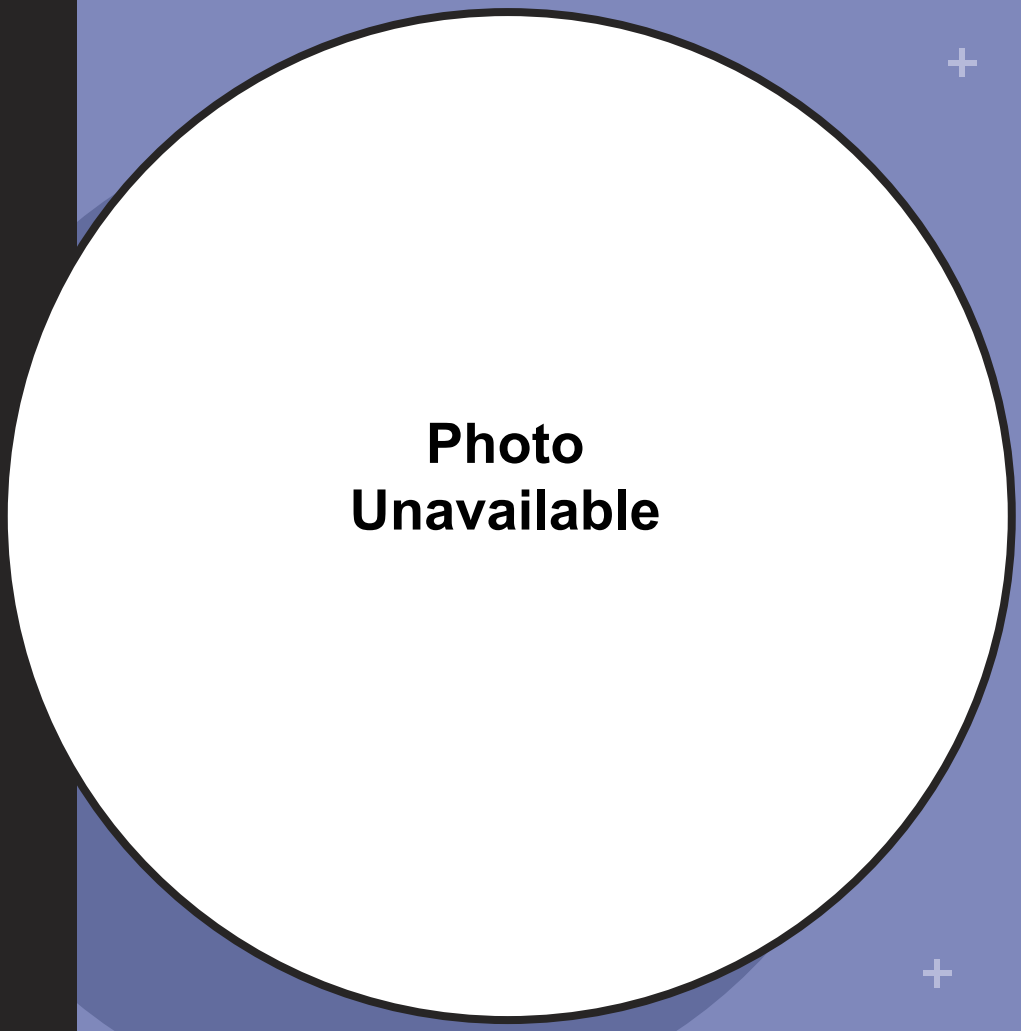
POSITRONIC INDUSTRIES

Front Runner Series Circular Connectors



FEATURING HIGH PERFORMANCE, LIGHTWEIGHT, COMPOSITE CONSTRUCTION

Products described within this catalog may be protected by one or more of the following U.S. patents:

5,255,580
5,329,697

Unless otherwise specified, dimensional tolerances are:

1) **±0.001 inches (0.03 mm) for male contact mating diameters.**
2) **±0.003 inches (0.08 mm) for contact termination diameters.**
3) **±0.005 inches (0.13 mm) for all other diameters.**
4) **±0.015 inches (0.38 mm) for all other dimensions.**

CATALOG NUMBER:
C–015 REV. NC
PRINTED DATE:
January, 2000
PUBLISHED IN THE UNITED STATES OF AMERICA

Manufacturing Quality and Reliability

Products

Positronic Industries manufactures a broad line of Industrial and Military Quality Subminiature-D, Rectangular, Power, Circular and Utility Connectors to International Standards.

Our connectors are widely utilized in telecommunications equipment, mainframe and peripheral computers, navigational systems, avionics and aerospace applications, robotics, automotive systems, medical equipment and process control applications.

Manufacturing Facilities

Positronic Industries has been in operation since its founding in Springfield, Missouri in 1966. Positronic is a vertically integrated manufacturer of high quality, high reliability, high performance connectors. Our connectors, connector accessories and options are designed, tooled, manufactured, finished and assembled within our own facilities. This integration provides quick turnaround and controllable quality assurance.

Quality Assurance

Positronic connectors are recognized throughout the world for their reliability, durability and performance qualities. The Springfield, Mt. Vernon and Miller, Missouri facilities maintain a complete, fully documented Quality Assurance System which is certified to the ISO 9001 Standard. A complete Testing Laboratory for electrical, environmental and dimensional verification is utilized by our Engineering, Plating and Quality Assurance Departments. Positronic connectors are qualified to appropriate Military Specifications and certified to Underwriter Laboratory safety requirements.

Factory Locations Include:

- Springfield, Missouri
  – A 139,000 sq. ft. facility which houses our Company Headquarters and serves the North American and Latin American markets.

- Auch, France
  – A 33,000 sq. ft. autonomous facility which serves the European, Mid-eastern and African markets.

- Ponce, Puerto Rico
  – A 57,000 sq. ft. autonomous facility.

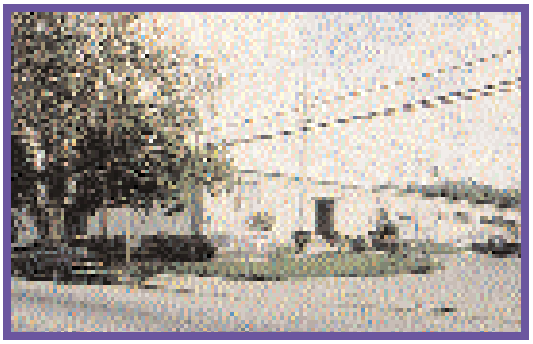
- Mt. Vernon, Missouri
  – A 42,000 sq. ft. satellite facility.

- Miller, Missouri
  – A 1,500 sq. ft. satellite assembly facility.

- Singapore
  – A 10,000 sq. ft. autonomous facility which serves the Pacific Basin market.

Company Headquarters

French Facility



Puerto Rico Facility

FRONT-RUNNER SERIES CIRCULAR CONNECTORS

HIGH PERFORMANCE, LIGHTWEIGHT, COMPOSITE CONSTRUCTION

- **SIZES 11 AND 19** connector diameters.
- **16 CONTACT ARRANGEMENTS** from 3 to 29 contacts.
- **EASY CONTACT SERVICING:** Rear insertion/front release of removable contacts.
- **TWO LEVEL SEQUENTIAL MATING OF CONTACTS.**
- **NON-CORRODIBLE/LIGHTWEIGHT COMPOSITE MATERIALS.**
- **ENVIRONMENTAL VERSION** features dust and water ingress protection to IEC IP67 (1 meter immersion for 30 minutes).
- **EMI/RFI SHIELDED VERSION,** electroless nickel plated plastic**.**

TABLE OF CONTENTS

GENERAL PRODUCT INFORMATION

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

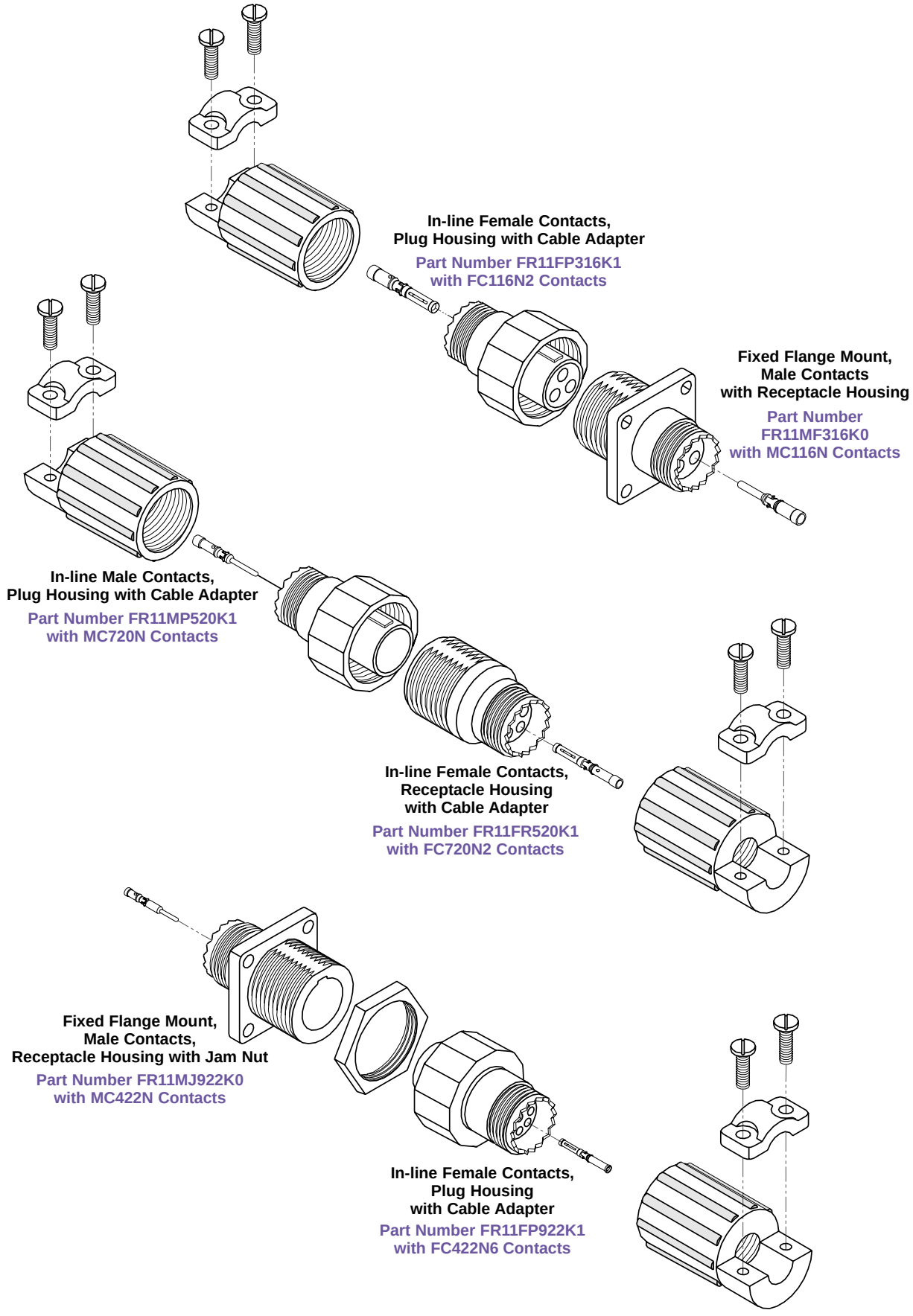
The **Front Runner Series** offers a multiplicity of connector features which makes it a first choice to meet the high performance and high reliability requirements of Medical, Transportation, Industrial Control, and Avionics applications. **Front Runner** features include:

1. Composite Components: Lightweight and non-corrodible. Contacts machined from solid copper alloy.
2. Sixteen (16) contact arrangements from 3 to 29 contacts.
3. Hot pluggable capabilities to 25 amperes.
4. Two level sequential mating of contacts.
5. A mix of power and signal contacts in Sizes 12, 16, 20, and 22. Crimp removable contacts and printed board straight and right angle terminations.
6. Mounting options include flange and jam nut or printed circuit board mount.
7. Environmental Version provides dust and water ingress protection to I.E.C. IP67 (1 meter immersion for 30 minutes).
8. EMI/RFI Shielded Version, electroless nickel plated plastic.
9. Easy Contact Servicing - Rear insertion/Front release contact retention system.
10. Threaded Coupling Nut System.

Consult the Factory Sales Service Department for additional information.

TYPICAL CONNECTOR ASSEMBLIES

FRONT-RUNNER CIRCULAR CONNECTOR SERIES



In-line Female Contacts, Plug Housing with Cable Adapter
Part Number FR11FP316K1
with FC116N2 Contacts

Fixed Flange Mount, Male Contacts with Receptacle Housing
Part Number FR11MF316K0
with MC116N Contacts

In-line Male Contacts, Plug Housing with Cable Adapter
Part Number FR11MP520K1
with MC720N Contacts

In-line Female Contacts, Receptacle Housing with Cable Adapter
Part Number FR11FR520K1
with FC720N2 Contacts

Fixed Flange Mount, Male Contacts, Receptacle Housing with Jam Nut
Part Number FR11MJ922K0
with MC422N Contacts

In-line Female Contacts, Plug Housing with Cable Adapter
Part Number FR11FP922K1
with FC422N6 Contacts

CONTACT ARRANGEMENTS

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

CONTACT ARRANGEMENTS FOR SIZE 11 HOUSING

VOLTAGE RATINGS PER EN60950 * INSULATION RESISTANCE OF 5 G OHMS
CONTACT ARRANGEMENTS ARE SHOWN APPROXIMATELY ACTUAL SIZE
MATING FACE OF MALE OR REAR VIEW OF FEMALE CONNECTOR SHOWN

Three (3) Size 16 Contacts
0.063 inch (1.6 mm) Minimum Creepage for Operation at 300V RMS

Five (5) Size 20 Contacts
0.039 inch (1.0 mm) Minimum Creepage for Operation at 200V RMS

Eight (8) Size 22 Contacts
0.028 inch (0.7 mm) Minimum Creepage for Operation at 100V RMS

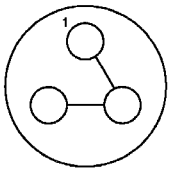
Four (4) Size 20 Contacts
0.059 inch (1.5 mm) Minimum Creepage for Operation at 250V RMS

Seven (7) Size 22 Contacts
0.063 inch (1.6 mm) Minimum Creepage for Operation at 300V RMS

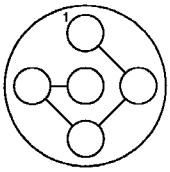
Nine (9) Size 22 Contacts
0.028 inch (0.7 mm) Minimum Creepage for Operation at 100V RMS

CONTACT ARRANGEMENTS FOR SIZE 19 HOUSING

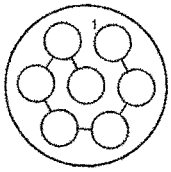
VOLTAGE RATINGS PER EN60950 * INSULATION RESISTANCE OF 5 G OHMS
CONTACT ARRANGEMENTS ARE SHOWN APPROXIMATELY ACTUAL SIZE
MATING FACE OF MALE OR REAR VIEW OF FEMALE CONNECTOR SHOWN



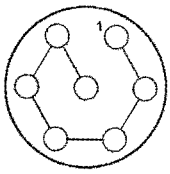
Three (3) Size 12 Contacts
0.197 inch (5.0 mm) Minimum Creepage for Operation at 1,000V RMS



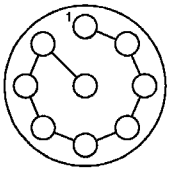
Five (5) Size 12 Contacts
0.091 inch (2.3 mm) Minimum Creepage for Operation at 400V RMS



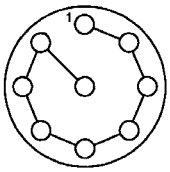
Seven (7) Size 12 Contacts
0.071 inch (1.8 mm) Minimum Creepage for Operation at 300V RMS



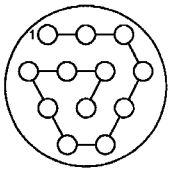
Seven (7) Size 16 Contacts
0.189 inch (4.8 mm) Minimum Creepage for Operation at 600V RMS



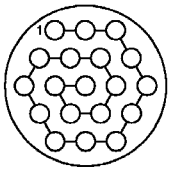
Nine (9) Size 16 Contacts
0.118 inch (3.0 mm) Minimum Creepage for Operation at 400V RMS



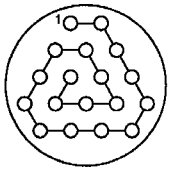
Nine (9) Size 20 Contacts
0.154 inch (3.9 mm) Minimum Creepage for Operation at 600V RMS



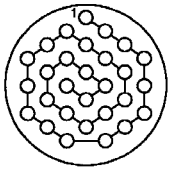
Twelve (12) Size 20 Contacts
0.102 inch (2.6 mm) Minimum Creepage for Operation at 400V RMS



Nineteen (19) Size 20 Contacts
0.059 inch (1.5 mm) Minimum Creepage for Operation at 250V RMS



Eighteen (18) Size 22 Contacts
0.086 inch (2.2 mm) Minimum Creepage for Operation at 400V RMS



Twenty-nine (29) Size 22 Contacts
0.051 inch (1.3 mm) Minimum Creepage for Operation at 250V RMS

NOTE: Contact the Factory for availability of other contact arrangements.

TECHNICAL CHARACTERISTICS

MATERIALS AND FINISHES:

Insulator Inserts: Glass-filled DAP, Type SDG-F, black color, UL 94V-0.

Non-Environmental Connectors:
- Housings: Glass-filled polyester, black color, UL 94V-0.
- Coupling Nut: Glass-filled polyester, black color, UL 94V-0.
- Cable Adapters: Glass-filled polyester, black color, UL 94V-0.

Environmental Connectors:
- Interfacial O-Rings: T.P.E.
- Cable Adapters: Glass-filled polyester with T.P.E. boot.
- Dust Cover: Glass-filled polyester, black color, or low density polyethylene, black color.

EMI/RFI Shielded Connectors:
- Housings: Thermoplastic, electroless nickel over copper plated.
- Cable Adapters: Thermoplastic, electroless nickel over copper plated.

Contacts: Copper alloy with gold flash over nickel or 0.8 microns (0.000030 inch) gold plate over nickel plate.

Jam Nuts: Aluminum, black anodized.

ELECTRICAL CHARACTERISTICS:

Nominal Contact Current Rating:
- Size 12: 25 amperes.
- Size 16: 13 amperes.
- Size 20: 7.5 amperes.
- Size 22: 5 amperes.

Initial Contact Resistance, Maximum:
- Size 12: 0.003 ohms per IEC 512-2, Test 2b.
- Size 16: 0.003 ohms per IEC 512-2, Test 2b.
- Size 20: 0.007 ohms per IEC 512-2, Test 2b.
- Size 22: 0.012 ohms per IEC 512-2, Test 2b.

Size 16 Micro-Coaxial Contacts: See page 18 for technical information.

Insulator Resistance: 5 G ohms per IEC 512-2, Test 3a, Method A.

Creepage and Clearance Distance: See values given with the specific contact arrangements on page 3.

Working Voltage: See values given with the specific contact arrangements on page 3.

Hot Pluggable (50 couplings per U.L. 1977, paragraph 15):
- Size 12 Contacts: 250 VAC at 25 amperes.
- Size 16 Contacts: 120 VAC at 4.5 amperes.

MECHANICAL CHARACTERISTICS:

Polarization: Plug and receptacle housings are molded with integral polarization system.

Removable Contacts: Rear insertion/Front release removal. Female contact features “Closed Entry Design“ for highest reliability.

Contact Retention in Insulator:
- Size 22: 6 lbs. (27 N) per IEC 512-8, Test 15a.
- Size 20: 10 lbs. (44 N) per IEC 512-8. Test 15a.
- Size 16: 20 lbs. (89 N) per IEC 512-8, Test 15a.
- Size 12: 20 lbs. (89 N) per IEC 512-8, Test 15a.

Sequential Contact Mating Systems: One and two level systems. Consult the Factory for ordering information.

Coupling System:
- Size 11 Housing: M19 coupling nut.
- Size 19 Housing: M32 coupling nut.

Printed Board Contact Terminations: Straight and 90° solder terminations. Consult the Factory for ordering information.

Mechanical Operations: 500 couplings.

CLIMATIC CHARACTERISTICS:

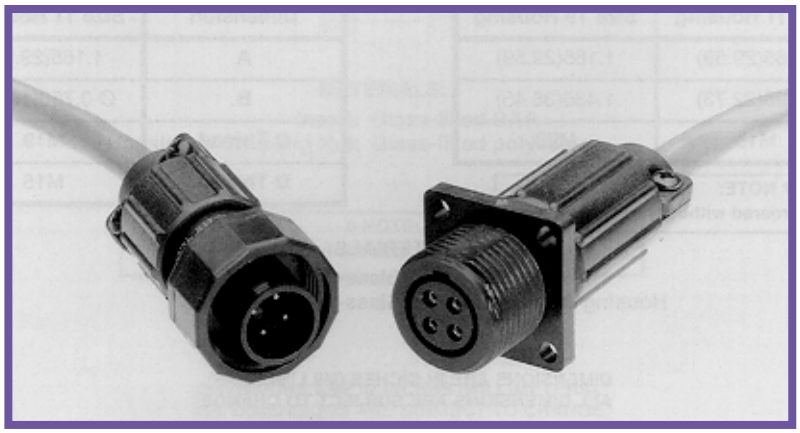
Working Temperature: -55˚C to +125˚C.

Dust and Water Ingress: Per IEC IP67 (1 meter immersion for 30 minutes).

EMI/RFI SHIELDING CHARACTERISTICS:

Surface Conductivity: < 0.5 ohm per square.

Attenuation: 70-80 dB at most frequencies.

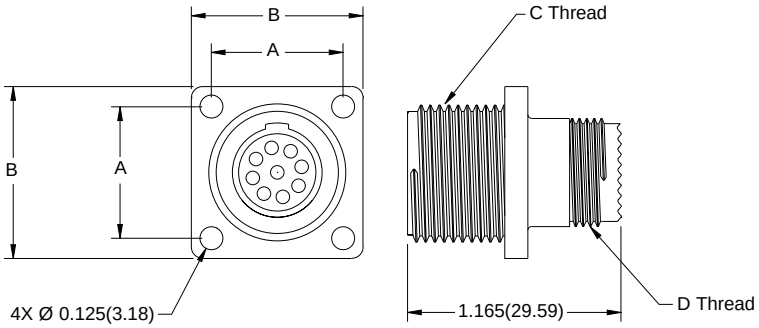


HOUSING DIMENSIONS

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

FIXED FLANGE-MOUNT HOUSING

RECEPTACLE HOUSING, MALE OR FEMALE CONTACTS

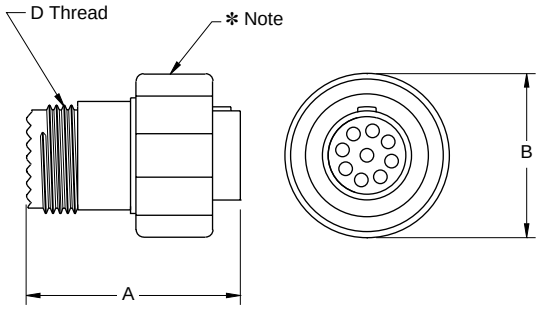


Dimension	Size 11 Housing	Size 19 Housing
A	0.719(18.26)	1.062(26.97)
B	0.938(23.83)	1.438(36.53)
C Thread	M19	M32
D Thread	M15	M28

MATERIALS:
Insert: Glass-filled DAP.
Housing: Glass-filled polyester.

FREE IN-LINE HOUSINGS

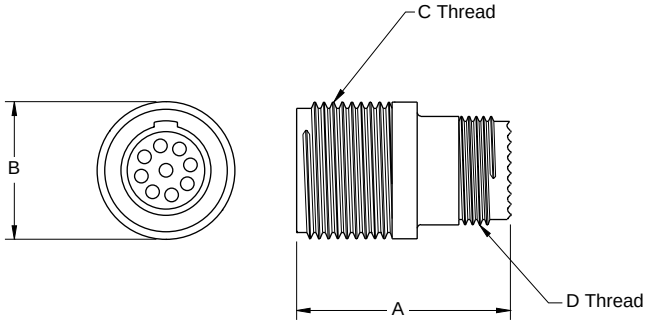
Plug Housing, Male or Female Contacts



Dimension	Size 11 Housing	Size 19 Housing
A	1.165(29.59)	1.165(29.59)
B	0.895(22.73)	1.435(36.45)
D Thread	M15	M28

✻ NOTE:
This connector may be ordered without the coupling nut.

Receptacle Housing, Male or Female Contacts



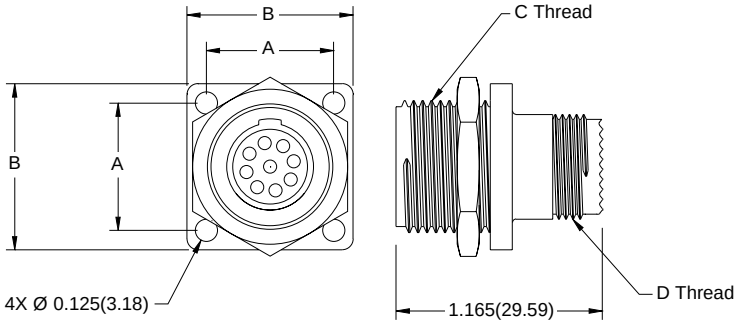
Dimension	Size 11 Housing	Size 19 Housing
A	1.165(29.59)	1.165(29.59)
B	Ø 0.750(19.05)	Ø 1.260(32.00)
C Thread	M19	M32
D Thread	M15	M28

MATERIALS:
Insert: Glass-filled DAP.
Housing & Coupling Nut: Glass-filled polyester.

DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

FIXED JAM NUT MOUNTING

RECEPTACLE HOUSING, MALE OR FEMALE CONTACTS



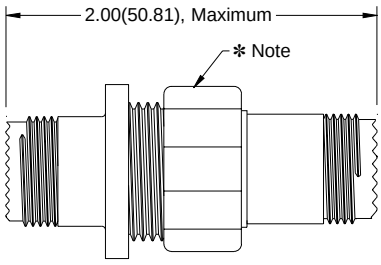
Dimension	Size 11 Housing	Size 19 Housing
A	0.719(18.26)	1.062(26.97)
B	0.938(23.83)	1.438(36.53)
C Thread	M19	M32
D Thread	M15	M28

MATERIALS AND FINISHES:

Insert: Glass-filled DAP.
Housing: Glass-filled polyester.
Jam Nut: Aluminum, black anodize.

IN-LINE TO IN-LINE MOUNTING

LENGTH OF MATED PAIR



MATERIALS:

Insert: Glass-filled DAP.
Housing & Coupling Nut: Glass-filled polyester.

✻ NOTE:
This connector may be ordered without the coupling nut.

DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

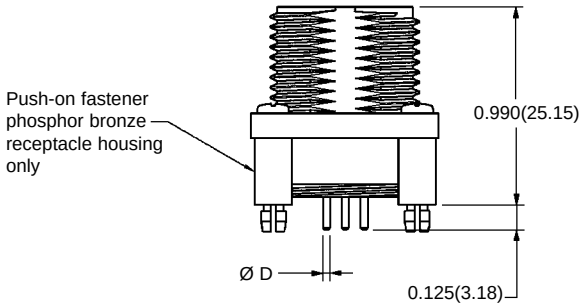
STRAIGHT AND 90° PRINTED BOARD CONNECTORS

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

STRAIGHT PRINTED BOARD MOUNT CONNECTOR

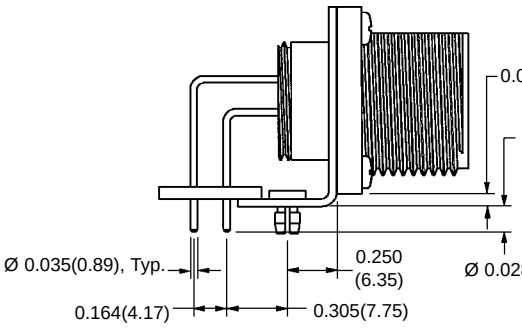
RECEPTACLE HOUSING, MALE OR FEMALE CONTACTS

Contact Size	Ø D
12	0.094(2.39)
16	0.035(0.89)
20	0.028(0.71)
22	0.025(0.64)

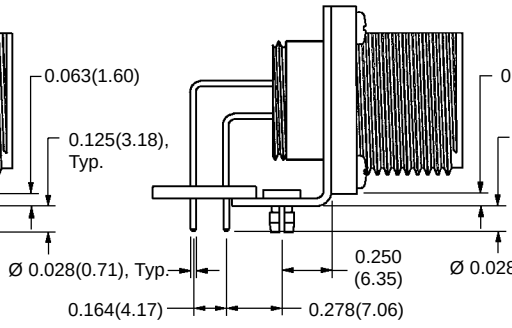


Typical Part Number:
FR11FF316K0-1554.0

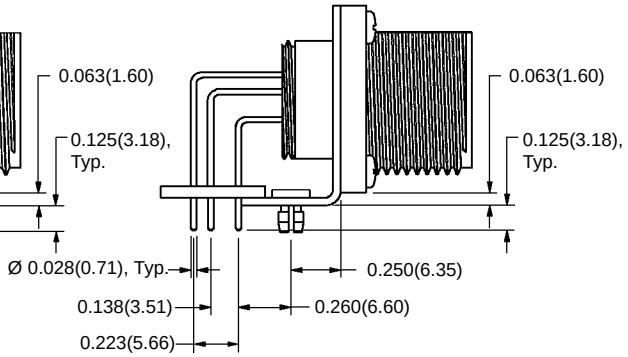
90° PRINTED BOARD MOUNT CONNECTOR



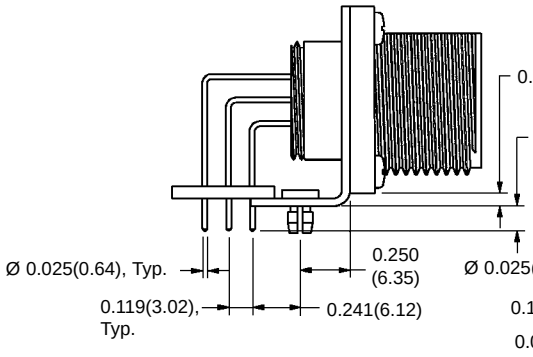
Typical Part Number:
FR11FF316K0-1553.0



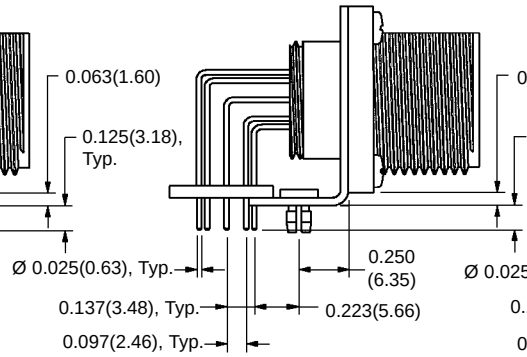
Typical Part Number:
FR11FF420K0-1553.0



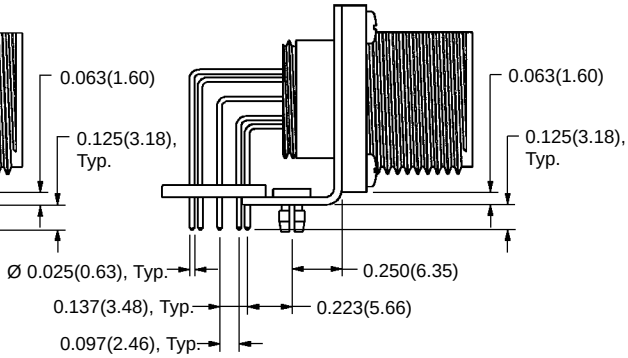
Typical Part Number:
FR11FF520K0-1553.0



Typical Part Number:
FR11FF722K0-1553.0



Typical Part Number:
FR11FF822K0-1553.0

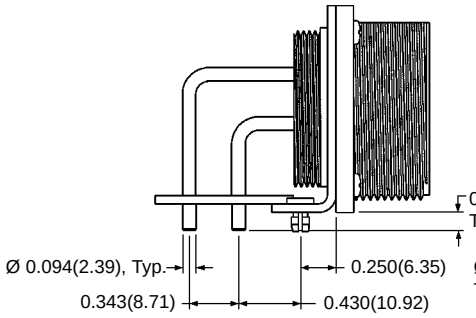


Typical Part Number:
FR11FF922K0-1553.0

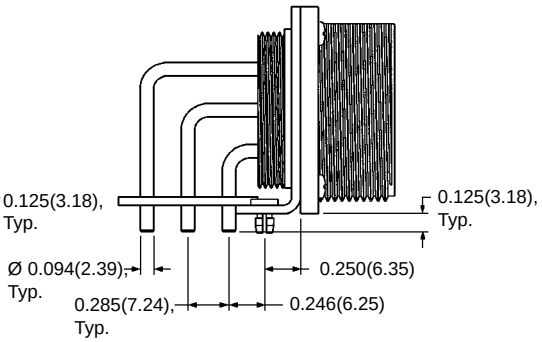
DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

90° PRINTED BOARD CONNECTORS

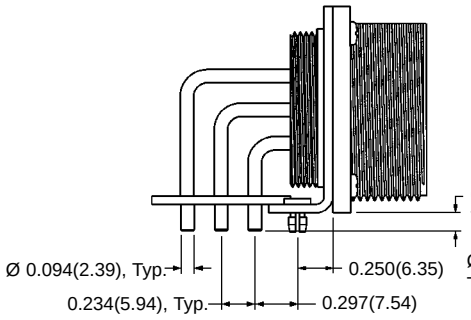
FRONT-RUNNER CIRCULAR CONNECTOR SERIES



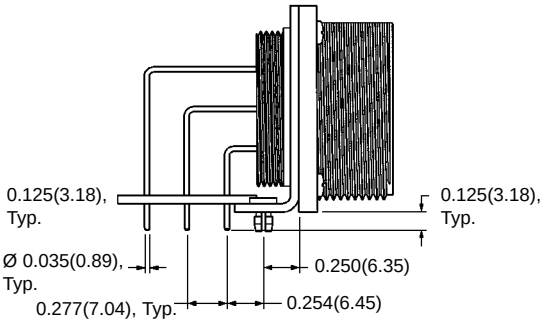
Typical Part Number:
FR19FF312K0-1553.0



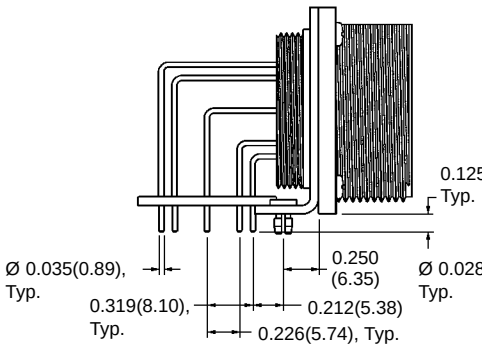
Typical Part Number:
FR19FF512K0-1553.0



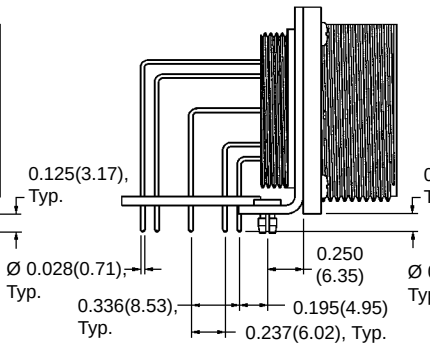
Typical Part Number:
FR19FF712K0-1553.0



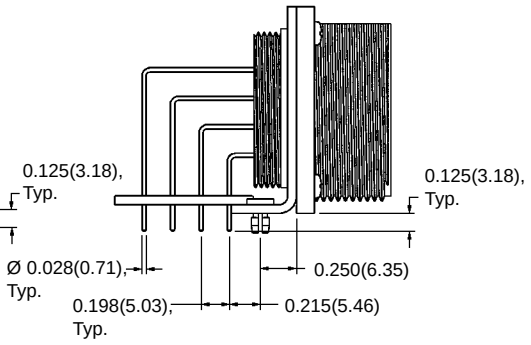
Typical Part Number:
FR19FF716K0-1553.0



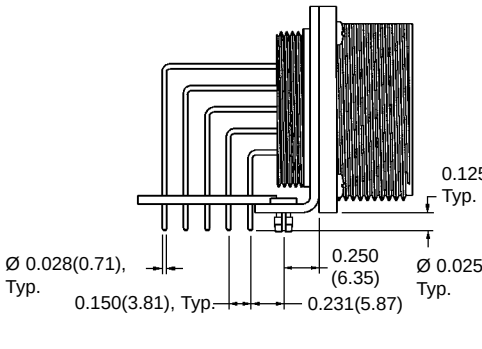
Typical Part Number:
FR19FF916K0-1553.0



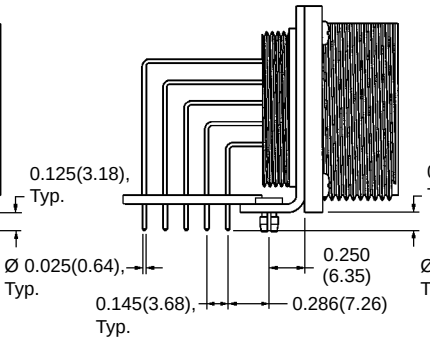
Typical Part Number:
FR19FF920K0-1553.0



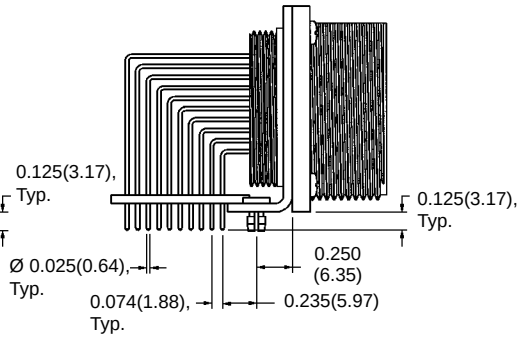
Typical Part Number:
FR19FF1220K0-1553.0



Typical Part Number:
FR19FF1920K0-1553.0



Typical Part Number:
FR19FF1822K0-1553.0



Typical Part Number:
FR19FF2922K0-1553.0

DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

STRAIGHT PRINTED BOARD CONTACT HOLE PATTERN

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

Suggest Ø 0.114(2.90) plated through hole for size 12 contact termination positions.

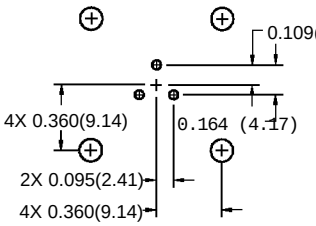
Suggest Ø 0.052(1.32) plated through hole for size 16 contact termination positions.

Suggest Ø 0.045(1.14) plated through hole for size 20 contact termination positions.

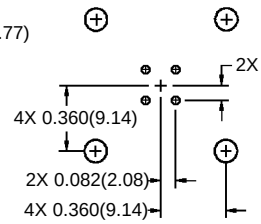
Suggest Ø 0.040(1.02) plated through hole for size 22 contact termination positions.

Suggest Ø 0.123±0.003 (3.12±0.08) hole for mounting connector with push-on fasteners.

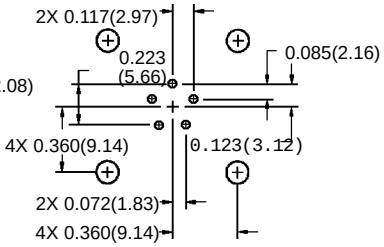
3 Size 16



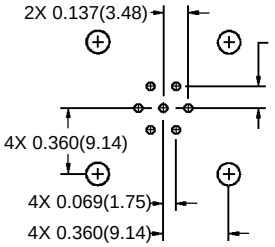
4 Size 20



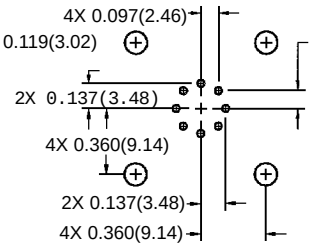
5 Size 20



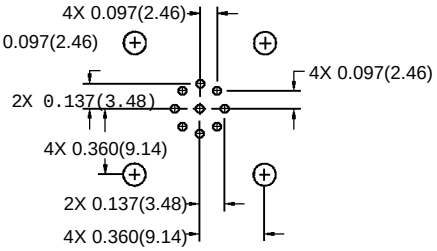
7 Size 22



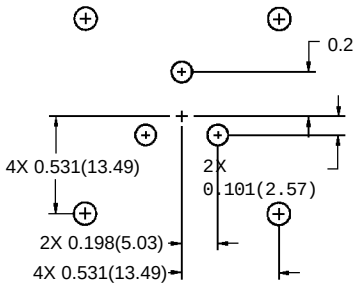
8 Size 22



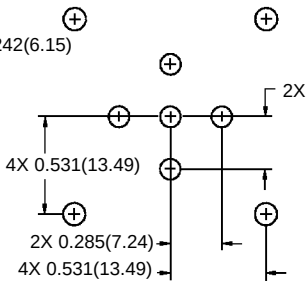
9 Size 22



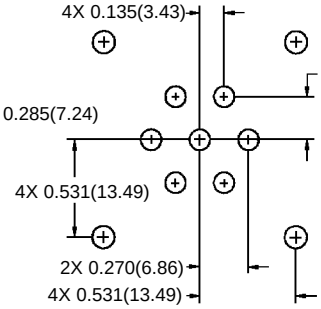
3 Size 12



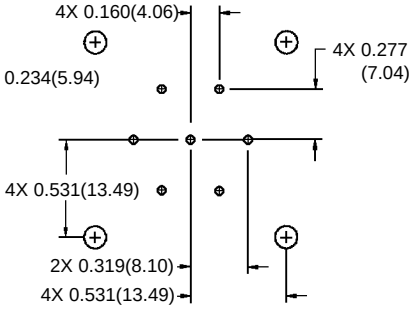
5 Size 12



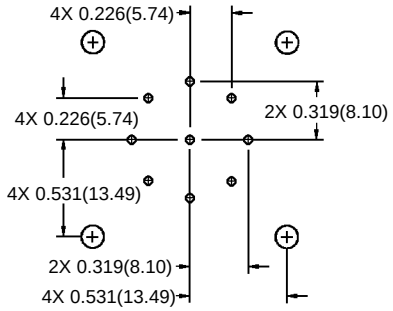
7 Size 12



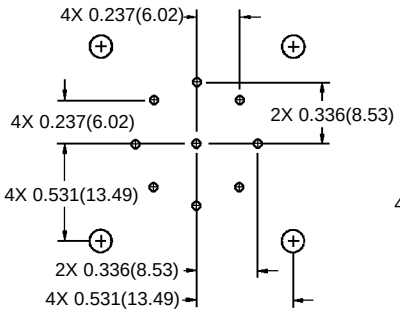
7 Size 16



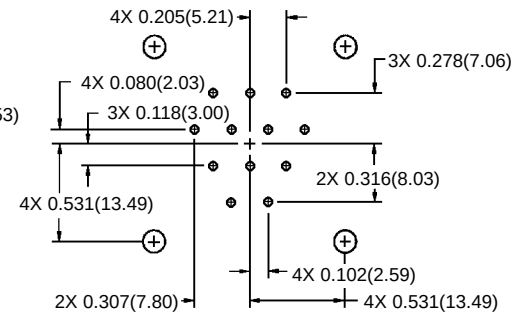
9 Size 16



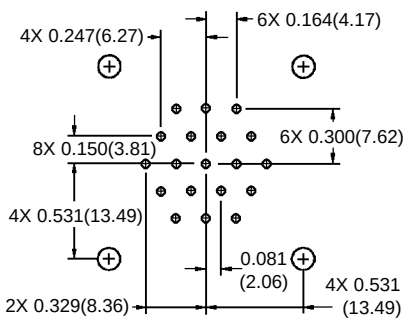
9 Size 20



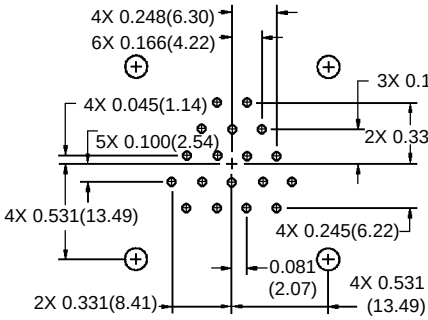
12 Size 20



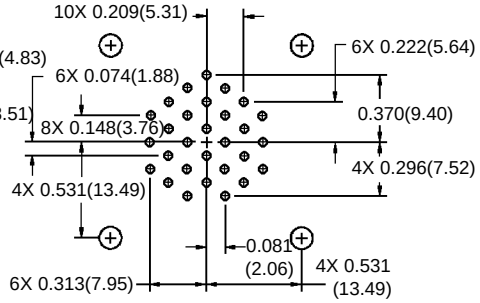
19 Size 20



18 Size 22



29 Size 22



DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

90° PRINTED BOARD CONTACT HOLE PATTERN

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

Suggest Ø 0.114(2.90) plated through hole for size 12 contact termination positions.

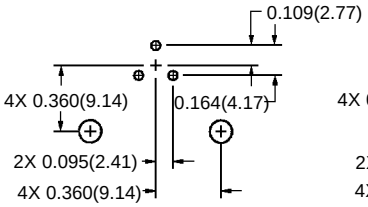
Suggest Ø 0.052(1.32) plated through hole for size 16 contact termination positions.

Suggest Ø 0.045(1.14) plated through hole for size 20 contact termination positions.

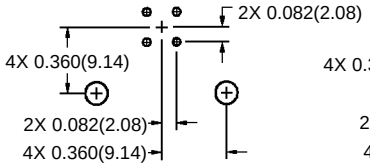
Suggest Ø 0.040(1.02) plated through hole for size 22 contact termination positions.

Suggest Ø 0.123±0.003 (3.12±0.08) hole for mounting connector with push-on fasteners.

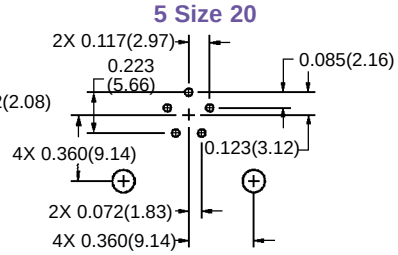
3 Size 16



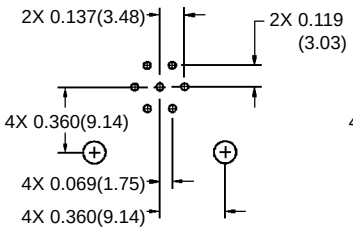
4 Size 20



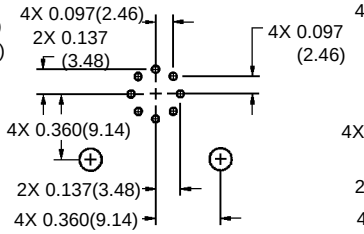
5 Size 20



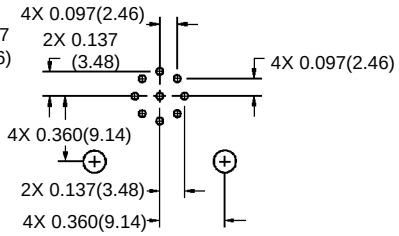
7 Size 22



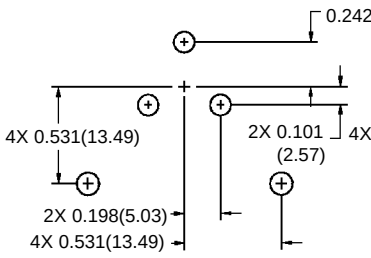
8 Size 22



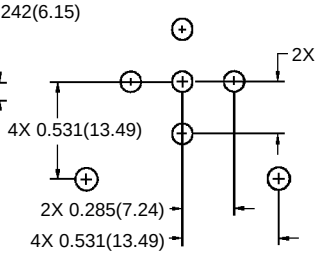
9 Size 22



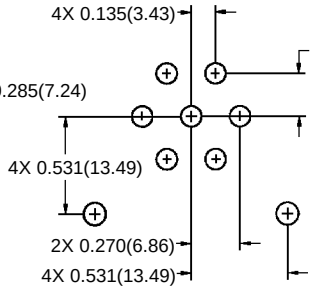
3 Size 12



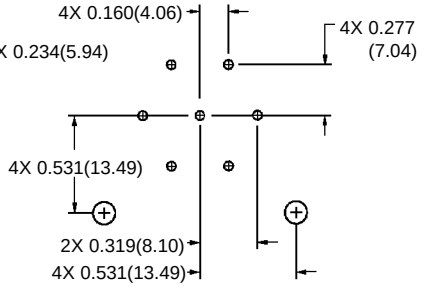
5 Size 12



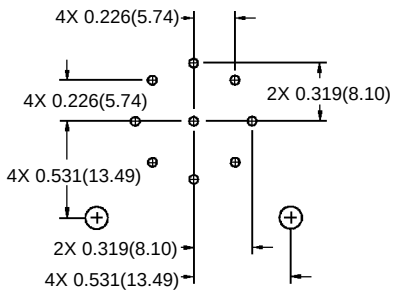
7 Size 12



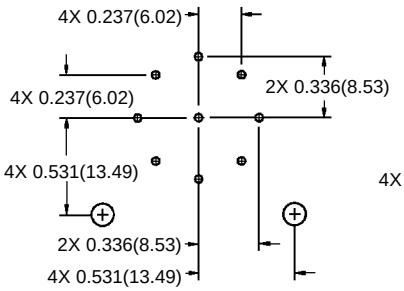
7 Size 16



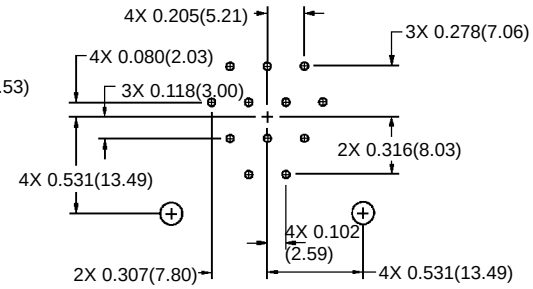
9 Size 16



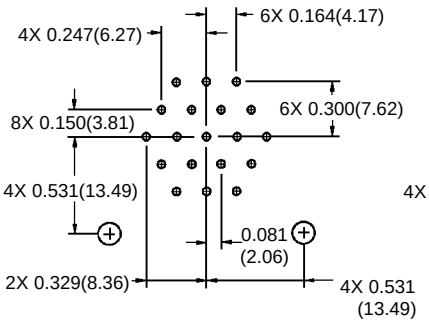
9 Size 20



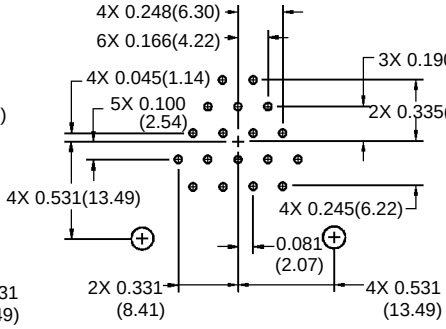
12 Size 20



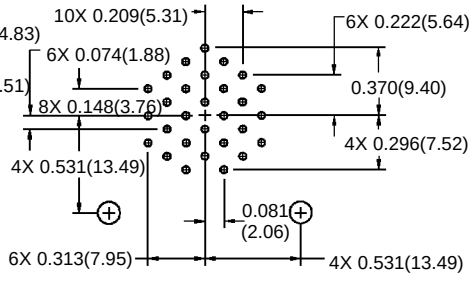
19 Size 20



18 Size 22



29 Size 22

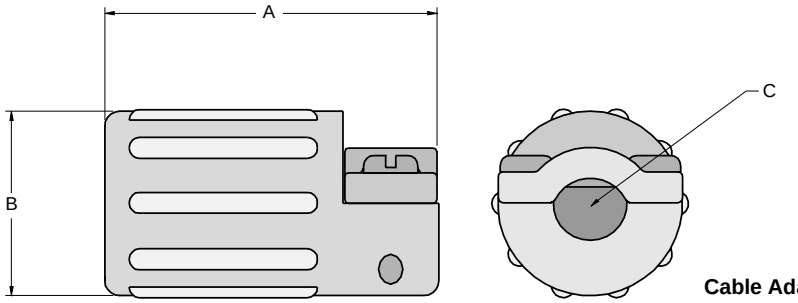


DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

NON-ENVIRONMENTAL VERSION ACCESSORIES

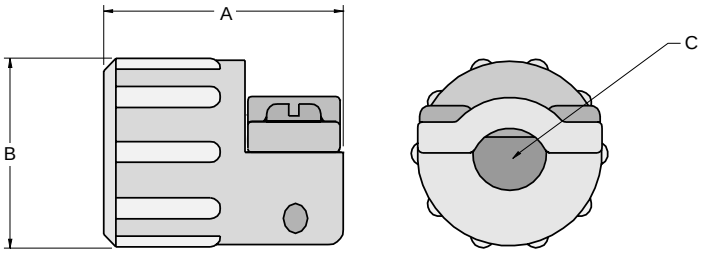
FRONT-RUNNER CIRCULAR CONNECTOR SERIES

CABLE ADAPTERS



MATERIALS:
Cable Adapter & Cable Clamp: Glass-filled polyester.

Long Cable Adapter



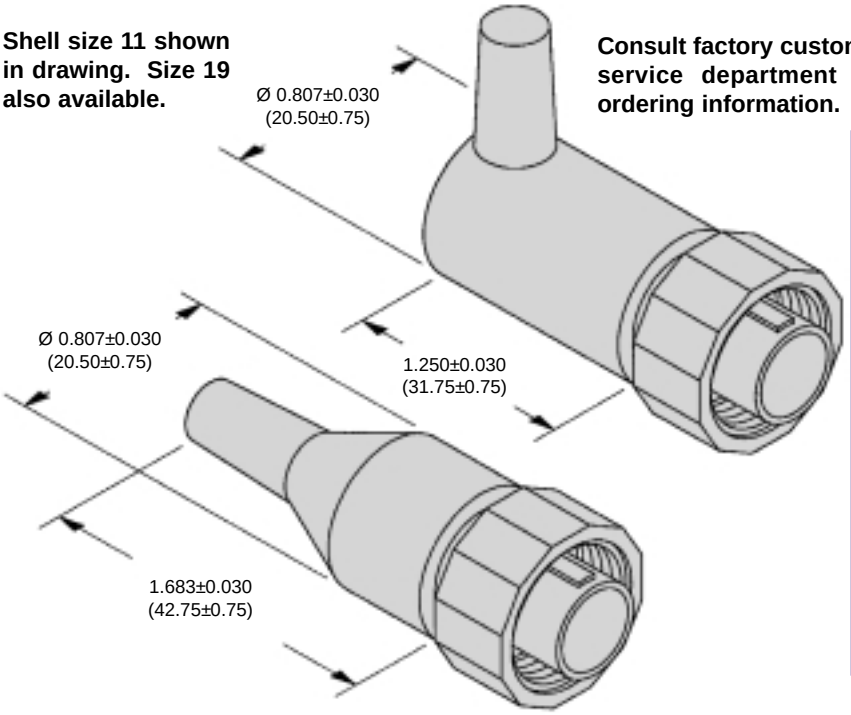
Short Cable Adapter

Dimensions	Long Cable Adapter			Short Cable Adapter		
	A	B	C Cable Range	A	B	C Cable Range
Size 11 Housing	1.350 (34.29)	0.750 (19.05)	0.300 (7.62) Maximum	0.975 (24.77)	0.750 (19.05)	0.300 (7.62) Maximum
Size 19 Housing	1.350 (34.29)	1.250 (31.75)	0.570 (14.48) Maximum	0.975 (24.77)	1.250 (31.75)	0.570 (14.48) Maximum

MOLDED CABLE ASSEMBLY

Shell size 11 shown in drawing. Size 19 also available.

Consult factory customer service department for ordering information.

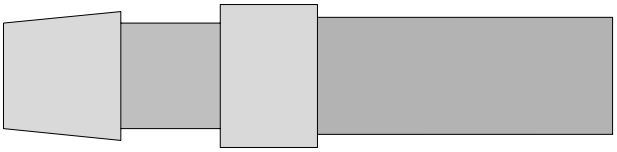


DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

ACCESSORIES AND PANEL CUTOUTS

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

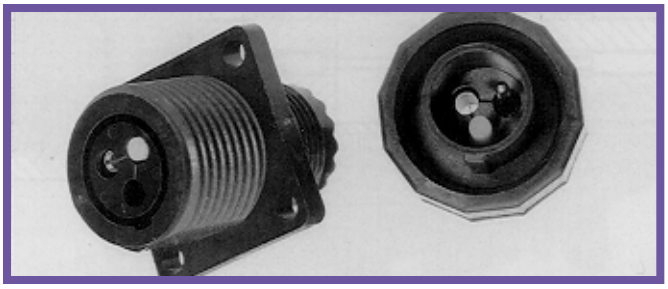
KEYING PLUGS



Keying Plug

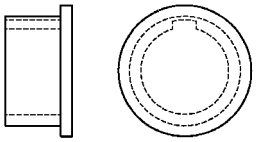
MATERIAL: Nylon.

CONTACT SIZE	KEYING PLUG PART NUMBER
SIZE 12	5123-1
SIZE 16	5123-2
SIZE 20	5123-3
SIZE 22	5123-4



PRESS-ON DUST COVERS

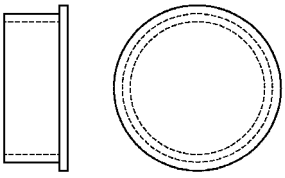
PART NUMBER
5125-11-2 for Size 11 Connector
5125-19-2 for Size 19 Connector



Use with Plug Shell

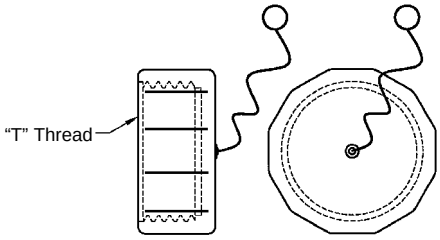
MATERIAL: Low density polyethylene.

PART NUMBER
5125-11-1 for Size 11 Connector
5125-19-1 for Size 19 Connector



Use with Receptacle Shell

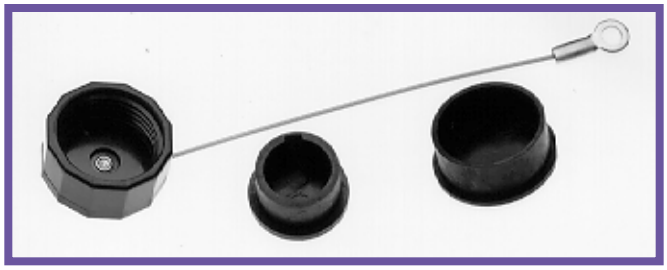
THREADED DUST COVERS



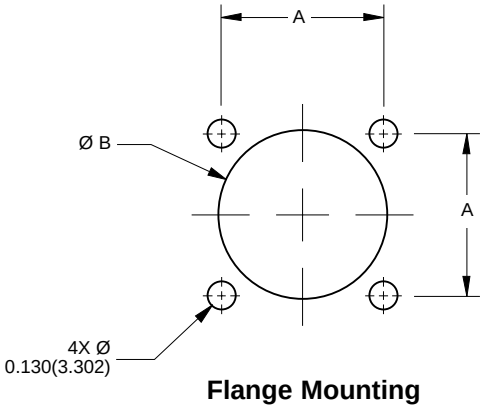
Use with Receptacle Shell

PART NUMBER	THREAD
5125-11-0 for Size 11 Connector	M19
5125-19-0 for Size 19 Connector	M32

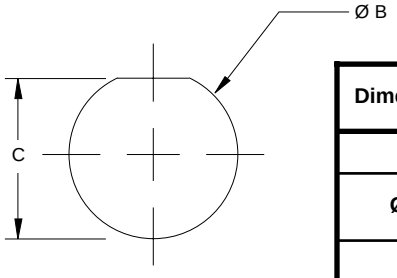
MATERIAL: Glass-filled polyester.



PANEL MOUNTING CUTOUTS



Flange Mounting



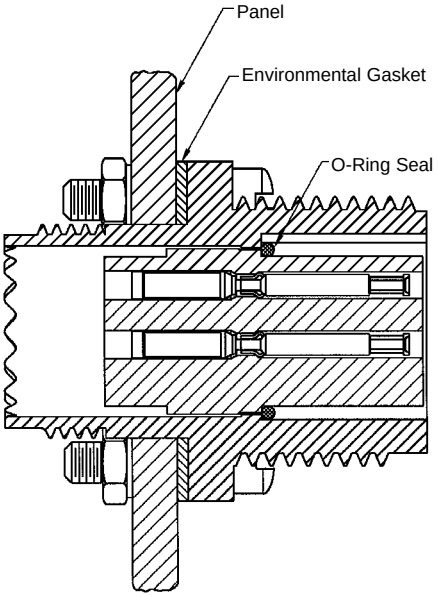
Jam Nut

Suggest 0.092(2.34) maximum panel thickness if using environmental flange gasket or 0.122(3.10) maximum panel thickness without gasket.

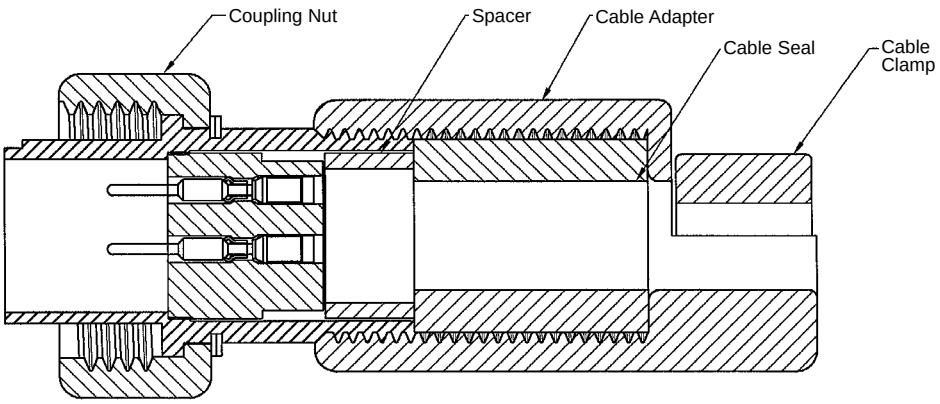
Dimension	Size 11 Housing	Size 19 Housing
A	0.719(18.26)	1.062(26.97)
Ø B	0.760 ±0.003 (19.30 ±0.08)	1.275 ±0.003 (32.39 ±0.08)
C	0.715 ±0.003 (18.16 ±0.08)	1.227 ±0.003 (31.17 ±0.08)

DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

ENVIRONMENTAL DESIGN FEATURES



Fixed Female Flange Mounted Connector



Free Male In-line Connector

MATERIALS:

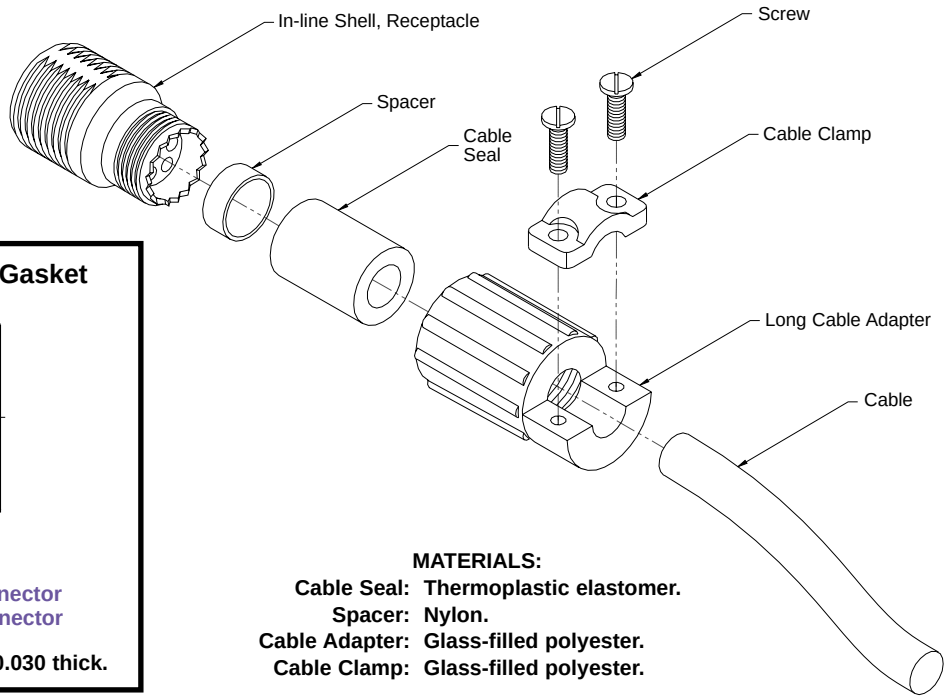
O-Ring: Thermoplastic elastomer.

ENVIRONMENTAL VERSION ACCESSORIES

NOTE: Environmental flange gaskets supplied with flange mount environmental connectors. Part numbers are shown for replacement parts only.

Environmental Cable Adapter Assembly

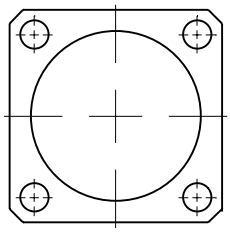
Male or Female, Free In-Line Connectors



MATERIALS:

Cable Seal: Thermoplastic elastomer.
Spacer: Nylon.
Cable Adapter: Glass-filled polyester.
Cable Clamp: Glass-filled polyester.

Environmental Flange Gasket



PART NUMBER:
5124-11-0 for Size 11 Connector
5124-19-0 for Size 19 Connector

MATERIAL: Neoprene sheet, 0.030 thick.

DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

EMI/RFI SHIELDED VERSION

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

TECHNICAL DATA

MATERIAL: **Electroless nickel over copper. Electroless plating offers surface conductivity of < 0.5 ohm per square and attenuation of 70-80 dB at most frequencies. Due to differences in cable construction and termination, results may vary and should be tested under actual operating conditions to determine exact values.**

NOTE: Dimensions are consistent with non-shielded versions.

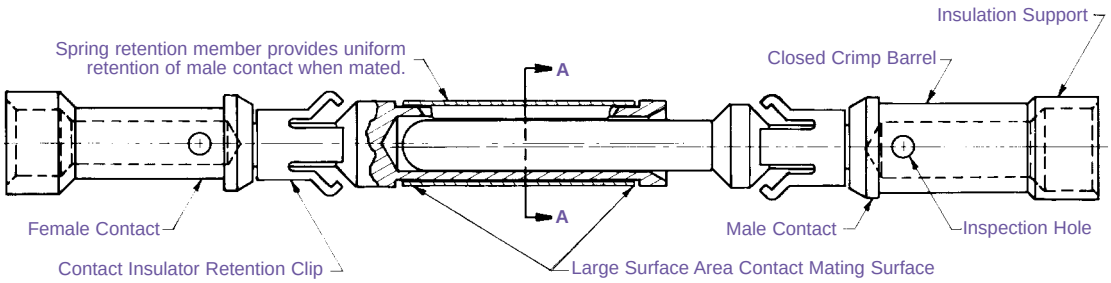
"LARGE SURFACE AREA" CONTACT MATING SYSTEM

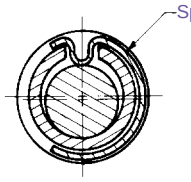
FRONT-RUNNER CIRCULAR CONNECTOR SERIES

FRONT RUNNER HIGH PERFORMANCE CONTACTS

"LARGE SURFACE AREA CONTACT MATING SYSTEM"

HIGH RELIABILITY "CLOSED ENTRY" DESIGN
PRECISION MACHINED SOLID COPPER ALLOY





SECTION A-A ENLARGED

All contacts of Positronic's Front Runner Series utilize the "Large Surface Area (L.S.A.) Contact Mating System." The "L.S.A. Contact Mating System" insures the lowest level of contact resistance during mechanical endurance tests of 1000 coupling cycles or more. Contact insertion/withdrawal forces remain substantially the same during the life of the connector.

Front Runner Series use only "Closed Entry" design female contacts. The "Closed Entry" design prevents probe damage to the female contacts, and will not allow the female contact to accept misaligned or bent male contacts.

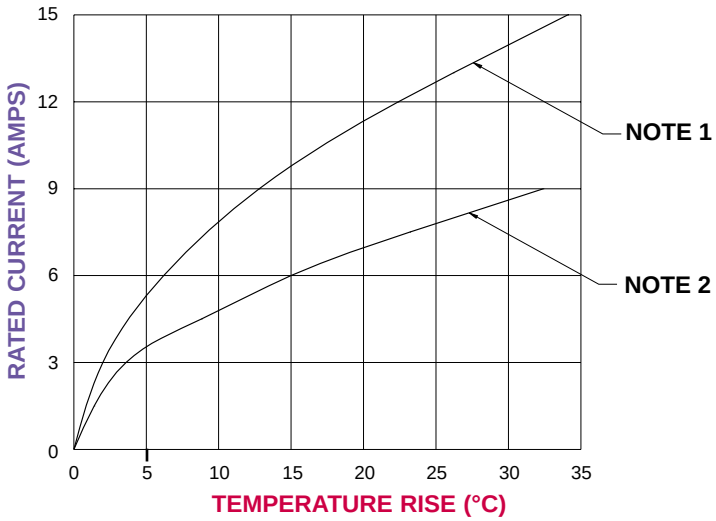
All Front Runner Series contacts are precision machined from solid copper alloy barstock. They are durable, smooth in construction, and have greater amperage capacities than hollow, sheet metal-style contacts.

Front Runner Series contacts, having a large contact surface area, produce less heat at the contact surface, thereby permitting the connector to operate at high amperage levels continuously and still maintain lower connector temperatures.

CONNECTOR TEMPERATURE RISE CURVES

(Tested per IEC Publication 512-3, Test 5a)

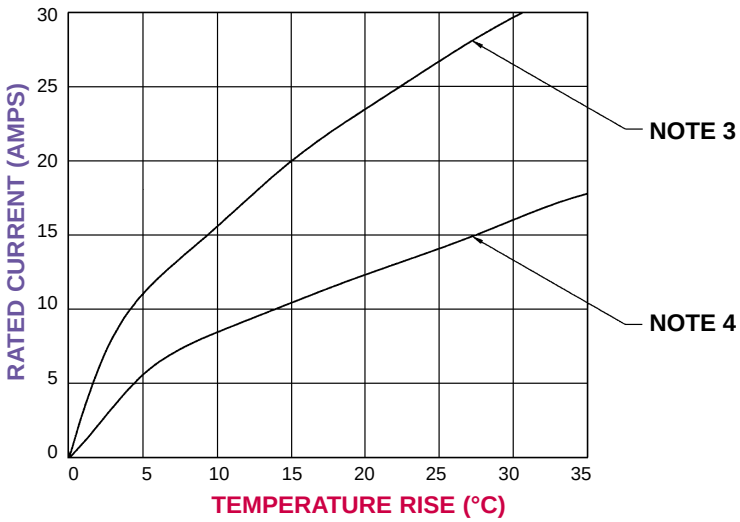
Size 16 Contact / Size 20 Contacts / Size 11 Housing



NOTE 1:
Curve developed using FR11MP316K0 and FR11FF316K0 connectors, MC116N and FC116N2 crimp contacts and 16 AWG (1.5 mm²) size wire. All contacts under load.

NOTE 2:
Curve developed using FR11MP520K0 and FR11FF520K0 connectors, MC720N and FC720N2 crimp contacts and 20 AWG (0.5 mm²) size wire. All contacts under load.

Size 12 Contact / Size 16 Contacts / Size 19 Housing



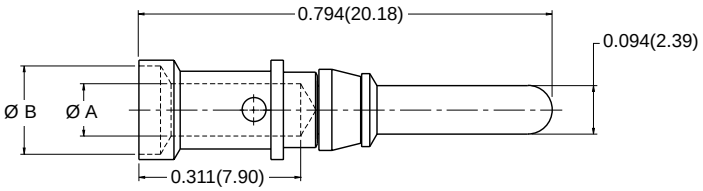
NOTE 3:
Curve developed using FR19MF312K0 and FR19FP312K0 connectors, MC612N and FC612N2 crimp contacts and 12 AWG (4.0 mm²) size wire. All contacts under load.

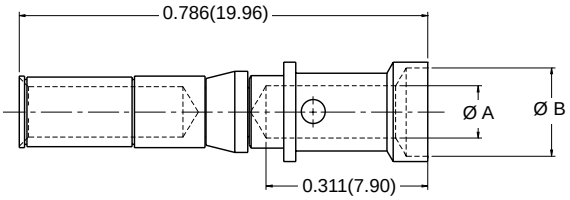
NOTE 4:
Curve developed using FR19MF716K0 and FR19FP716K0 connectors, MC116N and FC116N2 crimp contacts and 16 AWG (1.5 mm²) size wire. All contacts under load.

REMOVABLE CONTACTS

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

SIZE 12 CONTACTS





Male Contact

MALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
MC612N	12 (4.0)	0.100 (2.54)	0.170 (4.32)

Female Contact

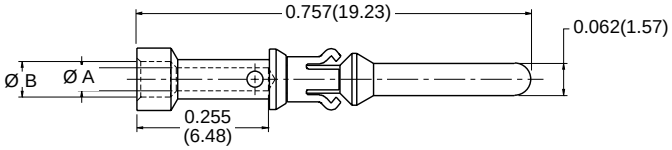
FEMALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
FC612N2	12 (4.0)	0.100 (2.54)	0.170 (4.32)

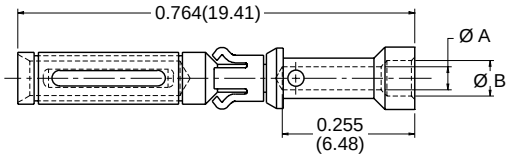
MATERIALS AND FINISHES:

Material: Copper Alloy.
Finish: 0.000010 inch (0.25 µ) gold over nickel or copper.

0.000030 inch (0.75 µ) gold over nickel available by adding "-14" suffix onto the part number. Example: MC612N-14.

SIZE 16 CONTACTS





Male Contact

MALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
MC114N	14 / 16 (2.5 / 1.5)	0.081 (2.06)	0.105 (2.67)
MC116N	16 / 18 (1.5 / 1.0)	0.067 (1,70)	0.093 (2.36)
MC120N	20 / 22 / 24 (0.5 / 0.3 / 0.25)	0.045 (1.14)	0.065 (1.65)

Female Contact

FEMALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
FC114N2	14 / 16 (2.5 / 1.5)	0.081 (2.06)	0.105 (2.67)
FC116N2	16 / 18 (1.5 / 1.0)	0.067 (1.70)	0.093 (2.36)
FC120N2	20 / 22 / 24 (0.5 / 0.3 / 0.25)	0.045 (1.14)	0.065 (1.65)

MATERIALS AND FINISHES:

Material: Copper Alloy.
Finish: 0.000010 inch (0.25 µ) gold over nickel or copper.

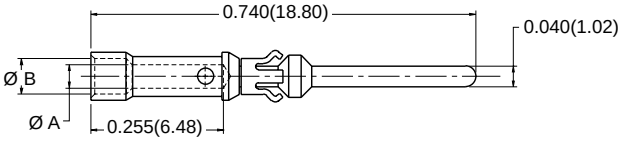
0.000030 inch (0.75 µ) gold over nickel available by adding "-14" suffix onto the part number. Example: FC116N2-14.

DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

REMOVABLE CONTACTS

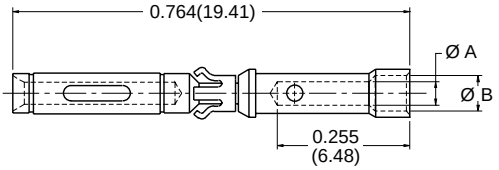
FRONT-RUNNER CIRCULAR CONNECTOR SERIES

SIZE 20 CONTACTS



Male Contact

MALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
MC720N	20 / 22 / 24 (0.5 / 0.3 / 0.25)	0.045 (1.14)	0.068 (1.73)



Female Contact

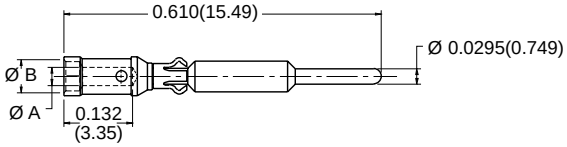
FEMALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
FC720N2	20 / 22 / 24 (0.5 / 0.3 / 0.25)	0.045 (1.14)	0.068 (1.73)

MATERIALS AND FINISHES:

Material: Copper Alloy.
Finish: 0.000010 inch (0.25 µ) gold over nickel or copper.

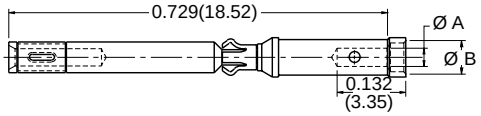
0.000030 inch (0.75 µ) gold over nickel available by adding "-14" suffix onto the part number. Example: FC720N2-14.

SIZE 22 CONTACTS



Male Contact

MALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
MC422N	22 / 24 / 26 (0.3 / 0.25 / 0.12)	0.035 (0.89)	0.056 (1.42)



Female Contact

FEMALE CONTACT PART NUMBER	WIRE SIZE AWG(mm²)	Ø "A"	Ø "B"
FC422N6	22 / 24 / 26 (0.3 / 0.25 / 0.12)	0.035 (0.89)	0.056 (1.42)

MATERIALS AND FINISHES:

Material: Copper Alloy.
Finish: 0.000010 inch (0.25 µ) gold over nickel or copper.

0.000030 inch (0.75 µ) gold over nickel available by adding "-14" suffix onto the part number. Example: MC422N-14.

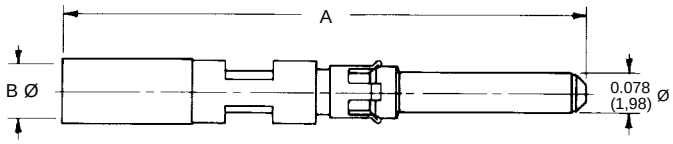
ADVANTAGES OF REAR INSERTION-FRONT RELEASE CONTACT RETENTION SYSTEM

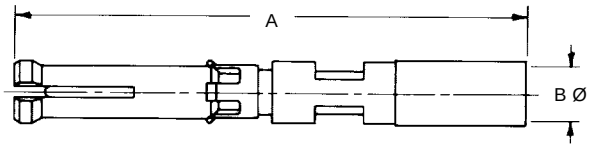
CONSIDERATION	FRONT RELEASE ADVANTAGE
1. Size	Will accept a wire with oversized insulation diameter.
2. Connector Wiring	Less open wiring is required between the connector and the lacing or between the connector and the cable jacket. Minimum service time is required for repairs.
3. Shielded Wires	Provides the most effective RFI shielding as the shielding can be brought closer to the grommet surface for terminations to the connector shell.
4. Contact Servicing	Since the removal tool is inserted from the front, finding the correct position is relatively simple.
5. Wire Breakage	The standard removal tool can be used to remove a contact which has a broken wire at the contact crimp joint.
6. Service Tools	Metal tools are available for inserting and removing contacts.

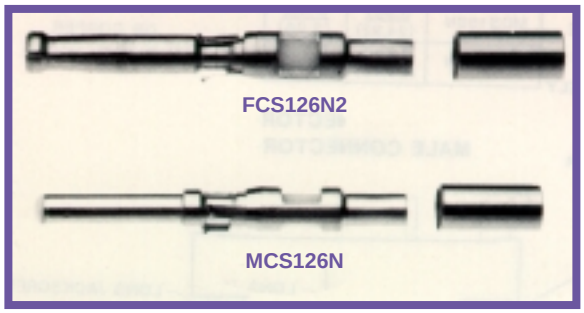
DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

CRIMP SHIELDED CONTACTS

SIZE 16







CONTACT DESIGNATION	PART NUMBER	A	B Ø	CABLE SIZE
MALE	MCS126N	0.993 (25.22)	0.045 (1.14)	RG 178 B/U RG 196 A/U
FEMALE	FCS126N2	0.967 (24.56)	0.045 (1.14)	RG 178 B/U RG 196 B/U
MALE	MCS226N	1.048 (26.62)	0.070 (1.78)	RG 179 B/U RG 316 /U
FEMALE	FCS226N2	1.022 (25.96)	0.070 (1.78)	RG 179 B/U RG 316 /U

TECHNICAL CHARACTERISTICS

MATERIALS AND FINISHES:

Insulating Material: (Dielectric) Teflon.

Inner Contacts: Phosphor bronze, 0.000030 inch (0.8 microns) gold over nickel.

Outer Contacts: Brass and beryllium copper, 0.000010 inch (0.2 microns) gold over nickel.

MECHANICAL CHARACTERISTICS:

Contact Retention in Insulator: 20 lbs. (89N).

Removable Contacts: Rear insertion, front removable.

Insertion Force per Contact: 8 oz. (2.2 N) per contact maximum.

Durability: 100 cycles minimum.

Vibration: 20g from 10 HZ to 500 HZ.

Shock: 30g - 11rms.

ELECTRICAL CHARACTERISTICS:

MICRO-COAXIAL CONTACTS	CONTACT / WIRE COMBINATIONS			
	126N		226N	
	RG178	RG196	RG179	RG316
Characteristic Impedance (ohms)	50	50	75	50
Frequency Range	0 - 500 MHz			
VSWR				
0 to 200 MHz	1.25			
200 to 500 MHz	1.70		2.25	
Insertion Loss @ 500 MHz	0.2 dB		1.0 dB	

Dielectric Strength at Sea Level: 600 V rms.

Initial Contact Resistance: 0.012 ohms maximum.

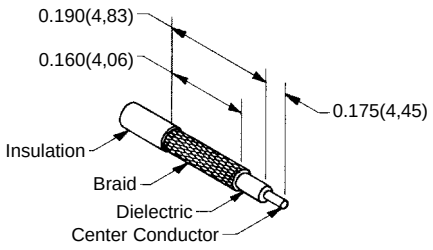
Insulator Resistance: 5 G ohms.

CLIMATIC CHARACTERISTICS:

Temperature Range: -55˚C to +125˚C

9506-0 CRIMP TOOL

SHIELDED CABLE STRIP LENGTH



DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

ORDERING INFORMATION

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

ORDERING INFORMATION
CODE NUMBERING SYSTEM

STEP	1	2	3	4	5	6	—	7
CODE	FR	11	MP	922	K	1		
	FR	11	FR	922	K	1		

STEP 1 - BASIC SERIES
FR - Front Runner Series

STEP 2 - HOUSING SIZE
11 - Size 11 Housing
19 - Size 19 Housing

STEP 3 - HOUSING STYLE AND GENDER
MP - Free In-line, Male Contacts with Plug Housing
FP - Free In-line, Female Contacts with Plug Housing
MF - Fixed Flange Mount, Male Contacts with Receptacle Housing
FF - Fixed Flange Mount, Female Contacts with Receptacle Housing
MJ - Fixed Jam Nut, Male Contacts with Receptacle Housing
FJ - Fixed Jam Nut, Female Contacts with Receptacle Housing
MR - Free In-line, Male Contacts with Receptacle Housing
FR - Free In-line, Female Contacts with Receptacle Housing

STEP 4 - CONTACT ARRANGEMENTS AND SIZE

SIZE 11 HOUSING

316 - Three (3) Size 16 Contacts
420 - Four (4) Size 20 Contacts
520 - Five (5) Size 20 Contacts
722 - Seven (7) Size 22 Contacts
822 - Eight (8) Size 22 Contacts
922 - Nine (9) Size 22 Contacts

SIZE 19 HOUSING

312 - Three (3) Size 12 Contacts
512 - Five (5) Size 12 Contacts
712 - Seven (7) Size 12 Contacts
716 - Seven (7) Size 16 Contacts
916 - Nine (9) Size 16 Contacts
920 - Nine (9) Size 20 Contacts
1220 - Twelve (12) Size 20 Contacts
1822 - Eighteen (18) Size 22 Contacts
1920 - Nineteen (19) Size 20 Contacts
2922 - Twenty-nine (29) Size 22 Contacts

STEP 5 - SERVICE CLASS
K - Non-Environmental
L - Environmental
M - EMI/RFI Shielded
LM - Environmental and EMI/RFI Shielded

Note: Crimp contacts must be ordered separately. Select desired contact size and wire gauge size from pages 16 and 17.

Order Size 16 micro-coaxial contacts from page 18.

STEP 6 - CABLE ADAPTERS (HOOD)
0 - None
1 - Long, Straight, Non-Environmental
2 - Short, Straight, Non-Environmental
4 - Long, Straight, Environmental
5 - Long, Straight, EMI/RFI
6 - Short, Straight, EMI/RFI

STEP 7 - SPECIAL OPTIONS
CONSULT THE FACTORY FOR ORDERING DETAILS OF THE FOLLOWING:

- MOS 1553.0: 90° Printed Board Mount Terminations with 0.125 (3.18) Contact Tail Length. Metal Mounting Brackets with Push-On Fasteners are Included. Receptacle Housing Connectors Only.
- MOS 1554.0: Straight Printed Board Mount Terminations with 0.125 (3.18) Contact Tail Length. Push-On Fasteners are Included. Receptacle Housing Connectors Only.
- Sequential Mating System.
- MOS 1512.0: Without Coupling Nut.
- Other Special Requirements.

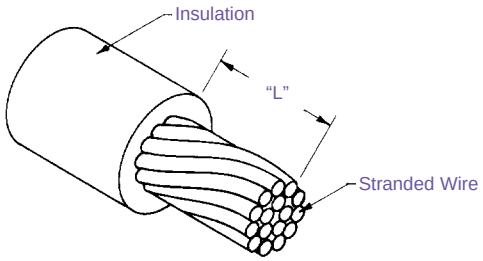
DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

CRIMPING INFORMATION FOR FRONT RUNNER CRIMP CONTACTS

Step 1: Strip wire to indicated length.

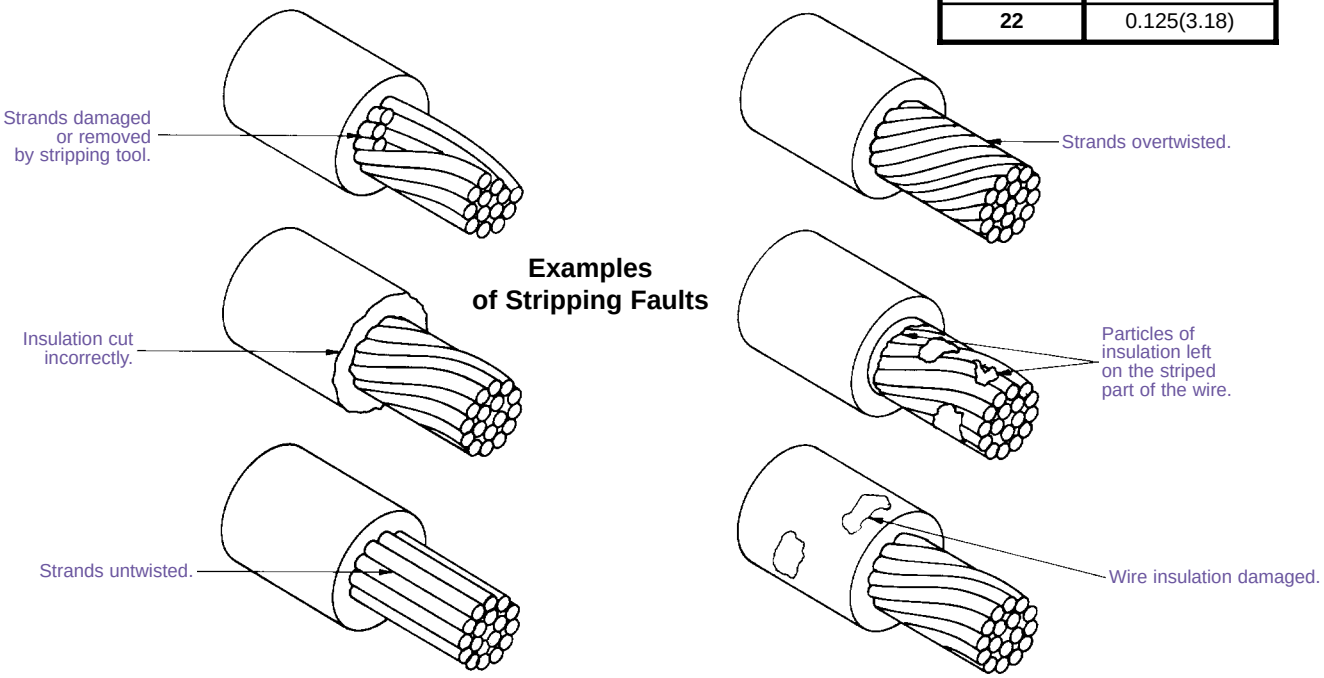
Take care not to:
- Damage or remove strands.
- Untwist or overtwist strands.
- Leave insulation particles on strands.
- Damage insulation.

Correctly Stripped Wire:



CONTACT SIZE	"L" ±0.020(0.51)
12	0.290(7.37)
16	0.230(5.84)
20	0.230(5.84)
22	0.125(3.18)

Examples of Stripping Faults



DIMENSIONS ARE IN INCHES (MILLIMETERS).
ALL DIMENSIONS ARE SUBJECT TO CHANGE.

Step 2: Crimp wire to contact.

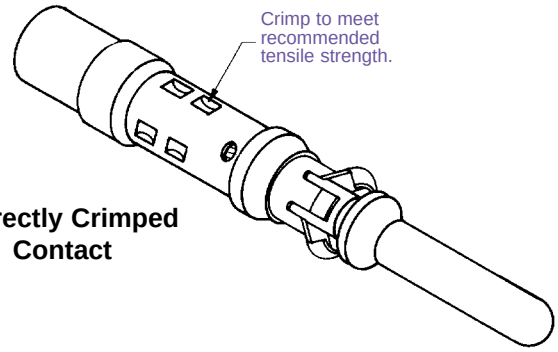
For Hand Crimp Tool:
- Place contact into crimping tool.
- Insert wire into contact.
- Center contact by slowly closing crimping tool until crimp indenters make contact with crimp barrel.
- Complete the cycle of the crimping tool in one smooth motion.
- Remove the crimped contact.

For Automatic Feed Pneumatic Crimp Tool:
- Insert wire into the contact, positioned in the crimp tool by the plastic carrier.
- Depress the activating device of the crimping tool to start crimping cycle.
- Remove the crimped contact.

CRIMPING INFORMATION FOR FRONT RUNNER CRIMP CONTACTS

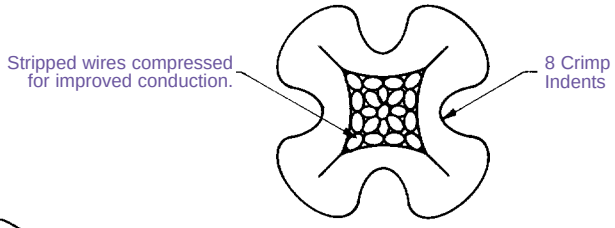
Step 3: Inspect crimp.

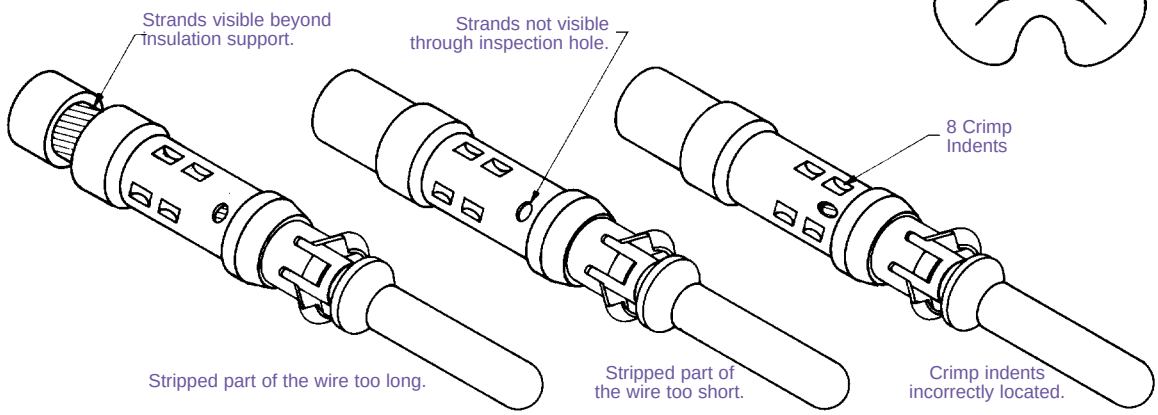
For All Tools:
- Strands to be visible through the inspection hole.
- Strands not to be visible beyond the insulation support.
- Crimped contact to meet recommended conductor tensile force shown in chart (below, left).
- Check for peeled gold and bent contact.



Correctly Crimped Contact

Cross-section of Correctly Crimped Contact





Examples of Crimping Faults

Positronic Recommended Conductor Tensile Strength

WIRE SIZE	AXIAL LOAD
12 AWG(4.0 mm²)	110 lbs.(489N)
14 AWG(2.5 mm²)	70 lbs.(311N)
16 AWG(1.5 mm²)	50 lbs.(222N)
18 AWG(1.0 mm²)	28 lbs.(125N)
20 AWG(0.5 mm²)	20 lbs.(89N)
22 AWG(0.3 mm²)	12 lbs.(53N)
24 AWG(0.25 mm²)	8 lbs.(36N)
26 AWG(0.12 mm²)	5 lbs.(22N)

POSITRONIC RECOMMENDED TOOLS				
Tool Description	**Size 12 Contact**	**Size 16 Contact**	**Size 20 Contact**	**Size 22 Contact**
Hand Crimp Tool	9501 with 9502-19 Positioner	9501 with 9502-1 Positioner	9507 with 9502-21 Positioner for Male Contacts or 9502-22 Positioner for Female Contacts	9507 with 9502-12 Positioner for Male Contacts or 9502-20 Positioner for Female Contacts.
Pneumatically Actuated Automatic Feed, Strip, and Crimp Tool	----------	9550-0	9550-1	9550-1
Contact Insertion Tool	9099-3	9099	9099-4	9099-1
Contact Extraction Tool	2711-0	9081	9081-2	9081-3

CONTACT CRIMPING TOOLS AND ACCESSORIES

FRONT-RUNNER CIRCULAR CONNECTOR SERIES

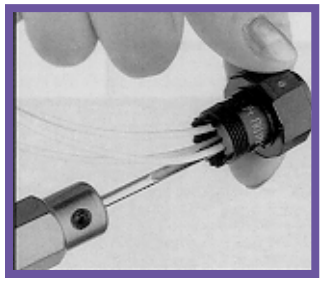
CONTACT INSERTION TOOL

An easy-to-use contact insertion tool for 12 AWG (4.0 mm²) and smaller wires. Reference photos at the bottom of this page for recommended insertion procedure.

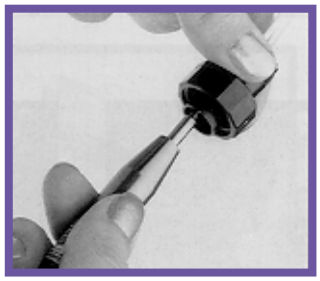
CONTACT EXTRACTION TOOLS

These spring-loaded contact extraction tools simplify the extraction of removable contacts from the connector insulators. Simply insert the hollow tool tip over the male or female contact from the front face of the insulator, rotate the tool slightly while increasing the pushing force against the butt of the extraction tool. The contact will be released from the insulator retention system and will "pop out" of the rear face of the insulator. Reference photos at the bottom of this page for recommended removal procedure.

CONTACT INSERTION



CONTACT EXTRACTION



NOTE:

Reference chart, bottom of page 21, for recommended tool part numbers.

CYCLE-CONTROLLED STEP ADJUSTABLE HAND CRIMP TOOL

Features of this positive ratchet action tool include accommodations for wire sizes 12 AWG (4.0 mm²) through 26 AWG (0.12 mm²) and eight (8) impression crimp-on wires and contacts of various compositions. A turret head is required for use with this basic tool.

AUTOMATIC FEED, STRIP AND CRIMP TOOL, PNEUMATICALLY ACTIVATED

This fast cycling and reliable automatic feed, strip and crimp tool produces a four, double-indent crimp, meeting Military Standard and proprietary specifications on wire sizes 12 AWG (4.0 mm²) through 26 AWG (0.12 mm²).

The tool is a bench mount unit of compact size and weight. Contacts must be ordered separately and are supplied on a reel in quantities of 2000. A foot pedal control valve is supplied as a standard accessory.

NORTH AMERICAN HEADQUARTERS

UNITED STATES, Springfield, Missouri

Factory Sales and Engineering Offices	(800)641-4054

PUERTO RICO, Ponce Factory

Factory Sales and Engineering Offices	(787)841-0920

MEXICO

Factory Sales and Engineering Offices	(800)872-7674

CANADA

Factory Sales and Engineering Offices	(800)327-8272

PACIFIC BASIN HEADQUARTERS

SINGAPORE, Asian Factory

Factory Sales and Engineering Offices	65-6842-1419
Malaysia Sales Office	65-6842-1419
Taiwan Sales Office	8862-2937-8775
China (Shanghai) Sales Office	8621-6308-3640
Japan Sales Office	8135-661-3047

*Additional Technical Agents in Australia, New Zealand, India South Korea,Thailand, Philippines, Hong Kong and Indonesia.

EUROPEAN HEADQUARTERS

FRANCE, Auch Factory

Factory Sales and Engineering Offices	33 5 62 63 44 91

EUROPE, Direct Sales Offices

Northern France Sales Office	33 1 45 88 13 88
Southern France Sales Office	33 4 67 72 80 28
Italy Sales Office	39 2 54 116 106
Germany Sales Office	49 2351 63 47 39

EUROPE, Technical Agents

Technical Agents in Austria, Benelux, Denmark, Finland, Greece, Ireland, Scotland, Slovenia, Spain, Sweden, Switzerland and the United Kingdom

MIDEAST, Technical Agents

Technical Agents in Israel and Turkey

POSITRONIC INDUSTRIES, INC.
423 N Campbell Ave • PO Box 8247 • Springfield, MO 65801
Tel (417) 866-2322 • Fax (417) 866-4115 • Toll Free (800) 641-4054
info@connectpositronic.com

POSITRONIC INDUSTRIES, S.A.S.
Zone Industrielle d'Engachies • 46 Route d'Engachies • F-32020
Auch Cedex 9 • France
Telephone 05 62 63 44 91 • Telecopieur 05 62 63 51 17
contact@connectpositronic.com

POSITRONIC ASIA PTE LTD.
3014A Ubi Road 1 #06-07 • Singapore 408703
Telephone (65) 6842-1419 • Fax (65) 6842-1421
singapore@connectpositronic.com

www.connectpositronic.com