100525-9	5-5100525-9
6-100525-1	6-5100525-1
6-100525-3	6-5100525-3
6-100525-9	6-5100525-9
100526-3	5100526-3
100526-9	5100526-9
2-100526-0	2-5100526-0
3-100526-2	3-5100526-2
5-100526-4	5-5100526-4
5-100526-6	5-5100526-6
5-100526-9	5-5100526-9
6-100526-1	6-5100526-1
6-100526-3	6-5100526-3
6-100526-9	6-5100526-9
100623-1	5100623-1
100624-1	5100624-1
100668-1	5100668-1
100669-1	5100669-1
100745-1	5100745-1
100746-1	5100746-1
100749-1	5100749-1
100750-1	5100750-1
100751-1	5100751-1
100752-1	5100752-1
100773-2	5100773-2
100773-3	5100773-3
100773-4	5100773-4
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100773-7	5100773-7
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106509-1	5106509-1
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148221-1	5148221-1
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148338-4	5148338-4
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188683-6	5188683-6
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188683-8	5188683-8
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188956-4	5188956-4
188956-5	5188956-5
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188956-7	5188956-7
188956-8	5188956-8
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223986-8	5223986-8
223989-1	5223989-1
223990-1	5223990-1
223991-1	5223991-1
223995-1	5223995-1
223995-2	5223995-2
223995-3	5223995-3
223995-4	5223995-4
223995-5	5223995-5
223996-1	5223996-1
233212-1	5233212-1
338108-2	5338108-2
338110-2	5338110-2
352009-1	5352009-1
352011-2	5352011-2
352011-2	5352011-2
352012-2	5352012-2
352012-3	5352012-3
352012-4	5352012-4
352012-5	5352012-5
352012-6	5352012-6
352012-7	5352012-7
352012-x	5352012-x
352029-2	5352029-2
352033-1	5352033-1
352033-1	5352033-1
352041-1	5352041-1
352041-3	5352041-3
352041-4	5352041-4
352041-5	5352041-5
352041-6	5352041-6
352041-7	5352041-7
352041-8	5352041-8
352049-1	5352049-1
352068-1	5352068-1
352068-1	5352068-1
352069-1	5352069-1
352096-1	5352096-1
352096-3	5352096-3

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UK: 44-141-810-8967

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352096-5	5352096-5
352096-6	5352096-6
352096-7	5352096-7
352096-8	5352096-8
352112-2	5352112-2
352112-2	5352112-2
352115-1	5352115-1
352121-1	5352121-1
352121-3	5352121-3
352121-4	5352121-4
352121-5	5352121-5
352121-6	5352121-6
352121-7	5352121-7
352121-8	5352121-8
352127-1	5352127-1
352129-2	5352129-2
352129-3	5352129-3
352129-4	5352129-4
352129-5	5352129-5
352129-6	5352129-6
352129-7	5352129-7
352130-2	5352130-2
352131-1	5352131-1
352152-1	5352152-1
352152-1	5352152-1
352167-1	5352167-1
352167-2	5352167-2
1-352167-1	1-5352167-1
1-352167-2	1-5352167-2
352168-1	5352168-1
352168-2	5352168-2
1-352168-1	1-5352168-1
1-352168-2	1-5352168-2
352171-1	5352171-1
352171-1	5352171-1
352171-1	5352171-1
352177-1	5352177-1
352196-1	5352196-1
352196-3	5352196-3
352196-4	5352196-4
352196-5	5352196-5
352196-6	5352196-6
352196-7	5352196-7
352196-8	5352196-8
352199-1	5352199-1
352199-3	5352199-3
352199-4	5352199-4
352199-5	5352199-5
352199-6	5352199-6
352199-7	5352199-7
352199-8	5352199-8
352200-1	5352200-1
352200-3	5352200-3
352200-4	5352200-4
352200-5	5352200-5
352200-6	5352200-6
352200-7	5352200-7
352200-8	5352200-8
352268-1	5352268-1
352269-1	5352269-1

Non-RoHS Part No.	RoHS Compliant Part No.
352269-1	5352269-1
352271-1	5352271-1
352272-1	5352272-1
1-352272-1	1-5352272-1
352273-1	5352273-1
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352380-1	5352380-1
352406-1	5352406-1
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352468-2	5352468-2
352601-2	5352601-2
352638-1	5352638-1
352639-1	5352639-1
352672-2	5352672-2
352673-2	5352673-2
352673-2	5352673-2
352674-2	5352674-2
352706-1	5352706-1
352706-2	5352706-2
352869-1	5352869-1
532808-1	5532808-1
532828-5	5532828-5
533065-6	5533065-6
620729-1	5620729-1
620729-2	5620729-2
620888-1	5620888-1
620888-2	5620888-2
620889-1	5620889-1
620889-2	5620889-2
620892-1	5620892-1
621275-1	5621275-1
621275-2	5621275-2
621275-3	5621275-3
621275-5	5621275-5
621275-6	5621275-6
621275-7	5621275-7
621408-1	5621408-1
621408-2	5621408-2
621408-3	5621408-3
621408-4	5621408-4
621409-1	5621409-1
621409-2	5621409-2
621409-3	5621409-3
621409-4	5621409-4
621410-1	5621410-1
621410-3	5621410-3
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621411-1	5621411-1
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621411-5	5621411-5
621412-2	5621412-2
621412-4	5621412-4
621412-5	5621412-5

Non-RoHS Part No.	RoHS Compliant Part No.
621412-6	5621412-6
621412-7	5621412-7
621412-8	5621412-8
621720-2	5621720-2
621720-3	5621720-3
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621720-7	5621720-7
621891-1	5621891-1
621891-2	5621891-2
636120-1	5636120-1
636120-2	5636120-2
636120-3	5636120-3
636171-1	5636171-1
636171-2	5636171-2
636171-3	5636171-3
636171-4	5636171-4
636171-5	5636171-5
636171-6	5636171-6
636207-1	5636207-1
636207-2	5636207-2
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636207-5	5636207-5
636207-6	5636207-6
636208-1	5636208-1
636208-2	5636208-2
636208-3	5636208-3
636208-4	5636208-4
636208-5	5636208-5
636208-6	5636208-6
636209-1	5636209-1
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636209-5	5636209-5
636209-6	5636209-6
636210-1	5636210-1
636210-2	5636210-2
636210-3	5636210-3
636210-4	5636210-4
636210-5	5636210-5
636210-6	5636210-6
646273-1	5646273-1
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646370-1	5646370-1
646372-1	5646372-1
646373-1	5646373-1
646375-1	5646375-1
646376-1	5646376-1
646386-1	5646386-1
646386-2	5646386-2
646386-3	5646386-3
646386-4	5646386-4

Non-RoHS Part No.	RoHS Compliant Part No.
646386-5	5646386-5
646386-6	5646386-6
646387-1	5646387-1
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646387-3	5646387-3
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646428-1	5646428-1
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646442-1	5646442-1
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646447-1	5646447-1
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646476-1	5646476-1
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646477-7	5646477-7
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646478-7	5646478-7
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646479-7	5646479-7
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646481-7	5646481-7
646481-x	5646481-x
646482-1	5646482-1
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Non-RoHS to RoHS Compliant Part Number Cross Reference (Continued)

Non-RoHS Part No.	RoHS Compliant Part No.
646482-4	5646482-4
646482-5	5646482-5
646482-6	5646482-6
646482-7	5646482-7
646483-1	5646483-1
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646484-3	5646484-3
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646484-7	5646484-7
646486-1	5646486-1
646487-1	5646487-1
646488-1	5646488-1
646488-1	5646488-1
646489-1	5646489-1
646489-1	5646489-1
646492-1	5646492-1
646493-1	5646493-1
646502-1	5646502-1
646502-2	5646502-2
646502-3	5646502-3
646502-4	5646502-4
646513-1	5646513-1
646514-1	5646514-1
646515-1	5646515-1

Non-RoHS Part No.	RoHS Compliant Part No.
646525-1	5646525-1
646525-2	5646525-2
646525-3	5646525-3
646525-4	5646525-4
646525-5	5646525-5
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646525-7	5646525-7
646529-1	5646529-1
646530-1	5646530-1
646530-1	5646530-1
646532-1	5646532-1
646533-1	5646533-1
646533-1	5646533-1
646534-1	5646534-1
646535-1	5646535-1
646538-1	5646538-1
646539-1	5646539-1
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646574-1	5646574-1
646576-1	5646576-1
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646576-6	5646576-6
646576-7	5646576-7
646703-1	5646703-1
646704-1	5646704-1
646709-1	5646709-1
646726-1	5646726-1

Non-RoHS Part No.	RoHS Compliant Part No.
646726-2	5646726-2
646726-3	5646726-3
646726-4	5646726-4
646726-5	5646726-5
646726-6	5646726-6
646726-7	5646726-7
646726-8	5646726-8
646728-1	5646728-1
646729-1	5646729-1
646730-1	5646730-1
646731-1	5646731-1
646732-1	5646732-1
646732-1	5646732-1
646734-1	5646734-1
646735-1	5646735-1
646735-1	5646735-1
646736-1	5646736-1
646737-1	5646737-1
646759-1	5646759-1
646773-1	5646773-1
646858-1	5646858-1
646886-1	5646886-1
646938-1	5646938-1
646948-1	5646948-1
646949-1	5646949-1
646950-1	5646950-1
646951-1	5646951-1
646952-1	5646952-1
646953-1	5646953-1
646954-1	5646954-1
646955-1	5646955-1
646956-1	5646956-1
646957-1	5646957-1

Non-RoHS Part No.	RoHS Compliant Part No.
646958-1	5646958-1
646959-1	5646959-1
646960-1	5646960-1
646961-1	5646961-1
953383-1	5953383-1
953384-1	5953384-1
953385-1	5953385-1
953386-1	5953386-1
986794-1	5986794-1
1206073-1	6206073-1
1206074-1	6206074-1
1206075-1	6206075-1
1206076-1	6206076-1
1206077-1	6206077-1
1206078-1	6206078-1
1345007-1	6345007-1
1345008-1	6345008-1
1392175-1	6392175-1
1393589-1	6393589-1
1393589-3	6393589-3
1393589-5	6393589-5
1393589-7	6393589-7
1393589-9	6393589-9
1-1393589-1	1-6393589-1
1-1393589-4	1-6393589-4
2-1393589-7	2-6393589-7
3-1393589-5	3-6393589-5
1-1393662-2	1-6393662-2
1612872-1	6612872-1
1612877-1	6612877-1
1612913-1	6612913-1
1674156-1	6674156-1

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tyco Electronics

Global Contacts

Americas

Argentina – Buenos Aires
Phone: +54-11-4733-2200
Fax: +54-11-4733-2211

Brasil – São Paulo
Phone: +55-11-3611-1311
Fax: +55-11-3611-0397

Canada – Markham
Phone: +905-475-6222
Fax: +905-474-5520
Product Information Center: (Technical Support)
Phone: +905-470-4425
Fax: +905-474-5525

Colombia – Bogota
Phone: +57-1-231-9398
Fax: +57-1-660-0206

Mexico – Mexico City
Phone: +52-5-729-0400
Fax: +52-5-361-8545

United States – Harrisburg, PA
Phone: +717-564-0100
Fax: +717-986-7575
Product Information Center: (Technical Support)
Phone: +800-522-6752
Fax: +717-986-7575

For Latin/South American Countries not shown
Phone: +54-11-4733-2015
Fax: +54-11-4733-2083

Asia/Pacific

Australia – Sydney
Phone: +61-2-9554-2600
Fax: +61-2-9502-2556
Product Information Center: (Technical Support)
Phone: +61-2-9840-8200
Fax: +61-2-9634-6188

India – Bangalore
Phone: +91-80-285-40800
Fax: +91-80-285-40820

Indonesia – Jakarta
Phone: +65-6482-0311
Fax: +65-6482-1012

Japan – Toyko
Phone: +81-44-844-8111
Fax: +81-44-812-3207
Product Information Center: (Technical Support)
Phone: +81-44-844-8013
Fax: +81-44-812-3200
Raychem Products
Phone: +81-44-900-5102
Fax: +81-44-5025-5027

Korea – Seoul
Phone: +82-2-3415-4500
Fax: +82-2-3486-3810

Malaysia – Kuala Lumpur
Phone: +60-3-78053055
Fax: +60-3-78053066

New Zealand – Auckland
Phone: +64-9-634-4580
Fax: +64-9-634-4586

Philippines – Makati City
Phone: +632-848-0171
Fax: +632-867-8661

People's Republic of China
Hong Kong
Phone: +852-2735-1628
Fax: +852-2735-0243

Shanghai
Phone: +86-21-53838188/64850602
Fax: +86-21-53838018/54260180

Shunde
Phone: +86-765-775-1368
Fax: +86-765-775-2823

Europe/Middle East/Africa

Austria – Vienna
Phone: +43-190-560-0
Fax: +43-190-560-1333

Belgium – Kessel-Lo
Phone: +32-16-35-23-00
Fax: +32-16-35-23-52

Bulgaria – Sofia
Phone: +359-2-971-2152
Fax: +359-2-971-2153

Czech Republic – Kurim
Phone: +420-5-41-162-111
Fax: +420-5-41-162-223

Denmark – Viby J
Phone: +45-70-15-52-00
Fax: +45-43-44-14-14

Egypt – Cairo
Phone: +20-2-417-76-47
Fax: +20-2-419-23-34

Estonia – Tallinn
Phone: +372-65-05-474
Fax: +372-65-05-470

Finland – Helsinki
Phone: +358-95-12-34-20
Fax: +358-95-12-34-250

France –
Cergy-Pontoise
Phone: +33-1-3420-8888
Fax: +33-1-3420-8600
Product Information Center: (Technical Support)
Phone: +33-1-3420-8943
Fax: +33-1-3420-8623

France
Tyco Electronics Export –
St Ouen L'Aumone
Phone: +33-1-3440-7200
Fax: +33-1-3440-7220 or
+33-1-3440-7230

Germany – Bensheim
Phone: +49-6251-133-0
Fax: +49-6251-133-1600
Product Information Center: (Technical Support)
Phone: +49-6251-133-1999
Fax: +49-6251-133-1988

Germany – Langen
Phone: +49-6103-709-0
Fax: +49-6103-709-1223

Germany – Speyer
Phone: +49-6232-30-0
Fax: +49-6232-30-2243

Germany
HTS Division – Neunkirchen
Phone: +49-2247-305-0
Fax: +49-2247-305-122

Great Britain –
Stanmore Middlesex
Phone: +44-208-954-2356
Fax: +44-208-954-6234
Product Information Center: (Technical Support)
Freephone GB: 0800-267-666
Phone: +44-141 810 8968
Fax: +44-141 810 8971
Great Britain – Dorcan, Swindon
Raychem Products
Phone: +44-1793-528171
Fax: +44-1793-572516

Greece – Athens
Phone: +30-1-9370-396/397
Fax: +30-1-9370-655

Hungary – Budapest
Phone: +36-1-289-1000
Fax: +36-1-289-1010

Ireland – Dublin
Phone: +353-1-820-3000
Fax: +353-1-820-9790

Israel – Yokneam
Phone: +972-4-959-0508
Fax: +972-4-959-0506

Italy – Collegno (Torino)
Phone: +39-011-4012-111
Fax: +39-011-4031-116

Lithuania – Vilnius
Phone: +370-5-2131-402
Fax: +370-5-2131-403

Netherlands – 's-Hertogenbosch
Phone: +31-73-624-6246
Fax: +31-73-621-2365
Product Information Center: (Technical Support)
Phone: +31-73-6246-999
Fax: +31-73-6246-998

Norway – Nesbru
Phone: +47-66-77-8899
Fax: +47-66-77-8855

Poland – Warsaw
Phone: +48-22-45-76-700
Fax: +48-22-45-76-720

Romania – Bucharest
Phone: +40-1-311-3479/3596
Fax: +40-1-312-0574

Russia – Moscow
Phone: +7-095-926-5506/07/08/09
Fax: +7-095-926-5505

Russia – St. Petersburg
Phone: +7-812-118-8192
Fax: +7-812-118-8193

Slovakia – Banská Bystrica
Phone: +421-48-415-20-11/12
Fax: +421-48-415-20-13

Slovenia – Ljubljana
Phone: +386-1561-3270
Fax: +386-1561-3240

South Africa – Port Elizabeth
Phone: +27-41-405-4500
Fax: +27-41-486-1314

Spain – Barcelona
Phone: +34-93-291-0330
Fax: +34-93-201-7879
Product Information Center: (Technical Support):
Phone: +34-93-291-0330
Fax: +34-93-200-3779

Sweden – Upplands Väsby
Phone: +46-8-50-72-50-00
Fax: +46-8-50-72-50-01

Switzerland – Steinach
Phone: +41-71-447-0447
Fax: +41-71-447-0444

Turkey – Istanbul
Phone: +90-212-281-8181/2/3
Fax: +90-212-281-8184

Ukraine – Kiev
Phone: +38-044-238-6908
Fax: +38-044-568-5740

Tyco Electronics Corporation
www.tycoelectronics.com

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Tyco Electronics Corporation
Harrisburg, Pennsylvania
www.tycoelectronics.com

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