



FRF/FVF Fire wall connectors are designed to meet the requirements of MIL-C-5015 and prevent the passage of +1093°C (+2000°F) flames for 20 minutes. They incorporate the latest sophisticated design improvements necessary to meet the exacting demands of supersonic flight applications. Some of these features are temperature capabilities to +204°C (+392°F) for more than 1000 hours, lighter weight, small than other MIL-C-5015 firewall connectors, and crimp front release contacts.

Firewall connectors fulfill the very important application of providing a means to penetrate the engine firewall of military and commercial aircraft with

electrical circuits, and still maintain the integrity of the flame barrier requirements of the aircraft firewall. These connectors provide protection against high temperatures, emergency fire-retardant conditions, moisture, atmospheric changes, and are resistant to fuels, cleaning agents, coolants, and hydraulic fluids. Materials of connector arrangements are designed to meet the requirements of MIL-C-5015 Class K connectors.

The maximum operating temperature noted for these connectors is the maximum internal hot spot resulting from any combination of electrical load and ambient conditions.

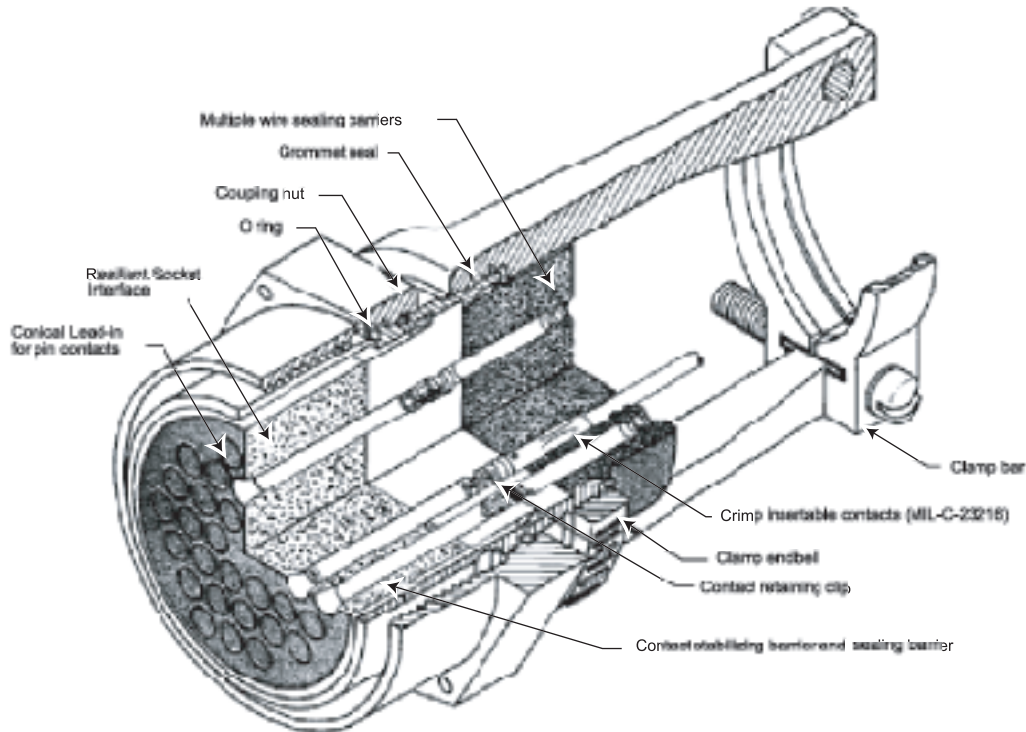
How to Order

	FRF	6	E	12S	3	P	X	-01
	FVF	0	A	12S	3	S	X	
	FRA	0	-	12S	3	P		
	FVA	6	-	12S	3	S		FO

SERIES PREFIX _____	FRF	6	E	12S	3	P	X	-01
SHELL STYLE _____								
ACCESSORY HARDWARE _____								
SHELL SIZE _____								
CONTACT ARRANGEMENT _____								
CONTACT TYPE _____								
INSERT PLARIZATION _____								
LESS CONTACTS _____								
MODIFIERS _____								

SERIES PREFIX FRF - Fluorosilicone elastomers, steel hardware with clear chromate (A105) finish FVF - Silicone elastomers, steel hardware with clear chromate (A105) finish FRA - Same as FRF except aluminum hardware FVA - Same as FVF except aluminum hardware	CONTACT ARRANGEMENT See pages 216-217	MODIFIERS (continued) 12 - Combination 07 and 10 codes 13 - 01 code, with safety wire holes on coupling nut 14 - 90° endbell (with saddle clamp and ferrule) 15 - Combination 01 and 14 codes 16 - 03 code plus ferrules (code 07) 17 - Obsolete 18 - 01 code and steel conduit adapter 19 - FRFO/FVFO receptacle with steel conduit adapter A72 - Black chromate finish (by customer request)
SHELL STYLE 6 - Plug 0 - Receptacle, flange mounting	CONTACT ARRANGEMENT P for pin; S for socket	NOTES 1. Modifier 01: Used for high vibration/shock applications 2. Less Contacts: Use the Modifier "-FO" or "L". The modifier will not be stamped on the connector. Modifier "-FO" is preferred. 3. Numerical FRA/FRF modifiers are assigned consecutively as needed and there is no significance to numerical order. 4. The basic FRA and FRF connectors were designed for use without ferrules. Ferrules are suggested when undersized wire is used so that the grommet seals will not spread apart (i.e. opened) when the wires are flexed as the wire maybe too stiff for its bend to be completely damped out by the endbell cable clamp.
ACCESSORY HARDWARE (ALUMINUM) E (FRF/FRA) - Endbell with cable clamp E (FVF/FVA) - Endbell with cable clamp with ferrules A (FRF/FRA) - Endbell adapter threaded for conduit A (FVF/FVA) - Endbell adapter threaded for conduit with ferrules - Use dash (-) for connectors less accessories (Dash must be included in description)	INSERT POLARIZATION W, X, Y or Z in accordance with MIL-C-5015. No designator required for normal	
LESS CONTACT FO - (Will not be stamped on connectors)	LESS CONTACT FO - (Will not be stamped on connectors)	
MODIFIERS 01 - Ball, self-locking knurled coupling nut (see note 1 below) 02 - Size 16 contacts to accommodate size 20 wire 03 - Clinch nut mounting receptacles (F28) 04 - Obsolete 05 - Knurled coupling nut 06 - Combination 01 and 02 codes 07 - Ferrules only (see note 4 below) 08 - Combination 01 and 07 codes (see note 4 below) 09 - Combination 05 and 07 codes (see note 4 below) 10 - Anchor nut plates on receptacle shells 11 - MS3057 type "A" endbell clamp, less bushing		
SHELL SIZE 10SL, 12S, 14S, 16S, 16, 18, 20, 22, 24, 28, 32 and 36		

Design Features

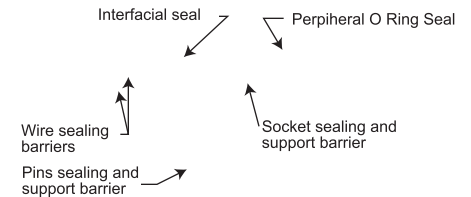


Complete Moisture Sealing

An improved shell-to-barrel O ring seals against pressure differential to 15 psi before and after exposure to +204°C (+392°F).

Positive interfacial sealing is accomplished with a pin and socket interlocking barrier design.

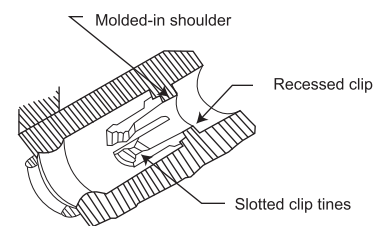
A highly reliable grommet sealing system incorporates multiple wire sealing barriers and a grommet-to-shell seal.



Rugged Metal Clip Retention System

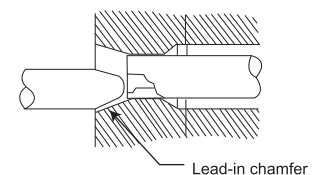
These clips are one-piece metal parts with slotted, inwardly deflected tines assuring positive contact retention. They are retained and positively located in the hard insulator contact cavities by a molded-in shoulder providing strength where the greatest load from mating and unmating occurs.

Contacts are seated on the clip shoulder, and the contact retaining clip locks on the taper retention undercut of the contact.



Improved Contact Alignment and Stability

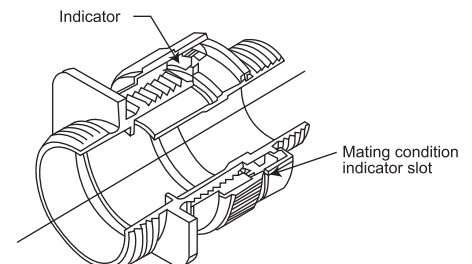
The large lead-in chamfer on the semi-resilient insert provides positive contact alignment by "guiding" the tip of the pin contact into the mating socket. This chamfer provides maximum contact centering without restricting contact float or tool insertion.



Optional Self-Locking Coupling Nut

The mechanism employs a spring-loaded detent system that is free running until near full engagement. At this point torque valves increase causing the mechanism to produce an audible clicking until full engagement. The mechanism is effective even when coupling stops at a position between detents.

When full mating is achieved, a color appears in the indicator window on the periphery of the coupling nut. The indicator is serrated so that full mating can be determined in a blind installation by feel, with a probe approximately .0312 (0.79) diameter.



Performance and Material Specifications

ELECTRICAL DATA

Contact Size	Wire Size (MIL-W-5086)	Insulation OD Limit	
		min.	max.
16	16 thru 20	.068 (1.73)	.135 (3.43)
12	12 thru 14	.092 (2.34)	.200 (5.08)
8	8 thru 10	.132 (3.35)	.300 (7.62)
4	4 thru 6	.227 (5.77)	.425 (10.80)
0	0 thru 2	.390 (9.91)	.590 (14.99)

MATERIALS AND FINISHES

Shell - Machined cadmium plated steel (FRF/FVF)
- Aluminum (FRA/FVA)

Insulator - Glass filled epoxy

Grommets and Interfacial Seals-FRF-Flourosilicone/FVF-Silicone

Contacts† - Copper alloy, gold plating per MIL-C-39029

Clip - Copper alloy

MECHANICAL FEATURES

Coupling - Threaded

Polarization - Single keyway per MIL-C-5015

Contact Retention - Metal Clip

Test Data (FRF and FVF Only)

Moisture Resistance - Exceed MIL-STD-202E,
Method 106D

Fire Test - Exceeds MIL-C-5051G, Para. 4.6.16

Fluid Emersion - Per MIL-C-5015G,
Para. 4.6.15.3

Fluid	Use	Fluid	Use
JP-4	Aviation fuel	Navee 427	Alkaline cleaner
Kerosene	Aviation fuel	MIL-L-23699	Turbine lube oil
MIL-H-5606	Hydraulic fluid	Skydrol 500A	Hydraulic fluid
Ethylene Glycol	Synthetic coolant	MIL-L-7808D	Turbine lube oil
Cee-Bee A-693	Alkaline cleaner	Texaco 6256	Turbine lube oil

Contacts

Pin and Socket

Pin and socket contacts are machined from bar stock to assure precision operation. They are designed to resist severe vibration and repeated connection and disconnection. The average force to either engage or separate pin and socket contacts will not exceed the average values given in the latest revision of MIL-C-39029.

Force in oz.	Contact Sizes				
	16	12	8	4	0
Maximum	30	30	160	240	320
Average	24	24	7	10.5	15
Minimum	2	3	5	10	14

Thermocouple Contacts

Size 12 and 16 contacts, machined from matching thermocouple lead wire alloys, can be supplied in ITT Cannon connectors. These thermocouple contacts maintain continuity from thermal-sensor leads through a bulkhead or other closures in temperature measuring applications.

These contacts for matching lead wires are detailed by the standards of the Instrument Society of America (I.S.A.).

I.S.A. Standards	Material
J	Iron and constantan
K	Chromel and alumel
T	Copper and constantan

Service Data

Maximum current ratings of contacts and maximum allowable voltage drop under test conditions when assembled as in service are shown. Maximum total current to be carried per connector is the same as that allowable in wire bundles as specified in MIL-W-5088.

Current Rating with Silver Plated Wire

Contact Size	Test Current (amps)	Potential Drop (millivolts)
16	13	49
12	23	42
8	46	26
4	80	23
0	150	21

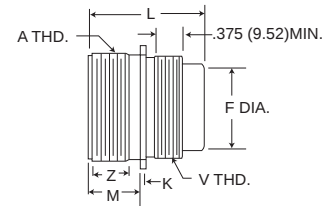
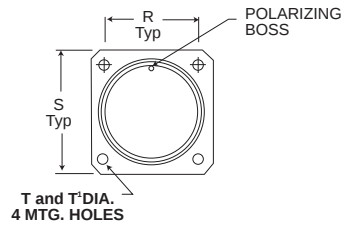
High Potential Test Data

These connectors show no evidence of breakdown when the test voltage indicated is applied between the two closest contacts and between the shell and the contacts closest to the shell for a period of one minute.

MS Service Rating	TEST Voltage (RMS) 60 cps	Operating Voltages Suggested		Air Spacing nom. inches	Creepage Distance nom. inches
		DC	AC (rms)		
Inst.	1000	250	200	-	1/16
A	2000	700	500	1/16	1/8
D	2800	1250	900	1/8	3/16
E	3500	1750	1250	3/16	1/4
B	4500	2450	1750	1/4	5/16
C	7000	4200	3000	5/16	1

Wall Mounting Receptacle

FRF0/FVF0



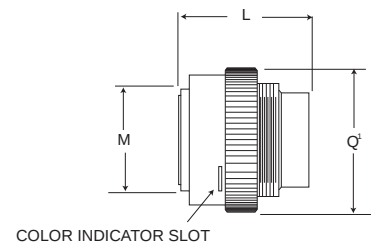
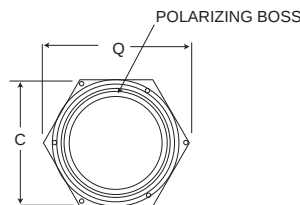
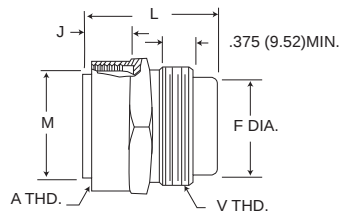
(T¹ is FRA/FVA dim. only)

Shell Size	A Thread	L Max.			F Max.	K Max.	M +.031 -.000	R ±.005	S Max.	T +.010 -.005	T¹ +.010 -.005	V Thread	Z Min.
		#16 #12	#8 #4	#0									
10SL	5/8-24UNEF-2A	1.685 (42.80)*	-	-	.455 (11.30)	.098 (2.49)	.562 (14.27)	.719 (18.26)	1.031 (26.19)	.150 (3.81)	.120 (3.04)	5/8-24UNEF-2A	.375 (9.52)
12S	3/4-20UNEF-2A	1.875 (47.62)	-	-	.445 (11.30)	.098 (2.49)	.562 (14.27)	.812 (20.62)	1.125 (28.58)	.150 (3.81)	.120 (3.04)	5/8-24UNEF-2A	.375 (9.52)
14S	7/8-20UNEF-2A	1.875 (47.62)	-	-	.522 (13.26)	.098 (2.49)	.562 (14.27)	.906 (23.01)	1.219 (30.96)	.150 (3.81)	.120 (3.04)	3/4-20UNEF-2A	.375 (9.52)
16S	1-20UNEF-2A	1.875 (47.62)	-	-	.647 (16.43)	.098 (2.49)	.562 (14.27)	.969 (24.61)	1.312 (33.32)	.150 (3.81)	.120 (3.04)	7/8-20UNEF-2A	.375 (9.52)
16	1-20UNEF-2A	1.922 (48.82)	2.141 (54.38)	-	.647 (16.43)	.098 (2.49)	.750 (19.05)	.969 (24.61)	1.312 (33.32)	.150 (3.81)	.120 (3.04)	7/8-20UNEF-2A	.625 (15.86)
20	1-1/4-18UNEF-2A	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	.921 (23.39)	.140 (3.56)	.750 (19.05)	1.156 (29.36)	1.531 (38.89)	.177 (4.50)	.120 (3.04)	1-1/8-18UNEF-2A	.625 (15.86)
22	1-3/8-UNEF-2A	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.016 (25.81)	.140 (3.56)	.750 (19.05)	1.250 (31.75)	1.656 (42.06)	.177 (4.50)	.120 (3.04)	1-1/4-18UNEF-2A	.625 (15.86)
24	1-1/2-18UNEF-2A	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.141 (28.98)	.140 (3.56)	.812 (20.62)	1.375 (34.92)	1.781 (45.24)	.177 (4.50)	.147 (3.73)	1-3/8-18UNEF-2A	.625 (15.86)
28	1-3/4-18UNS-2A	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.361 (34.57)	.140 (3.56)	.812 (20.62)	1.562 (39.67)	2.031 (51.59)	.177 (4.50)	.147 (3.73)	1-5/8-18UNEF-2A	.625 (15.86)
32	2-18UNS-2A	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.611 (40.92)	.140 (3.56)	.875 (22.22)	1.750 (44.45)	2.281 (57.94)	.290 (5.31)	.173 (4.39)	1-7/8-16UN-2A	.625 (15.86)
36	2-1/4-16UN-2A	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.826 (46.38)	.140 (3.56)	.875 (22.22)	1.938 (49.23)	2.531 (64.29)	.209 (5.31)	.173 (4.39)	2-1/8-16UN-2A	.625 (15.86)

*Available with pin inserts only.

Straight Plug

FRF6/FVF6

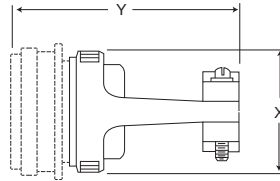
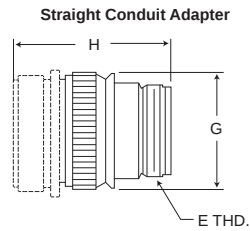


Shell Size	A Thread	L Max.			C Hex.	F Max.	J Max.	M Max.	Q Max.	Q¹ Max.	V Thread
		#16 #12	#8 #4	#0							
10SL	5/8-24UNEF-2B	1.819 (46.20)	-	-	.812 (20.62)	.455 (11.30)	.564 (14.33)	.446 (11.33)	.950 (24.13)	.970 (24.64)	5/8-24UNEF-2A
12S	3/4-20UNEF-2B	1.875 (47.62)	-	-	.937 (23.80)	.445 (11.30)	.564 (14.33)	.555 (14.10)	1.094 (27.79)	1.092 (27.74)	5/8-24UNEF-2A
14S	7/8-20UNEF-2B	1.875 (47.62)	-	-	1.000 (25.40)	.522 (13.26)	.264 (14.33)	.675 (17.14)	1.167 (29.64)	1.240 (31.50)	3/4-20UNEF-2A
16S	1-20UNEF-2B	1.875 (47.62)	-	-	1.125 (28.58)	.647 (16.43)	.564 (14.33)	.805 (20.45)	1.311 (33.30)	1.386 (35.20)	7/8-20UNEF-2A
16	1-20UNEF-2B	1.922 (48.82)	2.141 (54.38)	-	1.125 (28.58)	.647 (16.43)	.754 (19.15)	.805 (20.45)	1.311 (33.30)	1.386 (35.20)	7/8-20UNEF-2A
20	1-1/4-18UNEF-2B	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.375 (34.92)	.921 (23.39)	.754 (19.15)	1.050 (26.67)	1.600 (40.64)	1.650 (41.91)	1-1/8-18UNEF-2A
22	1-3/8-UNEF-2B	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.500 (38.10)	1.016 (25.81)	.754 (19.15)	1.175 (29.84)	1.744 (44.30)	1.745 (44.32)	1-1/4-18UNEF-2A
24	1-1/2-18UNEF-2B	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.625 (41.28)	1.141 (28.98)	.754 (19.15)	1.300 (33.02)	1.833 (46.56)	1.962 (49.83)	1-3/8-18UNEF-2A
28	1-3/4-18UNS-2B	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	1.875 (47.62)	1.361 (34.57)	.754 (19.15)	1.520 (38.61)	2.177 (55.30)	2.125 (53.98)	1-5/8-18UNEF-2A
32	2-18UNS-2B	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	2.125 (43.96)	1.611 (40.92)	.754 (19.15)	1.770 (44.96)	2.466 (62.64)	2.385 (60.58)	1-7/8-16UN-2A
36	2-1/4-16UN-2B	1.922 (48.82)	2.141 (54.38)	2.422 (61.52)	2.375 (60.33)	1.826 (46.38)	.754 (19.15)	1.980 (50.29)	2.754 (69.95)	2.585 (65.66)	2-1/8-16UN-2A

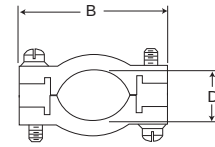
*Available with socket inserts only.

Accessory Hardware

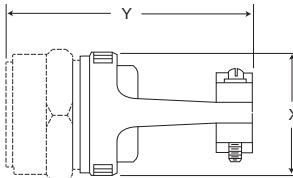
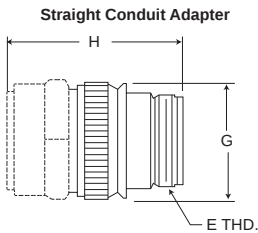
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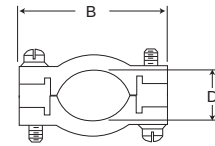
Straight Cable Clamp



FRF6/FVF6



Straight Cable Clamp



Shell Size	E Thread	B Max.	D Min.	H G Max.	Max. #16,#0	X Max.	Y Max.
10SL	5/8-24UNEF-2A	1.00 (25.40)	.312 (7.92)	.883 (22.43)	2.350 (59.69)	.953 (24.21)	2.940 (74.68)
12S	5/8-24UNEF-2A	1.00 (25.40)	.312 (7.92)	.883 (22.43)	2.350 (59.69)	.953 (24.21)	2.940 (74.68)
14S	3/4-20UNEF-2A	1.190 (30.23)	.438 (11.12)	1.003 (25.48)	2.350 (59.69)	1.078 (27.38)	3.090 (78.49)
16S	7/8-20UNEF-2A	1.280 (35.51)	.561 (14.25)	1.133 (28.78)	2.350 (59.69)	1.203 (30.56)	3.410 (86.61)
16	7/8-20UNEF-2A	1.280 (32.51)	.561 (14.25)	1.133 (28.78)	2.500 (63.50)	1.203 (30.56)	3.560 (90.42)
20	1-3/16-18UNEF-2A	1.530 (38.86)	.750 (19.05)	1.430 (36.32)	3.000 (76.20)	1.453 (36.91)	3.560 (90.42)
22	1-3/16-18UNEF-2A	1.630 (41.40)	.750 (19.05)	1.497 (38.02)	3.260 (82.80)	1.578 (40.08)	3.560 (90.42)
24	1-7/16-18UNEF-2A	1.775 (45.08)	.937 (23.80)	1.573 (39.95)	3.260 (82.80)	1.703 (43.26)	3.900 (99.06)
28	1-7/16-18UNEF-2A	2.025 (51.44)	1.187 (30.15)	1.792 (45.52)	3.260 (82.80)	1.953 (49.61)	3.900 (99.06)
32	1-3/4-18UNS-2A	2.265 (57.53)	1.250 (31.75)	2.121 (53.87)	3.260 (82.80)	2.203 (55.96)	4.400 (111.76)
36	2-18UNS-2A	2.525 (64.14)	1.375 (34.92)	2.308 (58.62)	3.300 (83.82)	2.453 (62.31)	4.650 (118.11)

Tooling



Contact Size	Crimp Tool	Crimp Head	Locator Number	Insertion Tool	Extraction Tool
16	M22520/1-01	M22520/1-02		MS90455-16 or MIL-I-81969/17-01	CET-FRF-16-22A
12				MS90455-12 or MIL-I-81960/17-02	CET-FRF-12
8	CBT-600B	CCH-8-1	CCHP-8-6	Not Req'd	CET-FRF-8
4	CBT-600B	CCH-4-1	CCHP-4-8	Not Req'd	CEF-FRF-4
0	CBT-600B	CCH-0-1	CCHP-0-8	Not Req'd	CET-FRF-0

Contact/Wire Seal Plugs

Contact Size*	Part Number		Wire Seal Plugs	Colors
	Pin	Socket		
16	030-1878-001	031-1040-001	225-0071-000	Blue
12	030-1879-003	031-1041-003	225-0072-000	Yellow
8	030-1880-001	031-1042-001	225-1009-000	Red
4	030-1881-001	031-1043-001	225-1008-000	Blue
0	030-8011-747	031-8012-747	225-1007-000	Yellow

*Consult factory for variations in contact finish, wire accommodation, and thermocouple materials.

Wire Stripping

Using proper assembly tools (see page 214), strip insulation from end of wire to be crimped. (See table for proper stripping dimensions.) Do not cut or damage wire strands.



Contact Size	A	
	Max.	Min.
16	.250 (6.35)	.220 (5.59)
12	.250 (6.35)	.220 (5.59)
8	.250 (6.35)	.220 (5.59)
4	.480 (12.18)	.450 (11.43)
0	.630 (16.00)	.600 (15.24)

Assembly Instructions

Contact Crimping

Insert wire into rear of contact. Wire insulation must butt against rear of contact. Wire must be visible thru inspection hole. Using M22520/1-01 crimp tool with proper locator, insert wire and contact into locator jaws. Squeeze tool handle together until ratchet releases. When using CBT 600B crimp tool, follow instructions supplied with tool. Inspect crimped contact to be sure proper crimp has been made.



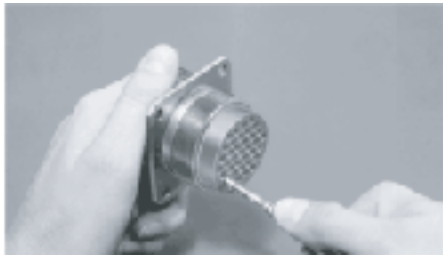
Contact Insertion



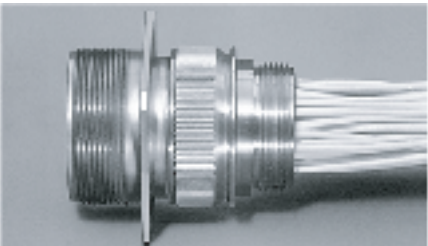
1. Slide conduit adapter or clamp bars over wire bundle in proper order for re-assembly.



2. Slide wired contact into proper insertion tool so that tip of tool butts against contact shoulder.

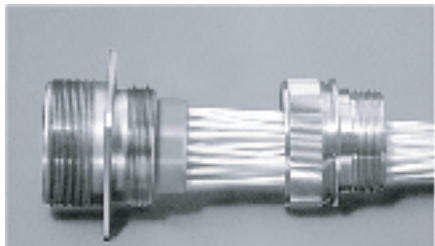


3. Inset wired contacts into cavities from rear of insulator until contact "clicks" into retaining clip. A slight pull on wire will assure that contact is securely seated.



4. After all contacts are inserted, assemble conduit adapter or clamp bars.

Contact Extraction



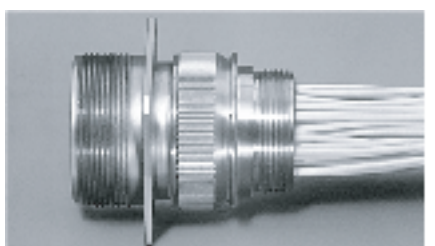
1. Remove conduit adapter or clamp bars from connector assembly.



2. Using proper extraction tool, insert tool around contact from front of insulator until tool tip butts against contact shoulder. Push plunger to release contact.



3. Pull wired contact out from rear of insulator.



4. After replacing contact, re-assemble conduit adapter or cable clamp.