

Amphenol® Tri-Start™ Subminiature Cylindrical Connectors

12-092-11



Amphenol

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NOTE:

The connector products in this brochure were formerly known as Bendix® products. These products are now manufactured and sold under the Amphenol® brand name. The name "Amphenol" will replace the name "Bendix" on products and literature in the future.

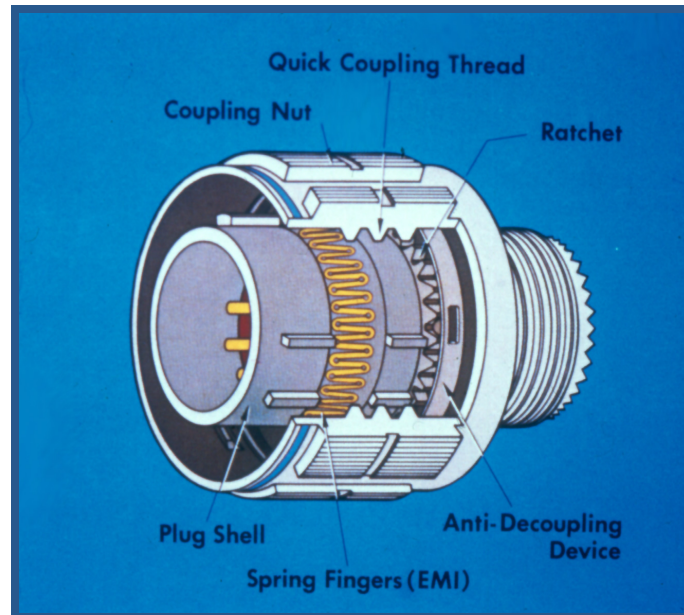
Amphenol Aerospace is a Certified ISO 9001 Manufacturer.

Amphenol® Tri-Start

Series III - the highest performance MIL-DTL-38999* connector

Amphenol® Tri-Start MIL-DTL-38999 Series III Connectors offer the highest performance capabilities for both general duty and severe environment applications. Meeting or exceeding MIL-DTL-38999 Series III requirements, the Tri-Start connector with standard metal shells (aluminum or stainless steel with several finish options) offers these features:

- **EMI Shielding** solid metal to metal coupling, grounding fingers, electroless nickel plating, and thicker wall sections provide superior EMI shielding capability of 65dB minimum at 10 GHz
- **Contact Protection** - recessed pins in this 100% scoop-proof connector minimize potential contact damage
- **Moisture Resistance** - improved interfacial seal design helps prevent electrolytic erosion of contacts
- **Corrosion Resistance** - shells of stainless steel or cadmium over nickel plating withstand a 500 hour salt spray exposure
- **Vibration/Shock** - operates under severe high temperature vibration, through 200°C
- **Firewall Capability** - available in a stainless steel shell, class RK, RS
- **Lockwiring Eliminated** - unique, self-locking, quick coupling connector eliminates lockwiring
- **Quick Coupling** - completely mates and self-locks in a 360° turn of the coupling nut
- **Inventory Support Commonality** - uses standard MIL-DTL-38999 contacts, application tools and insert arrangements
- **Electrostatic Discharge Protection (ESD)** - protection for sensitive circuitry without diodes, varistors, etc., with the use of the Faraday Cage principal which shunts high voltage, high current discharge events (see page 37)
- **Ground Plane Connectors** - with metallic insert for common grounding of coax, triax or twinax contact outer shield (see page 39)



MIL-Qualified to MIL-DTL-38999, Rev. K, the Amphenol® Composite Tri-Start Connector offers a lightweight, corrosion resistant connector with the same high performance features as its metal counterpart. The Composite Tri-Start Connector also includes the following features:

- **Lightweight** - 17% – 70% weight savings (17–40% weight savings vs. aluminum) (60–70% weight savings vs. stainless steel) See Composite weight comparison chart, pg. 36.
- **Corrosion Resistance** - available in standard MIL-DTL-38999 olive drab cadmium (175°C) and electroless nickel plating (200°C), both withstanding 2000 hours of salt spray exposure. The base material is able to withstand an indefinite exposure to salt spray.
- **Durability** - 1500 couplings minimum (in reference to connector couplings, not contacts)
- **Extended Life Contact** - Mil-approved plating process which provides 1500 couplings minimum

For additional information concerning the Amphenol® Tri-Start Connector, or if there are special application requirements, contact your local sales office or

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Sidney, New York 13838-1395
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* MIL-DTL-38999 Series III
supersedes MIL-C-38999 Series III

Tri-Start Connector Pat. 4,109,990

Composite Connector Patents:
4,268,103, 4,648,670, 4,682,832, 4,703,987

Amphenol® Tri-Start

the ultimate subminiature cylindrical



Wall Mount Receptacle



Straight Plug



Jam Nut Receptacle



Solder Mount Receptacle

Designed for Performance

Numerous advantages in performance capability are designed into the Amphenol® Tri-Start Connector. A positive metal to metal coupling design, grounding fingers, and electroless nickel plating provide superior EMI shielding capability of 65 dB minimum at 10 GHz.

Acme threads provide coupling durability. Thicker wall sections and a greater coupling surface area improve strength and shock resistance. Blunting of the thread on both the coupling nut and receptacle eliminates cross coupling. The connector quickly mates and self locks in a 360° turn of the coupling nut.

Elongated mounting holes permit the Tri-Start Connector to intermount with various existing MIL-spec box or wall mount receptacles, giving it a design replacement advantage.

Shells of stainless steel, or cadmium over nickel plating prevent severe corrosion. Resistance is tested through exposure to a 500 hour salt spray. Composite versions provide protection from salt spray exposure for 2000 hours. Other finish options are available; see how to order Tri-Start metal (pages 32 and 33) and Tri-Start Composite (pages 34 and 35).

Recessed pins minimize potential contact damage in this 100% scoop-proof connector. In a blind mating application, mating shells cannot “scoop” the pins, and cause a shorting or bending of contacts.

The design of the Amphenol® Tri-Start interfacial seal meets the MIL-DTL-38999 Series III requirements for electrolytic erosion resistance.

A rigid dielectric insert with excellent electrical characteristics provides durable protection to the contacts. The socket contacts are probe proof, and all contacts are rear removable. Available in sizes 10 power, 12, 16, 20 and 22D contacts are plated in the standard 50 micro inches minimum gold, with 100 micro inches as an option. Fiber optics, extended life and shielded coaxial contacts are also available in a wide selection of standard MIL-DTL-38999 insert patterns.

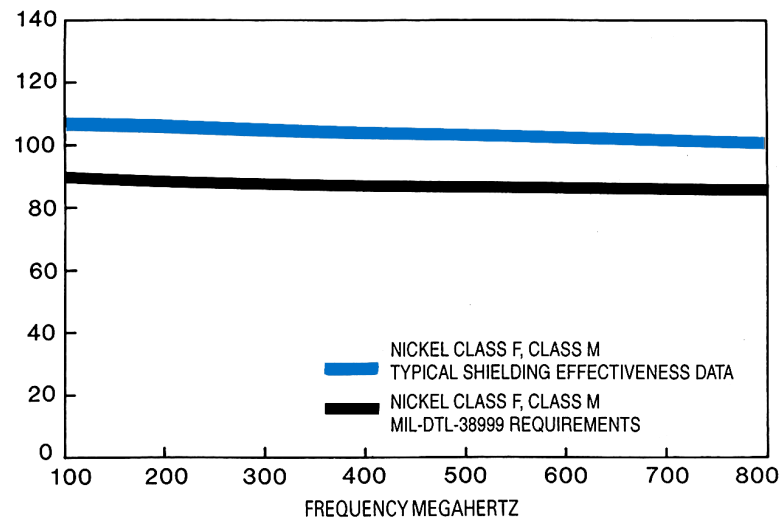
Optional Features

Options include hermetic seals, nickel plated stainless steel shells, and a fail-safe lanyard release design, providing a quick breakaway connector with Tri-Start dependability. Circuit protection with filter contacts or surge arresting devices are also available. Lightweight, composite shells with a conductive plating are available. Ground plane connectors for use with coaxial and triaxial contacts can also be specified.

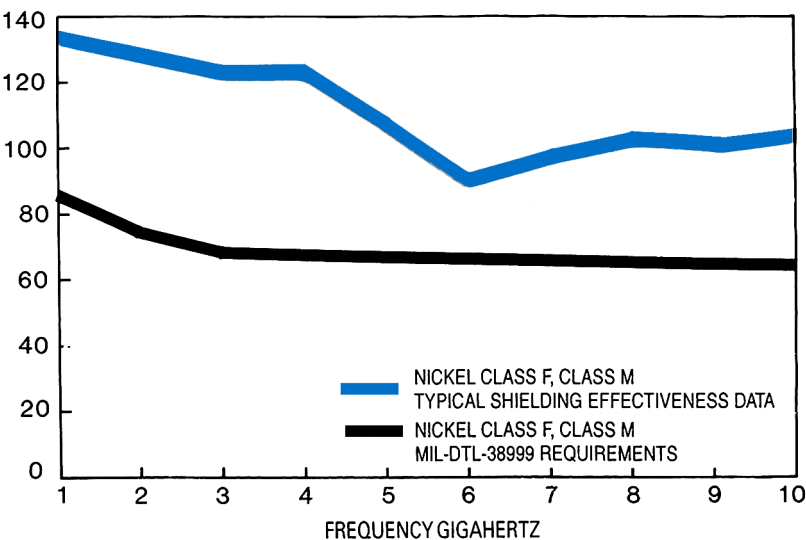
Tri-Start

test data

TRI-START, SERIES III
TYPICAL SHIELDING EFFECTIVENESS TEST DATA
EMI/EMP SHIELDING EFFECTIVENESS dB
TESTING BY TRIAXIAL METHOD



TRI-START, SERIES III
TYPICAL SHIELDING EFFECTIVENESS TEST DATA
EMI/EMP SHIELDING EFFECTIVENESS dB
TESTING BY MODE STIRRING METHOD



Test data beyond 2GHz is subject to equipment variation.

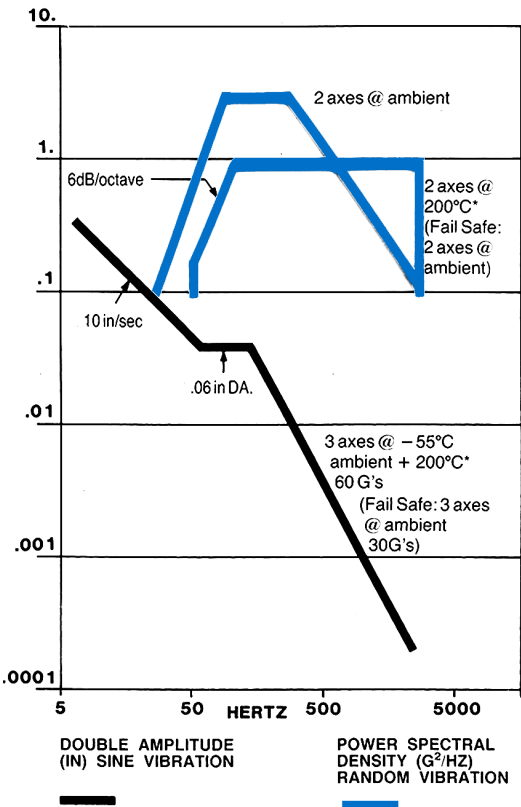
Amphenol® Tri-Start connectors provide EMI/EMP shielding capability which exceeds MIL-DTL-38999 Series III requirements.

The TV and CTV Series III connector with standard solid metal to metal coupling, EMI grounding fingers and conductive finishes has proven to be the ultimate in EMI/EMP shielding effectiveness. The charts illustrate shielding effectiveness data which is typical of Tri-Start connectors tested with the nickel finish (Class F-metal, Class M-composite) over a wide frequency range.

The vibration capability of the Tri-Start Series is shown in the chart below. This illustrates the most severe vibration envelope of any qualified connector available today.

These capabilities along with a 200°C temperature rating and superior moisture sealing protection provide the user with a connector that can withstand the most rigorous application.

TRI-START
VIBRATION CRITERIA



* Dependant on shell finish

Tri-Start

specifications

CONTACT RATING

Contact Size	Test Current		Maximum Millivolt Drop Crimp*	Maximum Millivolt Drop Hermetic*
	Crimp	Hermetic		
22D	5	3	73	85
20	7.5	5	55	60
16	13	10	49	85
12	23	17	42	85
10 (Power)	33	NA	33	NA

Contact Size	Crimp Well Data		Hermetic Data	
	Well Diameter	Nominal Well Dept	Well Diameter	Min. Well Depth
22D	.0345 ±.0010	.141	.036 ^{+.004} _{-.000}	.094
20	.047 ±.001	.209	.044 ^{+.004} _{-.000}	.125
16	.067 ±.001	.209	.078 ^{+.004} _{-.002}	.141
12	.100 ±.002	.209	.116 ^{+.004} _{-.002}	.141
10 (Power)	.137 ±.002	.355	NA	NA

* When using silver plated wire.

SERVICE RATING

Service Rating	Suggested Operating Voltage (Sea Level)		Test Voltage (Sea Level)	Test Voltage 50,000 Ft.	Test Voltage 70,000 Ft.	Test Voltage 110,000 Ft.
	AC (RMS)	DC				
M	400	550	1300 VRMS	550 VRMS	350 VRMS	200 VRMS
N	300	450	1000 VRMS	400 VRMS	260 VRMS	200 VRMS
I	600	850	1800 VRMS	600 VRMS	400 VRMS	200 VRMS
II	900	1250	2300 VRMS	800 VRMS	500 VRMS	200 VRMS

** Please note that the establishment of electrical safety factors is left entirely in the designers hands, since he is in the best position to know what peak voltage, switching surges, transients, etc. can be expected in a particular circuit.

FINISH DATA

Non-Hermetic Shell Components		
Finish	Service Class	
	Military	Proprietary
Anodic Coating (Non-Conductive)	C	RX**
Electroless Nickel	F (Metal)	RF
	M (Composite)	
Olive Drab Cadmium Plate Nickel Base	W (Metal)	RW
	J (Composite)	
Stainless Steel with Nickel Plate	S	RS
Stainless Steel	K	RK

*** Add suffix (005) to part number.

Hermetic Connectors		
Material/Finish	Service Class	
	Military	Proprietary
Stainless Steel	Y	Y
Stainless Steel, Nickel Plate	N	YN

insert availability and identification

Shell Size/Arrg.	Military Shell Size	Crimp	Hermetics* Class Y	Service Rating	Total Contacts	Contact Size							
						22D	20	16	12	12 (Coax)	10 (Power)	8 (Coax)	8†† (Twinax)
9-5H	A			Grounded	1								1
9-35	A	X	P	M	6	6							
9-94	A	◆		M	2		2						
9-98	A	X	P	I	3		3						
11-2★	B	◆		I	2			2					
11-5	B	◆		I	5		5						
11-35	B	X	P	M	13	13							
11-98	B	X	P	I	6		6						
11-99	B	X		I	7		7						
13-4★	C	X		I	4			4					
13-8	C	X	P	I	8		8						
13-35	C	X	P	M	22	22							
13-98	C	X	P	I	10		10						
15-5★	D	X	P	II	5			5					
15-15	D	X	P	I	15		14	1					
15-18	D	X	P	I	18		18						
15-19	D	◆		I	19		19						
15-35	D	X	•	M	37	37							
15-97	D	X	•	I	12		8	4					
17-2	E	X		M	39	38							1
17-6	E	X		I	6				6				
17-8★	E	X	P	II	8			8					
17-22★	E	◆		Coax	4					2		2	
17-26	E	X	•	I	26		26						
17-35	E	X	P	M	55	55							
17-99	E	X		I	23		21	2					
19-11★	F	X	P	II	11			11					
19-31	F	◆		M	15	12			1			2	
19-32	F	X	P	I	32		32						
19-35	F	X	P	M	66	66							
21-11★	G	X		I	11				11				
21-16★	G	X	P	II	16			16					
21-35	G	X	P	M	79	79							
21-39	G	X		I	39		37	2					
21-41	G	X	P	I	41		41						
21-75★	G	X		M	4								(See Note)
23-6★	H	P		M	6								6
23-21★	H	X	P	II	21			21					
23-35	H	X	P	M	100	100							
23-53	H	X	P	I	53		53						
23-54	H	◆		M	53	40		9	4				
23-55	H	◆		I	55		55						
25-4	J	X	P	I	56		48	8					
25-7	J	◆		Twinax	99	97							2
25-8★	J	◆		Twinax	8								8
25-11***	J	◆		N	11		2				9		
25-17	J	◆		M	42	36							6
25-19★	J	X		I	19				19				
25-20***	J	◆		N	30		10	13**		4			3
25-24★	J	X	•	I	24			12	12				
25-26	J	◆		I	25		16		5			4	
25-2	J	X		I	29			29					
25-35	J	X	P	M	128	128							
25-37★	J	◆		I	37			37					
25-43	J	X		I	43		23	20					
25-46	J	X		I	46		40	4				2†	
25-61	J	X	P	I	61		61						

X Completely tooled.

• Majority of tooling is completed (contact Sidney, NY for availability)

◆ Not tooled for 02-R

P Pin inserts only (contact Sidney, NY for socket availability).

* Optional solder or eyelet termination, hermetic inserts only.

★ Ground plane proprietary option available. Arrg. 9-5 is exclusively ground plane type. See page 39 for further information of ground plane connectors.

** Two size 16 contacts dedicated to fiber optics. Consult Sidney, NY or catalog 12-352 for fiber optic information.

*** For use in MIL-STD-1760 applications (see page 18).

† For RG180/U and RG195/U cables only.
(Contact Sidney, NY for other cable application).

†† Size 8 Coax and Twinax are interchangeable.

Note: MS connector 21-75 is supplied with size 8 twinax.

Proprietary connector 21-75 is supplied with size 8 coax.

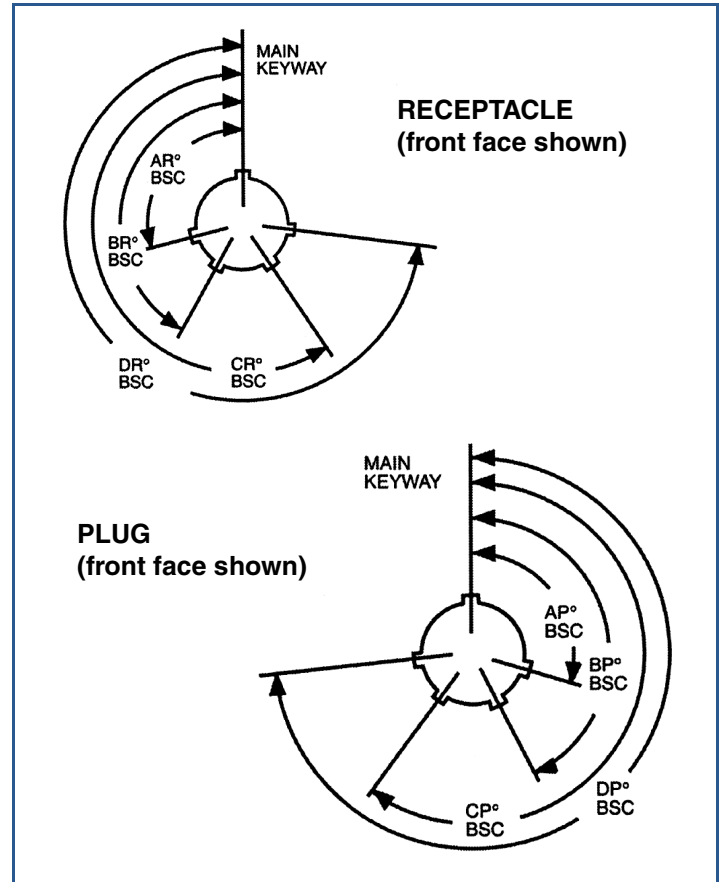
Tri-Start

alternate positioning

Master Key/Keyway Position

Shell Size	Key & keyway arrangement identification letter	AR° or AP° BSC	BR° or BP° BSC	CR° or CP° BSC	DR° or DP° BSC
9	N	105	140	215	265
	A	102	132	248	320
	B	80	118	230	312
	C	35	140	205	275
	D	64	155	234	304
11, 13, and 15	E	91	131	197	240
	N	95	141	208	236
	A	113	156	182	292
	B	90	145	195	252
	C	53	156	220	255
17 and 19	D	119	146	176	298
	E	51	141	184	242
	N	80	142	196	293
	A	135	170	200	310
	B	49	169	200	244
21, 23, and 25	C	66	140	200	257
	D	62	145	180	280
	E	79	153	197	272

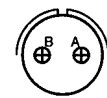
A plug with a given rotation letter will mate with a receptacle with the same rotation letter. The angles for a given connector are the same whether it contains pins or sockets. Inserts are not rotated in conjunction with the master key/keyway.

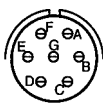
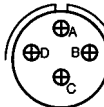
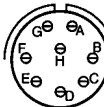
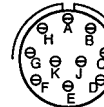
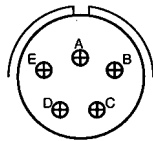


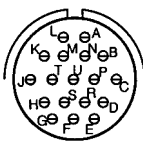
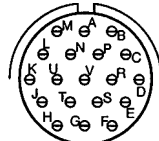
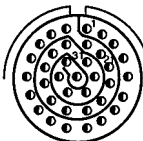
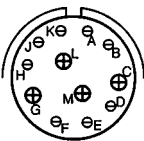
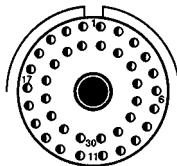
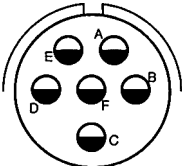
Tri-Start

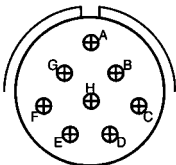
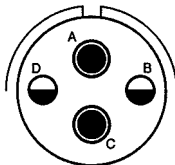
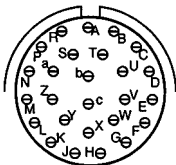
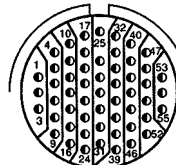
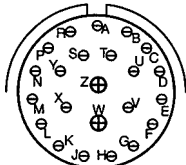
insert arrangements

front face of pin inserts illustrated

								
Insert Arrangement	9-5	9-35	9-94	9-98	11-2	11-5	11-35	11-98
Service Rating	Grounded	M	M	I	I	I	M	I
Number of Contact	1		2	3	2	5	13	6
Contact Size	8 Twinax	22D	20	20	16	20	22D	20

							
Insert Arrangement	11-99	13-4	13-8	13-35	13-98	15-5	15-15
Service Rating	I	I	I	M	I	II	I
Number of Contacts	7	4	8	22	10	5	14 1
Contact Size	20	16	20	22D	20	16	20 16

						
Insert Arrangement	15-18	15-19	15-35	15-97	17-2	17-6
Service Rating	I	I	M	I	M	I
Number of Contacts	18	19	37	8 4	38 1	6
Contact Size	20	20	22D	20 16	22D 8 Twinax	12

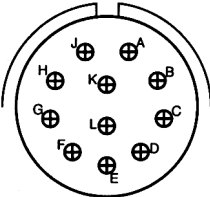
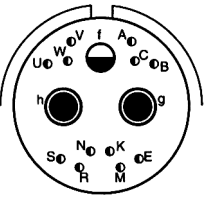
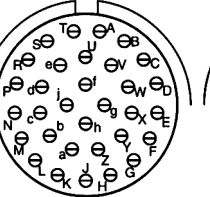
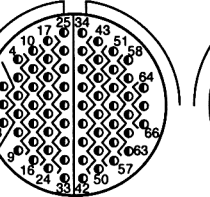
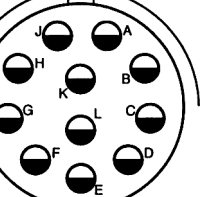
					
Insert Arrangement	17-8	17-22	17-26	17-35	17-99
Service Rating	II	Coax	I	M	I
Number of Contacts	8	2 2	26	55	21 2
Contact Size	16	12 Coax 8 Coax	20	22D	20 16

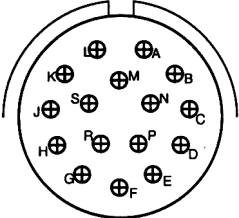
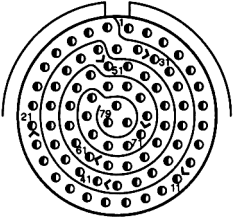
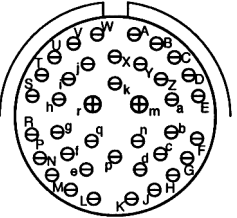
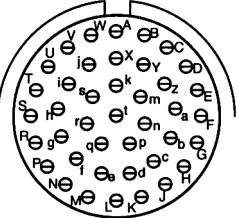
					
8	10	12	16	20	22D

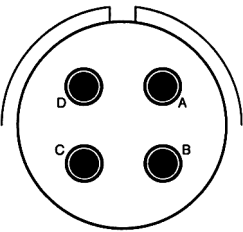
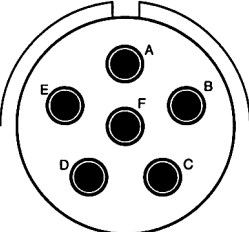
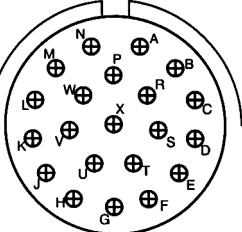
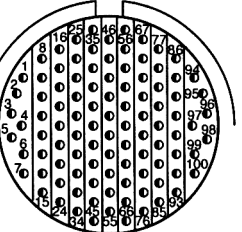
Tri-Start

insert arrangements

front face of pin inserts illustrated

					
Insert Arrangement	19-11	19-31	19-32	19-35	21-11
Service Rating	II	M	I	M	I
Number of Contacts	11	212	32	66	11
Contact Size	16	8 Coax1222D	20	22D	12

				
Insert Arrangement	21-16	21-35	21-39	21-41
Service Rating	II	M	I	I
Number of Contacts	16	79	372	41
Contact Size	16	22D	2016	20

				
Insert Arrangement	21-75	23-6	23-21	23-35
Service Rating	M	M	II	M
Number of Contacts	4	6	21	100
Contact Size	(See Note)	8 Twinax	16	22D

Note: MS connector 21-75 is supplied with size 8 twinax.
 Proprietary connector 21-75 is supplied with size 8 coax.

Tri-Start

insert arrangements

front face of pin inserts illustrated

Insert Arrangement
Service Rating
Number of Contacts
Contact Size

23-53
I
53
20

23-54
M
40 9 4
22D 16 12

23-55
I
55
20

Insert Arrangement
Service Rating
Number of Contacts
Contact Size

25-4
I
48 8
20 16

25-7
Twinax
97 2
22D 8 Twinax

25-8
Twinax
8
8 Twinax

Insert Arrangement
Service Rating
Number of Contacts
Contact Size

25-11***
N
2 9
20 10 Power

25-17
M
36 6
22D 8 Twinax

25-19
I
19
12

*** For use in MIL-STD-1760 applications (see page 18).

CONTACT LEGEND

8

10

12

16

20

22D

Tri-Start

insert arrangements

front face of pin inserts illustrated

Insert Arrangement	25-20***			
Service Rating	N			
Number of Contacts	10	13	3	4
Contact Size	20	16	8 Twinax	12 Coax

(Locations U and Y - Dedicated to Fiber Optics)

Insert Arrangement	25-29	
Service Rating	I	
Number of Contacts	29	
Contact Size	16	

Insert Arrangement	25-43	
Service Rating	I	
Number of Contacts	23	20
Contact Size	20	16

*** For use in MIL-STD-1760 applications (see page 18).

† Coax contacts for RG180 or RG195 cable.

CONTACT LEGEND



TVP00R (D38999/20)* – crimp, metal

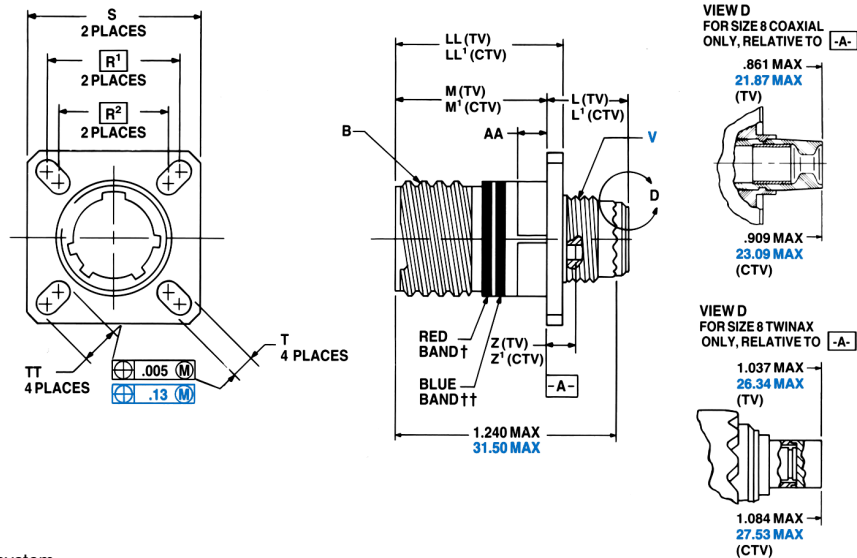
CTVP00R (D38999/20)** – crimp, composite

wall mounting receptacle

TVP00RW-XX-XXX
TVPS00RF-XX-XXX
TVPS00RF-XX-XXX
TVPS00RS-XX-XXX

CTVP00RW-XX-XXX
CTVS00RF-XX-XXX

D38999/20



†Red band indicates fully mated

††Blue band indicates rear release contact retention system

* To complete order number for TV metal connectors, see pages 32 and 33.

** To complete order number for CTV composite connectors, see pages 34 and 35.

Inches

Shell Size	MS Shell Size Code	B Thread Class 2A 0.1P-0.3L-TS (Plated)	L Max. (TV)	L ¹ Max. (CTV)	M +.000 - .005 (TV)	M ¹ +.000 - .005 (CTV)	R ¹	R ²	S Max.	T +.008 - .006	Z Max. (TV)	Z ¹ Max. (CTV)	AA Max. Panel Thickness	LL +.006 - .000 (TV)	LL ¹ ±.005 (CTV)	TT +.008 - .006
9	A	.6250	.469	.514	.820	.775	.719	.594	.948	.128	.153	.198	.234	.905	.913	.216
11	B	.7500	.469	.514	.820	.775	.812	.719	1.043	.128	.153	.198	.234	.905	.913	.194
13	C	.8750	.469	.514	.820	.775	.906	.812	1.137	.128	.153	.198	.234	.905	.913	.194
15	D	1.0000	.469	.514	.820	.775	.969	.906	1.232	.128	.153	.198	.234	.905	.913	.173
17	E	1.1875	.469	.514	.820	.775	1.062	.969	1.323	.128	.153	.198	.234	.905	.913	.194
19	F	1.2500	.469	.514	.820	.775	1.156	1.062	1.449	.128	.153	.198	.234	.905	.913	.194
21	G	1.3750	.500	.545	.790	.745	1.250	1.156	1.575	.128	.183	.228	.204	.905	.911	.194
23	H	1.5000	.500	.545	.790	.745	1.375	1.250	1.701	.154	.183	.228	.204	.905	.911	.242
25	J	1.6250	.500	.545	.790	.745	1.500	1.375	1.823	.154	.183	.228	.204	.905	.911	.242

Millimeters

Shell Size	MS Shell Size Code	L Max. (TV)	L ¹ Max. (CTV)	M +.00 - .13 (TV)	M ¹ +.00 - .13 (CTV)	R ¹	R ²	S Max	T +.20 - .13	V Thread Metric	Z Max. (TV)	Z ¹ Max. (CTV)	AA Max.	LL +.15 - .00 (TV)	LL ¹ ±.13 (CTV)	TT +.20 - .13
9	A	11.91	13.06	20.83	19.69	18.26	15.09	24.1	3.25	M12X1-6g	3.89	5.03	5.94	22.99	23.19	5.49
11	B	11.91	13.06	20.83	19.69	20.62	18.26	26.5	3.25	M15X1-6g	3.89	5.03	5.94	22.99	23.19	4.93
13	C	11.91	13.06	20.83	19.69	23.01	20.62	28.9	3.25	M18X1-6g	3.89	5.03	5.94	22.99	23.19	4.93
15	D	11.91	13.06	20.83	19.69	24.61	23.01	31.3	3.25	M22X1-6g	3.89	5.03	5.94	22.99	23.19	4.39
17	E	11.91	13.06	20.83	19.69	26.97	24.61	33.7	3.25	M25X1-6g	3.89	5.03	5.94	22.99	23.19	4.93
19	F	11.91	13.06	20.83	19.69	29.36	26.97	36.9	3.25	M28X1-6g	3.89	5.03	5.94	22.99	23.19	4.93
21	G	12.70	13.84	20.07	18.92	31.75	29.36	40.1	3.25	M31X1-6g	4.65	5.79	5.18	22.99	23.14	4.93
23	H	12.70	13.84	20.07	18.92	34.93	31.75	43.3	3.91	M34X1-6g	4.65	5.79	5.18	22.99	23.14	6.15
25	J	12.70	13.84	20.07	18.92	38.10	34.93	46.4	3.91	M37X1-6g	4.65	5.79	5.18	22.99	23.14	6.15

All dimensions for reference only

Designates true position dimensioning

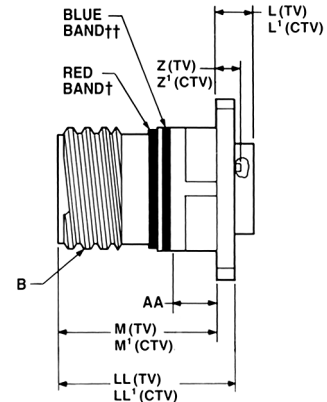
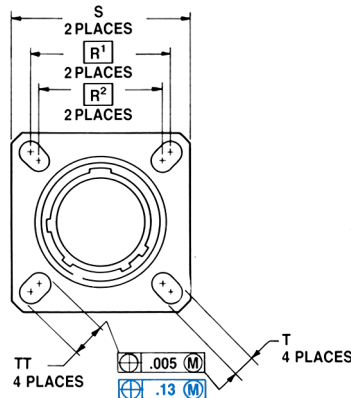
TVP02R* – crimp, metal

CTVP02R** – crimp, composite

box mounting receptacle

TVP02RW-XX-XXX
TVPS02RK-XX-XXX
TVS02RF-XX-XXX
TVPS02RS-XX-XXX

CTVP02RW-XX-XXX
CTVPS02RF-XX-XXX



† Red band indicates fully mated

†† Blue band indicates rear release contact retention system

* To complete order number for TV metal connectors, see pages 32 and 33.

** To complete order number for CTV composite connectors, see pages 34 and 35.

Consult Sidney, NY for availability of composite box mounting receptacles.

Inches

Shell Size	MS Shell Size Code	B Thread Class 2A 0.1P-0.3L-TS (Plated)	L Max. (TV)	L ¹ Max. (CTV)	M +.000 - .005 (TV)	M ¹ +.000 - .005 (CTV)	R ¹	R ²	S Max.	T +.008 - .006	Z Max. (TV)	Z ¹ Max. (CTV)	AA Max. Panel Thickness	LL +.006 - .000 (TV)	LL ¹ ±.005 (CTV)	TT +.008 - .006
9	A	.6250	.205	.250	.820	.775	.719	.594	.948	.128	.153	.198	.234	.905	.913	.216
11	B	.7500	.205	.250	.820	.775	.812	.719	1.043	.128	.153	.198	.234	.905	.913	.194
13	C	.8750	.205	.250	.820	.775	.906	.812	1.137	.128	.153	.198	.234	.905	.913	.194
15	D	1.0000	.205	.250	.820	.775	.969	.906	1.232	.128	.153	.198	.234	.905	.913	.173
17	E	1.1875	.205	.250	.820	.775	1.062	.969	1.323	.128	.153	.198	.234	.905	.913	.194
19	F	1.2500	.205	.250	.820	.775	1.156	1.062	1.449	.128	.153	.198	.234	.905	.913	.194
21	G	1.3700	.235	.280	.790	.745	1.250	1.156	1.575	.128	.183	.228	.204	.905	.911	.194
23	H	1.5000	.235	.280	.790	.745	1.375	1.250	1.701	.154	.183	.228	.204	.905	.911	.242
25	J	1.6250	.235	.280	.790	.745	1.500	1.375	1.823	.154	.183	.228	.204	.905	.911	.242

Millimeters

Shell Size	MS Shell Size Code	L Max. (TV)	L ¹ Max. (CTV)	M +.00 - .13 (TV)	M ¹ +.00 - .13 (CTV)	R ¹	R ²	S Max.	T +.20 - .13	Z Max. (TV)	Z ¹ Max. (CTV)	AA Max.	LL +.15 - .00 (TV)	LL ¹ ±.13 (CTV)	TT +.20 - .13
9	A	5.21	6.35	20.83	19.69	18.26	15.09	24.1	3.25	3.89	5.03	5.94	22.99	23.19	5.49
11	B	5.21	6.35	20.83	19.69	20.62	18.26	26.5	3.25	3.69	5.03	5.94	22.99	23.19	4.93
13	C	5.21	6.35	20.83	19.69	23.01	20.62	28.9	3.25	3.89	5.03	5.94	22.99	23.19	4.93
15	D	5.21	6.35	20.83	19.69	24.61	23.01	31.3	3.25	3.89	5.03	5.94	22.99	23.19	4.39
17	E	5.21	6.35	20.83	19.69	26.97	24.61	33.7	3.25	3.89	5.03	5.94	22.99	23.19	4.93
19	F	5.21	6.35	20.83	19.69	29.36	26.97	36.9	3.25	3.89	5.03	5.94	22.99	23.19	4.93
21	G	5.97	7.11	20.07	18.92	31.75	29.36	40.1	3.25	4.65	5.79	5.18	22.99	23.14	4.93
23	H	5.97	7.11	20.07	18.92	34.92	31.75	43.3	3.91	4.65	5.79	5.18	22.99	23.14	6.15
25	J	5.97	7.11	20.07	18.92	38.10	34.92	46.4	3.91	4.65	5.79	5.18	22.99	23.14	6.15

All dimensions for reference only

□ Designates true position dimensioning

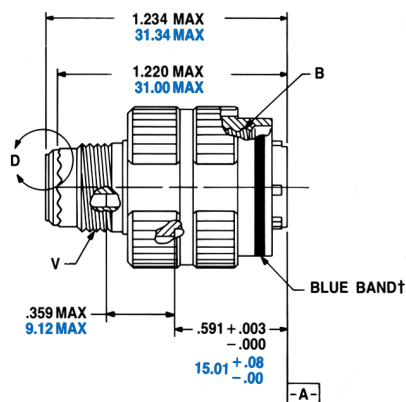
TV06R (D38999/26)* – crimp, metal

CTV06R (D38999/26)** – crimp, composite

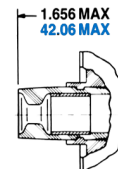
straight plug

TV06RW-XX-XXX
TVS06RK-XX-XXX
TVS06RF-XX-XXX
TVS06RS-XX-XXX

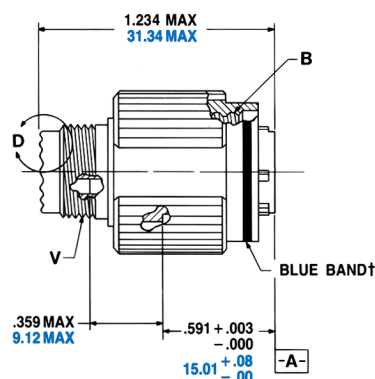
D38999/26



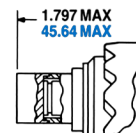
VIEW D
FOR SIZE 8 COAXIAL
ONLY, RELATIVE TO -A-



CTV06RW-XX-XXX
CTVS06RF-XX-XXX



VIEW D
FOR SIZE 8 TWINAX
ONLY, RELATIVE TO -A-



† Blue band indicates rear release contact retention system

* To complete order number for TV metal connectors, see pages 32 and 33.

** To complete order number for CTV composite connectors, see pages 34 and 35.

Inches

Shell Size	MS Shell Size Code	B Thread 0.1P-0.3L-TS-2B (Plated)	Q Dia. Max.
9	A	.6250	.859
11	B	.7500	.969
13	C	.8750	1.141
15	D	1.0000	1.266
17	E	1.1875	1.391
19	F	1.2500	1.500
21	G	1.3750	1.625
23	H	1.5000	1.750
25	J	1.6250	1.875

Millimeters

Shell Size	MS Shell Size Code	Q Max.	V Thread Metric
9	A	21.82	M12X1-6g
11	B	24.62	M15X1-6g
13	C	28.98	M18X1-6g
15	D	32.16	M22X1-6g
17	E	35.33	M25X1-6g
19	F	38.10	M28X1-6g
21	G	41.28	M31X1-6g
23	H	44.45	M34X1-6g
25	J	47.63	M37X1-6g

All dimensions for reference only.

TV07R (D38999/24)* – crimp, metal

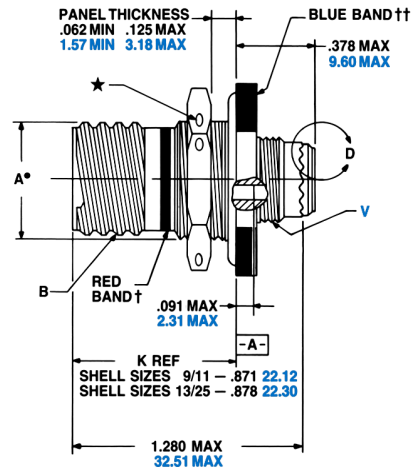
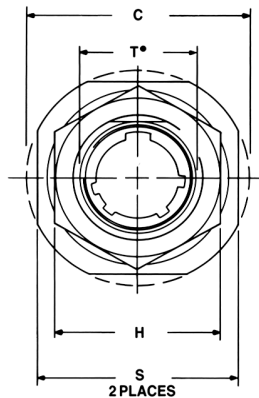
CTV07R (D38999/24)** – crimp, composite

jam nut receptacle

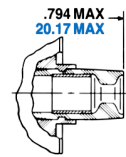
TV07RW-XX-XXX
TVS07RK-XX-XXX
TVS07RF-XX-XXX
TVS07RS-XX-XXX

CTV07RW-XX-XXX
CTVS07RF-XX-XXX

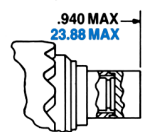
D38999/24



VIEW D
FOR SIZE 8 COAXIAL
ONLY, RELATIVE TO -A-



VIEW D
FOR SIZE 8 TWINAX
ONLY, RELATIVE TO -A-



- † Red band indicates fully mated
†† Blue band indicates rear release contact retention system
★ .059 dia. min. 3 lockwire holes
2.32 dia min.
Formed lockwire hole design (6 holes) is optional
* To complete order number for TV metal connectors, see pages 32 and 33.
** To complete order number for CTV composite connectors, see pages 34 and 35.

Inches

Shell Size	MS Shell Size Code	A* +.000 -.010	B Thread Class 2A 0.1P-0.3L-TS (Plated)	C Max.	H Hex +.017 -.016	S ±.010	T* +.010 -.000
9	A	.669	.6250	1.199	.875	1.062	.697
11	B	.769	.7500	1.386	1.000	1.250	.822
13	C	.955	.8750	1.511	1.188	1.375	1.007
15	D	1.084	1.0000	1.636	1.312	1.500	1.134
17	E	1.208	1.1875	1.761	1.438	1.625	1.259
19	F	1.333	1.2500	1.949	1.562	1.812	1.384
21	G	1.459	1.3750	2.073	1.688	1.938	1.507
23	H	1.575	1.5000	2.199	1.812	2.062	1.634
25	J	1.709	1.6250	2.323	2.000	2.188	1.759

Millimeters

Shell Size	MS Shell Size Code	A* +.00 -.25	C Max.	H Hex +.43 -.41	S ±.25	T* +.25 -.00	V Thread Metric
9	A	16.99	30.45	22.23	26.97	17.70	M12X1-6g
11	B	19.53	35.20	25.40	31.75	20.88	M15X1-6g
13	C	24.26	38.38	30.18	34.93	25.58	M18X1-6g
15	D	27.53	41.55	33.32	38.10	28.80	M22X1-6g
17	E	30.68	44.73	36.53	41.28	31.98	M25X1-6g
19	F	33.86	49.50	39.67	46.02	35.15	M28X1-6g
21	G	37.06	52.65	42.80	49.23	38.28	M31X1-6g
23	H	40.01	55.85	46.02	52.37	41.50	M34X1-6g
25	J	43.41	59.00	50.80	55.58	44.68	M37X1-6g

All dimensions for reference only.

• D shaped panel cut-out dimensions

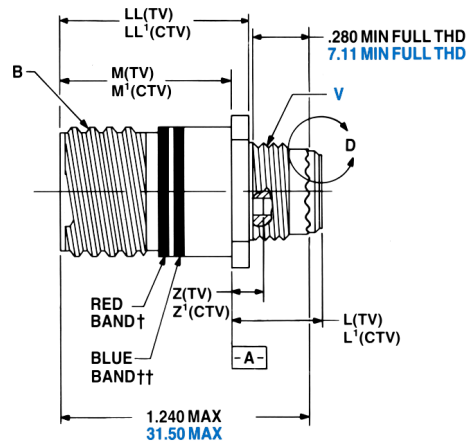
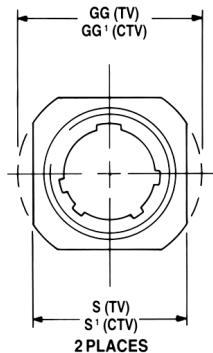
TV01R* – crimp, metal

CTV01R** – crimp, composite

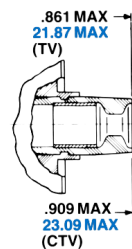
line receptacle

TV01RW-XX-XXX
TVS01RF-XX-XXX

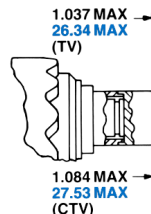
CTV01RW-XX-XXX
CTVS01RF-XX-XXX



VIEW D
FOR SIZE 8 COAXIAL
ONLY, RELATIVE TO -A-



VIEW D
FOR SIZE 8 TWINAX
ONLY, RELATIVE TO -A-



†Red band indicates fully mated

††Blue band indicates rear release contact retention system

* To complete order number for TV metal connectors, see pages 32 and 33.

** To complete order number for CTV composite connectors, see pages 34 and 35.

Inches

Shell Size	MS Shell Size Code	B Thread 0.1P-0.3L-TS-2A (Plated)	M +.000 -.005 (TV)	M¹ +.000 -.005 (CTV)	L Max. (TV)	L¹ Max. (CTV)	S ±.010 (TV)	S¹ ±.010 (CTV)	Z Max. (TV)	Z¹ Max. (CTV)	GG ±.010 (TV)	GG¹ ±.010 (CTV)	LL +.006 -.000 (TV)	LL¹ ±.005 (CTV)
9	A	.6250	.820	.775	.469	.514	.675	.635	.153	.198	.812	.699	.905	.913
11	B	.7500	.820	.775	.469	.514	.800	.765	.153	.198	.905	.875	.905	.913
13	C	.8750	.820	.775	.469	.514	.925	.885	.153	.198	1.093	1.007	.905	.913
15	D	1.0000	.820	.775	.469	.514	1.050	1.100	.153	.198	1.219	1.140	.905	.913
17	E	1.1875	.820	.775	.469	.514	1.238	1.197	.153	.198	1.375	1.229	.905	.913
19	F	1.2500	.820	.775	.469	.514	1.300	1.260	.153	.198	1.469	1.380	.905	.913
21	G	1.3750	.790	.745	.500	.545	1.425	1.385	.183	.228	1.625	1.493	.905	.911
23	H	1.5000	.790	.745	.500	.545	1.550	1.510	.183	.228	1.750	1.626	.905	.911
25	J	1.6250	.790	.745	.500	.545	1.675	1.635	.183	.228	1.875	1.777	.905	.911

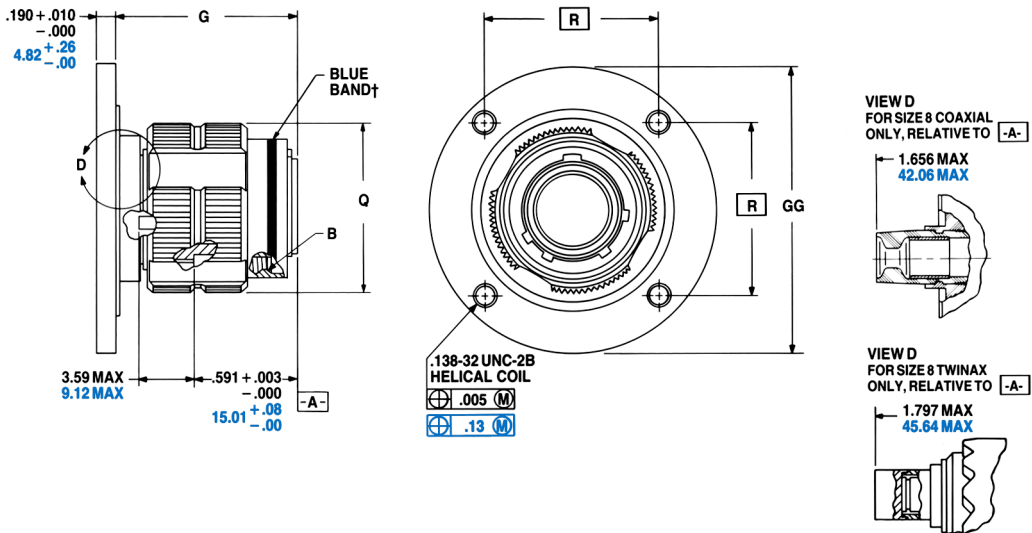
Millimeters

Shell Size	MS Shell Size Code	M +.00 -.13 (TV)	M¹ +.00 -.13 (CTV)	L Max. (TV)	L¹ Max. (CTV)	S ±.25 (TV)	S¹ ±.25 (CTV)	V Thread Metric	Z Max. (TV)	Z¹ Max. (CTV)	GG ±.25 (TV)	GG¹ ±.25 (CTV)	LL +.15 -.00 (TV)	LL¹ ±.13 (CTV)
9	A	20.83	19.69	11.91	13.06	17.15	16.13	M12X1-6g	3.89	5.03	20.62	17.75	22.99	23.19
11	B	20.83	19.69	11.91	13.06	20.32	19.43	M15X1-6g	3.89	5.03	22.99	22.22	22.99	23.19
13	C	20.83	19.69	11.91	13.06	23.50	22.47	M18X1-6g	3.89	5.03	27.76	25.57	22.99	23.19
15	D	20.83	19.69	11.91	13.06	26.67	27.94	M22X1-6g	3.89	5.03	30.96	28.95	22.99	23.19
17	E	20.83	19.69	11.91	13.06	31.45	30.40	M25X1-6g	3.89	5.03	34.93	31.21	22.99	23.19
19	F	20.83	19.69	11.91	13.06	33.02	32.00	M28X1-6g	3.89	5.03	37.31	35.05	22.99	23.19
21	G	20.07	18.92	12.70	13.84	36.20	35.18	M31X1-6g	4.65	5.79	41.28	37.92	22.99	23.14
23	H	20.07	18.92	12.70	13.84	39.37	38.35	M34X1-6g	4.65	5.79	44.45	41.30	22.99	23.14
25	J	20.07	18.92	12.70	13.84	42.55	41.53	M37X1-6g	4.65	5.79	47.63	45.13	22.99	23.14

All dimensions for reference only.

TV09R* – crimp, metal flange mounting plug

TV09RW-XX-XXX
TVS09RF-XX-XXX



† Blue band indicates rear release contact retention system
* To complete order number, see page 32.

Inches						
Shell Size	MS Shell Size Code	B Thread 0.1P-0.3L-TS-2A (Plated)	G ±.060	Q Dia. Max.	R	GG Dia. ±.005
9**	A	.6250	1.106	.859	1.038	1.838
11	B	.7500	1.106	.969	1.115	1.948
13**	C	.8750	1.106	1.141	1.240	2.124
15	D	1.0000	1.106	1.266	1.327	2.248
17	E	1.1875	1.106	1.391	1.417	2.375
19	F	1.2500	1.356	1.500	1.557	2.495
21	G	1.3750	1.356	1.625	1.624	2.568
23	H	1.5000	1.356	1.750	1.713	2.723
25	J	1.6250	1.356	1.875	1.801	2.848

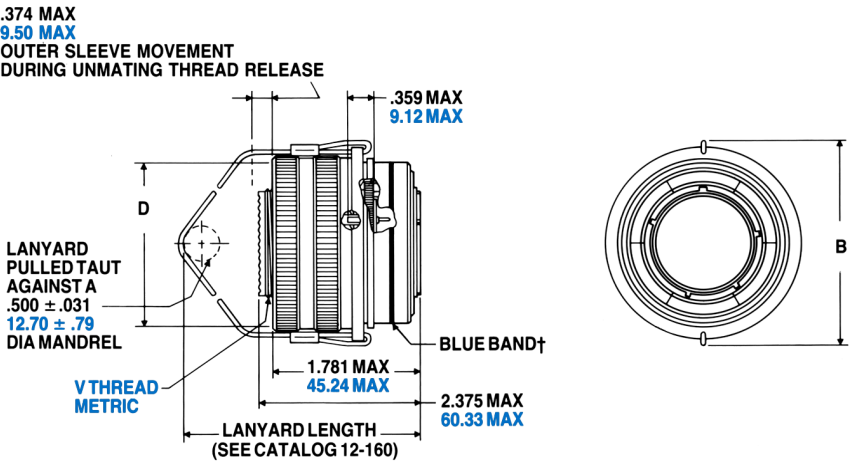
Millimeters					
Shell Size	MS Shell Size Code	G ±1.52	Q Dia. Max.	R	GG Dia. ±.13
9**	A	28.09	21.82	26.37	46.69
11	B	28.09	24.62	28.32	49.48
13**	C	28.09	28.98	31.50	53.95
15	D	28.09	32.16	33.71	57.10
17	E	28.09	35.33	35.99	60.33
19	F	34.44	38.10	39.55	63.37
21	G	34.44	41.28	41.25	65.23
23	H	34.44	44.45	43.51	69.16
25	J	34.44	47.63	45.75	72.34

All dimensions for reference only.
** Partially tooled. Consult Sidney NY for availability

R Designates true position dimensioning

TV Fail Safe – crimp, metal lanyard release plug

- *88-5565XX-XX
- *91-5565XX-XX
- *D38999/29 (Pins Only)
- *D38999/30 (Sockets only)



† Blue band indicates rear release contact retention system
 * To complete order number, see page 33 and Amphenol catalog 12-160.

Inches

Shell Size	MS Shell Size Code	B Max.	D Max. Accessory Dia.
11	B	1.846	1.109
13	C	1.972	1.250
15	D	2.079	1.375
17	E	2.205	1.500
19	F	2.301	1.625
21	G	2.472	1.750
23	H	2.594	1.875
25	J	2.705	2.000

Millimeters

Shell Size	MS Shell Size Code	B Max.	D Max. Accessory Dia.	V Thread Metric
11	B	46.89	28.17	M15X1.0-6g
13	C	50.09	31.75	M18X1.0-6g
15	D	52.81	34.93	M22X1.0-6g
17	E	56.01	38.10	M25X1.0-6g
19	F	58.45	41.28	M28X1.0-6g
21	G	62.79	44.45	M31X1.0-6g
23	H	65.89	47.63	M34X1.0-6g
25	J	68.71	50.08	M37X1.0-6g

All dimensions for reference only.

TV Fail Safe for MIL-STD-1760 – crimp, metal lanyard release plug

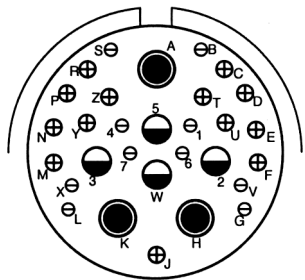
***D38999/31**

- ***88-555875/76

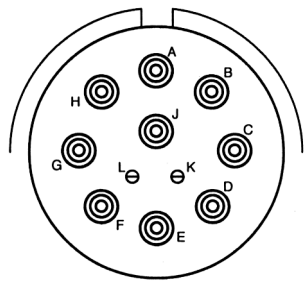
***91-555875/76
- Style 1
- ***88-558518/19

***91-558518/19
- Style 2

For Style 1 “Long Version”
contact Amphenol for drawing
T3W-16B25-XXXXX



25-20
Primary Interface Signal Set

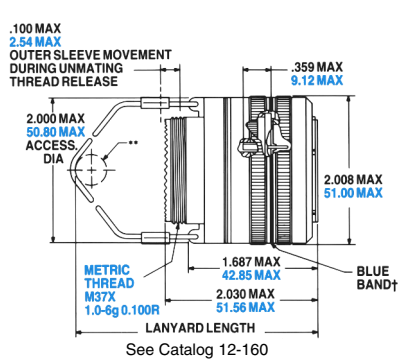


25-11
Auxiliary Power Signal Set

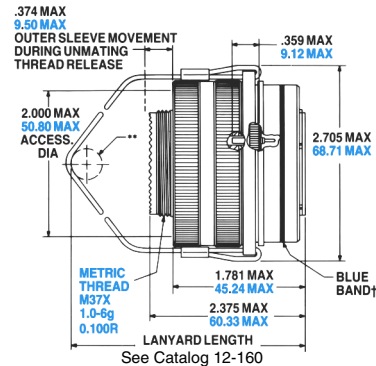
Front face of pin insert illustrated



SHELL SIZE 25 ONLY



STYLE 1



STYLE 2

- † Blue band indicates rear release contact retention system
* To complete order number, see page 33 and Amphenol catalog 12-160.
** Lanyard pulled taut against a .500 ±.031 dia. mandrel
*** Consult Sidney, NY for how to order proprietary part numbers.
All dimensions for reference only

1760 Fail Safe Features:

- Incorporates all MIL-DTL-38999 Series III features
- Intermateable with D38999/20 and /24
- Available with pin contacts only for MIL-STD-1760 applications
- Insert arrangements totally compatible with MIL-STD-1553B Aircraft Multiplex Data Bus
- 25-20 arrangement available only in “N” normal rotation
- 25-11 arrangement available only in “A” rotation
- O.D. cadmium corrosion resistant finish
- Accepts MIL-C-85049 backshell hardware
- Fiber optics

Pin Contact Data for MIL-STD-1760

Insert Arrangement	Service Rating	Total Contacts	Contact Size			
			20	16*	12 (coax)	8 (twinax)
25-20	N	30	10	13*	4	3

* Two size 16 contacts dedicated to fiber optics. Consult Sidney, NY or catalog section 12-352 for fiber optic contact information.

Insert Arrangement	Service Rating	Total Contacts	Contact Size	
			20	10 (power)
25-11††	N	11	2	9

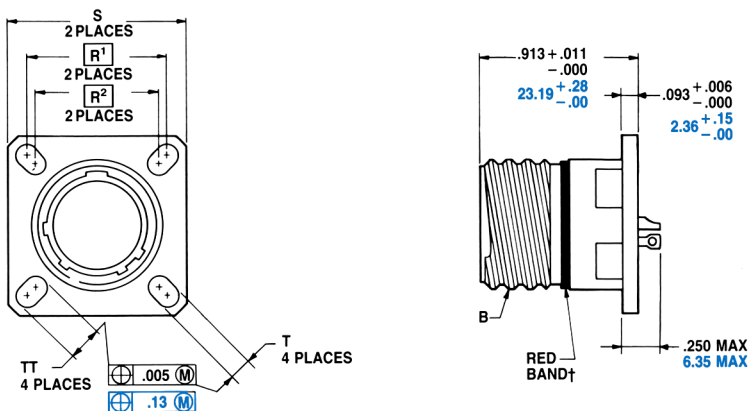
Contact Size	Proprietary No.	MS No.
8 (twinax)	21-33190-529	M39029/90-529
10 (power)	10-251415-105	M39029/58-528
12 (coax)	21-33122-546	M39029/28-211
16	†	†
20	†	†

- † Standard Subminiature Connector contacts - see page 20 for part numbers.
†† Currently available under proprietary part number only.

TVPS02Y (D38999/21)* – hermetic, metal box mounting receptacle

TVPS02Y-XX-XXX
TVPS02YN-XX-XXX

D38999/21



† Red band indicates fully mated
* To complete order number, see pages 32 and 33.

Inches							
Shell Size	MS Shell Size Code	B Thread Class 2A 0.1P-0.3L-TS (Plated)	R¹	R²	S ±.010	T +.008 -.006	TT +.008 -.006
9	A	.6250	.719	.594	.938	.128	.216
11	B	.7500	.812	.719	1.031	.128	.194
13	C	.8750	.906	.812	1.125	.128	.194
15	D	1.0000	.969	.906	1.219	.128	.173
17	E	1.1875	1.062	.969	1.312	.128	.194
19	F	1.2500	1.156	1.062	1.438	.128	.194
21	G	1.3750	1.250	1.156	1.562	.128	.194
23	H	1.5000	1.375	1.250	1.688	.154	.242
25	J	1.6250	1.500	1.375	1.812	.154	.242

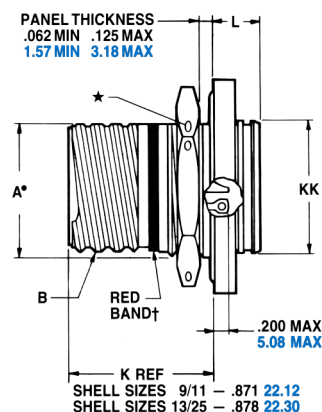
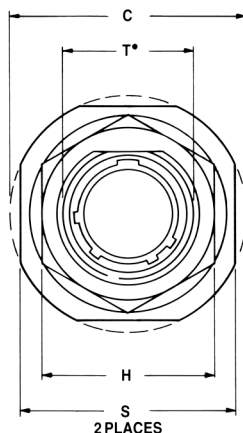
Millimeters						
Shell Size	MS Shell Size Code	R¹	R²	S ±.25	T +.20 -.15	TT +.20 -.15
9	A	18.26	15.09	23.83	3.25	5.49
11	B	20.62	18.26	26.19	3.25	4.93
13	C	23.01	20.62	28.58	3.25	4.93
15	D	24.61	23.01	30.96	3.25	4.39
17	E	26.97	24.61	33.32	3.25	4.93
19	F	29.36	26.97	36.53	3.25	4.93
21	G	31.75	29.36	39.67	3.25	4.93
23	H	34.93	31.75	42.88	3.91	6.15
25	J	38.10	34.93	46.02	3.91	6.15

All dimensions for reference only. Designates true position dimensioning

TVS07Y (D38999/23)* – hermetic, metal jam nut receptacle

TVS07Y-XX-XXX
TVS07YN-XX-XXX

D38999/23



† Red band indicates fully mated

★ .059 dia. min. 3 lockwire holes
2.32 dia. min.

Formed lockwire hole design (6 holes) is optional

* To complete order number, see pages 32 and 33.

Inches

Shell Size	MS Shell Size Code	A* +.000 -.010	B Thread Class 2A 0.1P-0.3L-TS (Plated)	C Max.	H Hex +.017 -.016	L Max.	S ±.010	T* +.010 -.000	KK +.011 -.000
9	A	.669	.6250	1.199	.875	.357	1.062	.697	.642
11	B	.769	.7500	1.386	1.000	.357	1.250	.822	.766
13	C	.955	.8750	1.511	1.188	.357	1.375	1.007	.892
15	D	1.084	1.0000	1.636	1.312	.357	1.500	1.134	1.018
17	E	1.208	1.1875	1.761	1.438	.357	1.625	1.259	1.142
19	F	1.333	1.2500	1.949	1.562	.381	1.182	1.384	1.268
21	G	1.459	1.3750	2.073	1.688	.381	1.938	1.507	1.392
23	H	1.575	1.5000	2.199	1.812	.381	2.062	1.634	1.518
25	J	1.709	1.6250	2.323	2.000	.381	2.188	1.759	1.642

Millimeters

Shell Size	MS Shell Size Code	A* +.00 -.25	C Max.	H Hex +.43 -.41	L Max.	S ±.25	T* +.25 -.00	KK +.28 -.00
9	A	16.99	30.45	22.23	9.07	26.97	17.70	16.31
11	B	19.53	35.20	25.40	9.07	31.75	20.88	19.46
13	C	24.26	38.38	30.18	9.07	34.93	25.58	22.66
15	D	27.53	41.55	33.32	9.07	38.10	28.80	25.86
17	E	30.68	44.73	36.53	9.07	41.28	31.98	29.01
19	F	33.86	49.50	39.67	9.68	46.02	35.15	32.21
21	G	37.06	52.65	42.80	9.68	49.23	38.28	35.36
23	H	40.01	55.85	46.02	9.68	52.37	41.50	38.56
25	J	43.41	59.00	50.80	9.68	55.58	44.68	41.71

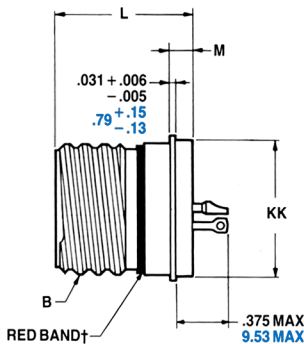
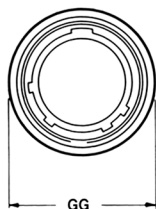
All dimensions for reference only.

• Designates true position dimensioning

TVSIY (D38999/25)* – hermetic, metal solder mounting receptacle

TVSIY-XX-XXX
TVSIYN-XX-XXX

D38999/25



† Red band indicates fully mated
* To complete order number, see pages 32 and 33.

Inches

Shell Size	MS Shell Size Code	B Thread Class 2A 0.1P-0.3L-TS (Plated)	L +.011 -.005	M +.006 -.005	GG Dia. +.011 -.010	KK Dia. +.001 -.005
9	A	.6250	.806	.125	.750	.672
11	B	.7500	.806	.125	.844	.781
13	C	.8750	.806	.125	.969	.906
15	D	1.0000	.806	.125	1.094	1.031
17	E	1.1875	.806	.125	1.218	1.156
19	F	1.2500	.806	.125	1.312	1.250
21	G	1.3750	.806	.125	1.438	1.375
23	H	1.5000	.838	.156	1.563	1.500
25	J	1.6250	.838	.156	1.688	1.625

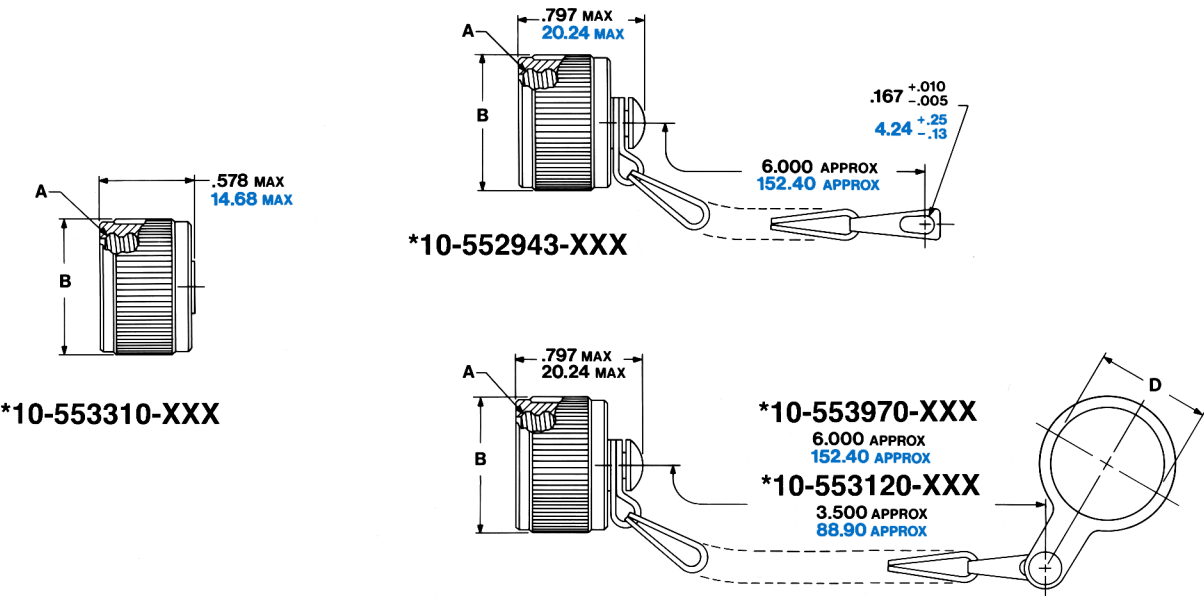
Millimeters

Shell Size	MS Shell Size Code	L +.28 -.00	M +.15 -.13	GG Dia. +.28 -.25	KK Dia. +.03 -.13
9	A	20.47	3.18	19.05	17.07
11	B	20.47	3.18	21.44	19.84
13	C	20.47	3.18	24.61	23.01
15	D	20.47	3.18	27.79	26.19
17	E	20.47	3.18	30.94	29.36
19	F	20.47	3.18	33.32	31.75
21	G	20.47	3.18	36.53	34.93
23	H	21.29	3.96	39.70	38.10
25	J	21.29	3.96	42.88	41.28

All dimensions for reference only.

Tri-Start – accessories

receptacle protection cap



* To complete order number, add shell size and suffix number.
For example, shell size 11 with olive drab cadmium nickel base, 10-552943-119.

Inches			
Shell Size	A Thread Class 2B 0.1P-0.3L-TS	B Dia. Max.	D Dia. +.010 -.000
9	.6250	.875	.703
11	.7500	1.000	.844
13	.8750	1.125	1.016
15	1.0000	1.250	1.141
17	1.1875	1.438	1.266
19	1.2500	1.500	1.391
21	1.3750	1.625	1.516
23	1.5000	1.750	1.641
25	1.6250	1.875	1.766

Millimeters			
Shell Size	MS Shell Size Code	B Dia. Max.	D Dia +.25 -.00
9	A	22.23	17.86
11	B	25.40	21.44
13	C	28.58	25.81
15	D	31.75	28.98
17	E	36.53	32.16
19	F	38.10	35.33
21	G	41.28	38.51
23	H	44.45	41.68
25	J	47.63	44.86

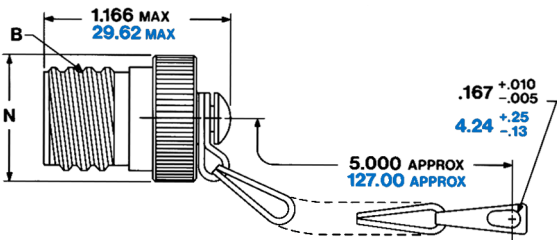
Consult Sidney, NY for availability of stainless steel protection caps.

All dimensions for reference only.
For MS protection caps, see page 29

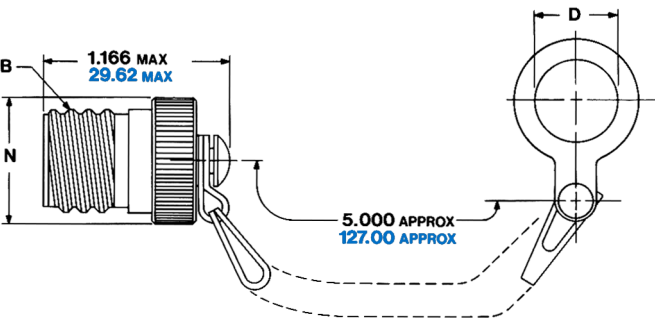
Tri-Start – accessories

plug protection cap

*10-552944-XXX



*10-553998-XXX



* To complete order number, add shell size and suffix number.
For example, shell size 11 with olive drab cadmium nickel base, 10-552944-119.

Inches			
Shell Size	A Thread Class 2A 0.1P-0.3L-TS	D +.010 -.000	N Dia. Max.
9	.6250	.516	.895
11	.7500	.641	1.000
13	.8750	.766	1.171
15	1.0000	.891	1.299
17	1.1875	1.016	1.436
19	1.2500	1.141	1.543
21	1.3750	1.266	1.670
23	1.5000	1.343	1.787
25	1.6250	1.516	1.914

Finish	10-No Suffix
Olive drab, cadmium, nickel base	-XX9
Electroless nickel	-XXG

Consult Sidney, NY for availability of stainless steel protection caps.

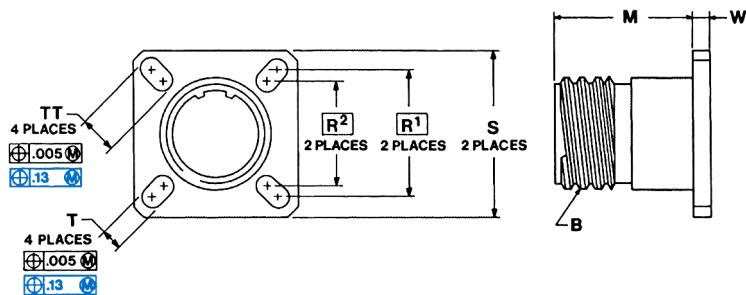
Millimeters			
Shell Size	MS Shell Size Code	D +.25 -.00	N Dia. Max.
9	A	13.11	22.73
11	B	16.28	25.40
13	C	19.46	29.74
15	D	22.63	32.99
17	E	25.81	36.47
19	F	28.98	39.19
21	G	32.16	42.42
23	H	34.11	45.39
25	J	38.51	48.62

All dimensions for reference only.
For MS protection caps, see page 29

Tri-Start – accessories

dummy receptacle

*10-553974-XXX



* To complete order number, add shell size and suffix number.
For example, shell size 11 with olive drab cadmium nickel
base, 10-553974-119

Finish	10-No Suffix
Olive drab, cadmium, nickel base	-XX9
Electroless nickel	-XXG

Inches									
Shell Size	MS Shell Size Code	B Thread Class 2A 0.1P-0.3L-TS (Plated)	M +.020 -.000	R ¹	R ²	S ±.010	T +.008 -.006	W ±.010	TT +.008 -.006
9	A	.6250	.822	.719	.594	.938	.128	.098	.216
11	B	.7500	.822	.812	.719	1.031	.128	.098	.194
13	C	.8750	.822	.906	.812	1.125	.128	.098	.194
15	D	1.0000	.822	.969	.906	1.219	.128	.098	.173
17	E	1.1875	.822	1.062	.969	1.312	.128	.098	.194
19	F	1.2500	.822	1.156	1.062	1.438	.128	.098	.194
21	G	1.3750	.791	1.250	1.156	1.562	.128	.125	1.94
23	H	1.5000	.791	1.375	1.250	1.688	.154	.125	.242
25	J	1.6250	.791	1.500	1.375	1.812	.154	.125	.242

Millimeters								
Shell Size	MS Shell Size Code	M +.51 −.00	R ¹	R ²	S ±.25	T +.20 −.15	W ±.25	TT +.20 −.15
9	A	20.88	18.26	15.09	23.83	3.25	2.49	5.49
11	B	20.88	20.62	18.26	26.19	3.25	2.49	4.93
13	C	20.88	23.01	20.62	28.58	3.25	2.49	4.93
15	D	20.88	24.61	23.01	30.96	3.25	2.49	4.39
17	E	20.88	26.97	24.61	33.32	3.25	2.49	4.93
19	F	20.88	29.36	26.97	36.53	3.25	2.49	4.93
21	G	20.09	31.75	29.36	39.67	3.25	3.18	4.93
23	H	20.09	34.93	31.75	42.88	3.91	3.18	6.15
25	J	20.09	38.10	34.93	46.02	3.91	3.18	6.15

All dimensions for reference only.

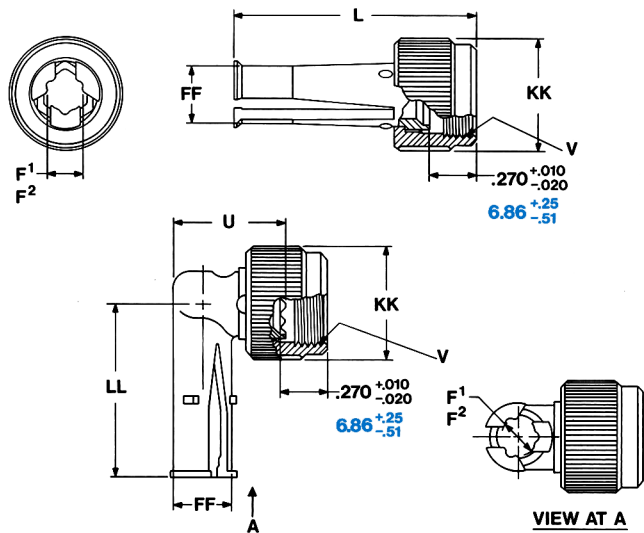
R¹ Designates true position dimensioning

Tri-Start – accessories

cable clamps

*10-552681-XXX

*10-552682-XXX



* To complete order number, add shell size and suffix number.
For example, shell size 11 with olive drab cadmium nickel base, 10-552681-119

Inches

Finish	10-No Suffix
Olive drab, cadmium, nickel base	-XX9
Electroless nickel	-XXG

Shell Size	MS Shell Size Code	F ¹ Min. Dia. Cable	F ² Max. Dia. Cable	L Max.	U Max.	FF Dia. Max.	KK Dia. Max.	LL Max.
9	A	.094	.203	1.431	.656	.347	.629	1.015
11	B	.141	.250	1.431	.688	.394	.756	1.062
13	C	.172	.323	1.431	.750	.467	.883	1.125
15	D	.203	.422	1.431	.859	.566	1.011	1.328
17	E	.234	.500	1.431	.937	.644	1.138	1.392
19	F	.265	.562	1.431	1.000	.706	1.265	1.453
21	G	.297	.625	1.492	1.062	.769	1.393	1.609
23	H	.328	.703	1.492	1.141	.847	1.488	1.656
25	J	.359	.765	1.492	1.203	.909	1.616	1.719

Millimeters

Shell Size	MS Shell Size Code	F ¹ Min. Dia. Cable	F ² Max. Dia. Cable	L Max.	U Max.	V Thread Metric	FF Dia. Max.	KK Dia. Max.	LL Max.
9	A	2.39	5.16	36.35	16.66	M12X1-6H	8.81	15.98	25.78
11	B	3.58	6.35	36.35	17.48	M15X1-6H	10.01	19.20	26.97
13	C	4.37	8.20	36.35	19.05	M18X1-6H	11.86	22.43	28.58
15	D	5.16	10.72	36.35	21.82	M22X1-6H	14.38	25.68	33.73
17	E	5.94	12.70	36.35	23.80	M25X1-6H	16.36	28.91	35.36
19	F	6.73	14.27	36.35	25.40	M28X1-6H	17.93	32.13	36.91
21	G	7.54	15.88	37.90	26.97	M31X1-6H	19.53	35.38	40.87
23	H	8.33	17.86	37.90	28.98	M34X1-6H	21.51	37.80	42.06
25	J	9.12	19.43	37.90	30.56	M37X1-6H	23.09	41.05	43.66

All dimensions for reference only.
Contact your local accessory supplier for composite cable clamps.
For composite strain reliefs see Product Data Sheet 145.

Tri-Start – accessories

“ABK” heat shrinkable backshells



“ABK” Heat Shrinkable Backshells

One Part Cable Termination for MIL-DTL-38999 Series I, II, III, & IV

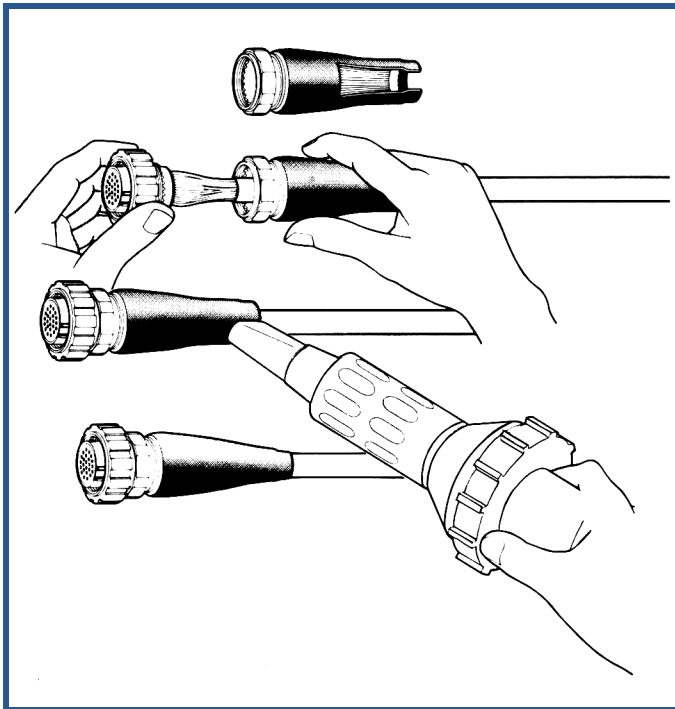
Benefits of “ABK” assemblies are:

- One piece part
- Quick and easy installation
- One part covers wide cable range
- Lightweight
- Stainless and aluminum adapters
- F, W and C Class finishes
- Shielded and unshielded
- Straight, 45° and 90° configurations
- Various materials, ie: LFH, fluid resistant
- Operating temp. range –55°C to +150°C
- Repairable

Amphenol® “ABK” heat shrinkable backshell kits are one-part assemblies for terminating MIL-DTL-38999 Series I, II, III & IV connectors to either shielded or unshielded cables.

Constructed using Spin Coupling adapters and heat-shrinkable molded parts, the kit comprises of components already well proven in harsh military environments.

Installation is simply effected by coupling the adapter to the connector and shrinking the rear of the molded part onto the cable with a hot air gun. The molded part has a hot melt adhesive pre-installed to provide a bond between the cable jacket and the molded part. When used in conjunction with shielded cables, the assembly provides electrical continuity between the cable shield and the connector with Rayaten™ molded parts which provide screening levels better than 80DB at 100 MHz.

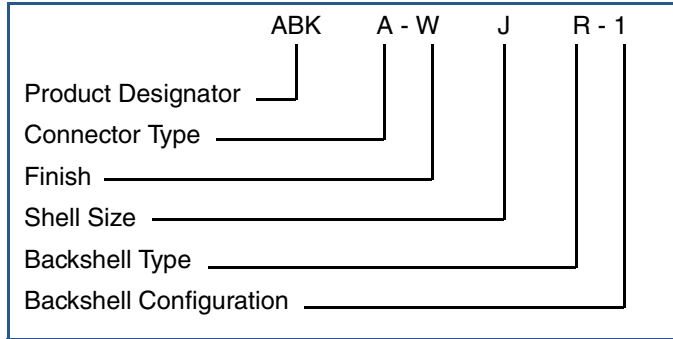


Simple Installation

Tri-Start – accessories

“ABK” heat shrinkable backshells, how to order

Amphenol® “ABK” Heat Shrinkable Backshells can be ordered by coded part number. Ordering procedure is illustrated by part number ABK-AWJ-R1 as shown below:



Notes:

The part number will change dependant on the connector that it has to interface with as well as that connector's shell size and finish.

Such features as anti-rotation teeth and “O” rings will be incorporated as standard features if dictated by the connector interface requirements.

Backshell kits are supplied in a sealed bag with cleaning tissue and a piece of 100 grit Emery cloth.

Although the backshell kits are heat-shrinkable, and therefore accommodate a wide range of cable and shield diameters, it is still very important to ensure that your requirements fall within that range.

CABLE RANGES

Using the chart below, check to ensure that your cable falls within the correct range; and if not, consult Amphenol Aerospace for availability of other cable ranges.

Shell Size			Cable Range	
Series III & IV	Series II	Series I	“R” Shielded / “U” Unshielded	
			Inches	Millimeters
A	8	9	.197 - .433 in.	5.0 - 11 mm
B	10	11	.197 - .433 in.	5.0 - 11 mm
C	12	13	.236 - .590 in.	6.0 - 15 mm
D	14	15	.279 - .709 in.	7.1 - 18 mm
E	16	17	.279 - .709 in.	7.1 - 18 mm
F	18	19	.331 - .866 in.	8.4 - 22 mm
G	20	21	.331 - .866 in.	8.4 - 22 mm
H	22	23	.390 - 1.181 in.	9.9 - 30 mm
J	24	25	.618 - 1.417 in.	15.7 - 36 mm

Product Designator

ABK designates Amphenol Backshell Kit

Connector Type

A designates D38999 Series I or II

B designates D38999 Series III or IV

Finish

C - Environmental, nonconductive anodize, 500 hr. salt spray

F - Environmental, electroless nickel

W - Environmental, olive drab cadmium, 500 hr. salt spray

Shell Size

Code Letter	A	B	C	D	E	F	G	H	J
Shell Size	9	11	13	15	17	19	21	23	25
Shell Size	8	10	12	14	16	18	20	22	24

Backshell Type

R designates Rayaten* (Shielded)

U designates Unshielded

Backshell Configuration

1 - Straight

2 - 45°

3 - Right angle

* Rayaten is a trademark of Raychem Corporation

Tri-Start – accessories

header assembly for flex print or PC board connectors

The use of connectors with printed circuit contact termination is rapidly gaining popularity due to the use of high volume, vapor phase or wave solder manufacturing processes. Termination of this style of connector to flex print or a printed circuit board represents a major cost in the manufacturing process for users. When adding filter or filter/transient protection connector, the total cost of a failed solder joint, a bent pin, or an unanticipated electrical failure becomes prohibitive. The header assembly from Amphenol will provide for easy separation of the connector from the board on these occasions.

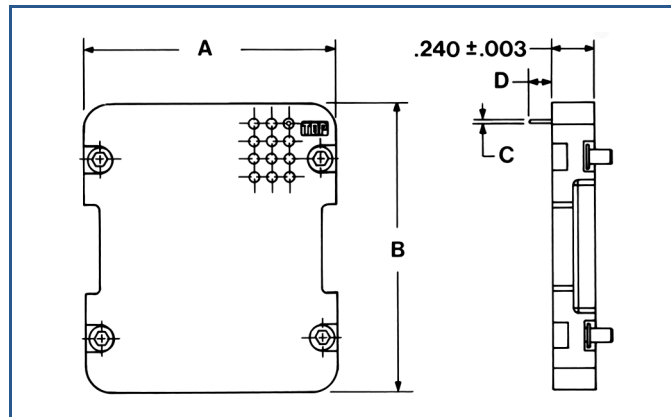
Incorporation of the header assembly provides the user with time and cost saving potentials. These header assemblies can be vapor phase or wave soldered to flex or printed circuit boards prior to the receipt of the EMI/EMP connector. Headers can be installed to standard connectors, allowing for electrical testing that would adversely affect the sensitive diodes, MOV's or capacitors in the EMI/EMP connectors. Expensive connector assemblies can be easily removed from and reattached to the header assembly as the manufacturing process dictates.

Shell modifications are recommended, but are not necessary. The header assembly can be attached to connectors with standard flange placement. The ideal application would involve either a single flange moved all the way to the rear of the connector or a double flange. Cinch nuts can be installed in either flange to allow easier mounting to the panel or the header assembly. The forward flange would mount the connector to the panel; the rear flange would be used to mount the header assembly.

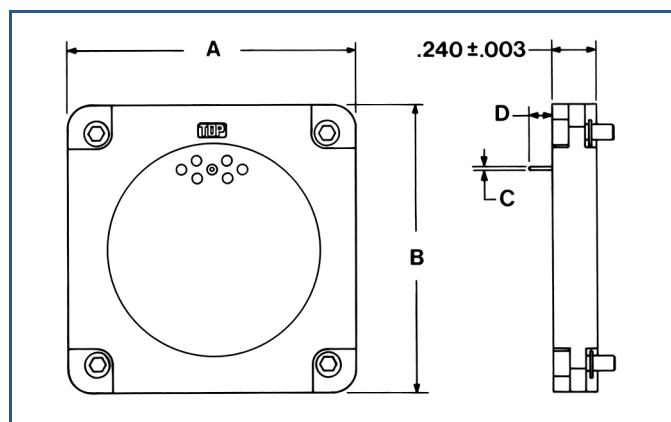
The heart of the header assembly is a short pin/socket contact. The tall of the contact would accommodate standard through-hole diameter and thickness of the flex or printed circuit board materials. The socket would be imbedded in the molded material, making electrical engagement with the printed circuit tail of the connector.

This header would be the same dimension as the flange of the mounting connector and would be approximately .250 inches (6.35 mm) thick. Electrical engagement areas of the header contact would be plated with .00003 inches minimum of gold over .00005 inches minimum of nickel. The body of the header itself is molded from Torlon or PPS (Polyphenylene Sulfide). Headers are configured to accommodate up to 150 pins in an ARINC arrangement or 128 pins for a cylindrical pattern. Various types of captivated or loose attaching screws can be incorporated for unique applications.

This header assembly is available to fit all major cylindrical Mil-Spec and ARINC connectors. The drawing above shows both an ARINC and a cylindrical configuration. "A" and "B" dimensions are determined by connector intermount. Contact Amphenol, Sidney, N.Y. for detailed dimensions.



ARINC Configuration



Cylindrical Configuration

STANDARD HEADER CONTACTS †

Contact Size	C Dia. ±.002	D Stickout ±.015	Mating Connector PCB Dia.
22	.020	.078, .128, .178	.017 – .025
20	.030	.078, .128, .178	.026 – .036
16, 12	.045	.078, .128, .178	.043 – .051 .005 Δ Max.

† Other sizes available; consult Amphenol, Sidney, N.Y.
NOTE: Consult Amphenol, Sidney, N.Y. for mating connector PCB stickout range.

See also flex termination assemblies for Tri-Start connectors on page 38 of this catalog, and ask for Amphenol catalog 12-170, Cylindrical Connectors for PCB Applications.

Tri-Start

contacts, sealing plugs, protection caps

STANDARD 500 CYCLE CONTACTS FOR TV AND CTV, P & S

Contact Size	TV/CTV Pins			TV/CTV Sockets		
	Proprietary No.	Military No.	Supersedes	Proprietary No.	Military No.	Supersedes
8 (Coax)*	21-33102-21	M39029/60-367	MS27536	21-33101-21	M39029/59-366	MS27535
8 (Twinax)	21-33190-529	M39029/90-529**	NA	21-33191-530	M39029/91-530	NA
10 (Power)	10-251415-105	M39029/58-528	NA	10-407035-105	M39029/56-527	NA
12	10-251415-12H	M39029/58-365	MS27493-12	10-597261-121	M39029/56-353	MS27490-12
16	10-251415-165	M39029/58-364	MS27493-16	10-597261-161	M39029/56-352	MS27490-16
20	LP-251415-205	M39029/58-363	MS27493-20	10-597261-201	M39029/56-351	MS27490-20
22D	LP-251415-725	M39029/58-360	MS27493-22D	10-597261-721	M39029/56-348	MS27490-22D

Above part numbers include standard 500 cycle finish designation - gold plating over suitable underplate in accordance with MIL-C-39029.

For other finish variations, consult Sidney, NY.

* For use with RG180B/U and RG195A/U cable. For other size 8 coax or optional sizes 12 and 16 coax contacts available for use in Tri-Start connectors, see catalog 12-130 or consult Sidney, NY.

** For use with M17/M176-00002 cable.

† Optional design - see slash sheet MS39029.

For other contact options available for use in Tri-Start connectors, (wire wrap, thermocouple, fiber optic) consult Sidney, NY.

1500 CYCLE CONTACTS FOR CTV, CLASSES H & J

Contact Size	CTV Pins			CTV Sockets		
	Proprietary No.	Military No.	Supersedes	Proprietary No.	Military No.	Supersedes
12	10-597072-2X	M39029/107-623	—	10-597073-2X	M39029/106-617	—
16	10-597068-2X	M39029/107-622	—	10-597069-2X	M39029/106-616	—
20	10-597064-2X	M39029/107-621	—	10-597065-2X	M39029/106-615	—
22D	10-597058-3X	M39029/107-620	—	10-597061-2X	M39029/106-614	—

PLASTIC PROTECTION CAPS

Shell Size	Plug	Receptacle
9	10-70506-14	10-70500-10
11	10-70506-16	10-70500-12
13	10-70500-18	10-70500-14
15	10-70500-20	10-70500-16
17	10-70500-22	10-70500-19
19	10-70500-24	10-70500-20
21	10-70524-1	10-70500-22
23	10-70506-28	10-70500-24
25	10-70500-28	10-70524-1

MS METAL PROTECTION CAPS

Shell Size	MS Shell Size Code	MS Plug Protection Cap	MS Receptacle Protection Cap
9	A	D38999/32W9X*	D38999/33W9X*
11	B	D38999/32W11X*	D38999/33W11X*
13	C	D38999/32W13X*	D38999/33W13X*
15	D	D38999/32W15X*	D38999/33W15X*
17	E	D38999/32W17X*	D38999/33W17X*
19	F	D38999/32W19X*	D38999/33W19X*
21	G	D38999/32W21X*	D38999/33W21X*
23	H	D38999/32W23X*	D38999/33W23X*
25	J	D38999/32W25X*	D38999/33W25X*

* To complete order number, replace X with applicable letter as follows:

R - designates eyelet type

N - designates washer type

MS metal protection caps are supplied with service class W which designates corrosion resistant olive drab cadmium plate aluminum.

Consult Sidney, NY for more detailed information on ordering MS Metal protection caps.

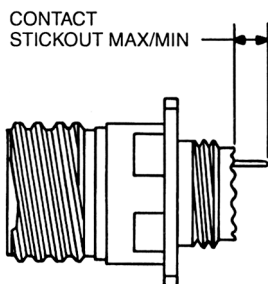
SEALING PLUGS

Contact Size	Proprietary No.	Military No.
8 (Coax)	10-482099-8	NA
8 (Twinax)	T3-4008-59P	NA
10 (Power)	10-576225	NA
12	10-405996-12	MS27488-12
16	10-405996-16	MS27488-16
20	10-405996-20	MS27488-20
22D	10-405996-22	MS27488-22

contacts – printed circuit board, wire wrap

SOCKETS

PCB Socket Contacts	Size	Tail Dia	Contact Stickout Max/Min (See Illustration below)			
			D38999/20 TVP00	D38999/26 TV06	D38999/24 TV07	
					Metal	Composite
10-497623-15	22D	.019	.291 .226	.316 .251	.285 .222	.242 .182
10-497623-25	22D	.019	.868 .803	.893 .828	.862 .802	.819 .759
10-497623-35	22D	.019	.348 .283	.373 .308	.342 .282	.299 .239
10-497623-45	22D	.019	.208 .143	.233 .168	.202 .142	.159 .099
10-497623-75	22D	.019	.146 .081	.171 .106	.140 .080	.097 .037
10-497623-105	22D	.019	.028 NS	.053 .000	.022 NS	.021 NS
10-497623-145	22D	.019	.609 .539	.634 .564	.603 .538	.560 .495
10-497623-155	22D	.019	.423 .358	.448 .383	.417 .357	.374 .314
10-497643-15	20	.019	.348 .294	.373 .319	.342 .293	.299 .250
10-497643-25	20	.019	.213 .159	.238 .184	.207 .158	.164 .115
10-497643-35	20	.019	.555 .501	.580 .526	.549 .500	.506 .457
10-497643-45	20	.019	.138 .084	.163 .109	.132 .083	.089 .040
10-497650-15	16	.040	.255 .201	.280 .226	.249 .200	.206 .157
Wire Wrap Contacts		Tail Square				
10-497577-15	22D	.025	.155 .090	.180 .115	.149 .089	.106 .046
10-497577-25	22D	.025	.002 NS	.027 NS	NS NS	NS NS
10-497577-35	22D	.025	.201 .136	.226 .161	.195 .135	.152 .092
10-497577-55	22D	.025	.566 .501	.591 .526	.560 .500	.517 .457
10-497621-15	20	.025	.151 .101	.176 .126	.145 .100	.102 .057
10-497621-25	20	.025	.605 .555	.630 .580	.599 .554	.556 .511
10-497621-35	20	.025	.308 .258	.333 .283	.302 .257	.259 .214



All dimensions for reference only.
Consult Sidney, NY for specific contact
contour stickout data.
NS designates No Stickout.

See also catalog 12-170,
Amphenol Cylindrical Connectors for
PCB Applications. This catalog pro-
vides the most commonly used insert
pattern pin-out drawings which have
been tooled for the purpose of attach-
ing cylindrical connectors to printed
circuit boards.

PINS

PCB Pin Contacts	Size	Tail Dia	Contact Stickout Max/Min (See Illustration below)			
			D38999/20 TVP00	D38999/26 TV06	D38999/24 TV07	
					Metal	Composite
10-407552-15	22M	.019	.335 .280	.360 .305	.329 .279	.286 .236
10-407552-55	22M	.019	.224 .169	.249 .194	.218 .168	.175 .125
10-407552-85	22M	.019	.060 .010	.085 .035	.054 .009	.011 NS
10-407552-95	22M	.019	NS	NS	NS	NS
10-407552-115	22M	.019	.002 NS	.023 NS	NS	NS
10-497640-15	20	.019	.348 .298	.373 .323	.342 .297	.299 .254
10-497640-25	20	.019	.213 .163	.238 .188	.207 .162	.164 .119
10-497640-45	20	.019	NS	NS	NS	NS
10-497640-65	20	.019	.138 .088	.163 .113	.132 .087	.089 .044
10-497596-15	20	.025	.058 .012	.083 .037	.052 .011	.009 NS
10-497596-25	20	.025	.148 .102	.173 .127	.142 .101	.099 .058
10-497596-35	20	.025	.229 .183	.254 .208	.223 .182	.180 .139
10-497596-55	20	.025	.346 .300	.371 .325	.340 .299	.297 .256
10-497695-15	16	.040	.255 .205	.280 .230	.249 .204	.206 .161
10-497630-25	16	.062	.348 .298	.373 .323	.342 .297	.299 .254
10-497630-35	16	.062	.060 .010	.085 .035	.054 .009	.011 NS
10-497630-45	16	.062	.108 .062	.133 .087	.102 .061	.059 .018
10-597502-15	12	.081	.228 .178	.252 .203	.222 .177	.179 .134
Wire Wrap Contacts		Tail Square				
10-407572-15	22D	.025	.014 NS	.498 .007	.008 NS	NS NS
10-407572-35	22D	.025	.155 .105	.180 .130	.149 .104	.106 .061
10-407572-45	22D	.025	.255 .205	.280 .230	.249 .204	.206 .161
10-407572-75	22D	.025	.521 .475	.546 .500	.515 .474	.472 .431
10-407584-25	20	.025	.605 .559	.630 .584	.599 .558	.556 .515
10-407584-35	20	.025	.308 .262	.333 .287	.302 .261	.259 .218

PCB socket and pin part numbers include finish designation - gold plating
over suitable underplate in accordance with MIL-C-39029. For other finish
variations, consult Sidney, NY.

Note: 22M and 22D contacts are interchangeable.

For other contact options available for use in Tri-Start connectors (thermo-
couple, fiber optic), consult Sidney, NY.

Tri-Start

application tools

The following data includes information pertaining to the application tools which have been established for crimping, inserting, and removing contacts incorporated in the TV, CTV and MIL-DTL-38999 Series III connectors. For additional information on coaxial contact tools see catalog 12-130.

All crimping tools included are the “full cycling” type and when

used as specified in the installation instructions (L-624 and L-844) covering the TV, CTV and MS series connectors, will provide reliable crimped wire to contact terminations. There is a possibility of additional crimping tools other than those included being available at present or in the future for this specific application.

CRIMPING TOOLS

Contact Size/Type	Crimping Tool	Turret Die or Positioner
12 Pin and Socket	M22520/1-01	M22520/1-04
16 Pin and Socket	M22520/1-01 M22520/7-01	M22520/1-04 M22520/7-04
20 Pin and Socket	M22520/1-01 M22520/2-01 M22520/7-01	M22520/1-04 M22520/2-10 M22520/7-08
22D Pin	M22520/2-01 M22520/7-01	M22520/2-09 M22520/7-07
22D Socket	M22520/2-01 M22520/7-01	M22520/2-07 M22520/7-05
8 Twinax Center Pin and Socket	M22520/2-01	M22520/2-37
8 Twinax Intermediate Outer Pin & Socket	M22520/5-01	M22520/5-200

Where 2 or 3 tools are listed for a contact size, only one tool and its die or positioner are required to crimp the contact.

The above crimping tools and positioners are available from the approved tool manufacturer.

Contact Size/Type	Crimping Tool	Turret Die or Positioner
8 Coaxial Inner Pin and Socket	M22520/2-01	M22520/2-31
8 Coaxial Outer Pin and Socket	M22520/5-01	M22520/5-05 Die Closure B
	M22520/5-01	M22520/5-41 Die Closure B
	M22520/10-01	M22520/10-07 Die Closure B
16 Coaxial Inner Pin and Socket	M22520/2-01	M22520/2-35
16 Coaxial Outer Pin and Socket	M22520/4-01	M22520/4-02
12 Coaxial Inner Pin and Socket	M22520/2-01	M22520/2-34
12 Coaxial Outer Pin and Socket	M22520/31-01	M22520/31-02
10 (Power)	***	***

INSERTION TOOLS

Use with Contact Size	Plastic Tools		Metal Tools			
	MS Part Number	Color	Angle Type		Straight Type Proprietary Part Number	Color
			MS Part Number	Proprietary Part Number		
10 (Power)	M81969/14-05*	Gray / (White)	M81969/8-11	†	†	Green
12	M81969/14-04*	Yellow / (White)	M81969/8-09	11-8674-12	11-8794-12	Yellow
16	M81969/14-03*	Blue / (White)	M81969/8-07	11-8674-16	11-8794-16	Blue
20	M81969/14-10*	Red / (Orange)	M81969/8-05	11-8674-20	11-8794-20	Red
22D	M81969/14-01*	Green / (White)	M81969/8-01	11-8674-24	11-8794-24	Black
8 Coaxial	None Required					
8 Twinax	None		M81969/46-06**	None		Red

REMOVAL TOOLS

Use with Contact Size	Plastic Tools		Metal Tools				
	MS Part Number	Color	For Unwired Contacts Proprietary Part Number	Angle Type		Straight Type Proprietary Part Number	Color
				MS Part Number	Proprietary Part Number		
10 (Power)	M81969/14-05*	(Gray) / White	†	M81969/8-12	†	†	Green / White
12	M81969/14-04*	(Yellow) / White	11-10050-11	M81969/8-10	11-8675-12	11-8795-12	Yellow / White
16	M81969/14-03*	(Blue) / White	11-10050-10	M81969/8-08	11-8675-16	11-8795-16	Blue / White
20	M81969/14-10*	Orange	11-10050-9	M81969/8-06	11-8675-20	11-8795-20	Red / White
22D	M81969/14-01*	(Green) / White	11-10050-7	M81969/8-02	11-8675-24	11-8795-24	Green / White
8 Coaxial	M81969/14-12	Green	None	None	11-9170	DRK264-8††	N/A
8 Twinax	M81969/14-12	Green	None	M81969/46-12**	11-9170	N/A	N/A

The M81969/8, 11-8674, 11-8675, and 11-8794 metal contact insertion and removal tools will accommodate wires having the maximum outside diameter as follows: Contact size 12– .155, 16– .109, 20– .077, 22D– .050. When wire diameters exceed those specified, the plastic tools must be used.

* Double end insertion/removal tool.

** Twinax insertion tools are available only in a straight type, metal version.

*** For size 10 power contact application tools, consult Sidney, NY.

† To be determined.

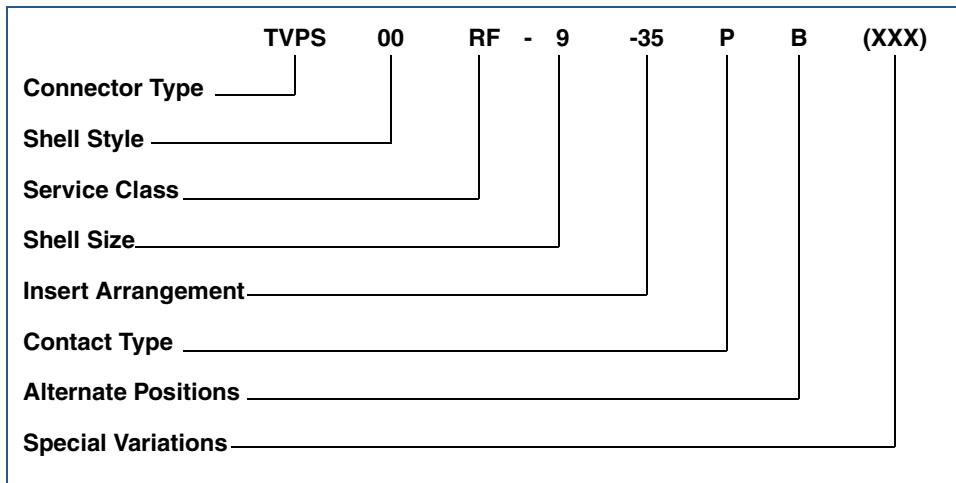
†† Contact Daniels Manufacturing Co. for availability.

Tri-Start

how to order – (Amphenol® TV, metal)

Proprietary Part Number

Amphenol® Tri-Start Connectors (metal) can be ordered by coded part number.
Ordering procedure is illustrated by part number TVPS00RF-9-35PB() as shown below:



Connector Type

- TV designates Tri-Start Series Connector
- TVP designates back panel mounted receptacle
- TVS designates 200°C rated
- TVPS designates back panel mounted, 200°C rated receptacle
- TVB designates thru bulkhead receptacle, flange mounting
- TVBJ designates thru bulkhead receptacle, jam nut mounting

Shell Style

- 00 designates wall mount receptacle
- 01 designates line receptacle
- 02 designates box mount receptacle
- 06 designates straight plug
- 07 designates jam nut receptacle
- 09 designates flange mounted plug
- I designates solder mounted receptacle, hermetic only

Service Class

- RX non-conductive, anodic coated aluminum, 500 hour salt spray, 200°C (requires special variation suffix 005)
- RF electroless nickel plated aluminum, optimum EMI shielding effectiveness – 65dB @ 10GHz specification min., 48 hour salt spray, 200°C
- RGF** electroless nickel plated ground plane aluminum, 200°C
- RGW** olive crab cadmium plated ground plane aluminum, 175°C
- RK* corrosion resistant stainless steel, firewall capability, plus 500 hour salt spray resistance, EMI – 45 dB @ 10 GHz specification min., 200°C
- RW corrosion resistant olive drab cadmium plate aluminum, 500 hour extended salt spray, EMI – 50 dB @ 10 GHz specification min., 175°C

- Y hermetic seal, passivated stainless steel, 200° C
- RS* (non-hermetic connectors), nickel plated stainless steel, optimum EMI shielding effectiveness – 65 dB @ 10 GHz specification min., 48 hour salt spray, 200°C, firewall barrier
- YN (hermetic connectors), nickel plated stainless steel, 200°C

Shell Size

MIL-DTL-38999, Sizes 9 – 25

A	B	C	D	E	F	G	H	J	MIL Shell Size
9	11	13	15	17	19	21	23	25	Amphenol Shell Size

Insert Arrangement

MIL-DTL-38999, see insert arrangement chart, page 5

Contact Type

- P designates pin contacts
- S designates socket contacts

Alternate Positions

Locksmith keying - rotation of minor keys. See page 6.
"N" not required for normal position.

Special Variations

- (100) eyelet termination (hermetic)
- (005) anodic coating

* Coaxial arrangements are not available in these classes.

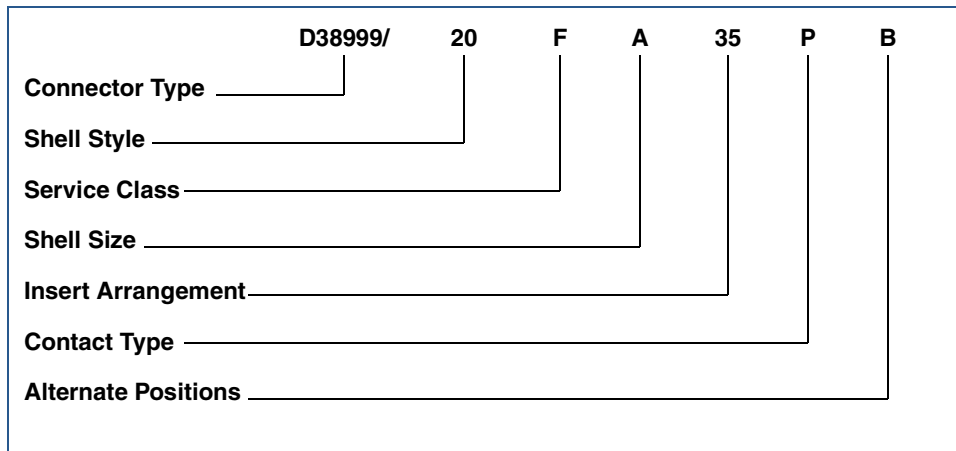
** For more information on Coax/Triax/Twinax Ground Plane Connectors see page 39.

Tri-Start

how to order – (D38999, TV military, metal)

Military Part Number

To more easily illustrate ordering procedure of Tri-Start Connectors (metal) by military designation, part number D38999/20F A35PB is shown as follows:



Connector Type

D38999/ designates MIL-DTL-38999 Series III Connector

Shell Style

- 20 designates wall mount receptacle
- 21 designates box mount receptacle, hermetic
- 23 designates jam nut receptacle, hermetic
- 24 designates jam nut receptacle
- 25 designates solder mount receptacle, hermetic
- 26 designates straight plug
- 27 designates weld mount receptacle, hermetic
- 29 designates Lanyard Release plug with pin contacts*
- 30 designates Lanyard Release plug with socket contacts*
- 31 designates Lanyard Release plug with MIL-STD-1760 pin contacts*

* For ordering Amphenol® Lanyard Release Connectors consult catalog 12-160. Ordering procedure for Lanyard Release Connectors includes specifying lanyard length codes and designating Style 1 or 2.

- 32 designates plug protection cap
- 33 designates receptacle protection cap

See page 29 for ordering information on MS protection caps.

Service Class

- C non-conductive, anodic coated aluminum, 500 hour salt spray, 200°C
- F electroless nickel plated aluminum, optimum EMI shielding effectiveness – 65dB @ 10GHz specification min., 48 hour salt spray, 200°C

- K corrosion resistant stainless steel, firewall capability, plus 500 hour salt spray resistance, EMI – 45 dB @ 10 GHz specification min., 200°C
- W corrosion resistant olive drab cadmium plate aluminum, 500 hour extended salt spray, EMI – 50 dB @ 10 GHz specification min., 175°C
- Y hermetic seal, passivated stainless steel, 200°C
- S (non-hermetic connectors), nickel plated stainless steel, optimum EMI shielding effectiveness – 65 dB @ 10 GHz specification min., 48 hour salt spray, 200°C
- N (hermetic connectors), nickel plated stainless steel, 200°C

Shell Size

MIL-DTL-38999, Sizes 9 – 25

A	B	C	D	E	F	G	H	J	MIL Shell Size
9	11	13	15	17	19	21	23	25	Amphenol Shell Size

Insert Arrangement

MIL-DTL-38999, see insert arrangement chart, page 5

Contact Type

- P designates pin contacts
- S designates socket contacts
- A designates same as “P” except supplied less pin contacts
- B designates same as “S” except supplied less socket contacts (A & B designates non-standard contact applications)

Alternate Positions

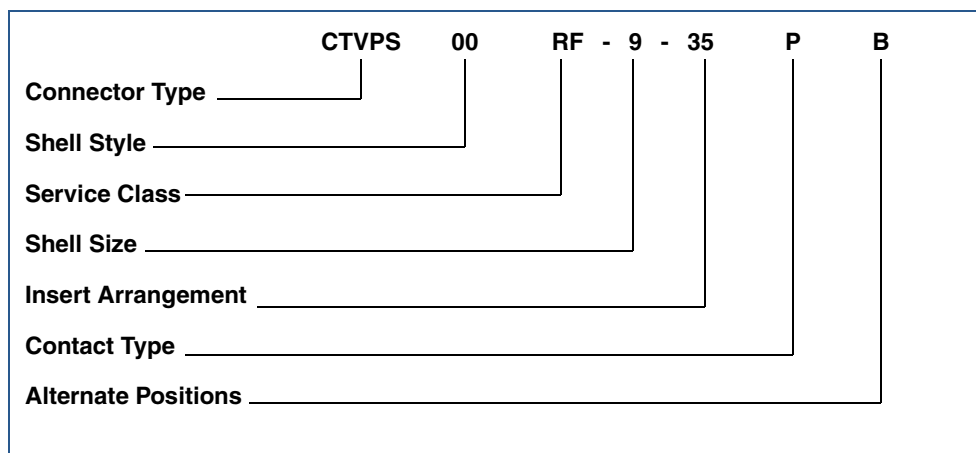
Locksmith keying - rotation of minor keys. See page 6. (Use N for normal)

Tri-Start

how to order – (Amphenol[®] CTV, composite)

Proprietary Part Number

Amphenol[®] Tri-Start Composite Connectors can be ordered by coded part number. Ordering procedure is illustrated by part number CTVPS00RF-9-35PB as shown below:



Connector Type

CTV designates Tri-Start Series Connector
CTVP designates back panel mounted receptacle
CTVS designates 200°C rated
CTVPS designates back panel mounted, 200°C rated receptacle

Shell Style

00 designates wall mount receptacle
01 designates line receptacle
02 designates box mount receptacle*
06 designates straight plug
07 designates jam nut receptacle

Service Class

RF electroless nickel plated composite, 200°C
RW olive drab cadmium plated composite, 175°C
RGF** electroless nickel plated ground plane composite, 200°C
RGW** olive drab cadmium plated ground plane composite, 175°C

Shell Size

9 thru 25 available

Insert Arrangement

MIL-DTL-38999, see insert arrangement chart, page 5

Contact Type

H designates 1500 cycle pin contacts
J designates 1500 cycle socket contacts
P designates 500 cycle pin contacts
S designates 500 cycle socket contacts

Alternate Positions

Locksmith keying - rotation of minor keys. "N" not required for normal position, see page 6.

* Consult Sidney, NY for availability.

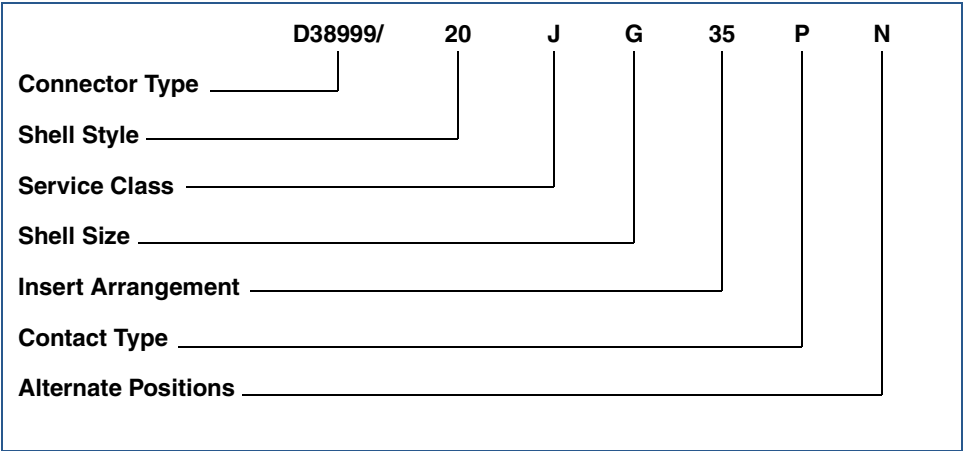
** For more information on Coax/Triax/Twinax Ground Plane Connectors see page 39.

Tri-Start

how to order – (D38999, CTV military, composite)

Military Part Number

To more easily illustrate ordering procedure of Tri-Start Composite Connectors by military designation, part number D38999/20JG35PN is shown as follows:



Connector Type

D38999/ designates MIL-DTL-38999 Series III Connector

Shell Style

- 20 designates wall mount receptacle
- 24 designates jam nut receptacle
- 26 designates straight plug

Service Class

- J olive drab cadmium plate (175°C)
- M electroless nickel plate (200°C)

Shell Size

MIL-DTL-38999, Sizes 9 – 25

A	B	C	D	E	F	G	H	J	MIL Shell Size
9	11	13	15	17	19	21	23	25	Amphenol Shell Size

Insert Arrangement

MIL-DTL-38999, see insert arrangement chart, page 5

Contact Type

- H designates 1500 cycle pin contacts
 - J designates 1500 cycle socket contacts
 - P designates 500 cycle pin contacts
 - S designates 500 cycle socket contacts
 - A designates same as “P” except supplied less pin contacts
 - B designates same as “S” except supplied less socket contacts
- (A & B designate non-standard contact applications)

Alternate Positions

Locksmith keying - rotation of minor keys. See page 6
(Use N for normal).

Tri-Start

weight comparisons

Depending on the shell style, shell size and contact count, weight savings can range from 17% to 40% compared to standard aluminum product.

Tri-Start Weight in ounces (includes contacts)

Size/ Arrangement	Wall Mount Receptacle (00)						Jam Nut Receptacle (07)						Plug (06)					
	Stainless Steel		Aluminum		Composite		Stainless Steel		Aluminum		Composite		Stainless Steel		Aluminum		Composite	
	Pin	Socket	Pin	Socket	Pin	Socket	Pin	Socket	Pin	Socket	Pin	Socket	Pin	Socket	Pin	Socket	Pin	Socket
9-35	.7216	.7840	.3248	.3777	.2588	.3121	1.1472	1.2096	.4416	.5040	.3489	.4413	1.0736	1.1360	.4236	.4625	.2606	.2994
9-98	.7216	.7776	.2496	.3056	.1664	.2224	1.1472	1.2032	.4416	.4976	.3744	.4640	1.0736	1.1296	.3968	.4624	.2991	.2337
11-35	.9488	1.0800	.3632	.4960	.2753	.4081	1.4304	1.5632	.5936	.7264	.4679	.6007	1.2480	1.3808	.5312	.6389	.3450	.4582
11-98	.9488	1.0620	.3632	.4768	.2753	.3889	1.4304	1.5440	.5936	.7072	.4679	.5815	1.2480	1.3616	.5330	.6283	.3468	.4457
13-8	1.2096	1.3888	.4800	.6592	.3696	.5488	1.9104	2.0896	.7664	.9456	.6560	.8352	1.8048	1.9840	.7936	.9728	.5237	.5952
13-35	1.2160	1.4320	.4864	.7024	.3762	.5922	1.9168	2.1328	.7728	.9888	.6136	.8296	1.8112	2.0272	.8000	.8472	.5301	.6531
13-98	1.2160	1.4016	.4864	.6720	.3762	.5618	1.9168	2.1024	.7728	.9584	.6136	.7992	1.8112	1.9968	.7978	.9856	.5244	.7157
15-5	1.5312	1.7904	.6352	.8944	.5027	.7619	2.3792	2.6384	.9728	1.2320	.7749	1.0341	2.2704	2.5456	.9632	1.1719	.6450	.8467
15-18	1.5456	1.8416	.7760	.9456	.6432	.8128	2.3936	2.6896	.9872	1.2832	.8544	1.1504	2.2848	2.5808	.9776	1.2736	.6594	.8208
15-35	1.5424	1.8768	.6464	.9808	.5139	.8483	2.3904	2.7344	.9840	1.3280	.7861	1.1301	2.2816	2.6256	1.2179	1.3184	.8961	1.0002
17-6	2.1488	2.5904	.9360	1.3776	.7812	1.2228	2.9152	3.3568	1.2336	1.6752	.9940	1.4356	2.5008	3.1024	1.1408	1.7424	.8160	1.4176
17-26	2.1344	2.5600	.9216	1.3472	.7668	1.1924	2.9008	3.3264	1.2192	1.6448	.9796	1.4052	2.4864	2.9120	1.1264	1.3343	.8017	.8062
17-35	2.1360	2.6640	.9232	1.4512	.7684	1.2964	2.9024	3.4304	1.2208	1.7488	.9812	1.5092	2.4880	3.0160	1.1280	1.5497	.8033	1.2144
19-11	2.2592	2.6656	.9696	1.4528	.7925	1.2757	3.4352	3.9184	1.4720	1.9552	1.2033	1.6865	2.9808	3.4640	1.3472	1.8304	.9632	1.4464
19-32	2.1888	2.7264	.9760	1.5136	.7989	1.3365	3.4416	3.9792	1.4784	2.0160	1.2097	1.7473	2.9872	3.5248	1.3536	1.8912	.9696	1.5072
19-35	2.1920	2.8432	.9792	1.6304	.8021	1.4533	3.4448	4.0960	1.4816	2.1328	1.2129	1.8641	2.9904	3.6416	1.3568	2.0080	.9728	1.6240
21-11	2.7456	3.4640	1.3088	2.0272	1.1088	1.8272	3.9712	4.6896	1.8128	2.5312	1.6128	2.3312	3.4448	4.1632	1.7344	2.5312	1.3039	1.8710
21-16	2.6784	3.3168	1.2416	1.8800	1.0422	1.6806	3.9040	4.5424	1.7456	2.3840	1.4505	2.0889	3.3776	4.0160	1.6672	2.3168	1.2352	1.8736
21-35	2.6672	3.4992	1.2304	2.0624	1.0310	1.8630	3.8928	4.7248	1.7344	2.5664	1.4393	2.2713	3.3664	4.1984	1.6560	2.2309	1.2255	1.8003
21-41	2.6768	3.3600	1.2400	1.9232	1.0406	1.7238	3.9024	4.5856	1.7440	2.4272	1.4489	2.1321	3.3760	3.5792	1.6656	1.8688	1.2336	1.4368
23-21	3.0352	3.8624	1.4496	2.2768	1.2279	2.0551	4.2368	5.0640	1.9440	2.7712	1.6368	2.4640	3.7920	4.6192	1.9216	2.7488	1.4637	2.2896
23-35	3.0240	4.0448	1.4384	2.4592	1.2167	2.2375	4.2256	5.2464	1.9328	2.9536	1.6256	2.6464	3.7808	4.8016	1.9104	2.6087	1.4525	2.1507
23-53	2.8992	3.9072	1.4560	2.4816	1.2343	2.2599	4.2432	5.1088	1.9504	2.8160	1.6432	2.5088	3.7984	4.6640	1.9280	2.7936	1.4672	2.2384
25-4	3.4512	4.4800	1.7312	2.8816	1.4864	2.1904	4.8048	5.8272	2.2016	3.2480	1.9568	2.8720	4.2224	5.2496	2.2128	3.2560	1.7133	2.4163
25-19	3.5312	4.7264	1.8112	3.0064	1.5664	2.7616	4.8848	6.0816	2.2816	3.4784	2.0368	3.2336	4.3024	5.4992	2.2928	3.4896	1.7933	2.7058
25-20	3.8190	4.7150	2.0173	3.1125	1.7733	2.8512	5.1430	6.0380	2.4877	3.5421	2.1872	3.2416	4.4350	5.3300	2.2580	3.0182	1.8288	2.8928
25-35	3.4416	4.6656	1.7216	2.9456	1.4776	2.7016	4.7952	6.0192	2.1920	3.4160	1.8915	3.1155	4.2128	5.4368	2.2032	3.4272	1.7037	2.9277
25-61	3.4304	4.4848	1.7282	2.7648	1.4841	2.5208	4.7840	5.8384	2.1808	3.2352	1.8803	2.9347	4.2016	5.2560	2.1920	3.2464	1.6912	2.7456

All weight measurements are for reference only.

Tri-Start

Electrostatic Discharge (ESD) protected connectors

Amphenol has developed a new design feature for the Tri-Start connectors which will protect sensitive components from Electrostatic Discharge (ESD) without diodes, varistors, gas tubes, or “experimental” semiconductive materials.

These connectors utilize the Faraday Cage principal to shunt electrostatic discharge events to the conductive enclosure on which the connector is mounted, thus never allowing the high voltage, high current discharge event to reside on any contacts.

The ESD protected connectors have the same physical envelope as their standard counterparts, and do not require special mounting or terminating techniques. All of the contacts remain fully functional, and electrical characteristics such as capacitance are not effected.

Product Features:

- Connector Envelope Identical to Unprotected Design for Most Applications
- Exceeds Protection Requirements of IEC 801-2 and MIL-STD-1686:
 - Ensures that All Components within a Conductive Enclosure will be Subjected to a Maximum of 10V during Electrostatic Discharges between -26 KV and +26 KV
- Voltage Observed on Contacts during ESD Events – <10V (at 1 megohm)
- Current Observed on Contacts during ESD Events – <100 milliamperes (at 2 ohms)
- Response Time – Instantaneous (Voltage and Current are Maximum Values)
- Maximum ESD Voltage – Tested to ± 26 KV
- No Capacitive Loading
- Eliminates the Need for Discrete Components (such as diodes) and Maximizes Printed Circuit Board Real Estate for Equipment Housed in Conductive Enclosures which require ESD Protection as Free-standing Units
- Operating Voltage of Connectors not Effected for Most Designs
- Pulse Life – Infinite

Electrostatic Discharge (ESD) is the rapid transfer of a static electric charge from one body to another. A static electric charge consists of either a surplus or depletion of electrons on a body, which gives that body a potential or voltage relative to ground (or another body). The discharge is extremely fast (less than 1 nanosecond risetime) and the current flow may exceed 100 amps!



ESD Testing on MIL-DTL-38999, Series III Filter Cylindrical Connectors (Actual Photo)

A **Faraday cage** is a conductive enclosure. It may be solid in form such as a sheet-metal enclosure, or it may be full of apertures, such as a wire cloth box. When a charge is placed on a faraday cage the electrons which make up the charge, having like polarity, try to position themselves as far as possible from each other. This places the electrons on the outer surface of the enclosure, leaving the inner surface uncharged. The charge on the outer surface does not induce a charge on any neutral object inside of the faraday cage, and therefore does not try to transfer itself onto the internal object. Neutral objects (such as IC's) inside of a faraday cage are thereby protected from ESD activity external to the faraday cage.

The voltage and current observed on neutral objects within a faraday cage during ESD events are due to the secondary effects of ESD. These include Electromagnetic Interference (EMI), magnetic and electrical field coupling. The faraday cage of the Amphenol ESD Protected Connectors has been designed to minimize these effects.

For more information on ESD protected connectors, ask for Product Data Sheet 171. Also, publication L-2075, “ESD Attenuation Test Procedure for Connectors with Faraday Cage Protective Structures” is available as a reference document.

Tri-Start specials

FIBER OPTIC

Amphenol® multi-channel fiber optic connectors offer a precision optic interconnect system within the high performance MIL-DTL-38999 Series III** connector. The metal-to-metal feature of the Tri-Start connector provides protection from damage in severe environmental and physical conditions. Optical performance is optimized utilizing the ceramic alignment features employed by the termini. Insertion losses are typically .8dB and can range from .5 to 1.5 dB, depending on test conditions.

Ask for publication 12-352 or contact Sidney, NY for complete information on Amphenol Fiber Optic Connectors.



Fiber Optic Connectors

TRANSIENT PROTECTION

EMI/EMP protection devices can be integrated into the MIL-DTL-38999 Series III* connector to provide a cost effective alternative to discrete devices mounted inside the box. These unique, high performance designs provide weight and space savings necessary for modern electronic systems.

Ask for publication 12-120 or contact Amphenol, Sidney, NY for complete information on Amphenol Filter/Transient Protection Connectors.



Transient Protection Connectors



Flex Termination Assemblies

FLEX TERMINATION ASSEMBLIES FOR PRINTED CIRCUIT BOARD APPLICATIONS

Amphenol provides flex termination assemblies for printed circuit board attachment through Amphenol ACT, Advanced Circuit Technology. Flex circuits are available for MIL-DTL-38999 connectors in flat or sculptured styles. Sculptured® Flexible Circuits with built-in terminations eliminate the failures associated with crimped or solder-on contacts, and they are designed to geometrically fit the tight space requirements within a unit. They plug into a printed circuit board and create a self-locking terminal pad which eliminates the need for an additional interconnect to the PCB.

Ask for catalog 12-170, Amphenol Cylindrical Connectors for PCB Applications.

CAN COUPLER

Can couplers are used in MIL-STD-1553 Data Bus Systems where a high concentration of remote terminals exists. In comparison to other types of Data Bus Couplers, can couplers offer substantial weight and space savings. These can couplers incorporate Tri-Start wall mount receptacles and are available in stainless steel, aluminum or weight reducing composite versions. For more information contact Amphenol, Sidney, NY.



Can Couplers

* MIL-DTL-38999 Series III
supersedes MIL-C-38999 Series III

Tri-Start

specials - ground plane connectors

Amphenol offers MIL-DTL-38999 Series III* connectors for data bus, LAN and coax/triax/twinax transmission lines with conductive inserts that ground the outer conductor of the coax, triax or twinax contact to the shell. These connectors are sold "less contacts". They will accommodate size 8 coax, triax or twinax contacts or size 12 and 16 coax contacts.

The insert availability chart on page 5 indicates the patterns that are available in a ground plane version, (see those designated with a star symbol), and consult how to order pages for ordering procedures.

CONNECTORS WITH COAX CONTACTS

For shielded wire applications, coaxial contacts can be incorporated into MIL-DTL-38999* connectors. Designed-in crimp or solder types are available to fit various RG and special cables. High performance coaxial contacts eliminate discontinuities or impedance variations due to movement of parts under axial load.

For further information on coax contacts ask for catalog 12-130.

CONNECTORS WITH CONCENTRIC TWINAX CONTACTS

The size 8 concentric twinax contact was developed for use in MIL-STD-1553 Airborne multiplex data bus applications which require high performance interconnect characteristics in multi-pin connectors. Ideal for this application need is the high performance Tri-Start connector with its fully scoop-proof feature of recessed pins. The concentric twinax contact is crimp terminable to twisted-shielded cable. Other features include:

- Provides protection from magnetic and electrostatic interference including nuclear electromagnetic pulse
- Maintains shield integrity through a multi-pin cylindrical connector and does not require contact polarization within the insert
- 175°C rated and meets performance levels of MIL-DTL-38999 Series III* connectors
- MIL-C-17/176-00002 cable termination
- Qualified to M39029/90 & /91
- Integral part of the MIL-STD-1760 interconnection system

For further information on concentric twinax contacts ask for Product Data Sheet 136.

CONNECTORS WITH REDUCED COMPONENT TWINAX (RCT) CONTACTS

The RCT (Reduced Component Twinax) contact meets MIL-C-39029/90 and /91 requirements for interchangeability and performance while reducing the number of user-assembled components from seven to three. The inner conductors and outer barrel of the RCT are each terminated to the cable by a crimp joint, so no costly assembly soldering operations are required. Features include:

- Three user assembled components
- Available in size 8 and size 10 contacts
- MIL-C-17/176-00002 cable termination
- For installation in MIL-DTL-38999 Series III connectors
- Termination completed in only two crimping operations
- Inner conductors stripped to common length, eliminating multiple measurements

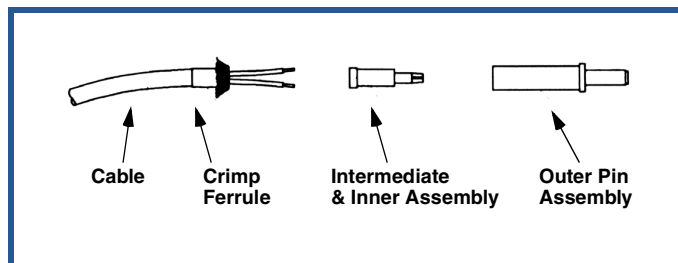
For further information on RCT contacts ask for Product Data Sheet 140.



Ground Plane Connector with Metallic Insert and Concentric Twinax Contacts



Concentric Twinax Contacts Qualified to M39029/90 and /91



RCT (Reduced Component Twinax) Contact

* MIL-DTL-38999 Series III
supersedes MIL-C-38999 Series III