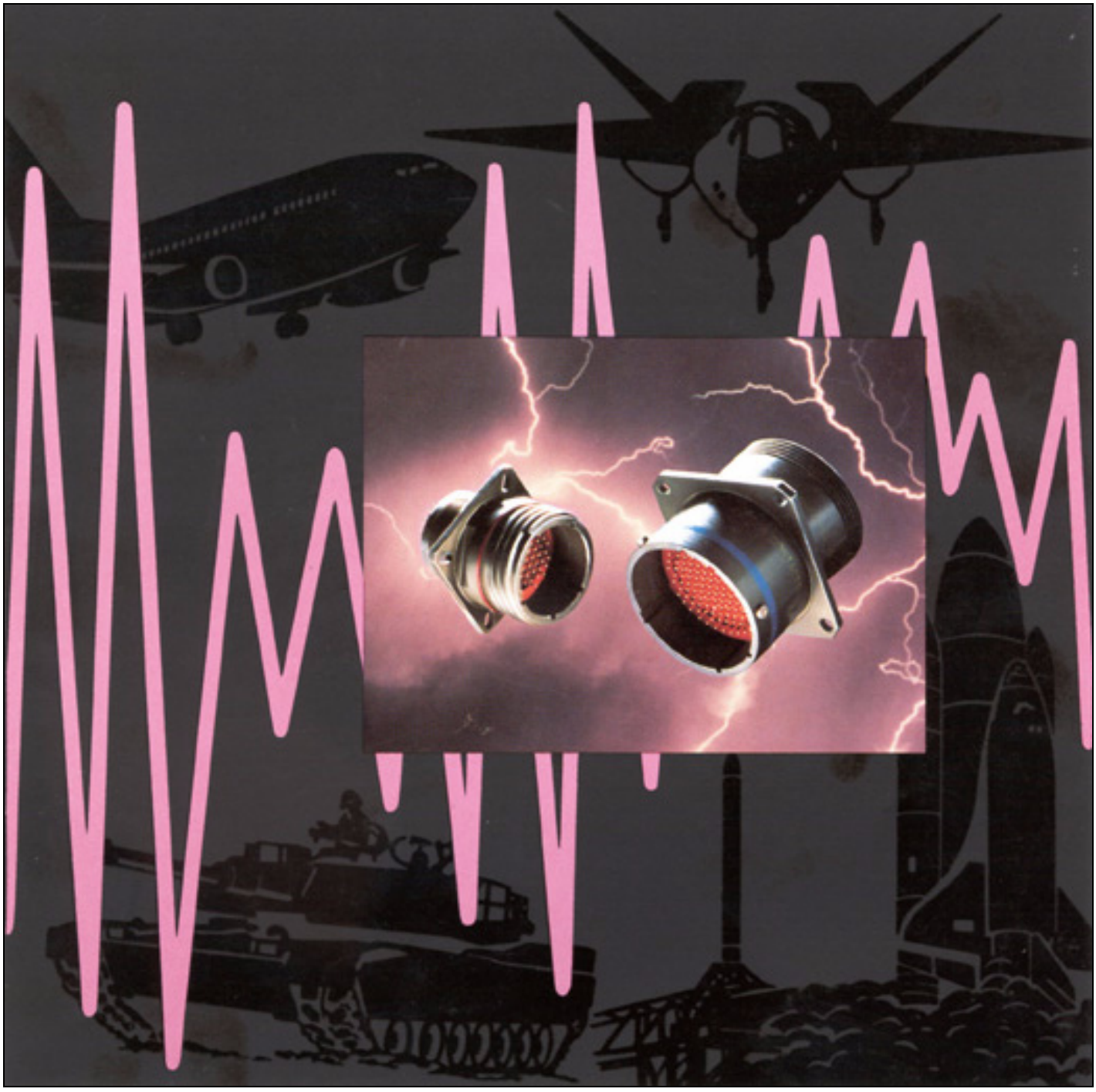
Amphenol® EMI Filter/ Transient Protection Connectors

12-120-11



Amphenol

Table of Contents

The following format is suggested when ordering Amphenol® EMI filter connectors:

- Choose the contact and attenuation characteristics required (pages 4 and 5)
- Choose the contact size and insert arrangement (page 9)
- Choose the shell style that fits your application (pages 11 thru 52)
- To arrive at part number, see How to Order (page 62)

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.

Due to space limitations, metric equivalents of dimensional data in this catalog have not been included.
All dimensions given may be converted to the metric system by the standard formula: dimension (inches) x 25.40 = dimension (millimeters).

Amphenol Aerospace is a Certified ISO 9001 Manufacturer

Amphenol® EMI/EMP Protection
for sensitive circuits

Amphenol® EMI/EMP Protection Connectors offer the versatility of standard connectors with EMI/EMP protection for sensitive circuits. Internal housing of the EMI/EMP devices eliminates costly and bulky exterior discrete protection devices.

Available in many sizes, styles and arrangements, Amphenol ® EMI/EMP Protection Connectors are intermountable and intermateable with the following Mil-Spec Connectors:

- **MIL-C-38999**
- **MIL-C-26482**
- **MIL-C-83723**
- **MIL-C-5015**
- **MIL-C-28840**
- **MIL-C-27599**
- **MIL-C-26500**
- **MIL-C-24308**

The Amphenol® EMI filter connector utilizes two manufacturing technologies to provide the user with the most cost effective performance across the frequency range. (For EMP performance data, see pages 56 - 59). The tubular design offers over 20 years of proven field reliability. All filter contacts within the connector share a common ground plane, which is connected to the connector shell. The pin to pin isolation is 85 dB minimum at 100 MHz. The planar design joins pins to a multi-layered ceramic forming an array sub-assembly, with a peripheral ground which is connected to the connector shell via a ground spring. Pin to pin capacitance is less than 10 pf with a pin to pin isolation of 85 dB minimum at 100 MHz.

Filter contacts for both designs contain either a pi passive element network comprised of a ferrite inductor and ceramic capacitor, or a single capacitor. An encapsulant of oven-cured epoxy, front and rear provides:

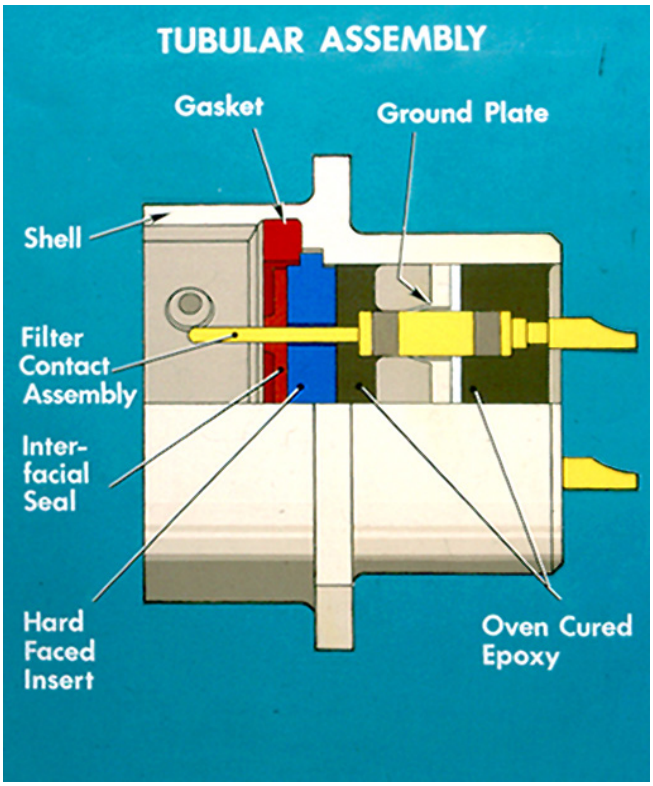
- Mechanical and thermal insulation of the ceramic elements – mechanical loading can be accomplished without capacitor damage. Pins can be bent 90° and straightened with no damage to the filter.
- Hermeticity (4.6 x 10^{-3}cc/sec) – prevents water from entering connector in high humidity environments.

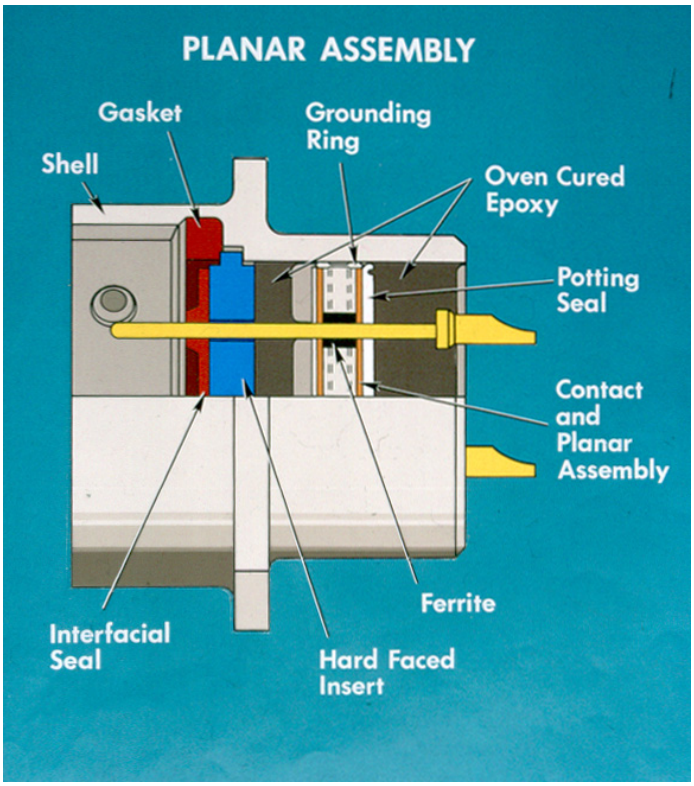
EMI Filter connectors are intended for use in temperatures from –55°C to +125°C. Attenuation will change with feed-through current and temperature.*

It is suggested that the user analyze his system requirements for EMI protection in the following areas:

- Working voltage
- Peak voltage
- Desired attenuation at a given frequency level
- Any special capacitance limitations

* The following publication offers more in-depth information:
General Design Guideline for EMI Filters and/or TVS (Transient Voltage Suppression) Connectors, L-1146





EMI Capabilities
for maximum design flexibility

Advantages of Filter Connectors:

- Reduction in overall weight and space with the elimination of external filter circuits
- Reduction of solder junctions
- Increase in reliability due to fewer connections
- Fragile filter elements protected from handling and environmental damage
- Pre-tested from factory and ready for installation

To assure reliability, connectors are subjected to an attenuation performance test verifying proper assembly and grounding of the filters. Attenuation data on filter performance is stated in reference to a 50 ohm impedance system in order to allow filter performance to be more easily translated into real world impedances.

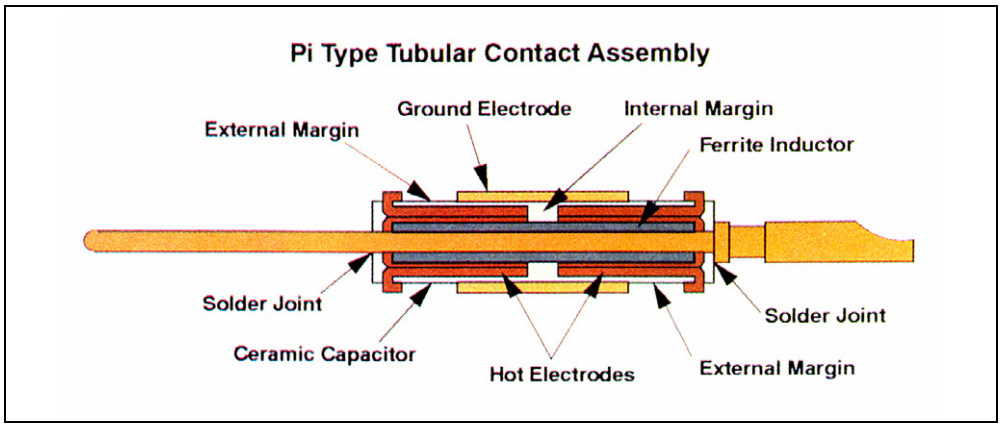
Those interested in determining the expected filter performance in an impedance system other than 50 ohms may refer to page 6 of this catalog.

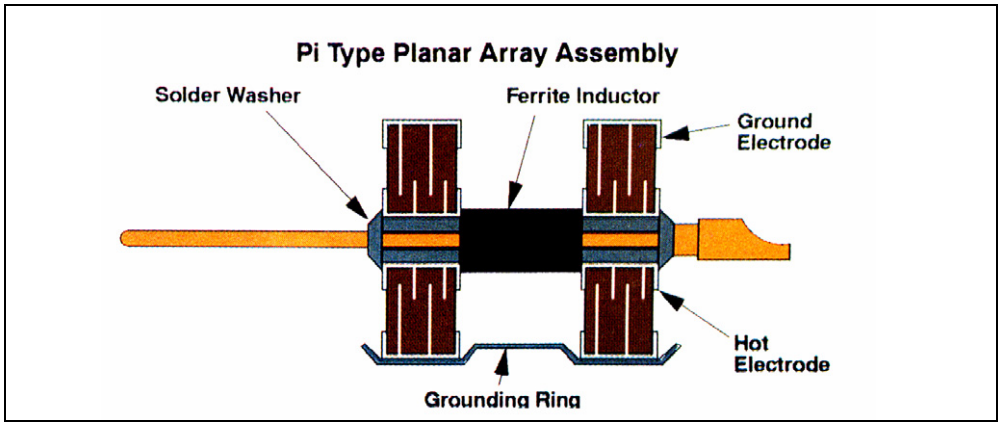
For more in-depth technical assistance, contact your local Amphenol field sales office or Amphenol, Sidney, NY. Publication L-1145, How to Specify Filter Connectors, is available upon request.

Definition of Filter Contacts:

MF	Medium Frequency 50 dB performance between 300 - 2999 KHz
HF	High Frequency 50 dB performance between 3 - 29 MHz
VHF	Very High Frequency 50 dB performance between 30 - 2999 MHz
UHF	Ultra High Frequency 50 dB performance between 300 - 2999 MHz

Filter contacts can be provided in all frequencies in contact sizes 22 or larger. Planar design allows packaging of MF and HF contacts in the same length unit as VHF and UHF contact connectors.





EMI Capabilities, cont.

Connector Options

- Plug shells with grounding fingers for shielding against external EMI.
- Filter adapters eliminate replacement of either existing mated pair. Place adapter between mating faces.
- Amphenol® UTS (Universal Termination System) allows crimp termination. Uses crimp insertable socket contacts on conductor wires. Sockets mate with filter pins, permanently encapsulated within the connector body. (Socket type M39029/57).
- Filter contacts can withstand voltage spikes as high as 1500 volts (standard design is 600 volts) with special conformal coating on capacitor margins. Design can be increased to 2500 V on special order. These Amphenol® filter connectors meet the levels and wave forms of SAE4L without failure.
- Filter contacts with 7 amps RF current capability. Standard product will meet 3 amps RF current from –55°C through +125°C.
- Receptacle shell modifications that allow mounting directly to a PC board or flex header. Offers improved reliability by eliminating external spacers and washers. (See pages 15, 28 and 31).
- EMI/Hermetic connectors –
  The hermetic filter connector, while only approximately 1/2 inch longer than standard series connectors, provides all the benefits of a hermetic connector, plus EMI protection for sensitive circuits. The filter assembly is protected by a fused glass insert within a unique steel housing. This design provides the capability to tolerate high level static pressure while maintaining a low level leakage rate.
- Composite shell filter connectors are available which meet the MIL-C-38999, Series III dimensional length. The composite Tri-Start connector offers a light-weight, corrosion resistant, durable connector with the same high performance features as its metal counterpart. The composite filter connector utilizes planar technology to accommodate VHF-1 electrical performance characteristics.

Contact Options

- Coaxial or concentric twinax contacts can be included in arrangements of filtered contacts for signal or power circuits.
- Filter contacts with differing cutoff frequencies can be mixed in any given insert arrangement
- Insulated feed-through contacts and ground pins can be included selectively for specific needs
- Thermocouple contacts

Methods of Wire Termination

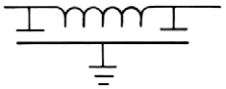
- Solder-wire termination
- PCB termination
- Solderless wrap
- UTS (see Connector Options)
- Weld terminal for thermocouple contacts

If one of the standard frequency ranges is not suitable, special variations are available to meet your requirements.

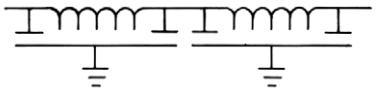
Filter Selection Data

Amphenol® EMI Connectors are produced with four basic types of filters. They are all low band pass filters with the following configurations:

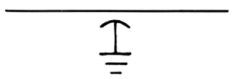
Pi - typical of the VHF and UHF filter



Cascaded Pi - typical of the HF filter. It consists of two VHF Pi filters on a common pin and is available in tubular designs only.



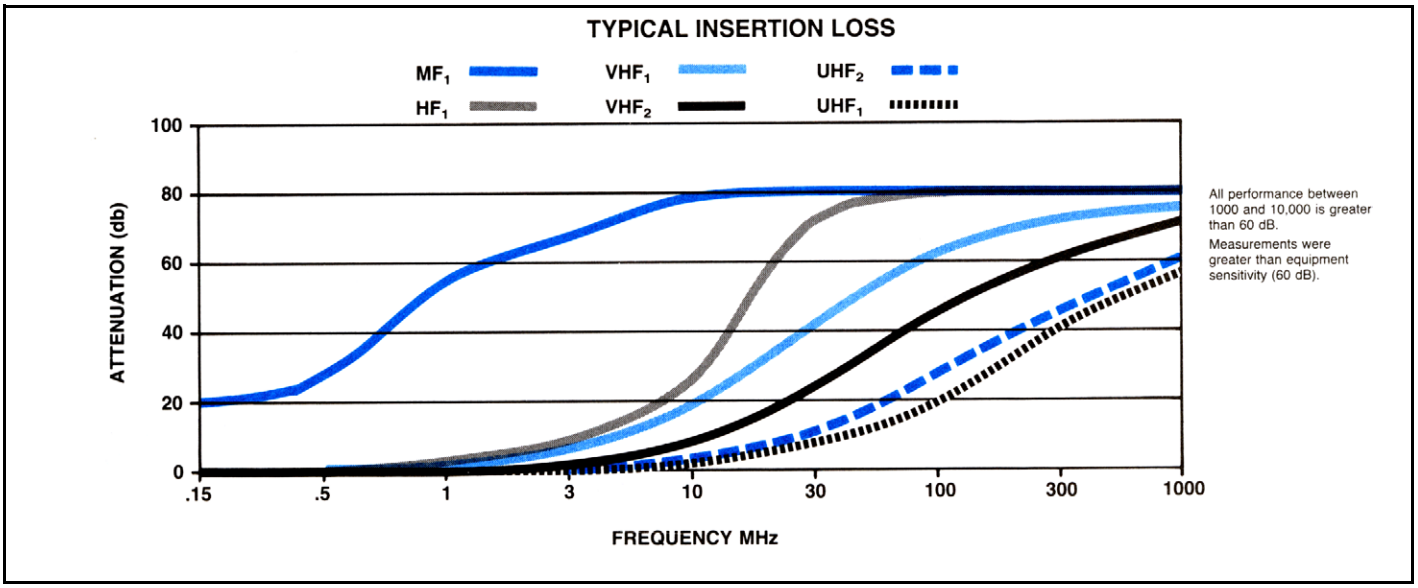
Capacitor - consists of a feed-through capacitor without any ferrite. It can be 50ηf to 1μf and carry the MF, HF and VHF designation depending on its typical 50dB performance.



Parameters		Medium Frequency Filter$_F$		High Frequency Filter	Very High Frequency Filter		Ultra High Frequency Filter	
		MF1 (Pi)	MF2**** (Capacitor)	HF1 (Cascaded Pi)	VHF1 (Pi)	VHF2† (Pi)	UHF1† (Pi)	UHF2† (Pi)
Minimum Attenuation (Test Points)*	150kHz	20dB	20dB	–	–	–	–	–
	15MHz	–	–	50dB	–	–	–	–
	50MHz	–	–	80dB	–	–	–	–
	100MHz	80dB	70dB	–	62dB	46dB	18dB	28dB
Maximum Working Voltage (User must specify DC or AC)	DC†††	50VDC	50VDC	200VDC	200VDC	200VDC	200VDC	200VDC
	AC60 or 400 Hz††††	–	–	115VAC	115VAC	115VAC	115VAC	115VAC
Dielectric Withstanding Voltage Capability (for 5 sec. with 10 milliamperes max. charging current)		100 volts DC	100 volts DC	500 volts DC	500 volts DC	500 volts DC	500 volts DC	500 volts DC
Maximum Feed-thru Current (DC and/or Audio Frequency R.M.S.)	Size 16 contacts	not available	not available	13.0 amps	13.0 amps	13.0 amps	13.0 amps	13.0 amps
	Size 20 contacts	7.5 amps	7.5 amps	7.5 amps	7.5 amps	7.5 amps	7.5 amps	7.5 amps
	Size 22 contacts	not available	not available	not available	5.0 amps	5.0 amps	5.0 amps	5.0 amps
Maximum RF Current		3.0 amps	3.0 amps	3.0 amps	3.0 amps	3.0 amps	3.0 amps	3.0 amps
Minimum Insulation Resistance**		250 megohms	250 megohms	10 gigaohms	10 gigaohms	10 gigaohms	10 gigaohms	10 gigaohms
Typical Capacitance***		1.0 microfarad	1.0 microfarad	16 nanofarads	7 nanofarads	2.5 nanofarads	375 picofarads	710 picofarads
Air Leakage††		4.6×10^{-3} cc/sec						
Operating Temperature Range		–55°C to +125°C						

* When tested at 25°C per MIL-STD-220.
** After 2 minutes at working DC voltage through a protective resistance of 1 megohm when measured between contact and ground at +25°C.
*** When measured at a frequency of 1 ±.1kHz and a voltage not exceeding 1.0 V.A.C.R.M.S. at +25°C.
**** Capacitor filters from .05 to 1 microfarad and DCWV from 50 to 200 volts are available. These filters will also fit, and are available in all tooled VHF series shells.
† Consult Amphenol, Sidney, NY or your Amphenol representative for part number.
†† Lower leakage rates are available upon request.
††† Summation of the DC and low level AC super-imposed peak voltage.
†††† All filters specified for AC applications must be conformal coated to sustain a 1,500V surge.
♦ Consult Amphenol, Sidney, NY or your Amphenol representative for availability.

Effect of Temperature on EMI Filter Attenuation



TYPICAL INSERTION LOSS (dB)
PER MIL-STD-220, 5 ADC, 25°C

Capacitance	1MHz	3MHz	10MHz	30MHz	100MHz	300MHz	1000MHz
375 pf UHF_1	0	0	1	8	16	–	–
750 pf UHF_2	0	0	3	10	19	–	–
2500 pf VHF_2	0	2	8	20	28	–	–
7000 pf VHF_1	5	9	17	23	40	–	–
16000 pf HF_1	6	14	20	24	80	–	–

Most filter attenuation curves and capacitance values are expressed at 25°C. However, temperature can affect the capacitance of a titanate filter element, affecting the insertion loss that the element will cause.

In order to assist the user in anticipating the effect of various temperatures, the following charts applicable to Amphenol® filter connectors utilizing MF_1, HF_1, VHF_1, VHF_2, UHF_1 and UHF_2 filters are provided. Please note that all insertion loss (attenuation) values given were measured with no load applied. The band designations refer to MIL-STD-2120.

MF_1*

Typical Capacitance = 1,000,000 pf Min. 800,000 pf Max. 1,600,000 pf
Type Pi

Temp.	F_{CO}	1MHz	3MHz	10MHz	30MHz	100MHz	300MHz	1000MHz
–55°C	–	18	–	64	80	80	80	80
Room	7.94K	55	–	80	80	80	80	80
+125°C	–	22	–	70	80	80	80	80

HF_1

Typical Capacitance = 16,000 pf Min. 9,800 pf Max. 24,000 pf
Type Cascaded Pi

Temp.	F_{CO}	1MHz	3MHz	15MHz	50MHz	100MHz	300MHz	1000MHz
–55°C	–	2	6	24	62	80	80	80
Room	648K	3	9	50	80	80	80	80
+125°C	–	0	6	30	62	80	80	80

VHF_1

Typical Capacitance = 7,000 pf Min. 4,900 pf Max. 12,000 pf
Band G, Type Pi

Temp.	F_{CO}	1MHz	3MHz	10MHz	30MHz	100MHz	300MHz	1000MHz
–55°C	–	1	2	8	21	44	61	65
Room	1.27M	1	6	18	42	62	72	75
+125°C	–	0	2	9	24	45	62	64

Note: F_{CO} = Cut-off Frequency
* Consult Amphenol, Sidney, NY for availability.

VHF_2

Typical Capacitance = 2,500 pf Min. 1,900 pf Max. 4,000 pf
Band E, Type Pi

Temp.	F_{CO}	1MHz	3MHz	10MHz	30MHz	100MHz	300MHz	1000MHz
–55°C	–	0	2	7	17	40	58	71
Room	3.3M	0	2	8	24	46	61	71
+125°C	–	0	3	10	26	46	63	69

UHF_2

Typical Capacitance = 750 pf Min. 500 pf Max. 1,100 pf
Band C, Type Pi

Temp.	F_{CO}	1MHz	3MHz	10MHz	30MHz	100MHz	300MHz	1000MHz
–55°C	–	0	0	3	9	25	46	61
Room	12.7M	0	0	3	10	28	46	61
+125°C	–	0	0	3	10	24	42	60

UHF_1

Typical Capacitance = 375 pf Min. 290 pf Max. 450 pf
Band B, Type Pi

Temp.	F_{CO}	1MHz	3MHz	10MHz	30MHz	100MHz	300MHz	1000MHz
–55°C	–	0	0	1	6	21	43	58
Room	21.9M	0	0	1	8	18	42	56
+125°C	–	0	0	1	8	17	38	50

Impedance Matching Formula
(your system to a 50 ohm system)

The following formula and example are offered in order to determine the expected filter performance in an impedance system other than 50 ohms.

With the attenuation expressed in 50 ohms and the transfer impedance curve shown in Figure 1 below, a designer can relate the expressed attenuation to the input and output impedance of his circuit.

Example:

(1) Noise is 40dB above specification level at 100 MHz

(2) Input and output impedance are 10 and 100 ohms respectively

(3) Amphenol® VHF 7000 pf filter has a 65 dB minimum attenuation at 100 MHz and +25°C

Formula (Taken from Figure 1):

$1.4 \times 10^2\ \Omega$ = transfer impedance
for 65 dB in a 50 ohm system

$$\text{Atten (dB)} = 20 \log_{10}\left[1 + \frac{Z_S Z_L}{Z_{12}(Z_S + Z_L)}\right]$$

Z_S = source impedance

Z_L = load impedance

Z_{12} = transfer impedance

Atten = filter performance in a system other than 50 ohms

$$\text{Atten (dB)} = 20 \log_{10}\left[1 + \frac{10(100)}{1.4 \times 10^{-2}\ (10 + 100)}\right]$$

Attenuation = 56.3dB

In this case, the 7000 pf VHF filter will give 56.3 dB which is 16.3dB below the desired reduction in noise (40dB) as stated in the above problem.

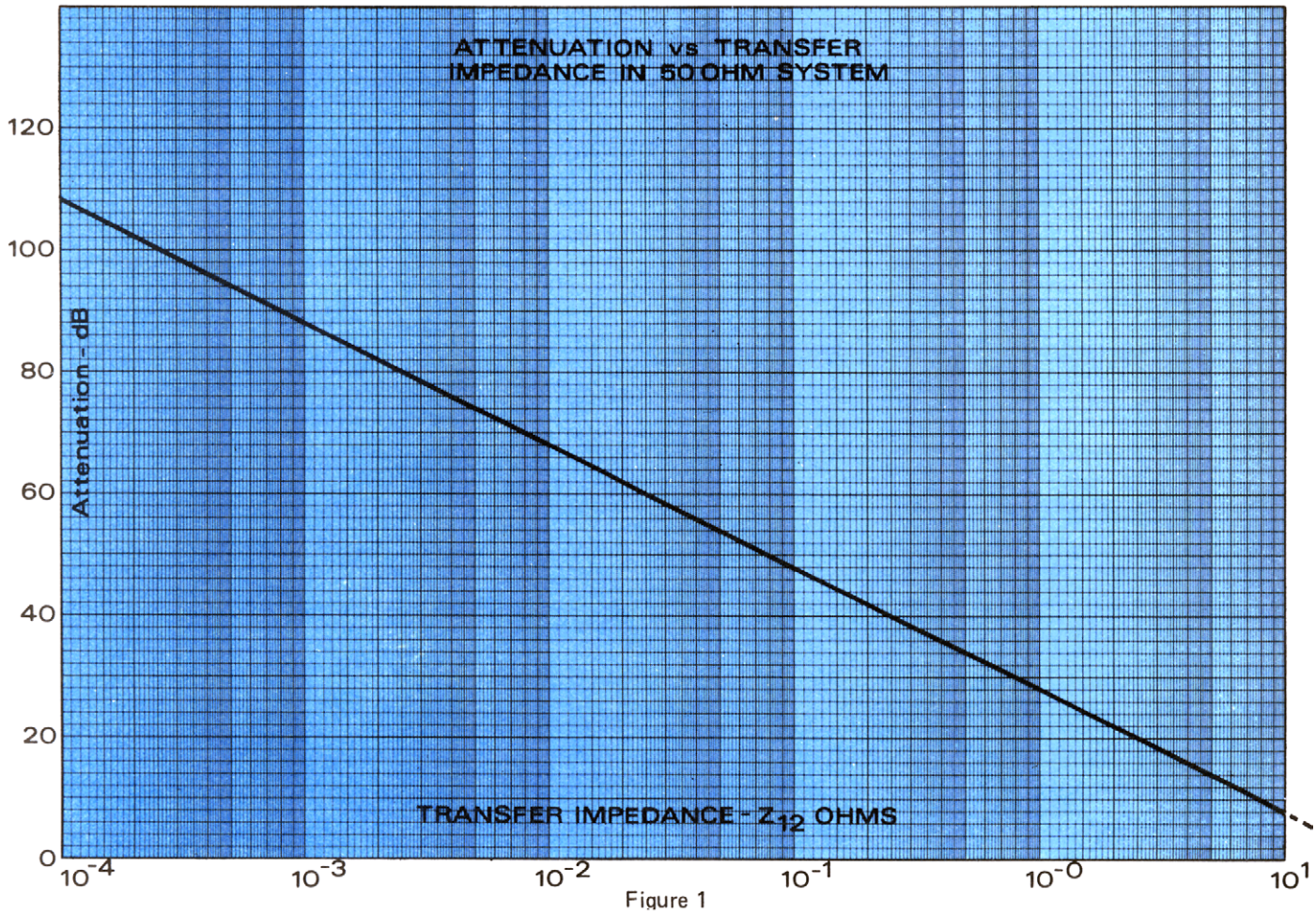


Figure 1

Quality Assurance Testing

ACCEPTANCE TESTING

All filter connectors undergo extensive acceptance testing to assure product quality. An outline of standard acceptance testing performed is as follows:

Mechanical Inspection

- Dimensional inspection of shells, keys, keyways and mounting surfaces by either in-process inspection of components or inspection of final assemblies.
- Visual inspection of contacts, inserts and seals, gaskets and surface finish of shells and hardware.
- Leakage inspection of receptacles using a mass spectrometer leak detector to reject parts having a leakage rate in excess of 4.6×10^{-3} cc/sec (1 cubic inch per hour).

Electrical Tests

- Filter contacts are tested to assure conformance to attenuation values at test points referenced in the filter selection data table (page 4). Testing is per modified MIL-STD-220 system.
- Insulation resistance of filter contacts is checked 100% **at the working voltage and to the test limit** listed for each filter in the filter selection data table.
- Dielectric withstanding voltage is tested on 100% of filter contacts at the voltage listed in the filter selection data table.
- Capacitance is tested 100% at 1KHz.

These acceptance tests, as well as exhaustive in-process inspection and testing, give Amphenol® filter connectors their reputation for reliability.

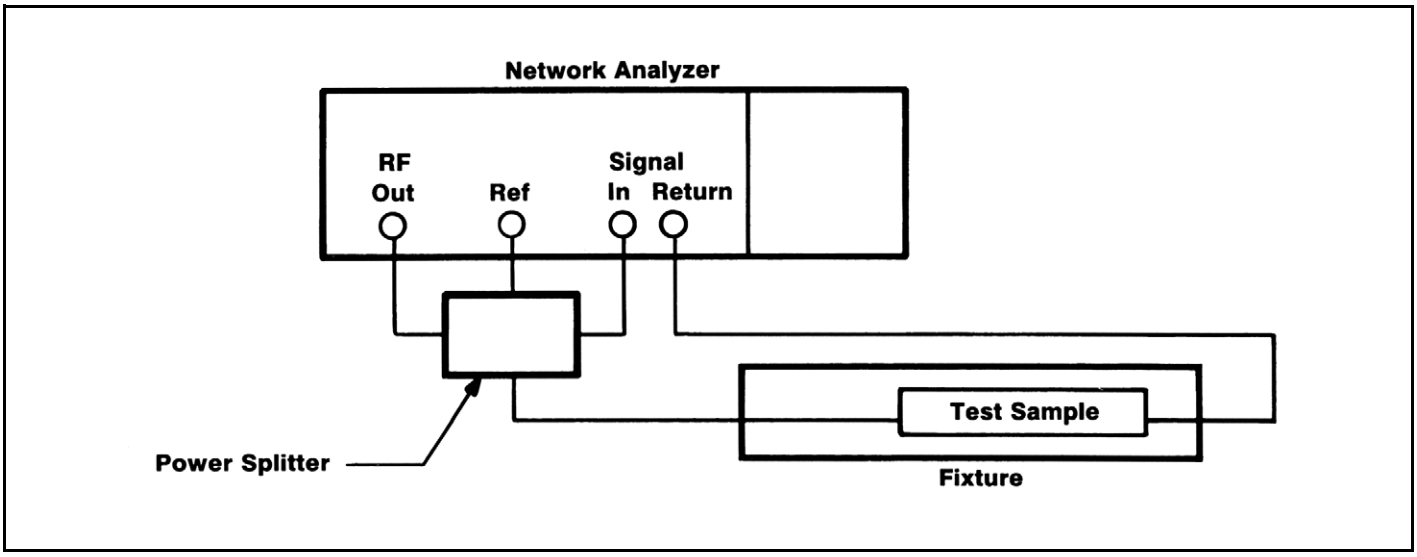
Special Tests

Additional acceptance testing can be provided upon request at additional cost.

Qualifications

Amphenol® filter connectors have been qualified and are on periodic requalification to specification BSF-1 (available from your Amphenol representative; ask for publication L-1259). This is patterned after MIL-C-38999, modified to include mechanical and environmental testing and electrical parameters important to filter connector performance.

ATTENUATION TEST CIRCUIT



Specification Data

Amphenol® Filter Connectors will meet all performance requirements of the reference specifications except for modifications to the paragraphs listed.

<table>
<tr><th>Test Description</th><th>MIL-C-38999 Paragraph Reference</th><th>Procedure</th><th colspan="4">Requirement</th></tr>
<tr><td>Contact Retention</td><td>4.7.19</td><td>An axial load of 10 lbs. applied to the mating end of each contact for 5 sec. minimum.</td><td colspan="4">Axial displacement of contacts shall not exceed 0.012 inch.</td></tr>
<tr><td>Coupling Torque</td><td>4.7.6</td><td>Filter connectors mated and unmated with counterpart connectors</td><td>Shell Size</td><td>Maximum Torque (in.-lb.)</td><td>Shell Size</td><td>Maximum Torque (in.-lb.)</td></tr>
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25</td><td>24
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40</td></tr>
<tr><td>Contact Resistance</td><td>4.7.13</td><td>Per MIL-C-39029 at rated current.</td><td colspan="2">Contact</td><td colspan="2">Millivolt Drop</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">16
20
22</td><td colspan="2">49
55
65</td></tr>
<tr><td>Temperature Cycling</td><td>4.7.4</td><td>Method 1003 MIL-STD-1344, Condition A, except low temperature –55°C</td><td colspan="4">No evidence of cracking, fracture or deterioration of insulation resistance or attenuation.</td></tr>
<tr><td>Leakage</td><td>4.7.5</td><td>Test on a mass spectrometer leak detector using the backfill method at one atmosphere differential pressure with a helium trace gas.</td><td colspan="4">Less than 4.6 x 10^{-3} cc/sec. leakage</td></tr>
<tr><td>Moisture Resistance</td><td>4.7.25</td><td>Per MIL-STD-202, Method 106, eliminating 7a, 7b, and 2.5.</td><td colspan="4">Insulation resistance greater than 100 megohms while at high humidity.</td></tr>
<tr><td>Durability</td><td>4.7.7</td><td>Mated and unmated 500 times to counterpart connectors at a rate of 200 ± 100 cycles per hour.</td><td colspan="4">No mechanical or electrical defects affecting performance, deterioration of insulation resistance or attenuation.</td></tr>
<tr><td>Vibration</td><td>4.7.22.1</td><td>Method 2005 MIL-STD-1344, Condition VI Letter J, 8 hrs. longitudinal and perpendicular axis 25°C and 4 hrs. at –55°C and +125°C</td><td colspan="4">No evidence of cracking, fracture or deterioration of insulation resistance or attenuation.</td></tr>
<tr><td>Physical Shock</td><td>4.7.23.1</td><td>Model 2004 MIL-STD-1344, Test Condition D</td><td colspan="4">No evidence of cracking, fracture or deterioration of insulation resistance or attenuation.</td></tr>
<tr><td>Corrosion</td><td>4.7.12</td><td>Per MIL-STD-202 Method 101, Condition B. Specimens are then dried in a circulating oven at 38 ± 3°C for 12 hrs. minimum and engaged and disengaged with mating connector one time to remove free salt deposits.</td><td colspan="4">Samples shall meet contact resistance requirements and shall show no exposure of base metal.
500 hour O.D. cadmium nickel base finish available.</td></tr>
<tr><td>Solvent Immersion</td><td>4.7.27</td><td>Unmated filter connectors shall be immersed 20 hrs. in hydraulic fluid per MIL-H-5606 and 20 hrs. in lubricating oil per MIL-L-7808. Connectors shall be air dried at room ambiance for one hour after each immersion.</td><td colspan="4">Parts shall meet attenuation test requirements after drying.</td></tr>
<tr><td>Insert Retention</td><td>4.7.11</td><td>A pressure of 200 psi shall be applied to inserts, less grommets and accessories, in each direction at rate of 10 psi/sec. Full pressure shall be maintained for 5 sec. minimum.</td><td colspan="4">Inserts shall not be displaced.</td></tr>
<tr><td>Attenuation</td><td>–</td><td>Per MIL-STD-220</td><td colspan="4">Equal to or greater than test points in performance table data.</td></tr>
<tr><td>Insulation Resistance</td><td>4.7.9.1</td><td>Per MIL-STD-202, Method 302. Measurements shall be between each contact and all other contacts tied in common to the shell (ground). Connectors shall be wired and mated during testing.</td><td colspan="4">Equal to or greater than the minimum value in the table when tested at the specified voltage per the performance data table.</td></tr>
<tr><td>Dielectric Withstanding Voltage (Sea Level)</td><td>4.7.10.1</td><td>Per MIL-STD-202, Method 301. Measurements shall be between each contact and all other contacts tied in common to the shell (ground). Voltage shall be applied for 6 seconds minimum.</td><td colspan="4">There shall be no flashover or dielectric breakdown when tested at specific voltage in the performance data table.</td></tr>
<tr><td>Dielectric Withstanding Voltage (Altitude)</td><td>4.7.10.2</td><td>Per MIL-STD-202, Method 105, Condition C. Connectors shall be unmated, and only the engaging face shall be subjected to altitude.</td><td colspan="2">Altitude</td><td colspan="2">Voltage*</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">70,000 ft.
90,000 ft.</td><td colspan="2">350 VDC
250 VDC</td></tr>
<tr><td></td><td></td><td></td><td colspan="4">* MF filters shall be subjected to the voltage in the performance data table.
There shall be no flashover or dielectric breakdown.</td></tr>
<tr><td>Examination of Product</td><td>4.7.1.1</td><td></td><td colspan="4">Filter connectors and piece parts shall conform to all applicable drawings.</td></tr>
</table>

Amphenol® Filter Connector Insert Availability Chart

Tooling Chart Guidelines

The tooling chart below represents VHF and HF filter types. Please consult Amphenol, Sidney, NY or your local Amphenol sales representative for tooling information on MF and UHF types.

The insert patterns consist of 100% of the indicated filter types, i.e.: 18-32P consists of 32 VHF-1 contacts. Unique mixes of filter types, feed-throughs, and ground contacts may result in tooling charges.

Some tooling charges are applicable when switching from an LJT pattern to a TV pattern.

Consult the applicable cylindrical connector catalog*** for contact size and count. Be aware of the high density insert patterns with dual identification, i.e.: 18-66 is the same as 19-35.

Shell Size	Insert Pattern	PT				JT				LJT*				LJT-UTS		TV**		TV-UTS		M83723	
		VHF		HF		VHF		HF		VHF		HF		VHF		VHF		VHF			
		21-20XXXX 21-22XXXX		21-33XXXX		21-24XXXX 21-34XXXX		21-37XXXX 21-38XXXX		21-29XXXX 21-47XXXX		21-36XXXX		21-48XXXX		21-52XXXX		21-50XXXX		21-73XXXX	
		P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
8/9	8-4	X																			
	8-35					X				X						X					
	8-44					X				X						X					
10/11	10-5					X		X		X											
	10-6	X																			
	10-35					X	X			X		X		X		X					
	10-98	X		X		X				X	X					X	X				
12/13	12-3	X	X	X																	
	12-8	X		X		X		X		X											
	12-10	X	X	X	X																
	12-12																			X	
	12-35	X				X	X			X	X			X		X		X			
	12-98	X				X	X	X	X	X											
14/15	14-5	X	X							X	X										
	14-12	X	X																		
	14-15	X	X																	X	
	14-18	X		X		X	X	X		X		X		X							
	14-19	X	X	X	X											X					
	14-35					X	X			X	X			X	X	X	X	X	X		
	14-97					X												X			
16/17	16-2															X		X			
	16-8	X		X			X		X	X		X									
	16-10																			X	
	16-24																			X	
	16-26	X	X	X	X	X	X	X	X	X	X	X	X			X	X				
	16-35					X				X	X			X	X	X	X	X	X		
	16-99									X	X							X			
18/19	18-8									X	X					X					
	18-11	X	X							X	X	X		X							
	18-14																			X	
	18-31																			X	
	18-32	X	X	X	X	X	X	X	X	X	X	X	X			X					
	18-35					X				X				X	X	X	X		X		
20/21	20-16	X	X	X	X	X	X			X		X						X	X		
	20-35					X				X		X		X		X					
	20-41	X	X	X	X	X		X		X	X	X				X					
	20-79									X											
22/23	22-12																				X
	22-14					X															
	22-21	X	X			X															
	22-35					X	X			X	X			X	X	X	X	X	X		
	22-41	X	X	X	X																
	22-53									X	X	X	X	X	X	X		X			
	22-55	X	X	X	X	X		X		X		X									
24/25	24-4													X		X	X				
	24-29									X	X					X		X			
	24-35					X	X			X	X			X	X	X	X	X	X		
	24-37													X				X	X		
	24-43															X					
	24-46															X					
	24-57																			X	X
	24-61	X	X	X						X				X		X		X			

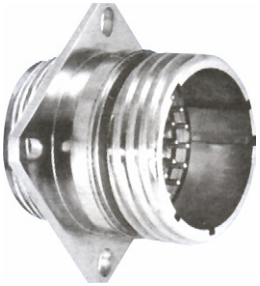
* LJT insert patterns are interchangeable with SJT insert patterns.
** TV insert patterns are interchangeable with FBL insert patterns.

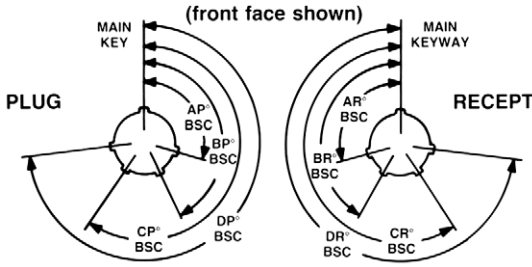
*** Ask for catalogs as follows:
For PT Miniature; Catalog 12-070.
For JT and LJT Subminiature; Catalog 12-090.
For TV (Tri-Start) Subminiature; Catalog 12-092
For M83723 Miniature; Catalog MS-102

Amphenol® FTV Series
Tri-Start™ Subminiature Cylindrical Filters

The Amphenol® FTV Series demonstrates unsurpassed technical leadership. With the added feature of the filter, this high performance general duty threaded connector is designed to withstand the pressures of severe environment applications.

- **Intermateable with MIL-C-38999 Series III connectors (see Catalog 12-092)**
- **Quick Mating – completely mates in a 360° turn of the coupling nut**
- **Lockwiring Eliminated – incorporates anti-decoupling device**
- **Contact Protection – 100% "scoop-proof"**
- **Improved Moisture Resistance – prevents electrolytic erosion of contacts**
- **Corrosion Resistant – 500 hour salt spray olive drab cadmium over nickel plating, class RW, or stainless steel shells**



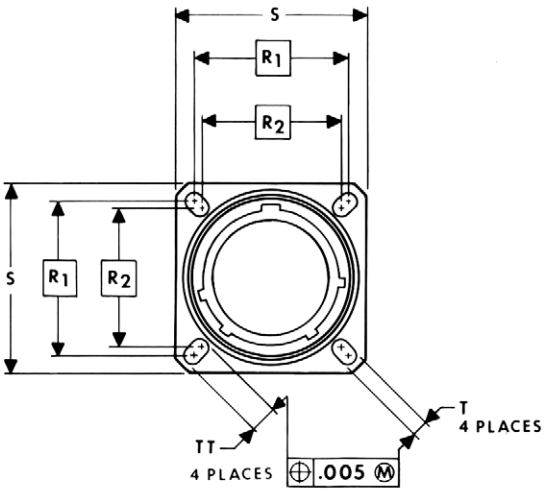


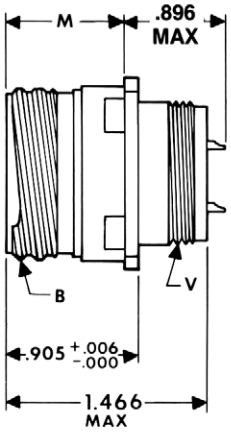
FTV Master Key/Keyway Rotation

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
	E	91	131	197	240
11, 13, 15	N	95	141	208	236
	A	113	156	182	292
	B	90	145	195	252
	C	53	156	220	255
	D	119	146	176	298
	E	51	141	184	242
17 and 19	N	80	142	196	293
	A	135	170	200	310
	B	49	169	200	244
	C	66	140	200	257
	D	62	145	180	280
	E	79	153	197	272
21, 23, 25	N	80	142	196	293
	A	135	170	200	310
	B	49	169	200	244
	C	66	140	200	257
	D	62	145	180	280
	E	79	153	197	272

All angles are BSC
The insert arrangement does not rotate with main key/keyway.

FTV
wall mounting receptacle





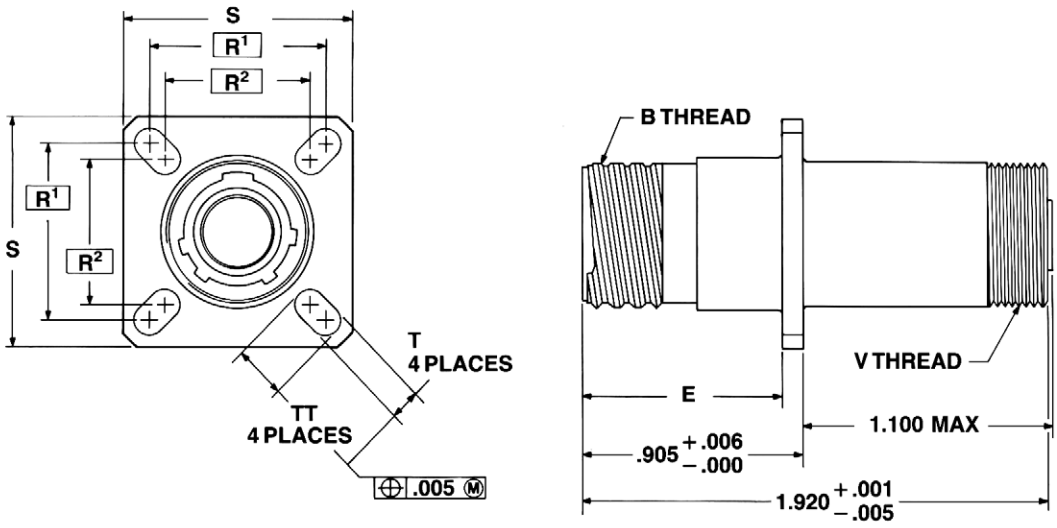
21-52X0XX-XXX

For ordering information, see how to order page 62.
Plug movement required to clear FTV receptacles: .625 min.

Shell Size	B Thread Class 2A 0.1P-0.3L-TS (Plated)	M +.000 −.005	R^1 TP	R^2 TP	S ±.010	T +.008 −.006	V Thread Metric (Plated)	TT +.008 −.006
9	.6250	.820	.719	.594	.938	.128	M12X1-6g0.100R	.216
11	.7500	.820	.812	.719	1.031	.128	M15X1-6g0.100R	.194
13	.8750	.820	.906	.812	1.125	.128	M18X1-6g0.100R	.194
15	1.0000	.820	.969	.906	1.219	.128	M22X1-6g0.100R	.173
17	1.1875	.820	1.062	.969	1.312	.128	M25X1-6g0.100R	.194
19	1.2500	.820	1.156	1.062	1.438	.128	M28X1-6g0.100R	.194
21	1.3750	.790	1.250	1.156	1.562	.128	M31X1-6g0.100R	.194
23	1.5000	.790	1.375	1.250	1.688	.154	M34X1-6g0.100R	.242
25	1.6250	.790	1.500	1.375	1.812	.154	M37X1-6g0.100R	.242

All dimensions for reference only.

FTV
wall mounting receptacle (UTS crimp)



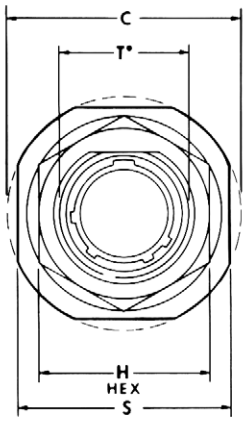
21-50X0XX-XXX
UTS (Crimp)
Contact
MIL-C-39029/57

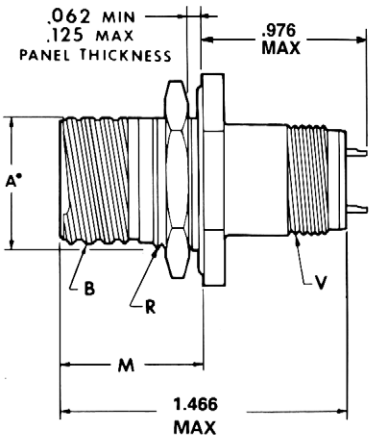
For ordering information, see how to order page 62.

Shell Size	B Thread Class 2A 0.1P-0.3L-TS (Plated)	E +.000 −.005	R^1 TP	R^2 TP	S ±.010	T +.008 −.006	V Thread Metric (Plated)	TT +.008 −.006
9	.6250	.820	.719	.594	.938	.128	M15X1-6g0.100R	.216
11	.7500	.820	.812	.719	1.031	.128	M18X1-6g0.100R	.194
13	.8750	.820	.906	.812	1.125	.128	M22X1-6g0.100R	.194
15	1.0000	.820	.969	.906	1.219	.128	M25X1-6g0.100R	.173
17	1.1875	.820	1.062	.969	1.312	.128	M28X1-6g0.100R	.194
19	1.2500	.820	1.156	1.062	1.438	.128	M31X1-6g0.100R	.194
21	1.3750	.790	1.250	1.156	1.562	.128	M34X1-6g0.100R	.194
23	1.5000	.790	1.375	1.250	1.688	.154	M37X1-6g0.100R	.242
25	1.6250	.790	1.500	1.375	1.812	.154	M41X1-6g0.100R	.242

All dimensions for reference only.

FTV
jam nut receptacle





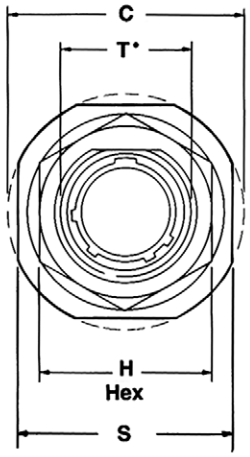
21-52X7XX-XXX

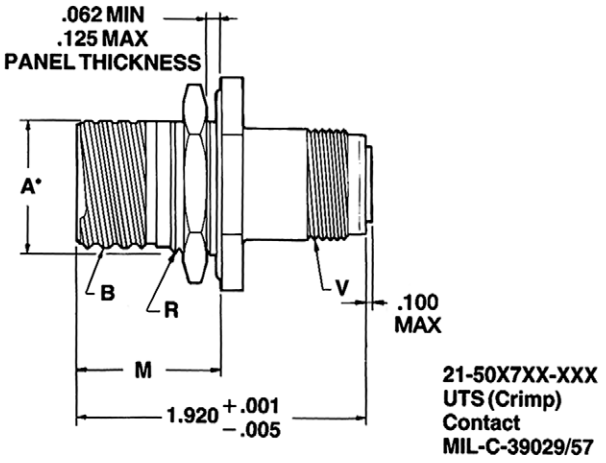
• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FTV receptacles: .625 min.

Shell Size	A• +.000 –.010	B Thread Class 2A 0.1P-0.3L-TS (Plated)	C Max	H Hex +.017 –.016	M +.011 –.010	R Thread (Plated)	S +.011 –.010	T• +.010 –.000	V Thread Metric (Plated)
9	.669	.6250	1.199	.875	.871	M17X1-6g0.100R	1.062	.697	M12X1-6g0.100R
11	.769	.7500	1.386	1.000	.871	M20X1-6g0.100R	1.250	.822	M15X1-6g0.100R
13	.955	.8750	1.511	1.188	.878	M25X1-6g0.100R	1.375	1.007	M18X1-6g0.100R
15	1.084	1.0000	1.636	1.312	.878	M28X1-6g0.100R	1.500	1.134	M22X1-6g0.100R
17	1.208	1.1875	1.761	1.438	.878	M32X1-6g0.100R	1.625	1.259	M25X1-6g0.100R
19	1.333	1.2500	1.949	1.562	.878	M35X1-6g0.100R	1.812	1.384	M28X1-6g0.100R
21	1.459	1.3750	2.073	1.688	.878	M38X1-6g0.100R	1.938	1.507	M31X1-6g0.100R
23	1.575	1.5000	2.199	1.812	.878	M41X1-6g0.100R	2.062	1.634	M34X1-6g0.100R
25	1.709	1.6250	2.323	2.000	.878	M44X1-6g0.100R	2.188	1.759	M37X1-6g0.100R

All dimensions for reference only.

FTV
jam nut receptacle (UTS crimp)



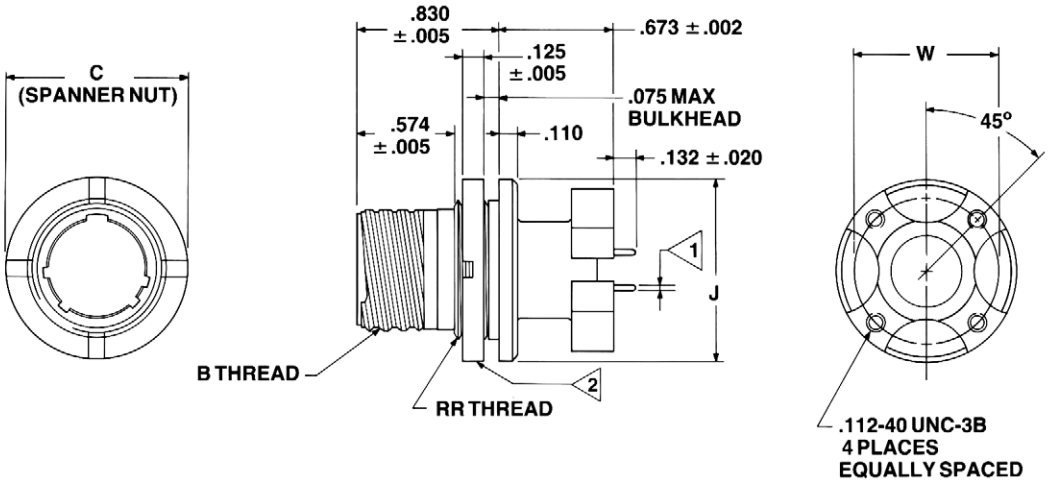


• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FTV receptacles: .625 min.

Shell Size	A• +.000 −.010	B Thread Class 2A 0.1P-0.3L-TS (Plated)	C Max	H Hex +.017 −.016	M ±.005	R Thread (Plated)	S +.011 −.010	T• +.010 −.000	V Thread Metric (Plated)
9	.669	.6250	1.199	.875	.871	M17X1-6g0.100R	1.062	.697	M15X1-6g0.100R
11	.769	.7500	1.386	1.000	.871	M20X1-6g0.100R	1.250	.822	M18X1-6g0.100R
13	.955	.8750	1.511	1.188	.878	M25X1-6g0.100R	1.375	1.007	M22X1-6g0.100R
15	1.084	1.0000	1.636	1.312	.878	M28X1-6g0.100R	1.500	1.134	M25X1-6g0.100R
17	1.208	1.1875	1.761	1.438	.878	M32X1-6g0.100R	1.625	1.259	M28X1-6g0.100R
19	1.333	1.2500	1.949	1.562	.878	M35X1-6g0.100R	1.812	1.384	M31X1-6g0.100R
21	1.459	1.3750	2.073	1.688	.878	M38X1-6g0.100R	1.938	1.507	M34X1-6g0.100R
23	1.575	1.5000	2.199	1.812	.878	M41X1-6g0.100R	2.062	1.634	M37X1-6g0.100R
25	1.709	1.6250	2.323	2.000	.878	M44X1-6g0.100R	2.188	1.759	M41X1-6g0.100R

All dimensions for reference only.

FTV
jam nut receptacle (printed circuit board mount)



1 STANDARD TAIL FOR SIZE 22 IS .020 ± .001

1 STANDARD TAIL FOR SIZE 20 IS .030 ± .001

2 SPECIAL TOOL REQUIRED TO TIGHTEN SPANNER NUT NOT SUPPLIED WITH CONNECTOR

21-60X7XX-XXX

For ordering information, see how to order page 62.

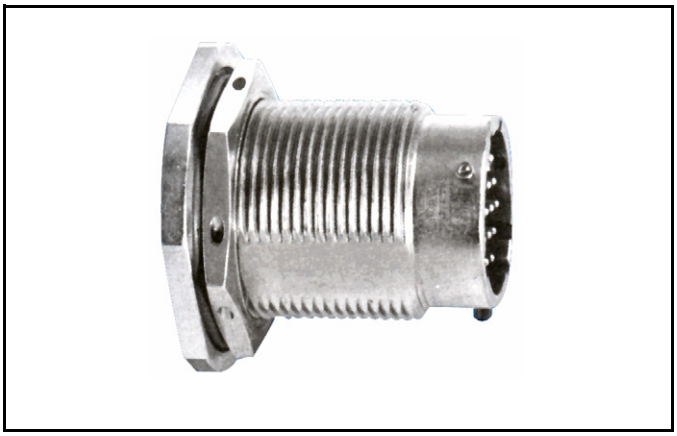
Shell Size	B Thread Class 2A 0.1P-0.3L-TS (Plated)	C Dia. ±.005	J Dia. ±.005	W Dia.	RR Thread (Plated)
11	.7500	1.062	1.062	.850	M20X1-6g0.100R
13	.8750	1.250	1.250	.994	M25X1-6g0.100R
15	1.0000	1.375	1.375	1.119	M28X1-6g0.100R
17	1.1875	1.500	1.500	1.237	M32X1-6g0.100R
19	1.2500	1.625	1.625	1.379	M35X1-6g0.100R
21	1.3750	1.750	1.750	1.489	M38X1-6g0.100R
23	1.5000	1.875	1.875	1.619	M41X1-6g0.100R
25	1.6250	2.000	2.000	1.744	M44X1-6g0.100R

All dimensions for reference only.

Amphenol® FJT Series
Subminiature Cylindrical Filters

The Amphenol® FJT Series space and weight saving design, coupled with a filter, gives high reliability.

- **Intermateable with MIL-C-38999/27599 Series II connectors (see Catalog 12-090)**
- **Quick Positive Coupling – 3 point bayonet locking**
- **Error-proof alternate positioning of shell keyways**
- **Higher reliability and greater durability with permanently encapsulated contacts**
- **Environmental Resistant**
- **Aluminum shells with several finish options**

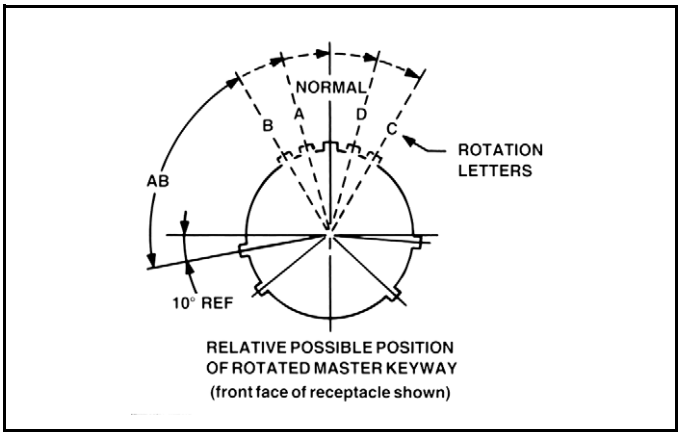


FJT Master Key/Keyway Rotation

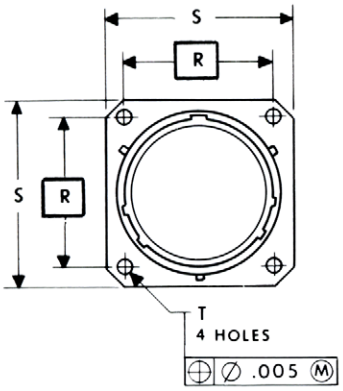
Shell Size	AB Angle of Rotation (Degrees)				
	Normal	A	B	C	D
8	100	82	–	–	118
10	100	86	72	128	114
12	100	80	68	132	120
14	100	79	66	134	121
16	100	82	70	130	118
18	100	82	70	130	118
20	100	82	70	130	118
22	100	85	74	126	115
24	100	85	74	126	115

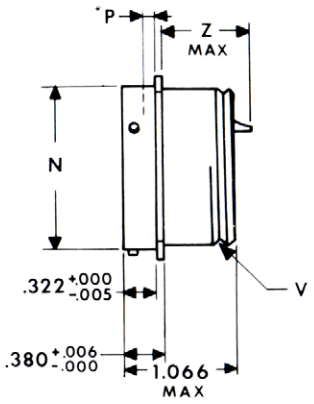
A plug with a given rotation letter will mate with a receptacle with the same rotation letter. The AB angle for a given connector is the same whether it contains pins or sockets. Inserts are not rotated in conjunction with the master key/keyway.

AB angles shown are viewed from the front face of the connector. A receptacle is shown at right. The angles for the plug are exactly the same, except the direction of rotation is opposite of that shown for the receptacle.

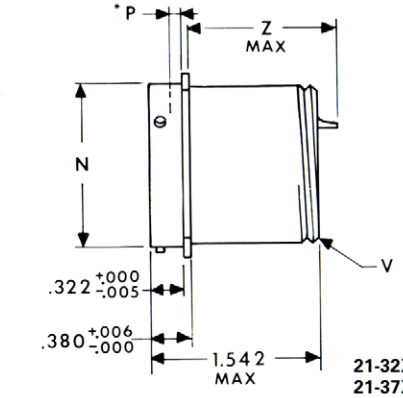


FJT
wall mounting receptacle





21-24X0XX-XXX (MS27334)



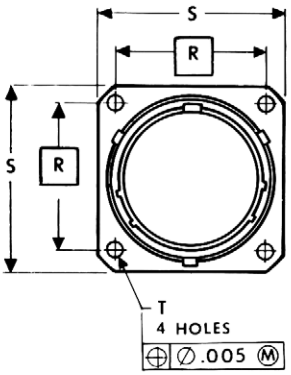
21-32X0XX-XXX (MS27334)
21-37X0XX-XXX (MS27334)

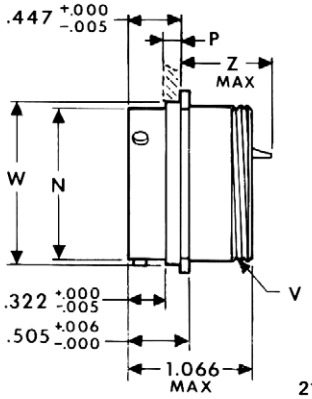
For ordering information, see how to order page 62.
Plug movement required to clear FJT receptacles: .281 min.
* Acceptable panel thickness for back panel mounting a standard receptacle.

Shell Size	N Dia +.001 –.005	P* Max.	R (TP)	S +.011 –.010	T Dia. ±.005	V Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters	
							Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 22 Contact Z Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
8	.473	.022	.594	.812	.120	.4375-28	.937	.952	.902	1.300	1.496
10	.590	.027	.719	.938	.120	.5625-24	.937	.952	.902	1.300	1.496
12	.750	.027	.812	1.031	.120	.6875-24	.937	.952	.902	1.300	1.496
14	.875	.027	.906	1.125	.120	.8125-20	.937	.952	.902	1.300	1.496
16	1.000	.027	.969	1.219	.120	.9375-20	.937	.952	.902	1.300	1.496
18	1.125	.027	1.062	1.312	.120	1.0625-18	.937	.952	.902	1.300	1.496
20	1.250	.054	1.156	1.438	.120	1.1875-18	.937	.952	.902	1.300	1.496
22	1.375	.054	1.250	1.562	.120	1.3125-18	.937	.952	.902	1.300	1.496
24	1.500	.054	1.375	1.688	.147	1.4375-18	.937	.952	.902	1.300	1.496

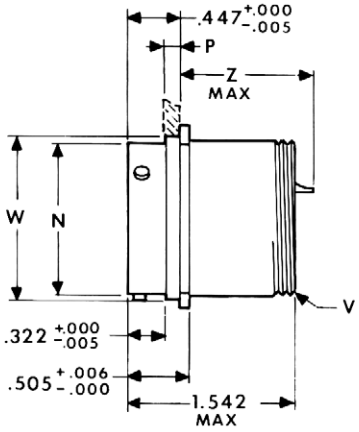
All dimensions for reference only.

FJTP
wall mounting receptacle (back panel mounting)





21-34X0XX-XXX (MS27497)



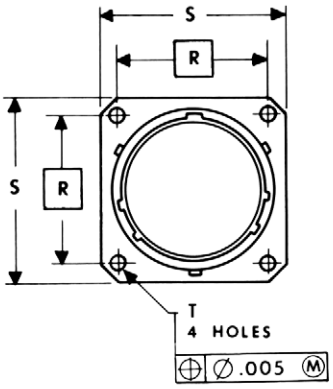
21-38X0XX-XXX (MS27497)
21-39X0XX-XXX (MS27497)

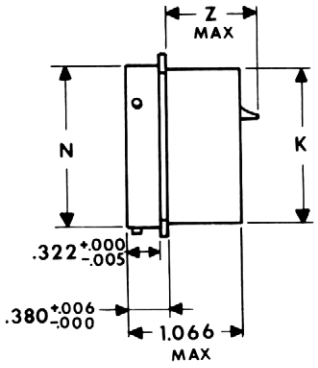
For ordering information, see how to order page 62.
Plug movement required to clear FJT receptacles: .281 min.

Shell Size	N Dia +.001 −.005	P Max. Panel Thickness	R (TP)	S +.011 −.010	T Dia. ±.005	V Thread UNEF-2A (Plated)	W Dia. +.001 −.005	SHORT SHELL VHF/UHF/MF Filters		LONG SHELL HF Filters	
								Size 16 or 16 & 20 Contacts Z Max.	Size 20 or 22 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 20 Contact Z Max.
8	.473	.147	.594	.812	.120	.4375-28	.516	.900	.875	1.385	1.285
10	.590	.152	.719	.938	.120	.5625-24	.633	.900	.875	1.385	1.285
12	.750	.152	.812	1.031	.120	.6875-24	.802	.900	.875	1.385	1.285
14	.875	.152	.906	1.125	.120	.8125-20	.927	.900	.875	1.385	1.285
16	1.000	.152	.969	1.219	.120	.9375-20	1.052	.900	.875	1.385	1.285
18	1.125	.152	1.062	1.312	.120	1.0625-18	1.177	.900	.875	1.385	1.285
20	1.250	.179	1.156	1.438	.120	1.1875-18	1.302	.900	.875	1.385	1.285
22	1.375	.179	1.250	1.562	.120	1.3125-18	1.427	.900	.875	1.385	1.285
24	1.500	.179	1.375	1.688	.147	1.4375-18	1.552	.900	.875	1.385	1.285

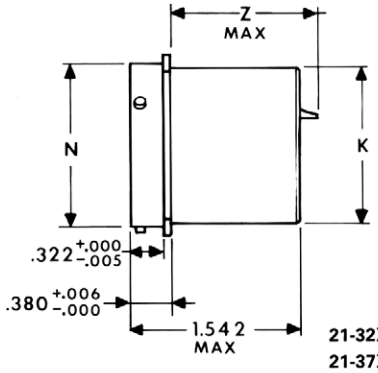
All dimensions for reference only.

FJT
box mounting receptacle





21-24X2XX-XXX (MS27335)



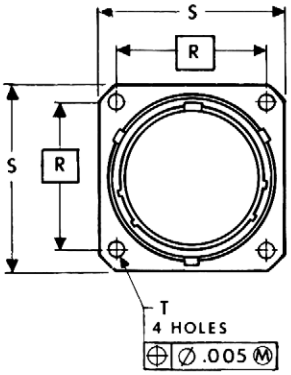
21-32X2XX-XXX (MS27335)
21-37X2XX-XXX (MS27335)

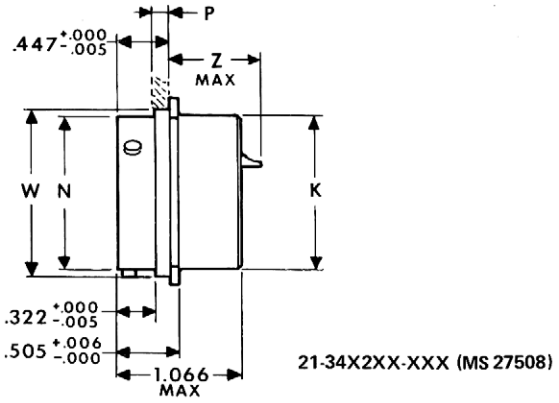
For ordering information, see how to order page 62.
Plug movement required to clear FJT receptacles: .281 min.

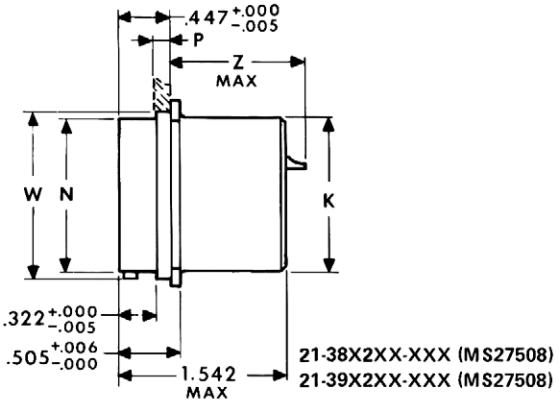
Shell Size	K Dia. +.000 −.007	N Dia +.001 −.005	R (TP)	S +.011 −.010	T Dia. ±.005	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters	
						Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 22 Contact Z Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
8	.438	.473	.594	.812	.120	.937	.952	.902	1.300	1.496
10	.562	.590	.719	.938	.120	.937	.952	.902	1.300	1.496
12	.688	.750	.812	1.031	.120	.937	.952	.902	1.300	1.496
14	.812	.875	.906	1.125	.120	.937	.952	.902	1.300	1.496
16	.938	1.000	.969	1.219	.120	.937	.952	.902	1.300	1.496
18	1.062	1.125	1.062	1.312	.120	.937	.952	.902	1.300	1.496
20	1.188	1.250	1.156	1.438	.120	.937	.952	.902	1.300	1.496
22	1.312	1.375	1.250	1.562	.120	.937	.952	.902	1.300	1.496
24	1.438	1.500	1.375	1.688	.147	.937	.952	.902	1.300	1.496

All dimensions for reference only.

FJTP
box mounting receptacle (back panel mounting)





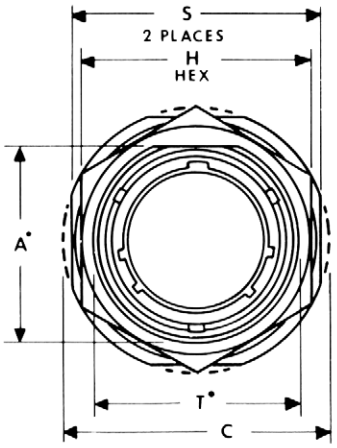


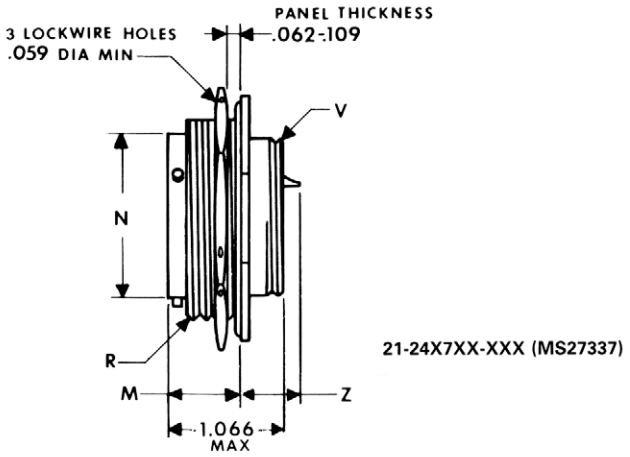
For ordering information, see how to order page 62.
Plug movement required to clear FJT receptacles: .281 min.

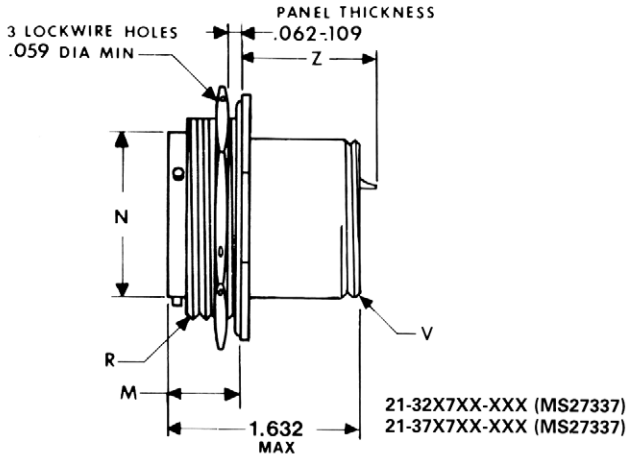
Shell Size	K Dia. +.000 –.007	N Dia +.001 –.005	P Max. Panel Thickness	R (TP)	S +.011 –.010	T Dia. ±.005	W Dia. +.001 –.005	SHORT SHELL VHF/UHF/MF Filters		LONG SHELL HF Filters	
								Size 16 or 16 & 20 Contacts Z Max.	Size 20 or 22 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 20 Contact Z Max.
8	.438	.473	.147	.594	.812	.120	.516	.900	.875	1.385	1.285
10	.562	.590	.152	.719	.938	.120	.633	.900	.875	1.385	1.285
12	.688	.750	.152	.812	1.031	.120	.802	.900	.875	1.385	1.285
14	.812	.875	.152	.906	1.125	.120	.927	.900	.875	1.385	1.285
16	.938	1.000	.152	.969	1.219	.120	1.052	.900	.875	1.385	1.285
18	1.062	1.125	.152	1.062	1.312	.120	1.177	.900	.875	1.385	1.285
20	1.188	1.250	.179	1.156	1.438	.120	1.302	.900	.875	1.385	1.285
22	1.312	1.375	.179	1.250	1.562	.120	1.427	.900	.875	1.385	1.285
24	1.438	1.500	.179	1.375	1.688	.147	1.552	.900	.875	1.385	1.285

All dimensions for reference only.

FJT
jam nut receptacle





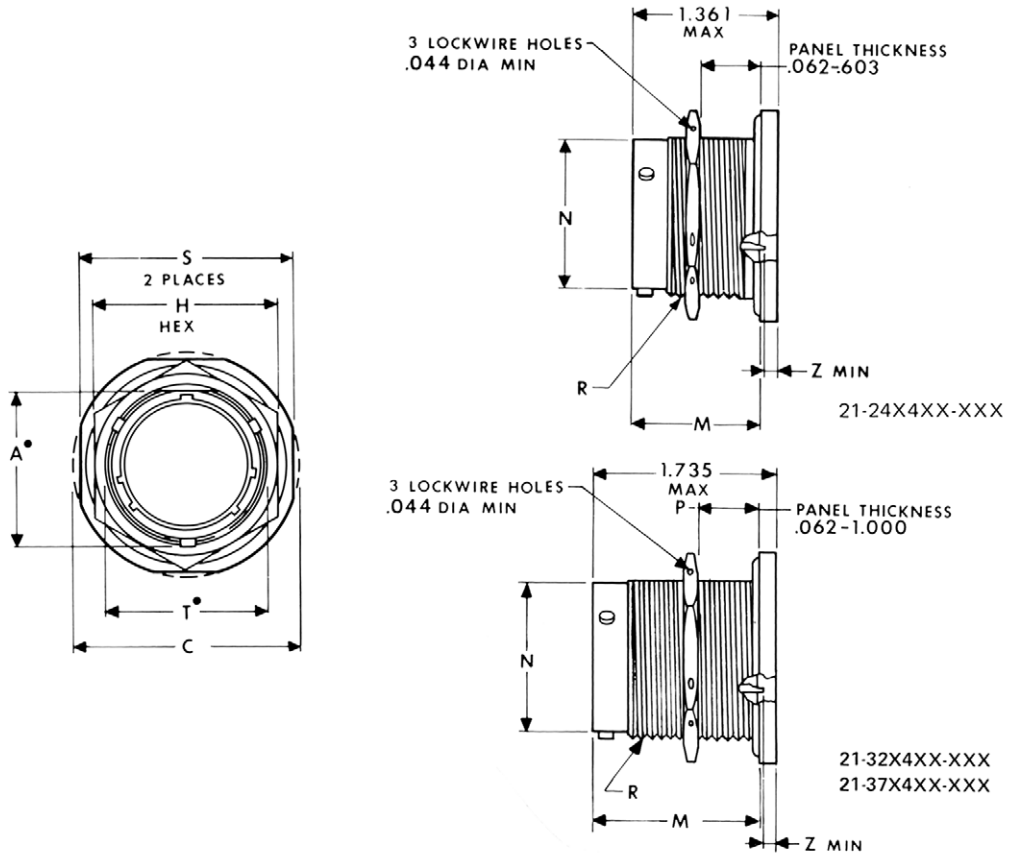


• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FJT receptacles: .281 min.

Shell Size	A• Flat +.000 –.010	C Dia. +.011 –.010	H Hex +.017 –.016	M ±.005	N Dia +.001 –.005	R Thread (Plated) Class -2A	S ±.010	T• Dia. +.010 –.000	V Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters	
										Size 16 or 16 & 20 Contacts Z Max.	Size 20 Contact Z Max.	Size 22 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 20 Contact Z Max.
8	.830	1.375	1.062	.438	.473	.8750-20UNEF	1.250	.884	.4375-28	.900	.884	.849	1.443	1.276
10	.955	1.500	1.188	.438	.590	1.0000-20UNEF	1.375	1.007	.5625-24	.900	.884	.849	1.443	1.276
12	1.084	1.625	1.312	.438	.750	1.1250-18UNEF	1.500	1.134	.6875-24	.900	.884	.849	1.443	1.276
14	1.208	1.750	1.438	.438	.875	1.2500-18UNEF	1.625	1.259	.8125-20	.900	.884	.849	1.443	1.276
16	1.333	1.938	1.562	.438	1.000	1.3750-18UNEF	1.781	1.384	.9375-20	.900	.884	.849	1.443	1.276
18	1.459	2.016	1.688	.438	1.125	1.5000-18UNEF	1.890	1.507	1.0625-18	.900	.884	.849	1.443	1.276
20	1.576	2.141	1.812	.464	1.250	1.6250-18UNEF	2.016	1.634	1.1875-18	.874	.858	.823	1.443	1.276
22	1.701	2.265	2.000	.464	1.375	1.7500-18UNS	2.140	1.759	1.3125-18	.874	.858	.823	1.417	1.250
24	1.826	2.390	2.125	.464	1.500	1.8750-16UN	2.265	1.884	1.4375-18	.874	.858	.823	1.417	1.250

All dimensions for reference only.

FJTP
jam nut receptacle (minimum penetration)



• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FJT receptacles: .281 min.

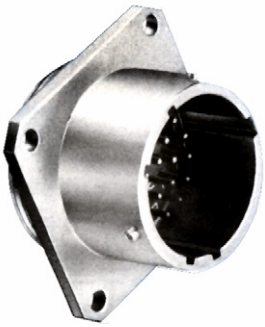
Shell Size	A• Flat +.000 –.010	C Dia. +.011 –.010	H Hex +.017 –.016	M ±.005	M[1] ±.005	N Dia +.001 –.005	R Thread UNEF-2A (Plated)	S +.011 –.010	T• Dia. +.010 –.000	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters	
										Size 16 or 16 & 20 Contacts Z Max.	Size 20 Contact Z Max.	Size 22 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 20 Contact Z Max.
8	.542	1.062	.750	1.220	1.594	.473	.5625-24	.938	.572	.000	.022	.057	.000	.000
10	.669	1.188	.875	1.220	1.594	.590	.6875-24	1.062	.697	.000	.022	.057	.000	.000
12	.830	1.375	1.062	1.220	1.594	.750	.8750-20	1.250	.844	.000	.022	.057	.000	.000
14	.955	1.500	1.188	1.220	1.594	.875	1.0000-20	1.375	1.007	.000	.022	.057	.000	.000
16	1.084	1.625	1.312	1.220	1.594	1.000	1.1250-18	1.500	1.134	.000	.022	.057	.000	.000
18	1.208	1.750	1.438	1.220	1.594	1.125	1.2500-18	1.625	1.259	.000	.022	.057	.000	.000
20	1.333	1.938	1.562	1.188	1.563	1.250	1.3750-18	1.812	1.384	.000	.022	.057	.000	.000
22	1.459	2.062	1.688	1.188	1.563	1.375	1.5000-18	1.938	1.507	.000	.022	.057	.000	.000
24	1.575	2.188	1.812	1.188	1.563	1.500	1.6250-18	2.062	1.634	.000	.022	.057	.000	.000

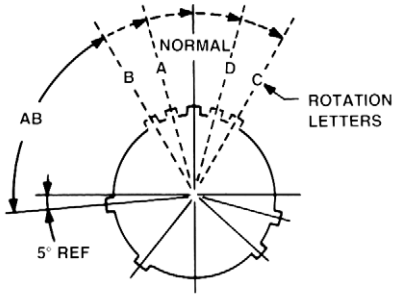
All dimensions for reference only.

Amphenol® FLJT Series
Subminiature Cylindrical Filters

The Amphenol® FLJT Series offers all the design features of the FJT plus a 100% "scoop-proof" contact protection design.

- **Intermountable with MIL-C-38999/27599 Series I connectors (see Catalog 12-090)**
- **Contact Protection - shell design prevents contact damage**
- **Quick Positive Coupling – 3 point bayonet locking**
- **Higher reliability and greater durability with permanently encapsulated contacts**
- **Environmental Resistant**
- **Aluminum shells with several finish options**
- **Error-proof alternate positioning of shell keyways**
- **Corrosion Resistant - 500 hour salt spray olive drab cadmium over nickel plating, class RW, or stainless steel shells**





RELATIVE POSSIBLE POSITION
OF ROTATED MASTER KEYWAY
(front face of receptacle shown)

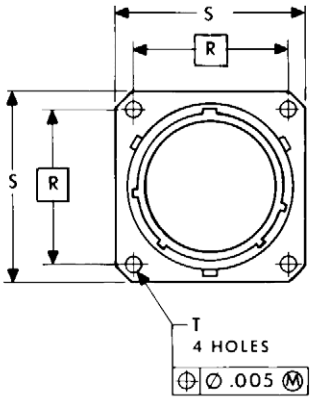
FLJT Master Key/Keyway Rotation

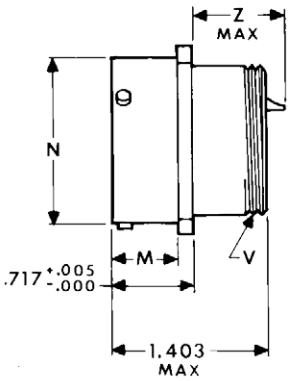
Shell Size	AB Angle of Rotation (Degrees)				
	Normal	A	B	C	D
9	95	77	–	–	113
11	95	81	67	123	109
13	95	75	63	127	115
15	95	74	61	129	116
17	95	77	65	125	113
19	95	77	65	125	113
21	95	77	65	125	113
23	95	80	69	121	110
25	95	80	69	121	110

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

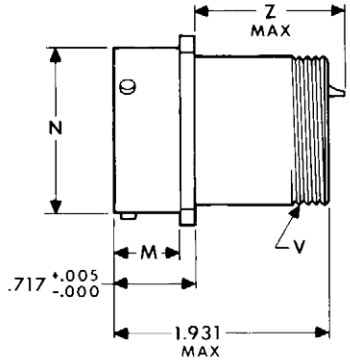
AB angles shown are viewed from the front face of the connector. A receptacle is shown at right. The angles for the plug are exactly the same, except the direction of rotation is opposite of that shown for the receptacle.

FLJT
wall mounting receptacle





21-29X0XX-XXX



21-36X0XX-XXX

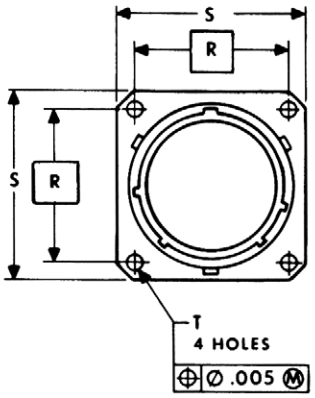
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

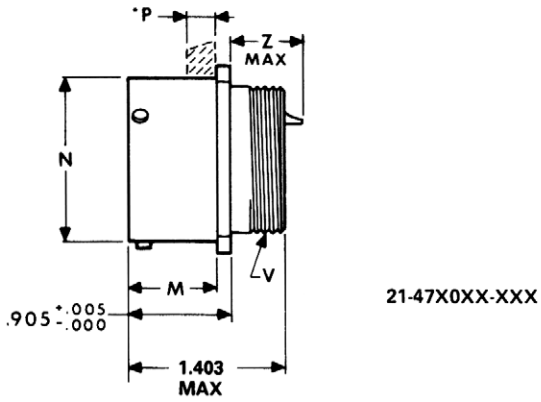
Shell Size	M +.000 –.006	N Dia. +.001 –.005	R (TP)	S +.011 –.010	T Dia. ±.005	V Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters	
							Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 22 Contact Z Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
9	.632	.572	.719	.938	.128	.4375-28	.865	.950	.820	1.324	1.394
11	.632	.700	.812	1.031	.128	.5625-24	.865	.950	.820	1.324	1.394
13	.632	.850	.906	1.125	.128	.6875-24	.865	.950	.820	1.324	1.394
15	.632	.975	.969	1.219	.128	.8125-20	.865	.950	.820	1.324	1.394
17	.632	1.100	1.062	1.312	.128	.9375-20	.865	.950	.820	1.324	1.394
19	.632	1.207	1.156	1.438	.128	1.0625-18	.865	.950	.820	1.324	1.394
21	.602	1.332	1.250	1.562	.128	1.1875-18	.865	.950	.820	1.324	1.394
23	.602	1.457	1.375	1.688	.147	1.3125-18	.865	.950	.820	1.324	1.394
25	.602	1.582	1.500	1.812	.147	1.4375-18	.865	.950	.820	1.324	1.394

All dimensions for reference only.

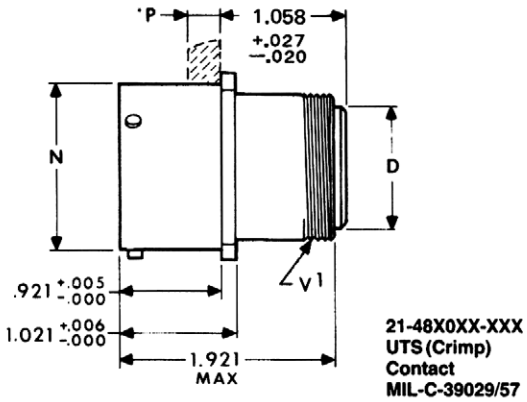
FLJTP, FLJTPQ

wall mounting receptacle (back panel mounting, UTS crimp)





21-47X0XX-XXX



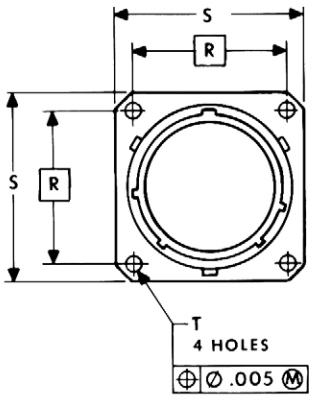
21-48X0XX-XXX
UTS (Crimp)
Contact
MIL-C-39029/57

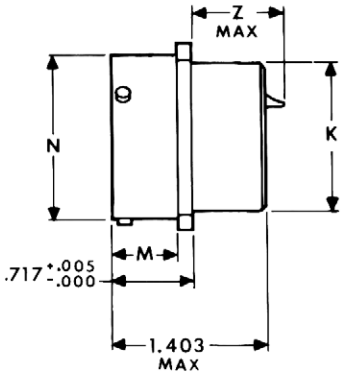
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

Shell Size	D Dia. ±.005	M +.000 −.006	N Dia. +.001 −.005	P Max. Panel Thickness	R (TP)	S +.011 −.010	T Dia. ±.005	V Thread UNEF-2A (Plated)	V[1] Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF Filters		
										Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 22 Contact Z Max.
9	.299	.820	.572	.234	.719	.938	.128	.4375-28	.5625-24	.672	.763	.632
11	.427	.820	.700	.234	.812	1.031	.128	.5625-24	.6875-24	.672	.763	.632
13	.541	.820	.850	.234	.906	1.125	.128	.6875-24	.8125-20	.672	.763	.632
15	.666	.820	.975	.234	.969	1.219	.128	.8125-20	.9375-20	.672	.763	.632
17	.791	.820	1.100	.234	1.062	1.312	.128	.9375-20	1.0625-18	.672	.763	.632
19	.897	.820	1.207	.234	1.156	1.438	.128	1.0625-18	1.1875-18	.672	.763	.632
21	1.022	.790	1.332	.204	1.250	1.562	.128	1.1875-18	1.3125-18	.672	.763	.632
23	1.147	.790	1.457	.204	1.375	1.688	.147	1.3125-18	1.4375-18	.672	.763	.632
25	1.272	.790	1.582	.193	1.500	1.812	.147	1.4375-18	1.5625-18	.672	.763	.632

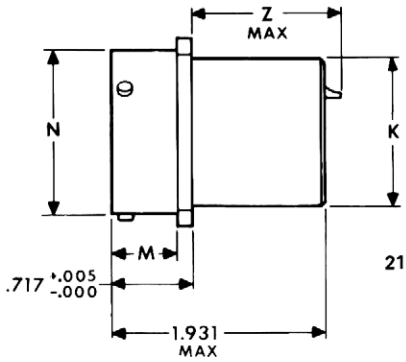
All dimensions for reference only.

FLJT
box mounting receptacle





21-29X2XX-XXX



21-36X2XX-XXX

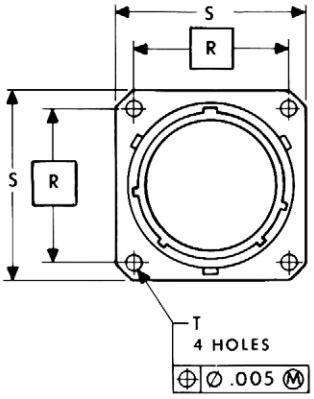
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

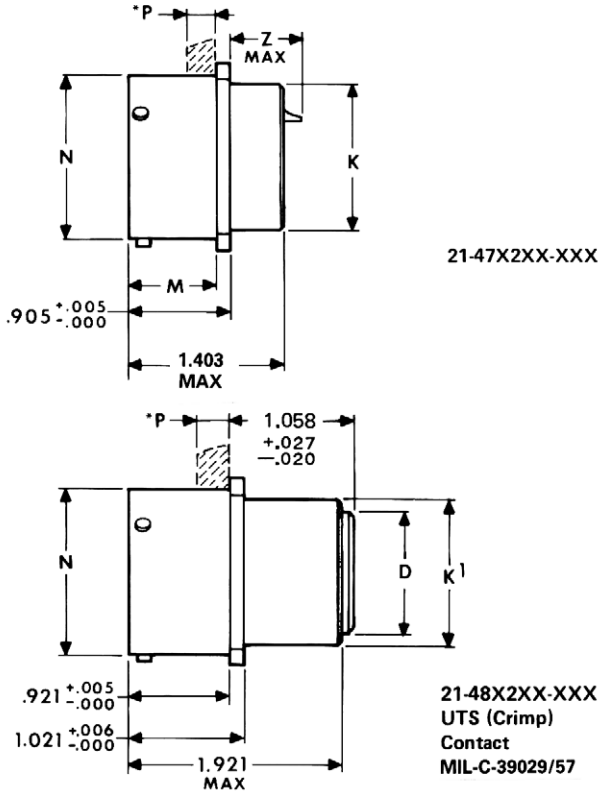
Shell Size	K Dia. +.001 –.006	M +.000 –.006	N Dia. +.001 –.005	R (TP)	S +.011 –.010	T Dia. ±.005	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters	
							Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 22 Contact Z Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
9	.436	.632	.572	.719	.938	.128	.865	.950	.820	1.324	1.394
11	.560	.632	.700	.812	1.031	.128	.865	.950	.820	1.324	1.394
13	.686	.632	.850	.906	1.125	.128	.865	.950	.820	1.324	1.394
15	.810	.632	.975	.969	1.219	.128	.865	.950	.820	1.324	1.394
17	.936	.632	1.100	1.062	1.312	.128	.865	.950	.820	1.324	1.394
19	1.060	.632	1.207	1.156	1.438	.128	.865	.950	.820	1.324	1.394
21	1.186	.602	1.332	1.250	1.562	.128	.865	.950	.820	1.324	1.394
23	1.310	.602	1.457	1.375	1.688	.147	.865	.950	.820	1.324	1.394
25	1.436	.602	1.582	1.500	1.812	.147	.865	.950	.820	1.324	1.394

All dimensions for reference only.

FLJTP

box mounting receptacle (back panel mounting, UTS crimp)





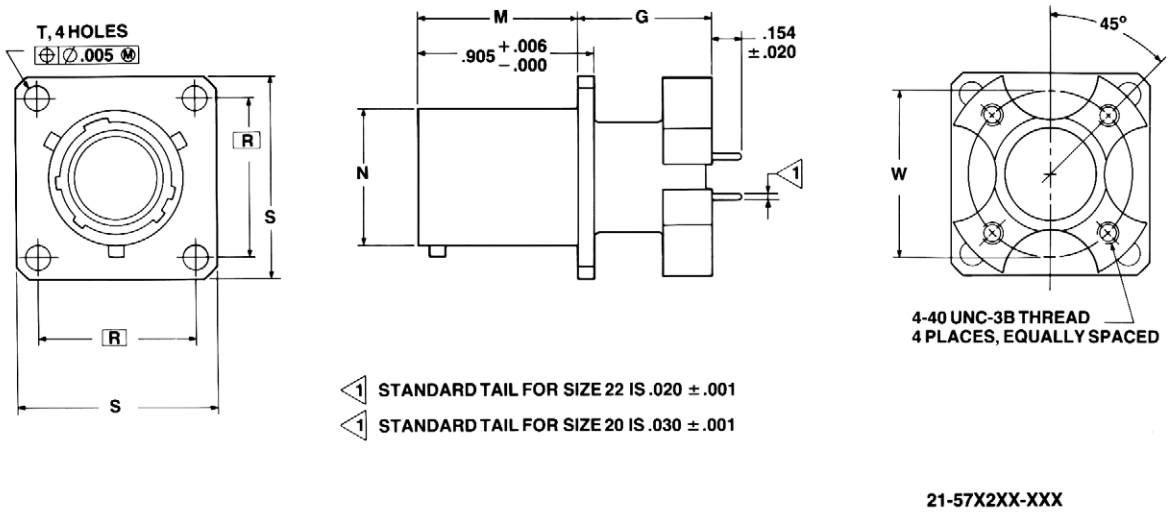
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

Shell Size	D Dia. ±.005	K Dia. +.000 −.006	K[1] Dia. +.000 −.007	M +.000 −.006	N Dia. +.001 −.005	P Max. Panel Thickness	R (TP)	S +.011 −.010	T Dia. ±.005	SHORT SHELL VHF/UHF Filters		
										Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 22 Contact Z Max.
9	.299	.437	.561	.820	.572	.234	.719	.938	.128	.672	.763	.632
11	.427	.562	.687	.820	.700	.234	.812	1.031	.128	.672	.763	.632
13	.541	.688	.811	.820	.850	.234	.906	1.125	.128	.672	.763	.632
15	.666	.812	.937	.820	.975	.234	.969	1.219	.128	.672	.763	.632
17	.791	.938	1.061	.820	1.100	.234	1.062	1.312	.128	.672	.763	.632
19	.897	1.062	1.187	.820	1.207	.234	1.156	1.438	.128	.672	.763	.632
21	1.022	1.188	1.312	.790	1.332	.204	1.250	1.562	.128	.672	.763	.632
23	1.147	1.312	1.437	.790	1.457	.204	1.375	1.688	.147	.672	.763	.632
25	1.272	1.438	1.562	.790	1.582	.193	1.500	1.812	.147	.672	.763	.632

All dimensions for reference only.

FLJT

box mounting receptacle (printed circuit board mount)

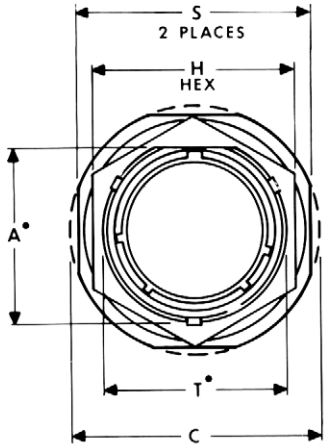


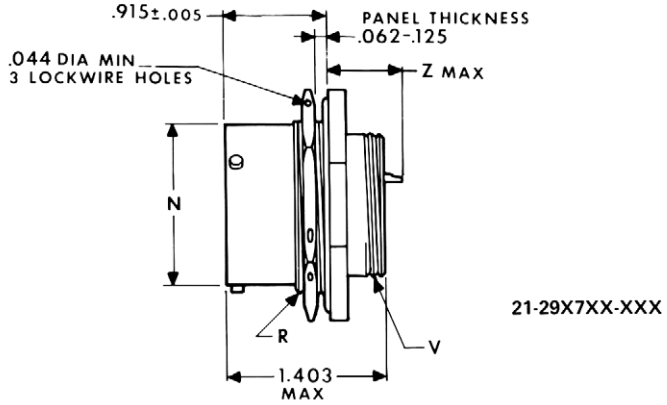
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

Shell Size	G +.006 −.005	M +.000 −.005	N Dia. +.001 −.005	R (TP)	S +.011 −.010	T Dia. +.004 −.003	W
11	.689	.820	.700	.812	1.031	.128	.850
13	.689	.820	.850	.906	1.125	.128	.994
15	.689	.820	.975	.969	1.219	.128	1.119
17	.689	.820	1.100	1.062	1.312	.128	1.237
19	.689	.820	1.207	1.156	1.438	.128	1.379
21	.689	.790	1.332	1.250	1.562	.128	1.489
23	.719	.790	1.457	1.375	1.688	.147	1.619
25	.719	.790	1.582	1.500	1.812	.147	1.744

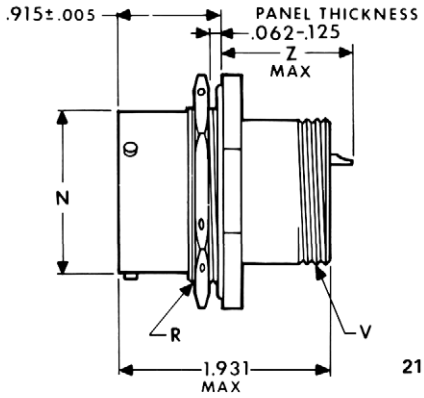
All dimensions for reference only.

FLJT
jam nut receptacle





21-29X7XX-XXX



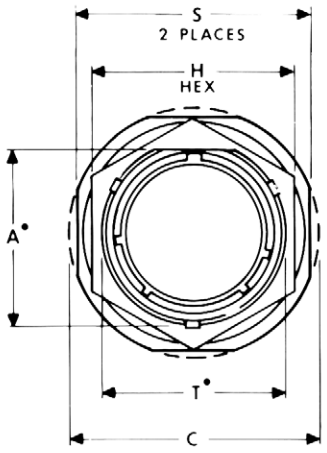
21-36X7XX-XXX

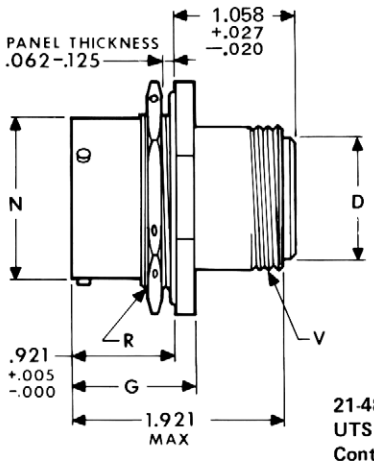
• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

Shell Size	A• Flat +.000 –.010	C Dia. +.011 –.010	H Hex +.017 –.016	N Dia +.001 –.005	R Thread (Plated) Class -2A	S +.016 –.015	T• Dia. +.010 –.000	V Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters	
									Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 22 Contact Z Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
9	.669	1.188	.875	.572	.6875-24UNEF	1.062	.697	.4375-28	.667	.756	.616	1.228	1.201
11	.769	1.375	1.000	.700	.8125-20UNEF	1.250	.822	.5625-24	.667	.756	.616	1.228	1.201
13	.955	1.500	1.188	.850	1.0000-20UNEF	1.375	1.007	.6875-24	.667	.756	.616	1.228	1.201
15	1.084	1.625	1.312	.975	1.1250-18UNEF	1.500	1.134	.8125-20	.667	.756	.616	1.228	1.201
17	1.208	1.750	1.438	1.100	1.2500-18UNEF	1.625	1.259	.9375-20	.667	.756	.616	1.228	1.201
19	1.333	1.938	1.562	1.207	1.3750-18UNEF	1.812	1.384	1.0625-18	.667	.756	.616	1.228	1.201
21	1.459	2.062	1.688	1.332	1.5000-18UNEF	1.938	1.507	1.1875-18	.667	.756	.616	1.228	1.201
23	1.580	2.188	1.812	1.457	1.6250-18UNEF	2.062	1.634	1.3125-18	.667	.756	.616	1.228	1.201
25	1.709	2.312	2.000	1.582	1.7500-18UNS	2.188	1.759	1.4375-18	.667	.756	.616	1.228	1.201

All dimensions for reference only.

FLJTPQ
jam nut receptacle (UTS crimp)





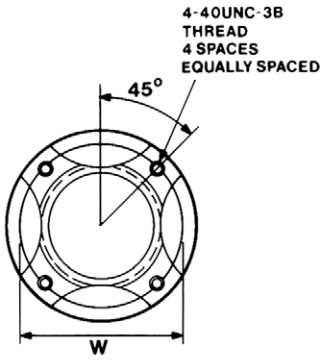
21-48X7XX-XXX
UTS (Crimp)
Contact
MIL-C-39029/57

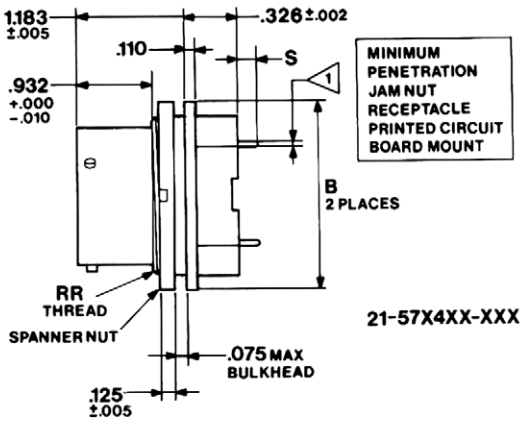
• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

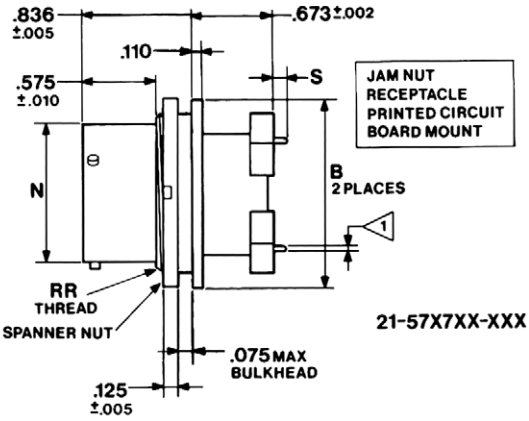
Shell Size	A• Flat +.000 –.010	C Dia. +.011 –.010	D Dia. ±.005	G +.006 –.005	H Hex +.017 –.016	N Dia +.001 –.005	R Thread (Plated) Class -2A	S +.016 –.015	T• Dia. +.010 –.000	V Thread UNEF-2A (Plated)
9	.669	1.188	.299	1.030	.875	.572	.6875-24UNEF	1.062	.697	.5625-24
11	.769	1.375	.427	1.030	1.000	.700	.8125-20UNEF	1.250	.822	.6875-24
13	.955	1.500	.541	1.030	1.188	.850	1.0000-20UNEF	1.375	1.007	.8125-20
15	1.084	1.625	.666	1.030	1.312	.975	1.1250-18UNEF	1.500	1.134	.9375-20
17	1.208	1.750	.791	1.030	1.438	1.100	1.2500-18UNEF	1.625	1.259	1.0625-18
19	1.333	1.938	.897	1.061	1.562	1.207	1.3750-18UNEF	1.812	1.384	1.1875-18
21	1.459	2.062	1.022	1.061	1.688	1.332	1.5000-18UNEF	1.938	1.507	1.3125-18
23	1.580	2.188	1.147	1.061	1.812	1.457	1.6250-18UNEF	2.062	1.634	1.4375-18
25	1.709	2.312	1.272	1.061	2.000	1.582	1.7500-18UNS	2.188	1.759	1.5625-18

All dimensions for reference only.

FLJT
jam mounting receptacle (printed circuit board mount)







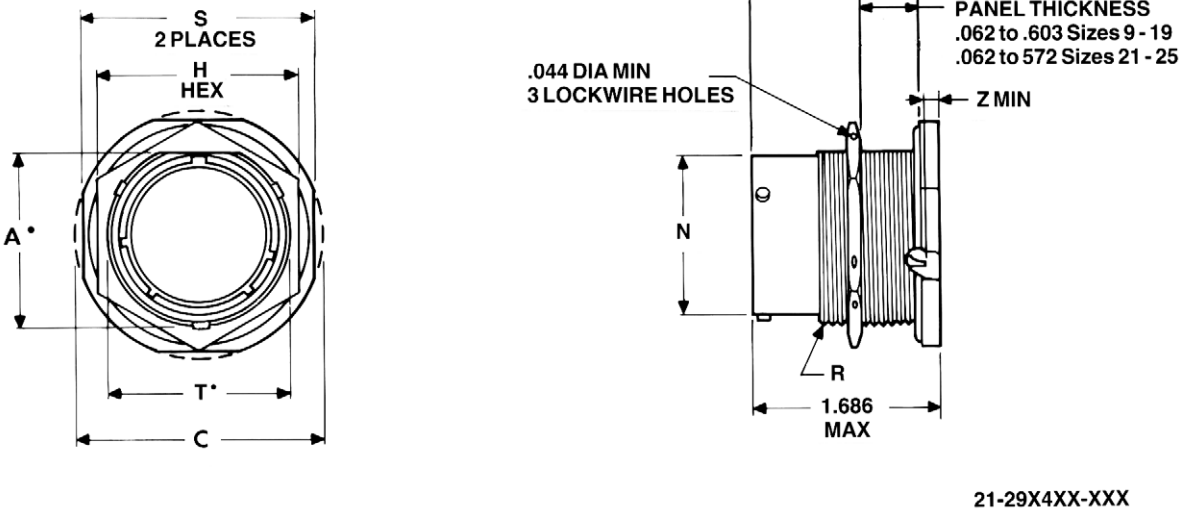
1 Standard tail for size 22 is .020 ± .001 in.
1 Standard tail for size 20 is .030 ± .001 in.

For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

Shell Size	B Dia. ±.005	N Dia. +.001 −.005	S ±.020	W	RR Thread UNEF-2A
11	1.062	.700	.132	.850	.8125-20
13	1.250	.850	.132	.994	1.0000-20
15	1.375	.975	.132	1.119	1.1250-20
17	1.500	1.100	.132	1.237	1.2500-18
19	1.625	1.207	.132	1.379	1.3750-18
21	1.750	1.332	.132	1.489	1.5000-18
23	1.875	1.457	.132	1.619	1.6250-18
25	2.000	1.582	.132	1.744	1.7500-18

All dimensions for reference only.

FLJT
jam nut receptacle (minimum penetration)



• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FLJT receptacles: .625 min.

Shell Size	A• Flat +.000 –.010	C Dia. +.011 –.010	H Hex +.017 –.016	M ±.005	N Dia +.001 –.005	R Thread (Plated) Class -2A	S +.016 –.015	T• Dia. +.010 –.000	SHORT SHELL VHF/UHF Filters			
									Size 16 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	Size 20 Contact Z Max.	Size 22 Contact Z Max.
9	.669	1.188	.875	1.557	.572	.6875-24UNEF	1.062	.697	.000	.000	.000	.000
11	.769	1.375	1.000	1.557	.700	.8125-20UNEF	1.250	.822	.000	.000	.000	.000
13	.955	1.500	1.188	1.557	.850	1.0000-20UNEF	1.375	1.007	.000	.000	.000	.000
15	1.084	1.625	1.312	1.557	.975	1.1250-18UNEF	1.500	1.134	.000	.000	.000	.000
17	1.208	1.750	1.438	1.557	1.100	1.2500-18UNEF	1.625	1.259	.000	.000	.000	.000
19	1.333	1.938	1.562	1.557	1.207	1.3750-18UNEF	1.812	1.384	.000	.000	.000	.000
21	1.459	2.062	1.688	1.525	1.332	1.5000-18UNEF	1.938	1.507	.000	.000	.000	.000
23	1.580	2.188	1.812	1.525	1.457	1.6250-18UNEF	2.062	1.634	.000	.000	.000	.000
25	1.709	2.312	2.000	1.525	1.582	1.7500-18UNS	2.188	1.759	.000	.000	.000	.000

All dimensions for reference only.

Amphenol® FSJT Series
Subminiature Cylindrical Filters

The Amphenol® FSJT Series combines the unique design features of the scoop-proof FLJT Series with the standard mounting dimensions of JT types. (See SJT Catalog 12-091)

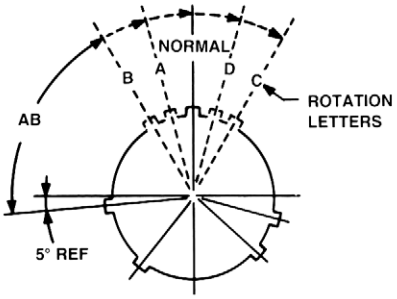
- **100% scoop-proof design**
- **Standard mounting dimensions**
- **Compliance with European Specifications PAN6433-2, LN29729, BS9522 F0012, VG96912**
- **Uses proven filter technology with available components from other series**
- **EMP protection versions available**

FSJT Master Key/Keyway Rotation

Shell Size	AB Angle of Rotation (Degrees)				
	Normal	A	B	C	D
8	95	–	–	–	–
10	95	81	67	123	109
12	95	75	63	127	115
14	95	74	61	129	116
16	95	77	65	125	113
18	95	77	65	125	113
20	95	77	65	125	113
22	95	80	69	121	110
24	95	80	69	121	110

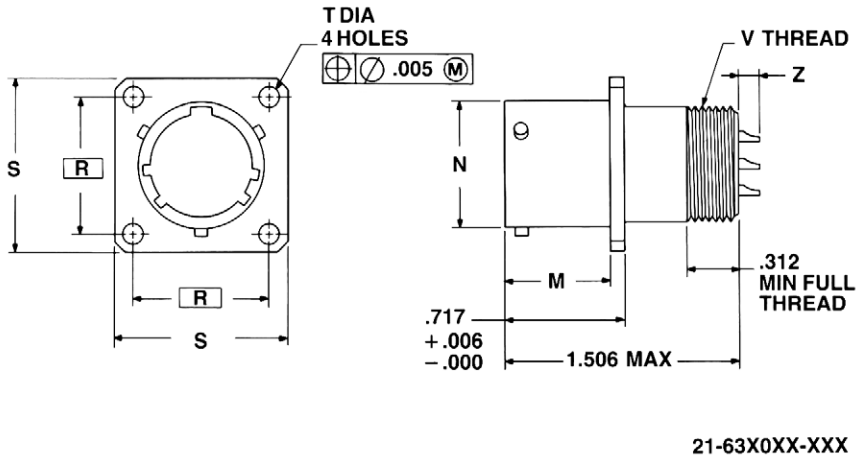
A plug with a given rotation letter will mate with a receptacle with the same rotation letter. The AB angle for a given connector is the same whether it contains pins or sockets. Inserts are not rotated in conjunction with the master key/keyway.

AB angles shown are viewed from the front face of the connector. A receptacle is shown at right. The angles for the plug are exactly the same, except the direction of rotation is opposite of that shown for the receptacle.



RELATIVE POSSIBLE POSITION
OF ROTATED MASTER KEYWAY
(front face of receptacle shown)

FSJT
wall mounting receptacle



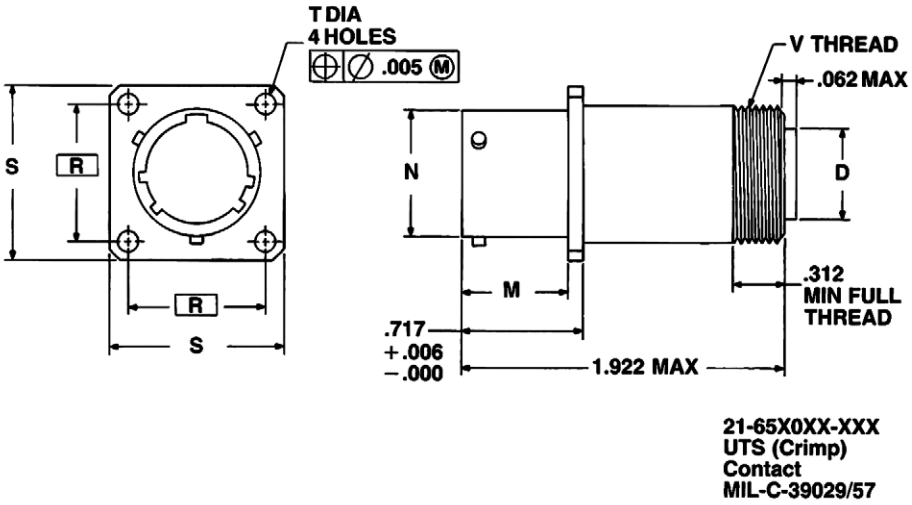
21-63X0XX-XXX

For ordering information, see how to order page 62.
Plug movement required to clear FSJT receptacles: .625 min.

Shell Size	M +.000 −.005	N Dia. +.001 −.005	R (TP)	S +.021 −.020	T Dia. +.004 −.003	V Thread UNEF-2A	Z Max.		
							Size 20 Contact	Size 16 or 16 & 20 Contacts	Size 22 Contact
10	.632	.590	.719	.938	.120	.5625-24	.165	.265	.134
12	.632	.750	.812	1.031	.120	.6875-24	.165	.265	.134
14	.632	.875	.906	1.125	.120	.8125-20	.165	.265	.134
16	.632	1.000	.969	1.219	.120	.9375-20	.165	.265	.134
18	.632	1.125	1.062	1.312	.120	1.0625-18	.165	.265	.134
20	.602	1.250	1.156	1.438	.120	1.1875-18	.165	.265	.134
22	.602	1.375	1.250	1.562	.120	1.3125-18	.165	.265	.134
24	.602	1.500	1.375	1.688	.147	1.4375-18	.165	.265	.134

All dimensions for reference only.

FSJT
wall mounting receptacle (UTS crimp)

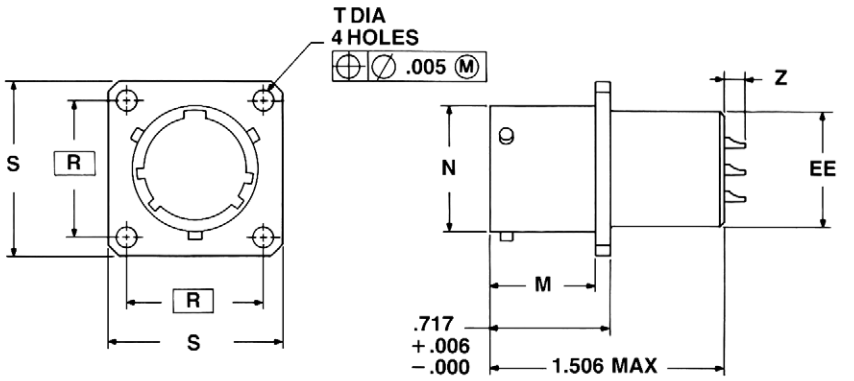


For ordering information, see how to order page 62.
Plug movement required to clear FSJT receptacles: .625 min.

Shell Size	D Dia. ±.005	M +.000 −.005	N Dia. +.001 −.005	R (TP)	S +.021 −.020	T Dia. +.004 −.003	V Thread UNEF-2A
10	.427	.632	.590	.719	.938	.120	.6875-24
12	.541	.632	.750	.812	1.031	.120	.8125-20
14	.666	.632	.875	.906	1.125	.120	.9375-20
16	.791	.632	1.000	.969	1.219	.120	1.0625-18
18	.897	.632	1.125	1.062	1.312	.120	1.1875-18
20	1.022	.602	1.250	1.156	1.438	.120	1.3125-18
22	1.147	.602	1.375	1.250	1.562	.120	1.4375-18
24	1.272	.602	1.500	1.375	1.688	.147	1.5625-18

All dimensions for reference only.

FSJT
box mounting receptacle



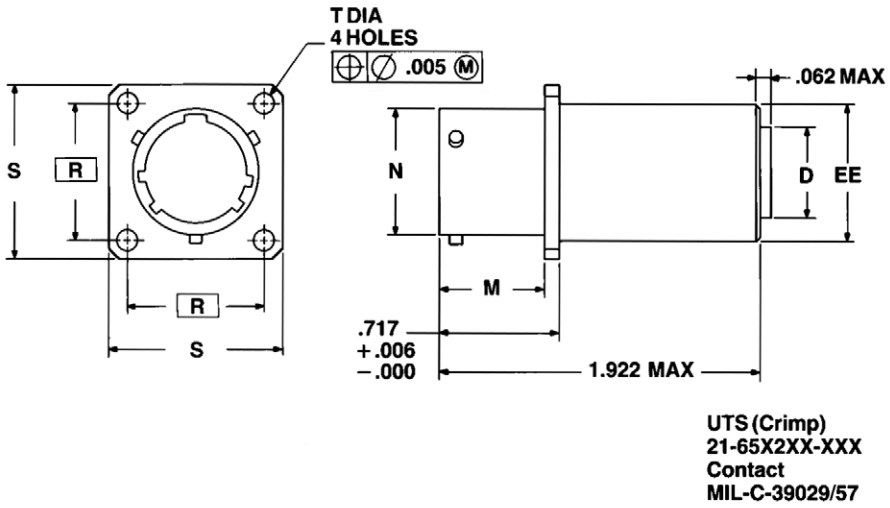
21-63X2XX-XXX

For ordering information, see how to order page 62.
Plug movement required to clear FSJT receptacles: .625 min.

Shell Size	M +.000 −.005	N Dia. +.001 −.005	R (TP)	S +.021 −.020	T Dia. +.004 −.003	EE +.001 −.005	Z Max.			
							Size 16 Contact	Size 20 Contact	Size 16 or 16 & 20 Contacts	Size 22 Contact
10	.632	.590	.719	.938	.120	.562	.265	.165	.265	.134
12	.632	.750	.812	1.031	.120	.687	.265	.165	.265	.134
14	.632	.875	.906	1.125	.120	.812	.265	.165	.265	.134
16	.632	1.000	.969	1.219	.120	.937	.265	.165	.265	.134
18	.632	1.125	1.062	1.312	.120	1.062	.265	.165	.265	.134
20	.602	1.250	1.156	1.438	.120	1.187	.265	.165	.265	.134
22	.602	1.375	1.250	1.562	.120	1.312	.265	.165	.265	.134
24	.602	1.500	1.375	1.688	.147	1.437	.265	.165	.265	.134

All dimensions for reference only.

FSJT
box mounting receptacle (UTS crimp)

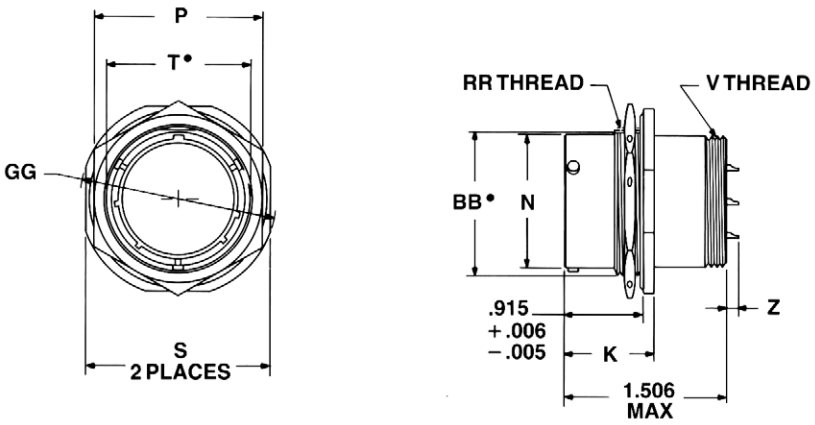


For ordering information, see how to order page 62.
Plug movement required to clear FSJT receptacles: .625 min.

Shell Size	D Dia. ±.005	M +.000 −.005	N Dia. +.001 −.005	R (TP)	S +.021 −.020	T Dia. +.004 −.003	EE Dia. +.001 −.005
10	.427	.632	.590	.719	.938	.120	.687
12	.541	.632	.750	.812	1.031	.120	.811
14	.666	.632	.875	.906	1.125	.120	.937
16	.791	.632	1.000	.969	1.219	.120	1.061
18	.897	.632	1.125	1.062	1.312	.120	1.187
20	1.022	.602	1.250	1.156	1.438	.120	1.312
22	1.147	.602	1.375	1.250	1.562	.120	1.437
24	1.272	.602	1.500	1.375	1.688	.147	1.562

All dimensions for reference only.

FSJT
jam nut receptacle



21-63X7XX-XXX

•"D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FSJT receptacles: .625 min.

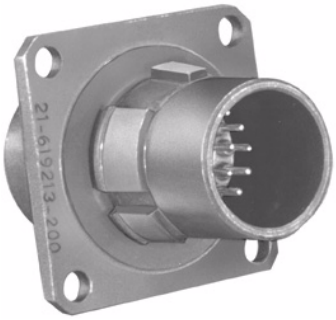
Shell Size	K +.006 −.005	N Dia. +.001 −.005	P Hex	S ±.016	T• +.010 −.000	V Thread UNEF Class 2A	Z ±.020	BB• +.000 −.010	GG Max.	RR Thread UNEF Class 2A	SS +.001 −.016
10	1.024	.590	.875	1.062	.697	.5625-24	.150	.669	1.203	.6875-24	.680
12	1.024	.750	1.062	1.250	.884	.6875-24	.150	.830	1.391	.8750-20	.859
14	1.024	.875	1.188	1.375	1.007	.8125-20	.150	.955	1.515	1.0000-20	.984
16	1.024	1.000	1.312	1.500	1.134	.9375-20	.150	1.084	1.641	1.1250-18	1.108
18	1.055	1.125	1.438	1.625	1.259	1.0625-18	.150	1.208	1.766	1.2500-18	1.233
20	1.055	1.250	1.562	1.812	1.384	1.1875-18	.150	1.333	1.953	1.3750-18	1.358
22	1.055	1.375	1.688	1.938	1.507	1.3125-18	.150	1.459	2.078	1.5000-18	1.483
24	1.055	1.500	1.812	2.062	1.634	1.4375-18	.150	1.580	2.203	1.6250-18	1.610

All dimensions for reference only.

Amphenol® FBL Series IV Subminiature Cylindrical Filters

Components designed to meet the severe mechanical and environmental requirements of MIL-C-38999 Series III are now available to Series IV users. Modifications of the connector are available with EMP protection, incorporating MOV's, diodes or a combination of both.

- **Intermateable with MIL-C-38999 Series IV plugs**
- **Maintains all the features of standard MIL-C-38999 Series IV receptacles**
- **Scoop-proof pins provide contact protection**
- **Uses insert patterns from MIL-C-38999 Series III**

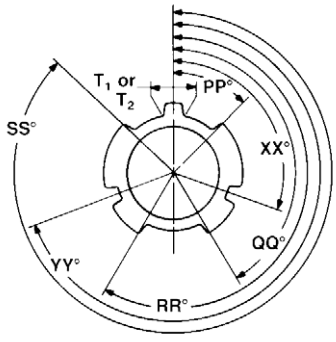


FBL Master Key/Keyway Rotation

Shell Size	Receptacle Key Position				Main Key Receptacle/Basic	
	PP°	QQ°	RR°	SS°	Socket Contact T_1	Pin Contact T_2
11	44°28'	151°6'	208°54'	315°32'	.075	.109
13	44°25'	150°31'	209°29'	315°35'	.076	.112
15	44°33'	150°24'	209°36'	315°27'	.096	.132
17	44°36'	150°22'	209°38'	315°24'	.096	.134
19	44°33'	150°27'	209°33'	315°27'	.117	.154
21	44°34'	150°23'	209°37'	315°26'	.118	.155
23	44°34'	150°20'	209°40'	315°26'	.138	.176
25	44°42'	150°22'	209°48'	315°18'	.139	.177

Polarity Dimensions

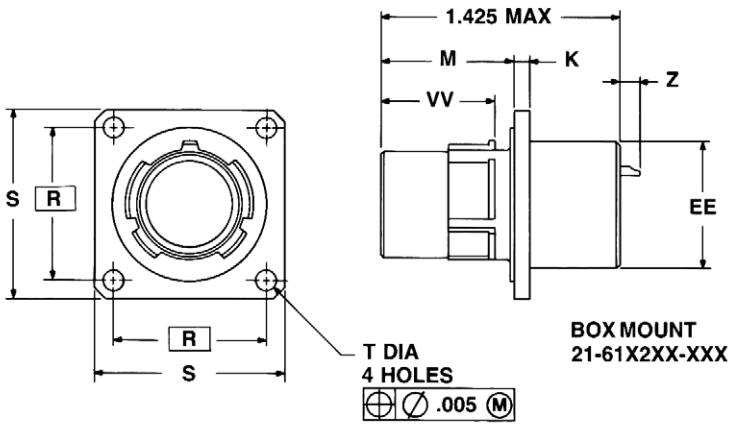
Key and Keyway Arrangement	XX°	YY°
N	110°	250°
A	100°	260°
B	90°	270°
C	80°	280°
D	70°	290°
K	120°	255°

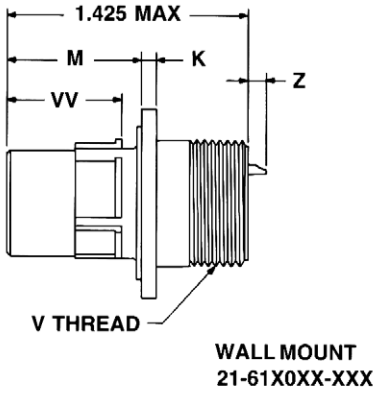


Relative Possible Position of Keyways
Front Face of Receptacle Shell

FBL

box mounting receptacle
wall mounting receptacle





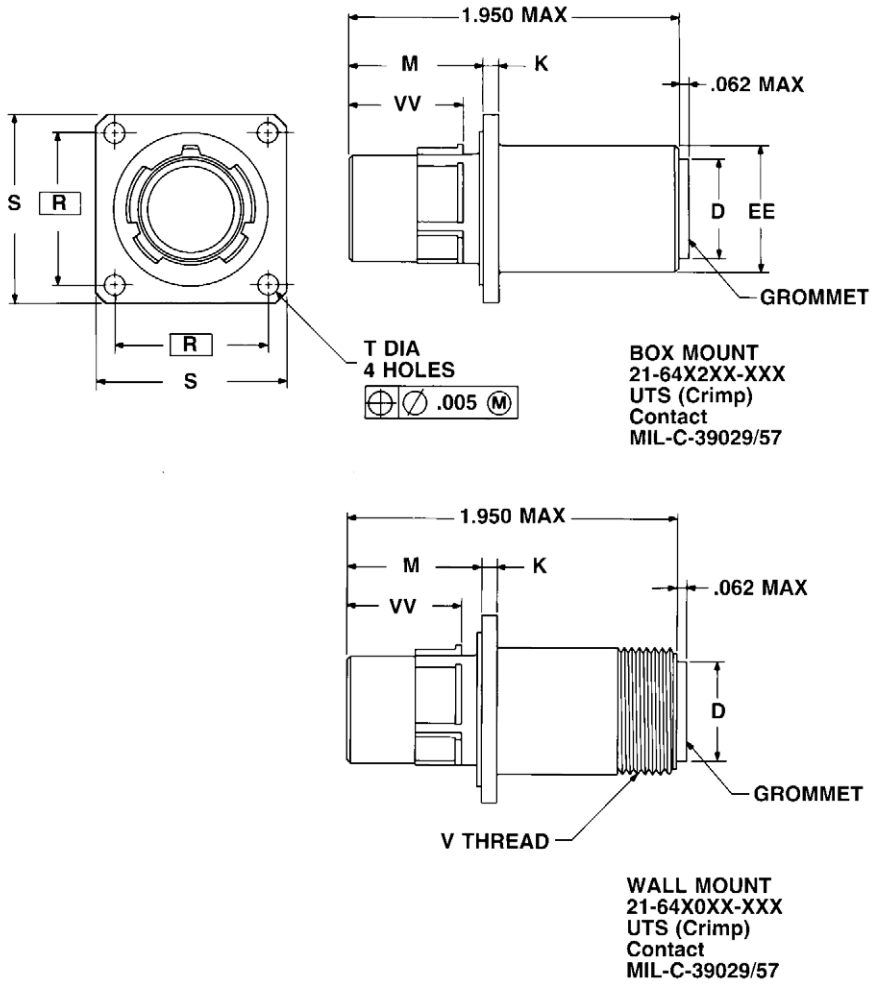
For ordering information, see how to order page 62.

Shell Size	K ±.010	M ±.020	R (TP)	S +.021 −.020	T Dia. +.004 −.003	V Thread (Plated) −.006	EE Dia. +.001 −.005	VV ±.003	Z Max.			
									Size 16 Contact	Size 20 Contact	Size 16 or 16 & 20 Contacts	Size 22 Contact
11	.092	.791	.812	1.029	.128	M15X1-6g0.100R	.589	.672	.265	.165	.265	.134
13	.092	.791	.906	1.124	.128	M18X1-6g0.100R	.707	.672	.265	.165	.265	.134
15	.092	.791	.969	1.218	.128	M22X1-6g0.100R	.865	.672	.265	.165	.265	.134
17	.092	.791	1.062	1.313	.128	M25X1-6g0.100R	.983	.672	.265	.165	.265	.134
19	.092	.791	1.156	1.439	.128	M28X1-6g0.100R	1.101	.662	.265	.165	.265	.134
21	.124	.791	1.250	1.561	.128	M31X1-6g0.100R	1.219	.662	.265	.165	.265	.134
23	.124	.791	1.375	1.687	.147	M34X1-6g0.100R	1.337	.662	.265	.165	.265	.134
25	.124	.791	1.500	1.813	.147	M37X1-6g0.100R	1.455	.662	.265	.165	.265	.134

All dimensions for reference only.

FBL

box mounting receptacle (UTS crimp)
wall mounting receptacle (UTS crimp)



For ordering information, see how to order page 62.

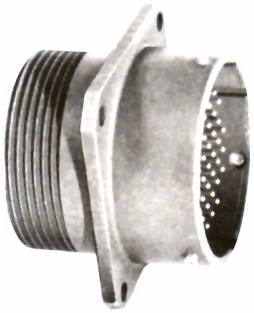
Shell Size	D Dia. ±.005	K ±.010	M ±.020	R (TP)	S +.021 −.020	T Dia. +.004 −.003	V Thread (Plated) −.006	EE Dia. +.001 −.005	VV ±.003
11	.427	.092	.791	.812	1.029	.128	M18X1-6g0.100R	.687	.672
13	.541	.092	.791	.906	1.124	.128	M22X1-6g0.100R	.811	.672
15	.666	.092	.791	.969	1.218	.128	M25X1-6g0.100R	.937	.672
17	.791	.092	,791	1.062	1.313	.128	M28X1-6g0.100R	1.061	.672
19	.897	.092	.791	1.156	1.439	.128	M31X1-6g0.100R	1.187	.662
21	1.022	.124	.791	1.250	1.561	.128	M34X1-6g0.100R	1.312	.662
23	1.147	.124	.791	1.375	1.687	.147	M37X1-6g0.100R	1.437	.662
25	1.272	.124	.791	1.500	1.813	.147	M41X1-6g0.100R	1.562	.662

All dimensions for reference only.

Amphenol® FPT Series
Miniature Cylindrical Filters

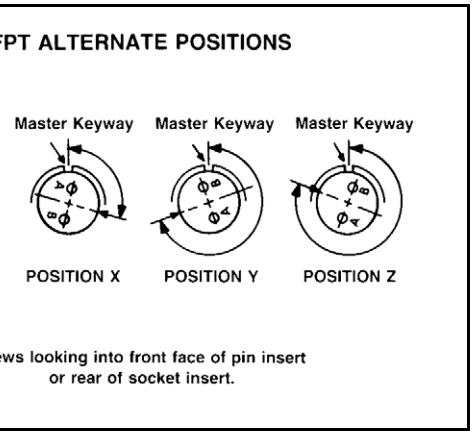
The Amphenol® FPT Series combines the unique design features of the miniature PT Series with an EMI filter.

- **Intermateable with MIL-C-26482 Series 1 and 2 connectors (see Catalog 12-070), and MIL-C-83723 Series I connectors (see Catalog MS-102)**
- **Quick positive coupling with visual confirmation of mating**
- **Error-proof alternate positioning of shell keyways**
- **Higher reliability and greater durability with permanently encapsulated contacts**
- **Aluminum shells with several finish options**

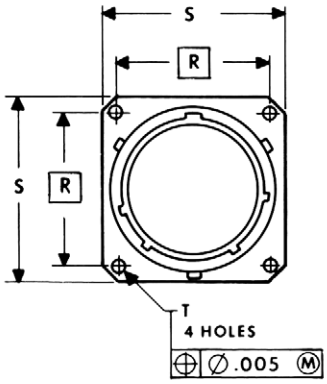


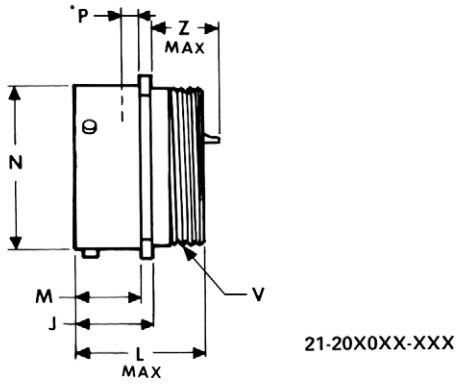
FPT Alternate Positions

Insert Arrangements	Degrees			
	W	X	Y	Z
10-5	45	151	180	270
10-6	90	–	–	–
10-98	90	180	240	270
12-3	–	–	180	–
12-8	90	112	203	292
12-10	60	155	270	295
12-98	61	135	189	340
14-12	434	90	–	–
14-18	15	90	180	270
14-19	30	165	315	–
16-8	54	152	180	331
16-26	60	–	275	338
18-32	85	138	222	265
20-41	45	126	225	–
22-41	39	–	–	–
22-55	30	142	226	314
24-61	90	180	270	324

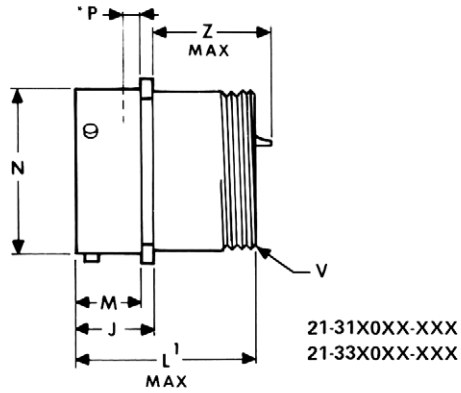


FPT
wall mounting receptacle





21-20X0XX-XXX



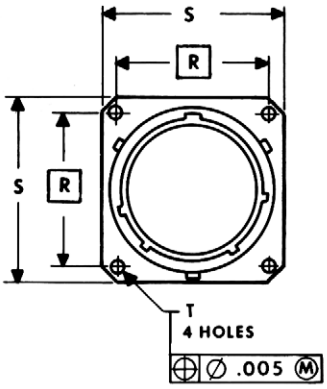
21-31X0XX-XXX
21-33X0XX-XXX

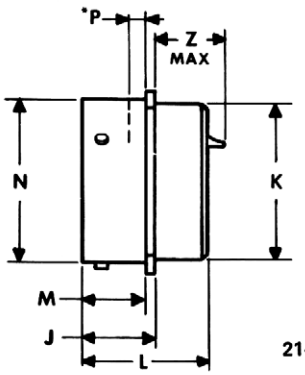
For ordering information, see how to order page 62.
Plug movement required to clear FPT receptacles: .438 min.
* Acceptable panel thickness for back panel mounting a standard receptacle.
† Consult Amphenol, Sidney, NY

Shell Size	J +.021 −.010	M +.010 −.000	N Dia +.001 −.005	P* Max.	R (TP)	S +.011 −.010	T Dia. ±.005	V Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters		
									L Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	L[1] Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
8	.493	.431	.473	.087	.594	.812	.120	.4375-28	1.103	.850	.904	1.588	1.258	1.328
10	.493	.431	.590	.087	.719	.938	.120	.5625-24	1.103	.850	.904	1.588	1.258	1.328
12	.493	.431	.750	.087	.812	1.031	.120	.6875-24	1.103	.850	.904	1.588	1.258	1.328
14	.493	.431	.875	.087	.906	1.125	.120	.8125-20	1.103	.850	.904	1.588	1.258	1.328
16	.493	.431	1.000	.087	.969	1.219	.120	.9375-20	1.103	.850	.904	1.588	1.258	1.328
18	.493	.431	1.125	.087	1.062	1.312	.120	1.0625-18	1.103	.850	.904	1.588	1.258	1.328
20	.650	.556	1.250	.212	1.156	1.438	.120	1.1875-18	1.166	.755	.809	1.651	1.163	1.233
22	.650	.556	1.375	.212	1.250	1.562	.120	1.3125-18	1.166	.755	.809	1.651	1.163	1.233
24	.683	.589	1.500	.212	1.375	1.688	.147	1.4375-18	1.166	.722	.776	1.651	1.130	1.200

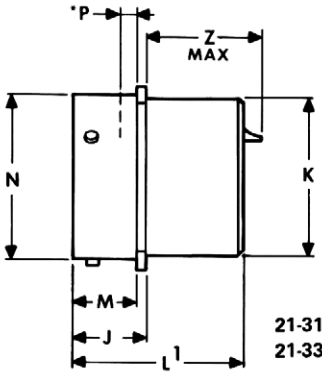
All dimensions for reference only.

FPT
box mounting receptacle





21-20X2XX-XXX



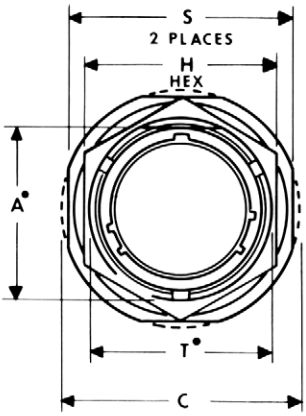
21-31X2XX-XXX
21-33X2XX-XXX

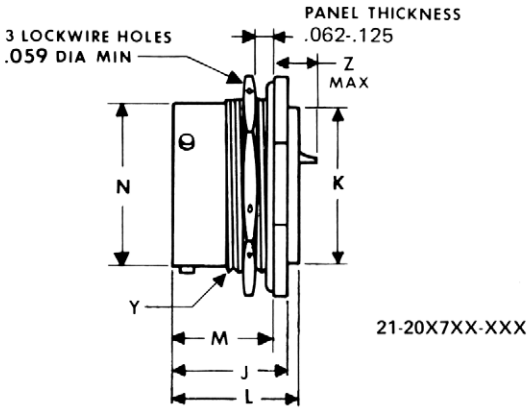
For ordering information, see how to order page 62.
Plug movement required to clear FPT receptacles: .438 min.
* Acceptable panel thickness for back panel mounting a standard receptacle.
† Consult Amphenol, Sidney, NY

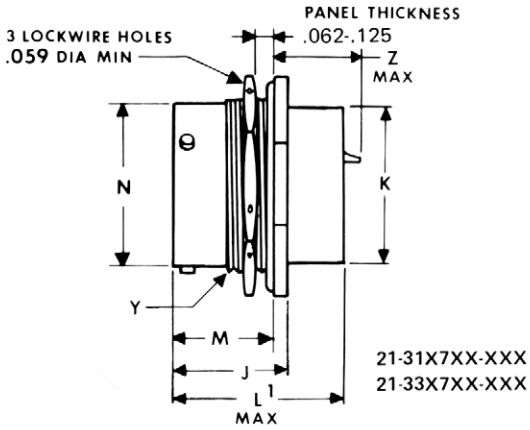
Shell Size	J +.021 –.010	K Dia. +.011 –.000	M +.010 –.000	N Dia +.001 –.005	P* Max.	R (TP)	S +.011 –.010	T Dia. ±.005	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters		
									L Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	L[1] Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
8	.493	.438	.431	.473	.087	.594	.812	.120	1.103	.850	.904	1.588	1.258	1.328
10	.493	.562	.431	.590	.087	.719	.938	.120	1.103	.850	.904	1.588	1.258	1.328
12	.493	.688	.431	.750	.087	.812	1.031	.120	1.103	.850	.904	1.588	1.258	1.328
14	.493	.812	.431	.875	.087	.906	1.125	.120	1.103	.850	.904	1.588	1.258	1.328
16	.493	.938	.431	1.000	.087	.969	1.219	.120	1.103	.850	.904	1.588	1.258	1.328
18	.493	1.062	.431	1.125	.087	1.062	1.312	.120	1.103	.850	.904	1.588	1.258	1.328
20	.650	1.188	.556	1.250	.212	1.156	1.438	.120	1.166	.755	.809	1.651	1.163	1.233
22	.650	1.312	.556	1.375	.212	1.250	1.562	.120	1.166	.755	.809	1.651	1.163	1.233
24	.683	1.438	.589	1.500	.212	1.375	1.688	.147	1.166	.722	.776	1.651	1.130	1.200

All dimensions for reference only.

FPT
jam nut receptacle





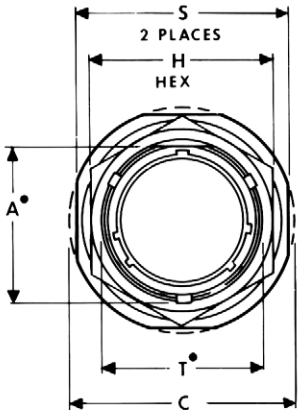


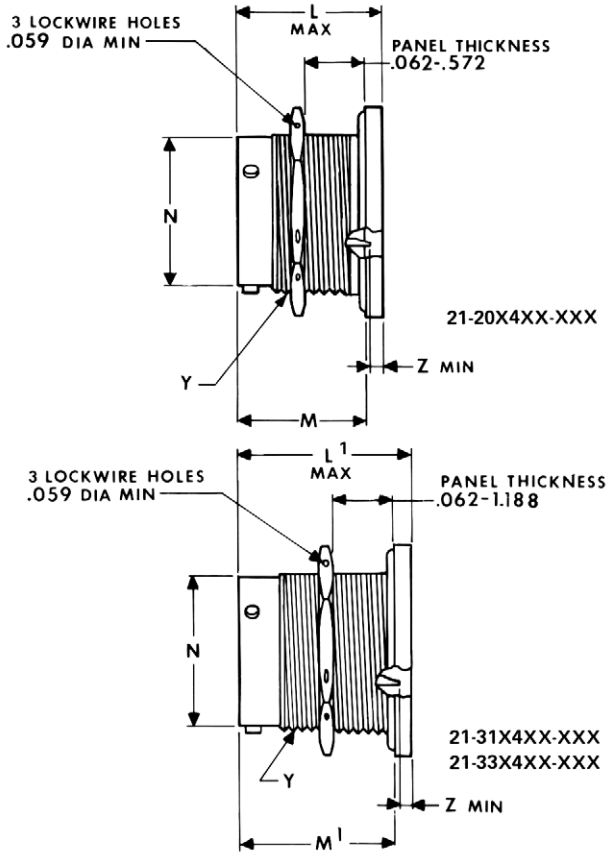
• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FPT receptacles: .438 min.
† Consult Amphenol, Sidney, NY

Shell Size	A• Flat +.000 –.010	C Dia. +.011 –.010	H Hex +.017 –.016	J +.006 –.005	K Dia. +.011 –.000	M ±.005	N Dia +.001 –.005	S ±.010	T• Dia. +.010 –.000	Y Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters		
											L Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	L[1] Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
8	.542	1.062	.750	.821	.438	.696	.473	.938	.572	.5625-24	1.103	.642	.698	1.588	1.050	1.120
10	.669	1.188	.875	.821	.562	.696	.590	1.062	.697	.6875-24	1.103	.642	.698	1.588	1.050	1.120
12	.830	1.375	1.062	.821	.688	.696	.750	1.250	.884	.8750-20	1.103	.642	.698	1.588	1.050	1.120
14	.955	1.500	1.188	.821	.812	.696	.875	1.375	1.009	1.0000-20	1.103	.642	.698	1.588	1.050	1.120
16	1.084	1.625	1.312	.821	.938	.696	1.000	1.500	1.134	1.1250-18	1.103	.642	.698	1.588	1.050	1.120
18	1.208	1.750	1.438	.821	1.062	.696	1.125	1.625	1.259	1.2500-18	1.103	.642	.698	1.588	1.050	1.120
20	1.333	1.938	1.562	1.040	1.188	.884	1.250	1.812	1.384	1.3750-18	1.166	.516	.570	1.651	.924	.994
22	1.459	2.062	1.688	1.040	1.312	.884	1.375	1.938	1.509	1.5000-18	1.166	.516	.570	1.651	.924	.994
24	1.575	2.188	1.812	1.073	1.438	.917	1.500	2.062	1.634	1.6250-18	1.166	.483	.537	1.651	.891	.961

All dimensions for reference only.

FPT
jam nut receptacle (minimum penetration)



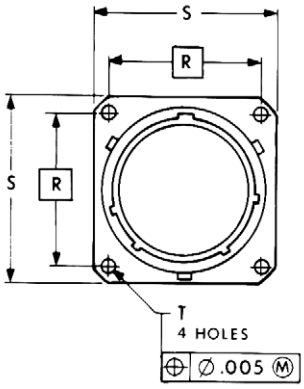


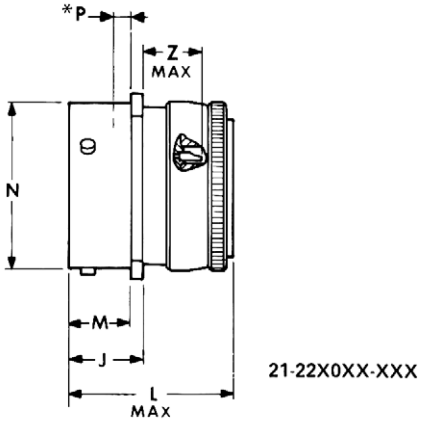
• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FPT receptacles: .438 min.
† Consult Amphenol, Sidney, NY

Shell Size	A• Flat +.000 –.010	C Dia. +.011 –.010	H Hex +.017 –.016	M +.016 –.015	M[1] +.016 –.015	N Dia +.001 –.005	S +.011 –.010	T• Dia. +.010 –.000	Y Thread UNEF-2A (Plated)	SHORT SHELL VHF/UHF/MF Filters			LONG SHELL HF Filters		
										L Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.	L[1] Max.	Size 20 Contact Z Max.	Size 16 or 16 & 20 Contacts Z Max.
8	.542	1.062	.750	1.235	1.690	.473	.938	.572	.5625-24	1.366	.022	.029	1.821	.070	.000
10	.669	1.188	.875	1.235	1.690	.590	1.062	.697	.6875-24	1.366	.022	.029	1.821	.070	.000
12	.830	1.375	1.062	1.235	1.690	.750	1.250	.884	.8750-20	1.366	.022	.029	1.821	.070	.000
14	.955	1.500	1.188	1.235	1.690	.875	1.375	1.009	1.0000-20	1.366	.022	.029	1.821	.070	.000
16	1.084	1.625	1.312	1.235	1.690	1.000	1.500	1.134	1.1250-18	1.366	.022	.029	1.821	.070	.000
18	1.208	1.750	1.438	1.235	1.690	1.125	1.625	1.259	1.2500-18	1.366	.022	.029	1.821	.070	.000
20	1.333	1.938	1.562	1.266	1.721	1.250	1.812	1.384	1.3750-18	1.428	.062	.029	1.883	.070	.000
22	1.459	2.062	1.688	1.266	1.721	1.375	1.938	1.509	1.5000-18	1.428	.062	.029	1.883	.070	.000
24	1.575	2.188	1.812	1.266	1.721	1.500	2.062	1.634	1.6250-18	1.428	.062	.029	1.883	.070	.000

All dimensions for reference only.

FPTE
wall mounting receptacle



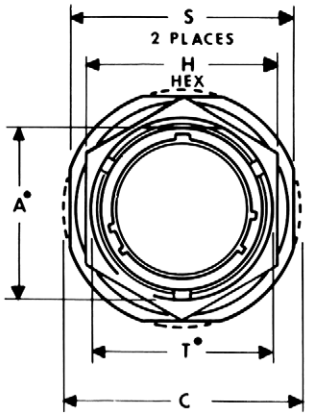


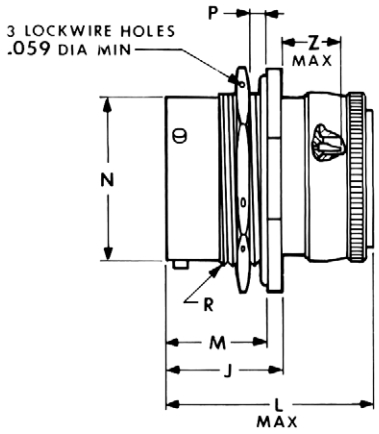
For ordering information, see how to order page 62.
Plug movement required to clear FPT receptacles: .438 min.
* Acceptable panel thickness for back panel mounting a standard receptacle.

Shell Size	J +.021 −.010	M +.010 −.000	N Dia +.001 −.005	P* Max.	R (TP)	S +.011 −.010	T Dia. ±.005	SHORT SHELL VHF/UHF/MF Filters	
								L Max.	Size 20 Contact Z Max.
8	.493	.431	.473	.087	.594	.812	.120	1.409	.774
10	.493	.431	.590	.087	.719	.938	.120	1.409	.774
12	.493	.431	.750	.087	.812	1.031	.120	1.409	.774
14	.493	.431	.875	.087	.906	1.125	.120	1.409	.774
16	.493	.431	1.000	.087	.969	1.219	.120	1.409	.774
18	.493	.431	1.125	.087	1.062	1.312	.120	1.409	.774
20	.650	.556	1.250	.212	1.156	1.438	.120	1.553	.679
22	.650	.556	1.375	.212	1.250	1.562	.120	1.553	.679
24	.683	.589	1.500	.212	1.375	1.688	.147	1.553	.646

All dimensions for reference only.

FPTE
jam nut receptacle





21-22X7XX-XXX

• "D" shaped mounting hole dimensions
For ordering information, see how to order page 62.
Plug movement required to clear FPT receptacles: .438 min.

Shell Size	A• Flat +.000 −.010	C Dia. +.011 −.010	H Hex +.017 −.016	J +.006 −.005	M ±.005	N Dia +.001 −.005	P Panel Thickness Max.	P Panel Thickness Min.	R Thread UNEF-2A (Plated)	S ±.010	T• Dia. +.010 −.000	SHORT SHELL VHF/UHF Filters L Max.	SHORT SHELL VHF/UHF Filters Size 20 Contact Z Max.
8	.542	1.062	.750	.821	.696	.473	.125	.062	.5625-24	.938	.572	1.546	.566
10	.669	1.188	.875	.821	.696	.590	.125	.062	.6875-24	1.062	.697	1.546	.566
12	.830	1.375	1.062	.821	.696	.750	.125	.062	.8750-20	1.250	.884	1.546	.566
14	.955	1.500	1.188	.821	.696	.875	.125	.062	1.0000-20	1.375	1.009	1.546	.566
16	1.084	1.625	1.312	.821	.696	1.000	.125	.062	1.1250-18	1.500	1.134	1.546	.566
18	1.208	1.750	1.438	.821	.696	1.125	.125	.062	1.2500-18	1.625	1.259	1.546	.566
20	1.333	1.938	1.562	1.040	.884	1.250	.250	.062	1.3750-18	1.812	1.384	1.672	.440
22	1.459	2.062	1.688	1.040	.884	1.375	.250	.062	1.5000-18	1.938	1.509	1.672	.440
24	1.575	2.188	1.812	1.073	.917	1.500	.250	.062	1.6250-18	2.062	1.634	1.672	.407

All dimensions for reference only.

Amphenol® EMI/RFI Connectors
Programmable

Amphenol® Programmable Filter Connectors combine the versatility of standard crimp connectors with EMI/RFI protection for sensitive circuitry. This connector is designed to filter and protect circuits from power surges, and will replace bulky filter networks that occupy critical space in electronic boxes.

Programmable connectors can be used either as filter connectors, or as transient protection devices. Metal Oxide Varistors (MOV) can be used singly or in conjunction with an EMI filter on the same contact, or mixed within any individual insert pattern. Ground, insulated or filter contacts can be combined within the same connector to accommodate unique and changing EMI requirements. MOVs or Diodes offer protection from transient energy ranging from 5 VDC to 240 VDC.

Amphenol® Programmable connectors provide benefits not available in fixed EMI/RFI connectors. Crimp style EMI contacts are insertable and removable from the rear of the connector, making modification of EMI performance as simple as changing a contact. Connectors are repaired by replacing the damaged contact using a standard M81969 insertion and removal tool. The table below indicates crimp frames and positioners to be used.

Contact Part No.	Contact Size	Turret**	Crimp Frame**
PFXXXXCR-22DP	22D Pin	K932	M22520/2-01
PFXXXXCR-22DS	22D Socket	K931	M22520/2-01
PFXXXXCR-20P	20 Pin	TH533	M22520/1-01
PFXXXXCR-20S	20 Socket	TH533	M22520/1-01
PFXXXXCR-16P	16 Pin	TH533	M22520/1-01
PFXXXXCR-16S	16 Socket	TH533	M22520/1-01

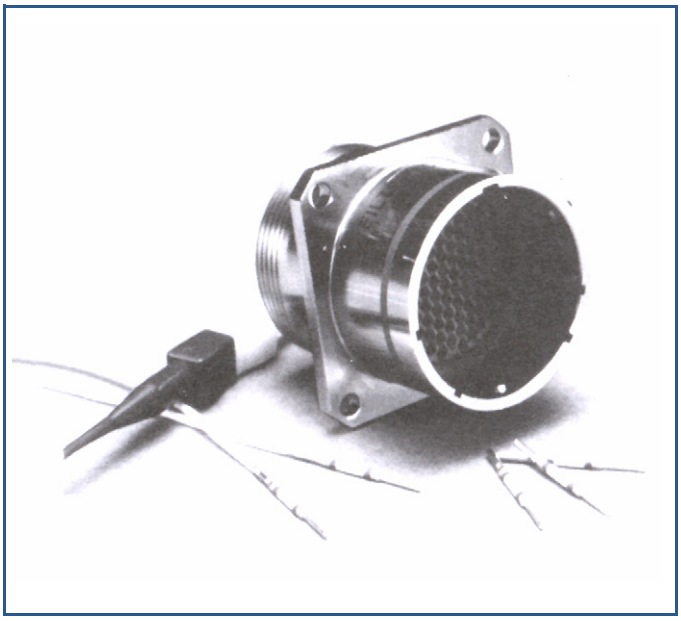
See L-624-3 for additional crimping, insertion and removal instructions

** Available from Daniels Mfg. Co., Inc., Orlando, FL

Crimp contacts or contacts for printed circuit board applications are offered in a wide range of capacitance values. Pi filters and capacitor filters in the VHF and UHF frequency ranges, as well as a 50,000 pf straight capacitance filter, are available.

Programmable EMI/RFI connectors are intermateable and intermountable with MIL-C-38999 Series I, II, III and IV.

See publication L-2057 for a complete list of attenuation values at specific capacitance ranges.

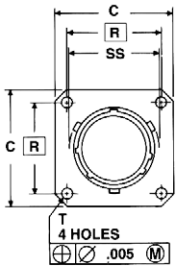


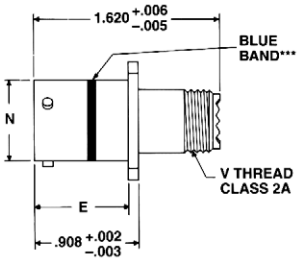
The following pages provide how to order instructions and dimensional information particular to the Programmable Filter Connector. If more information is required, contact Amphenol, Sidney, NY.

PFLJT Programmable

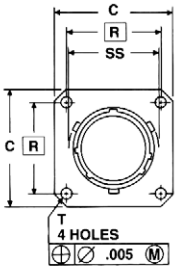
wall mounting receptacle, box mounting receptacle, jam nut receptacle

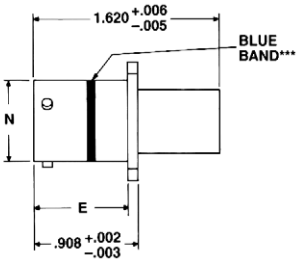
WALL MOUNT RECEPTACLE
PFLJTPQ00*



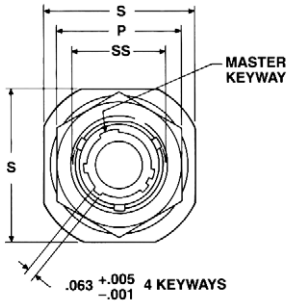


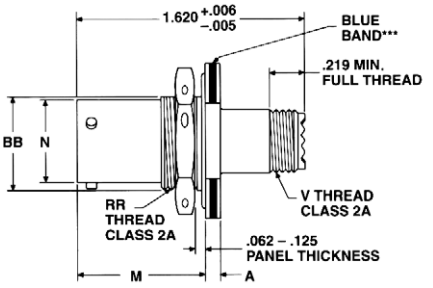
BOX MOUNT RECEPTACLE
PFLJTP02*





JAM NUT RECEPTACLE
PFLJT07*





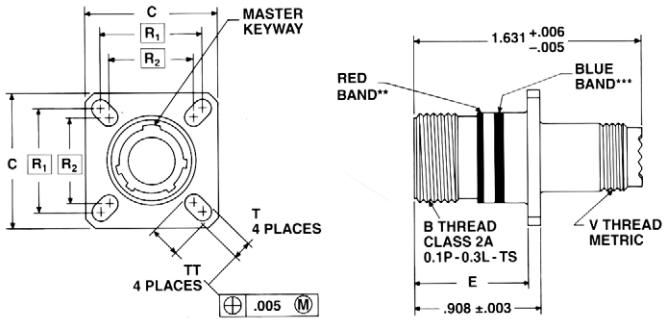
* To complete order number, see Programmable Filter how to order on page 53.
** Red band indicates fully mated.
*** Blue band indicates rear release contact retention system.

Shell Size	A +.011 −.010	C +.011 −.010	E +.000 −.006	M ±.005	N Dia. +.001 −.005	P Hex +.017 −.016	R	S +.016 −.015	T Dia. +.004 −.003	V Thread	BB Flat +.000 −.010	RR Thread (Plated)	SS Dia. +.000 −.016
11	.109	1.031	.820	.915	.700	1.000	.812	1.250	.128	.5625-24UNEF	.755	.8125-20UNEF	.810
13	.109	1.125	.820	.915	.850	1.188	.906	1.375	.128	.6875-24UNEF	.942	1.0000-20UNEF	.960
15	.109	1.219	.820	.915	.975	1.312	.969	1.500	.128	.8125-20UNEF	1.066	1.1250-18UNEF	1.085
17	.109	1.312	.820	.915	1.100	1.438	1.062	1.625	.128	.9375-20UNEF	1.191	1.2500-18UNEF	1.210
19	.140	1.438	.820	.915	1.207	1.562	1.156	1.812	.128	1.0625-18UNEF	1.316	1.3750-18UNEF	1.317
21	.140	1.562	.790	.915	1.332	1.688	1.250	1.938	.128	1.1875-18UNEF	1.441	1.5000-18UNEF	1.442
23	.140	1.688	.790	.915	1.457	1.812	1.375	2.062	.147	1.3125-18UNEF	1.566	1.6250-18UNEF	1.567
25	.140	1.812	.790	.915	1.582	2.000	1.500	2.188	.147	1.4375-18UNEF	1.691	1.7500-18UNS	1.692

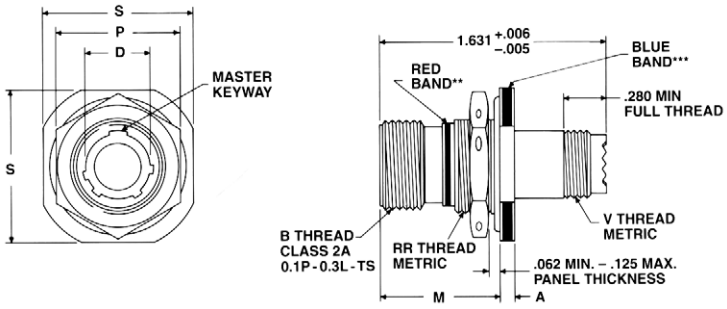
All dimensions for reference only.
☐ Designates true position dimensions.
The LJT is a MIL-C-38999, Series I connector. See catalog 12-090 for additional design specifications.
The Programmable Filter LJT is intermateable and intermountable with BS952090001 and HE308.

PFTV Programmable
wall mounting receptacle, jam nut receptacle

WALL MOUNT RECEPTACLE
PFTVP00*



JAM NUT RECEPTACLE
PFTV07*



* To complete order number, see Programmable Filter how to order on page 53.
** Red band indicates fully mated.
*** Blue band indicates rear release contact retention system.

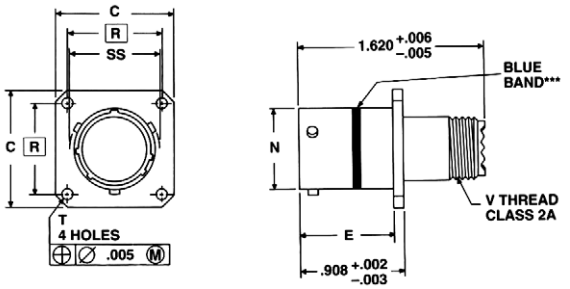
Shell Size	B Thread (Plated)	C ±.010	D Dia +.005 −.001	E +.000 −.005	M ±.005	P Hex +.017 −.016	R_1	R_2	S ±.010	T +.008 −.006	V Thread Metric (Plated)	RR Thread Metric (Plated)	TT +.008 −.006
11	.7500	1.031	.570	.820	.871	1.000	.812	.719	1.250	.128	M15X1-6g	M20X1-6g	.194
13	.8750	1.125	.682	.820	.878	1.188	.906	.812	1.375	.128	M18X1-6g	M25X1-6g	.194
15	1.1000	1.219	.807	.820	.878	1.312	.969	.906	1.500	.128	M22X1-6g	M28X1-6g	.173
17	1.1875	1.312	.932	.820	.878	1.438	1.062	.969	1.625	.128	M25X1-6g	M32X1-6g	.194
19	1.2500	1.438	1.037	.820	.878	1.562	1.156	1.062	1.812	.128	M28X1-6g	M35X1-6g	.194
21	1.3750	1.562	1.162	.790	.878	1.688	1.250	1.156	1.938	.128	M31X1-6g	M38X1-6g	.194
23	1.5000	1.688	1.287	.790	.878	1.812	1.375	1.250	2.062	.154	M34X1-6g	M41X1-6g	.242
25	1.6250	1.812	1.412	.790	.878	2.000	1.500	1.375	2.188	.154	M37X1-6g	M44X1-6g	.242

All dimensions for reference only.
☐ Designates true position dimensions.
The TV is a MIL-C-38999, Series III connector. See catalog 12-092 for additional design specifications.
The Programmable Filter TV is intermateable and intermountable with BS952090003 and JN1034.

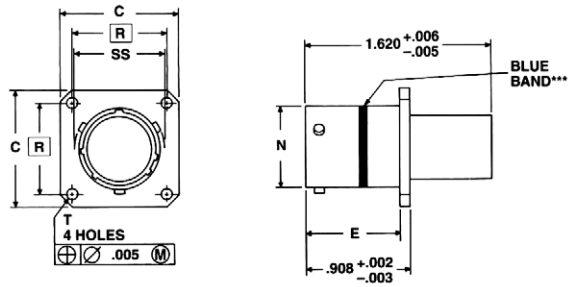
PFSJT Programmable

wall mounting receptacle, box mounting receptacle, jam nut receptacle

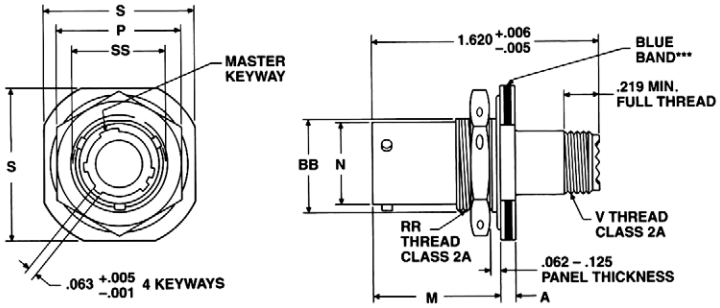
WALL MOUNT RECEPTACLE
PFSJTPQ00*



BOX MOUNT RECEPTACLE
PFSJTP02*



JAM NUT RECEPTACLE
PFSJT07*



* To complete order number, see Programmable Filter how to order on page 53.
** Red band indicates fully mated.
*** Blue band indicates rear release contact retention system.

Shell Size	A +.011 –.010	C +.011 –.010	E +.000 –.006	M ±.005	N Dia. +.001 –.005	P Hex +.017 –.016	R	S +.016 –.015	T Dia. +.004 –.003	V Thread	BB Flat +.000 –.010	RR Thread (Plated)	SS Dia. +.000 –.016
10	.109	.938	.820	.915	.590	.875	.719	1.062	.120	.5625-24UNEF	.669	.6875-24UNEF	.680
12	.109	1.031	.820	.915	.750	1.062	.812	1.250	.120	.6875-24UNEF	.830	.8750-20UNEF	.859
14	.109	1.125	.820	.915	.875	1.188	.906	1.375	.120	.8125-20UNEF	.955	1.0000-20UNEF	.984
16	.109	1.219	.820	.915	1.000	1.312	.969	1.500	.120	.9375-20UNEF	1.084	1.1250-18UNEF	1.108
18	.140	1.312	.820	.915	1.125	1.438	1.062	1.625	.120	1.0625-18UNEF	1.208	1.2500-18UNEF	1.233
20	.140	1.438	.790	.915	1.250	1.562	1.156	1.812	.120	1.1875-18UNEF	1.333	1.3750-18UNEF	1.358
22	.140	1.562	.790	.915	1.375	1.688	1.250	1.938	.120	1.3125-18UNEF	1.459	1.5000-18UNEF	1.483
24	.140	1.688	.790	.915	1.500	1.812	1.375	2.062	.147	1.4375-18UNEF	1.580	1.6250-18UNS	1.610

All dimensions for reference only.
☐ Designates true position dimensions.
The SJT is a proprietary connector. See catalog 12-091 for additional design specifications.
The Programmable Filter SJT complies with VG96912 for intermating and intermounting

Programmable EMI/RFI
how to order

Programmable Filter Connector part number breakdown, less contacts for connector LJT, SJT and TV types:

PF	LJT	P02RT	25	-	35	P	A	(XXX)	B
1	2	3	4		5	6	7	8	9

1. PF designates Programmable Filter
2. Connector Series*:
   LJT
   TV (Tri-Start)
   SJT
   JT (for availability, consult Amphenol, Sidney, NY)
3. Shell Style, Service Class and Finish:
   LJT/SJT (style & class only, finish designated by variation suffix):
   P02RT (box mount)
   PQ00RT (wall mount)
   07RT (jam nut)
   TV: P00RF (wall mount electroless nickel)
   P00RW (wall mount O.D. cadmium)
   07RF (jam nut electroless nickel)
   07RW (jam nut O.D. cadmium)
4. Shell Size:
   LJT/TV: 9 through 25
   SJT: 8 through 24
5. Insert Pattern - refer to insert availability chart on page 9
6. Insert Gender: Pin or Socket
7. Alternate Shell Position:
   LJT/SJT: A through D
   TV: A through E
8. Variation Suffix
   Finish designation for LJT/SJT:
   (023) electroless nickel
   (014) O.D. cadmium
9. "B" or "W" - indicates source of origin**

Programmable Filter Contacts Part Number Breakdown:

PF	49	2	1	CR	22D	P	(XXX)	B
1	2	3	4	5	6	7	8	9

1. PF designates Programmable Filter
2. Significant figures of capacitance (in PF)
   for example: 4900 = 49
3. Multiplier (No. of zeros)
4. Filter Circuit:
   1 = Pi
   2 = C
   3 = LRC
   4 = CLR
   8 = Ground
   9 = Feed-thru
5. Termination Style:
   CR designates Crimp
   PR designates Printed Circuit Tail
6. Contact Size:
   16, 20, 22D
7. Contact Gender: Pin or Socket
8. Contact Variation Suffix
9. "B" or "W" - indicates source of origin**

Capacitor Color Coding

Filter Type	Color
UHF_1	Violet
UHF_2	Pink
VHF_1	Green
VHF_2	Brown
VHF_3 (18nFd)	Gray
VHF_4 (50nFd)	Blue

* Connector Series:
LJT is a MIL-C-38999, Series I connector. See catalog 12-090 for additional design specifications.
TV (Tri-Start) is a MIL-C-38999, Series III connector. See catalog 12-092 for additional design specifications.
SJT is a proprietary connector. See catalog 12-091 for additional design specifications.
JT is a MIL-C-38999, Series II connector. See catalog 12-090 for additional design specifications.

** B designates Amphenol® from Amphenol, Sidney, N.Y., U.S.A.
W designates Amphenol Limited, Whitstable, England

Amphenol® Filter Adapters
effective circuit protection for existing applications

Filter adapters present an effective and economical method of introducing EMI/EMP protection to an installed system. The adapter series of filter connectors from Amphenol are available to intermate with all the popular MIL-Specs and can provide the circuit protection at the MF, HF, VHF and UHF levels.

Features of the Amphenol® adapter include:

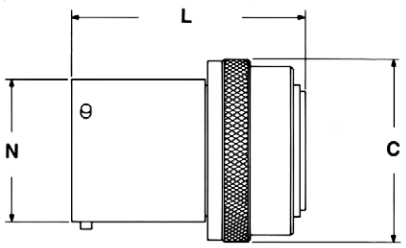
- **Planar technology from the industry's leader in cylindrical filter products**
- **MOV or diode capability for transient protection**
- **Wide range of tooled patterns**
- **Space qualified components**

Installation of the adapter is quick and efficient, requiring no tools, fixtures or extended downtime. Simply unmate the existing cable harness from the receptacle; attach the coupling nut to the receptacle on the unit; then mate the cable harness to the receptacle side of the adapter.

Several design alternatives are available that will help ensure that the adapter remains permanently attached to either the cable harness or the unit receptacle.

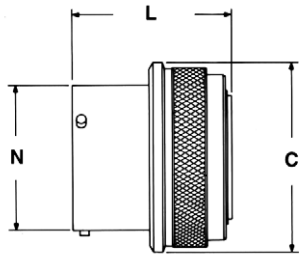
FPT, FJT, FLJT, FTV
adapters

FPT Adapter
21-900075-XX



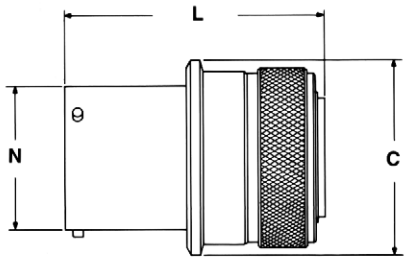
FPT Shell Size	C Dia. Ref.	N Dia. +.001 –.005	L Max.
12	1.035	.750	1.626
14	1.158	.875	1.626
16	1.280	1.000	1.626
18	1.403	1.125	1.626
20	1.525	1.250	1.688
22	1.648	1.375	1.688
24	1.770	1.500	1.688

FJT Adapter
21-900393-XX



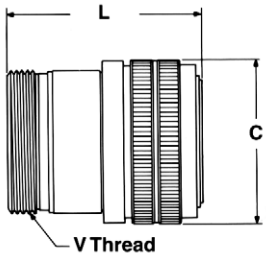
FJT Shell Size	C Dia. +.011 –.010	N Dia. +.001 –.005	L Max.
12	1.143	.750	1.397
14	1.255	.875	1.397
16	1.388	1.000	1.397
18	1.510	1.125	1.397
20	1.633	1.250	1.397
22	1.756	1.375	1.397
24	1.878	1.500	1.397

FLJT Adapter
21-900423-XX



FLJT Shell Size	C Dia. +.011 –.010	N Dia. +.001 –.005	L Max.
11	1.045	.700	2.038
13	1.246	.850	2.038
15	1.371	.975	2.038
17	1.496	1.100	2.038
19	1.616	1.207	2.038
21	1.743	1.332	2.038
23	1.866	1.457	2.038
25	1.991	1.582	2.038

FTV Adapter
21-900529-XX



FTV Shell Size	C Dia. Ref.	V Thread 0.1P-0.3L-TS Class 2A	L Max.
13	1.121	.8750	2.257
17	1.386	1.1875	2.257
25	1.864	1.6250	2.257

All dimensions for reference only.
Consult Amphenol, Sidney, NY for ordering information.

Amphenol® Transient Protection
MOV – Metal Oxide Varistor Connectors

- **Filter connector size package**
- **Protection for 14, 31, 38, 130 and 150 circuits**
- **Radiation hardened**
- **No additional circuits required**
- **Low impedance**
- **Increased reliability**
- **Nanosecond response time**
- **Elimination of costly external suppression assemblies**

The Amphenol® MOV Connector offers the versatility of a standard connector, with transient protection for sensitive circuits.

Transients in electrical circuits caused by a sudden release of stored energy can originate within or outside of the circuit and may be repeatable or random.

Regardless of frequency or origin, transient caused failures generated by load switching, lightning, electrostatic discharge (ESD) and electromagnetic pulse (EMP) can destroy unprotected IC components.

Compatible with present filter connector assembly procedures, sleeves can be combined in parallel or series with existing filters. Internal housing of the MOV sleeve offers weight and space savings over other protection methods available today, and eliminates costly and bulky exterior suppression mechanisms in appropriate situations. Sleeves are presently available in contact sizes 22, 20 and 16.

Transient protection can be provided in receptacle, plug or adapter configuration. These connectors are intermateable and intermountable with the following MIL-Specs:

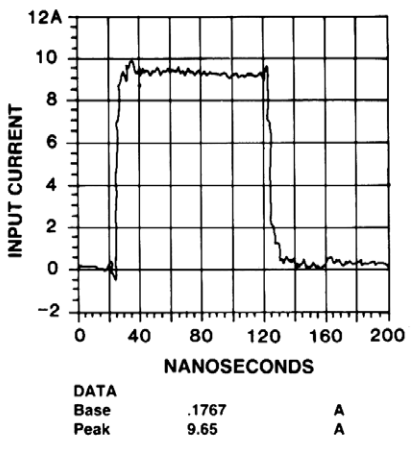
- MIL-C-5015
- MIL-C-26482
- MIL-C-26500
- MIL-C-27599
- MIL-C-38999
- MIL-C-83723
- MIL-C-24308
- MIL-C-28840

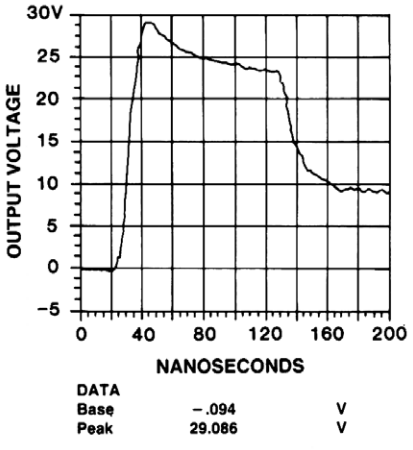
M.O.V. PERFORMANCE CHARACTERISTICS

Designation	Contact Size	Maximum Ratings (125°C)					Characteristics (25°C)								
		Continuous		Transient		Maximum Leakage Current at V_t (dc)	Varistor Voltage at 1mA DC Test Current			Maximum Clamping Voltage V_c at Test Current (8/20µS)		Capacitance f = 1 MHz		Maximum Leakage Current at 25°C	
		RMS Voltage (AC)	DC Voltage	Energy (10/1000µS)	Peak Current (8/20µS)							Picofarads			
		V_m Volts	V_m Volts	W_{tm} Joules	I_{tm} Amperes	I_L Max. µA	Min. Volts	V_N (dc) Volts	Max. Volts	V_C Volts	I_p Amps	Min.	Max.	I_L Max. µA	V_t dc = .9x V_m dc
F22	22	10	14	1.5	250	50	18	22	26	42	10	1600	3000	5.0	14
F39	22	25	31	1.5	250	50	35	39	48	85	5	450	2000	5.0	28
F39	20	25	31	2.0	300	50	35	39	48	85	10	700	2000	5.0	28
F47	22	30	38	1.5	250	50	42	47	58	100	5	400	2000	5.0	36
F47	20	30	38	2.0	300	50	42	47	58	100	10	650	2000	5.0	36
F47	16	30	38	3.0	350	50	42	47	58	100	20	1000	2500	5.0	36
F200	22	130	130	2.4	300	100	184	200	228	375	5	150	350	5.0	130
F200	20	130	130	3.0	400	100	184	200	228	375	10	150	400	5.0	130
F200	16	130	130	5.0	500	100	184	200	228	375	20	250	700	5.0	130
F240	22	150	150	2.4	300	100	212	240	268	430	5	100	300	5.0	150
F240	20	150	150	3.0	400	100	212	240	268	430	10	100	350	5.0	150
F240	16	150	150	5.0	500	100	212	240	268	430	20	200	650	5.0	150

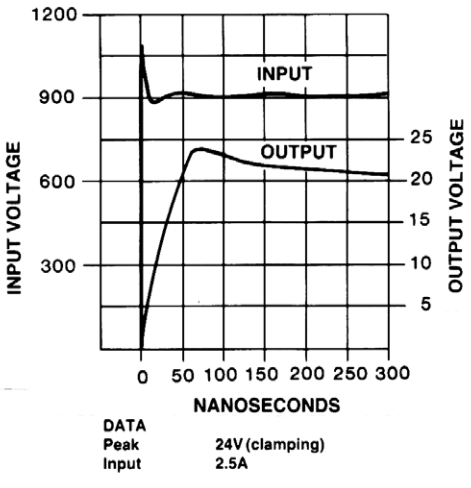
NOTE: Continuous voltage ratings are based on 1000 hour reliability assurance tests at 125°C rated ambient temperature per MIL-STD-202 Method 108.

The following charts show the typical MOV response to an input pulse open circuit of 1000V and 10A peak square wave with a 5 nanosecond rise time in a 50 Ohm system.





The following chart shows response time and output voltage of a typical MOV sleeve with 1000V, 5 nanosecond, 2.5A input pulse mounted in an LJT 13–35P connector. Test was performed without load.



Amphenol® Transient Protection
Diode Connectors

- **Clamping voltage as low as 11.9 volts**
- **Low capacitance – suitable for high frequency applications**
- **Unipolar or bipolar – using existing proven diode technology**
- **Protection for 5.8 to 200 VDC circuits**
- **No additional circuits required**
- **Low impedance – high frequency response**
- **Increased reliability**
- **Nanosecond response time**
- **Elimination of costly external suppression assemblies**
- **Screened to applicable requirements of MIL-S-19500TX/TXV**
- **Available as repairable or fixed diode design**
- **Keeps transients outside of the box**
- **Minimizes fast transient voltage overshoot**

Diode Connector and Adapter

Close-up View of Diode Contact

The Amphenol® Diode Connector offers the versatility of a standard connector, with transient protection for sensitive circuits, such as TTL Lines.

Transients in electrical circuits caused by a sudden release of stored energy can originate within or outside of the circuit and may be repeatable or random.

Regardless of frequency or origin, transient caused failures generated by load switching, lightning, electrostatic discharge (ESD) and electromagnetic pulse (EMP) can destroy unprotected IC components.

Compatible with present filter connector assembly procedures, diodes can stand alone or can be combined in series with filters. Internal housing of the diode offers weight and space savings over other protection methods available today, and eliminates costly and bulky exterior suppression mechanisms in appropriate situations. Diodes are presently available in contact sizes 22, 20 and 16.

Transient protection can be provided in receptacle, plug or adapter configurations. These connectors are intermateable and intermountable with the following MIL-Specs:

- MIL-C-5015
- MIL-C-26482
- MIL-C-26500
- MIL-C-27599
- MIL-C-38999
- MIL-C-83723
- MIL-C-24308
- MIL-C-28840

Low capacitance diodes <100 pfd are available; consult Amphenol, Sidney, NY.

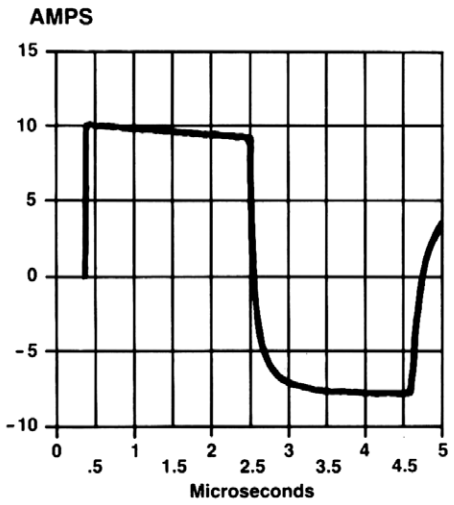
Publication SL-360 offers in-depth information concerning front repairability of diode connectors.

STANDARD DIODE CONNECTOR CHARACTERISTICS AT 25 °C

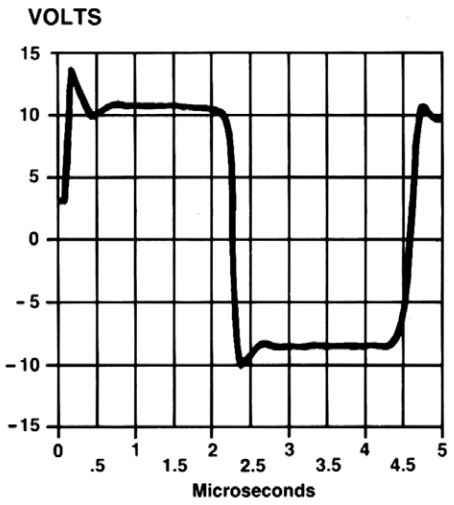
Stand-off Voltage † (VDC)	Max. Capacitance (pf)	Breakdown Voltage at 1 ma (VDC)	Max. Clamping Voltage (8 x 20µ sec. pulse)	Leakage Current at Stand-off Voltage (µA)	Power Capability † 20µs Exp. Impulse (Peak) (Watts)
+ 5.8	1600	+ 6.45 to + 7.1*	+11.9	<100	1000
± 5.8	1000	± 6.45 to ± 7.1*	±11.9	<150	1000
± 7.0	750	± 7.3 to ± 9.3	±13.5	<10	1000
± 8.0	750	± 8.2 to ±10.6	±15.4	<5	1000
+ 8.0	1500	+ 8.5 to +10.6	+15.4	<5	1000
±10.0	500	±11.1 to ±12.3	±17.0	<1	1000
+10.0	1100	+11.1 to +12.3	+17.0	<1	1000
±15.0	500	±16.7 to ±18.5	±24.9	<1	1000
+15.0	750	+16.2 to +19.2	+24.9	<1	1000
–15.0	750	–16.2 to –19.2	–24.9	<1	1000
±17.0	500	±18.9 to ±23.0	±32.0	<1	1000
+17.1	600	+19.0 to +21.0	+27.7	<1	1000
±22.0	500	±25.7 to ±28.4	±38.0	<1	1000
±25.0	500	±27.8 to ±30.7	±40.5	<1	1000
+28.0	500	+30.5 to +35.7	+46.4	<1	1000
±33.3	500	+37.1 to +41.0	±53.9	<1	1000
+33.3	500	+37.1 to +41.0	+53.9	<1	1000
±40.0	500	±44.4 to ±49.1	±64.5	<1	1000
±45.0	500	±47.1 to ±58.1	±84.2	<1	1000
+57.8	500	+64.6 to +71.4	+95.2	<1	1000
±57.8	500	±64.6 to ±71.4	±95.2	<1	1000

Clamping Time -
Unipolar: Less than 1 nanosecond, 0V to breakdown
Bipolar: Less than 5 nanoseconds, 0V to breakdown
* This device only measured at 10ma
† Higher power ratings also available

DIODE CONTACT PULSE TEST, ± 5.8 DIODE



INPUT CURRENT ±10A
TO CONTACT



OUTPUT VOLTAGE +14V
TO –10V AFTER DIODE

Amphenol® Transient Protection
ESA – Energy Shunting Assembly

The Amphenol® Energy Shunting Assembly (ESA) is a simple, compact unit which provides lightning and electromagnetic pulse (EMP) protection of systems in which many signal lines enter sensitive electronic equipment. The efficient packaging of the ESA circumvents the concept of one protective device per line. It provides a surge arrestor which has the advantage of space saving, low cost and simplified assembly when compared to current protective devices which range from diodes to large spark gaps.

The current ESA design consists of two 53-pin contact, Mil-Standard, hermetic connectors assembled back to back, and encompassing a ground plate. A sealed chamber is formed within this thru-bulkhead unit, housing 53 in-line spark gaps. Introducing a controlled atmosphere enhances fast rise breakdown.

The ESA can be integrated with an EMI filter connector which can improve its performance. These two assemblies provide a method to help protect against lightning, EMP, EMI and TEMPEST effects.

The ESA concept can be easily tailored to particular requirements considering the connector family, contact count, contact type, and shell configuration.

Performance Characteristics

1. DC breakdown voltage		230 Volts
2. Maximum rated surge discharge current (8 x 20 microsecond pulse)		5,000 Amperes per pin
3. Insulation resistance		10^{10} ohms minimum
4. Capacitance between each electrode and the ground plane		Less than 2 pf
5. Rate-of-rise breakdown voltage	Maximum Breakdown Voltage (Volts) 600 800 1,500 2,000	Rate of Rise (Volts/microsecond) 10 1,000 10,000 1000,000
6. Surge breakdown unbalance (at 100 Volts/microseconds)		180 Volts
7. Surge life (500 Ampere – 10 x 1,000 microsecond)		400 Surges
8. Hold-over voltage		100 Volts
9. Arcing voltage		40 Volts
10. Glow to arc transition point		1 Ampere
11. Temperature range		–40°F to 150°F (233°K to 339°K)

Filter 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 flex or printed circuit board assemblies to an expensive 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.

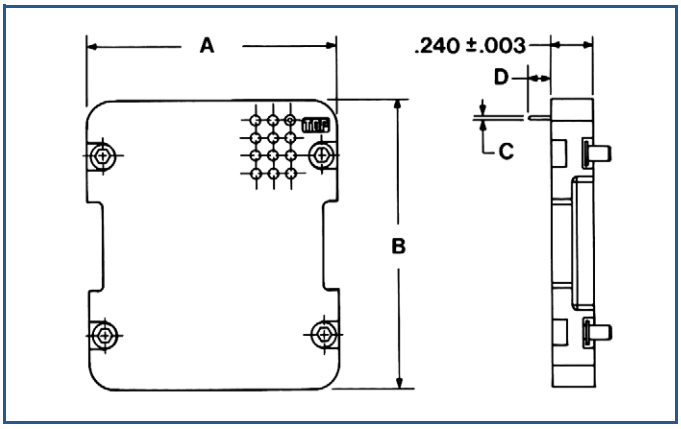
Incorporation of the header assembly provides the user with time and cost saving potentials. These header assemblies can be vapor phase or wave soldered to flex or printed circuit boards prior to the receipt of the EMI/EMP connector. Headers can be installed to standard connectors, allowing for electrical 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.

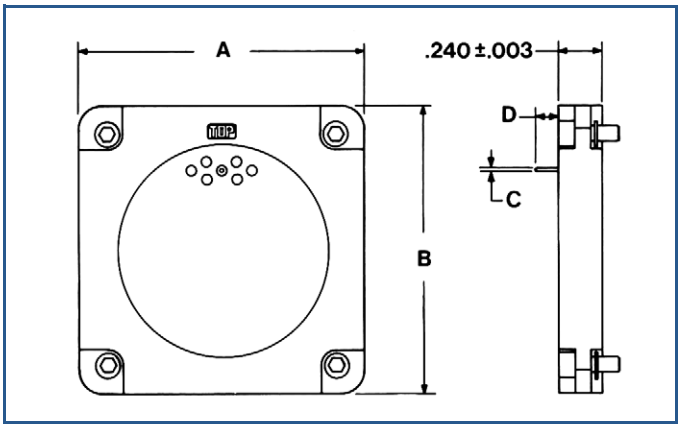
The heart of the header assembly is a short pin/socket contact. The tall of the contact would accommodate standard through-hole diameter and thickness of the flex or printed circuit board materials. The socket would be imbedded in the molded material, making electrical engagement with the printed circuit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



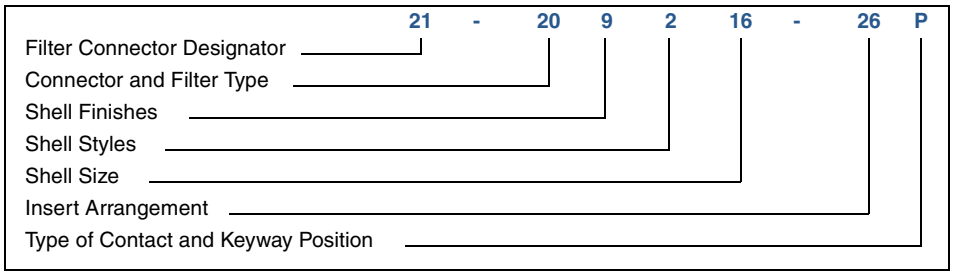
Cylindrical Configuration

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 △ Max.

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

How to Order



Standard voltage for diode is ±8 volts. Any deviation requires a –200 suffix.

Standard voltage for a MOV is 47 volts. Any deviation requires a –200 suffix.

Standard diode/filter combination is ±8 volt/VHF-1 filter. Any deviation requires a –200 suffix.

Standard MOV/filter combination is 47 volt/VHF-1 filter. Any deviation requires a –200 suffix.

HF filters in size 16 and 20 contacts only.

Any mixture of filters and non-filters requires a –200 suffix.

21 Filter Connector Designator
- 21 - Filter Connector
- 36 - MOV Connector*
- 47 - Diode Connector*

20 Connector/Filter Type
- 20 - FPT with VHF-1 filter (short shell)
- 22 - FPTE with VHF-1 filter (short shell)
- 24 - FJT with VHF-1 filter (short shell)
- 25 - FJT with ±8 volt diode/VHF-1 filter combination
- 26 - AN with VHF-1 filter
- 29 - FLJT with VHF-1 filter (short shell)
- 31 - FPT with MF filter (short shell)
- 32 - FJT with MF filter (short shell)
- 33 - FPT with HF filter (long shell)
- 34 - FJTP with VHF-1 filter (short shell)
- 36 - FLJT with HF filter (long shell)
- 37 - FJT with HF filter (long shell-min. penetration also available)
- 38 - FJTP with HF filter (long shell)
- 39 - FJTP with MF filter (short shell)
- 40 - FLJT with MF filter (short shell)
- 41 - FJT (UTS) with VHF-1 filter (short shell)
- 42 - FLB with VHF-1 filter
- 46 - FPT (UTS) with VHF-1 filter
- 47 - FLJTP with VHF-1 filter (short shell)
- 48 - FLJTPQ (UTS) with VHF-1 filter (short shell)
- 50 - FTV (UTS) with VHF-1 filter (short shell)
- 51 - FTV (UTS) with HF filter (long shell)
- 52 - FTV with VHF-1 filter (short shell)
- 53 - FTV with HF-1 filter (long shell)
- 54 - FAN with HF-1 filter (long shell)
- 56 - FJTP (UTS) with VHF-1 filter
- 57 - FLJT with VHF-1 filter (printed circuit mount)
- 58 - FJTPQ (UTS) with VHF-1 filter (short shell)
- 60 - FTV with VHF-1 filter (printed circuit board mount, mod. flange)
- 61 - FBL with VHF-1 filter (short shell)
- 63 - FSJT with VHF-1 filter (short shell)
- 64 - FBL (UTS) with VHF-1 filter
- 65 - FSJT (UTS) with VHF-1 filter
- 66 - FBL programmable filter
- 67 - FTV with VHF-1 filter (printed circuit board mount, Std. flange)
- 68 - FTV (UTS) with ±8 volt diode/VHF-1 filter combination
- 69 - FLJT with programmable filter
- 70 - FJT with programmable filter
- 71 - FTV with programmable filter
- 73 - M83723 bayonet coupling with VHF-1 filter
- 75 - FSJT with programmable filter
- 76 - FTV with VHF-1 filter composite shell
- 77 - FLJT with ±8 volt diode/VHF-1 filter combination
- 82 - FTV with ±8 volt diode/VHF-1 filter combination
- 83 - FSJT with ±8 volt diode/VHF-1 filter combination
- 84 - FTV (UTS) with ±8 volt diode only
- 85 - FBL with ±8 volt/VHF-1 filter combination
- 87 - FLJT (UTS) with ±8 volt diode/VHF-1 filter combination
- 96 - FPT-E (UTS) with VHF-1 1500V filter

9 Shell Finishes
- 0 - chromate
- 1 - bright cadmium
- 2 - stainless steel
- 4 - electroless nickel, MS (F)
- 5 - gold plate over nickel
- 7 - cadmium plate over nickel, MS (A)
- 8 - bright nickel
- 9 - cadmium plate, nickel base, OD, MS(B), (500 hr. salt spray test)

2 Shell Styles
- 0 - wall mount receptacle
- 2 - box mount receptacle
- 3 - jam nut receptacle with rear thread (PT only)
- 4 - minimum penetration jam nut receptacle
- 7 - jam nut receptacle

16 Shell Size
- 8 through 24 - FJT and FPT shell sizes available
- 9 through 25 - FLJT and FTV shell sizes available

26 Insert Arrangement
See insert availability chart, page 9.

P Type of Contact and Insert Arrangement
- P - pins in a normal rotation
- S - sockets in a normal rotation

For alternate rotations, choose the suffix letter from table below.

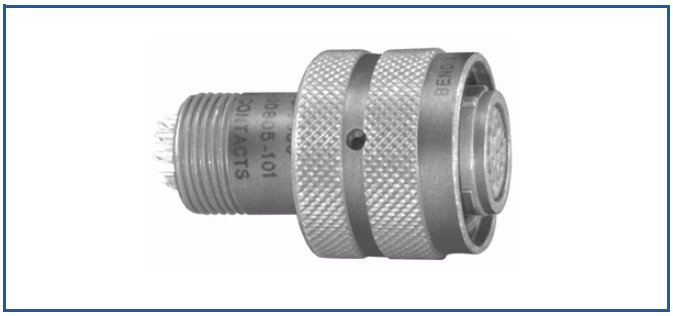
* Please consult Amphenol, Sidney, NY to set up part numbers.
For adapter part numbers, see adapter section (Pages 54 and 55).

ALTERNATE ROTATION SUFFIX LETTERS

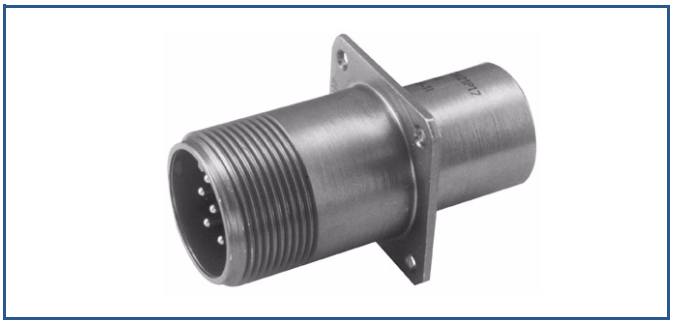
FJT, FLJT or FSJT			FTV			FPT			FBL Series IV		
Alternate Position	Suffix Letter		Alternate Position	Suffix Letter		Alternate Position	Suffix Letter		Alternate Position	Suffix Letter	
	Pins	Sockets		Pins	Sockets		Pins	Sockets		Pins	Sockets
Normal	P	S	Normal	P	S	Normal	P	S	N	P	S
A	E	F	A	G	H	W	G	H	A	E	F
B	R	T	B	I	J	X	I	J	B	G	H
C	W	X	C	K	L	Y	K	L	C	J	L
D	Y	Z	D	M	N	Z	M	N	D	R	T
			E	R	T				K	W	X

Amphenol® EMI/Transient Protection
specials

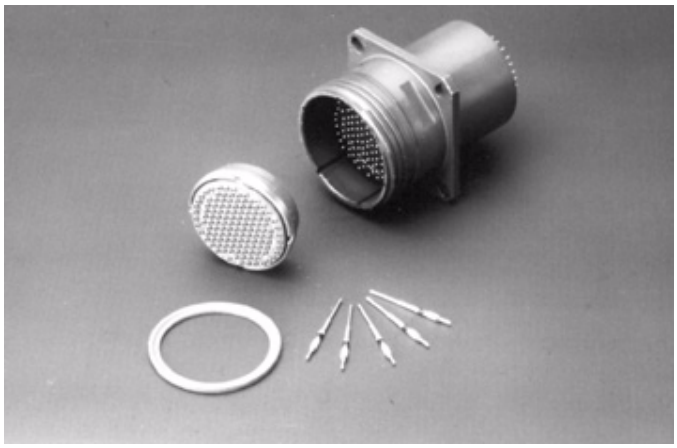
The Hermetic Filter Connector, while only approximately 1/2 inch longer than standard series connectors, provides all the benefits of a hermetic connector, as well as EMI protection for sensitive circuits. The filter assembly is protected by a fused glass insert within a unique steel housing. This design accounts for the connector's capability in tolerating high level static pressure, while maintaining a low level leakage rate. Applications include pressurized test equipment, environmental and toxic gas chambers, and moisture sealing on industrial equipment and missiles.



The Filtered Plug is designed for applications where EMI protection is essential, but access to the receptacle is denied. The filtered plug presents an alternative for the electrical engineer. The filter plug is designed with the same components as a standard filter receptacle, but offers the option of being mounted on the cable harness. This device is a cost effective method of achieving EMI protection when length restrictions prohibit inclusion of an adapter to the system. Consult Amphenol Aerospace, Sidney, NY for availability.

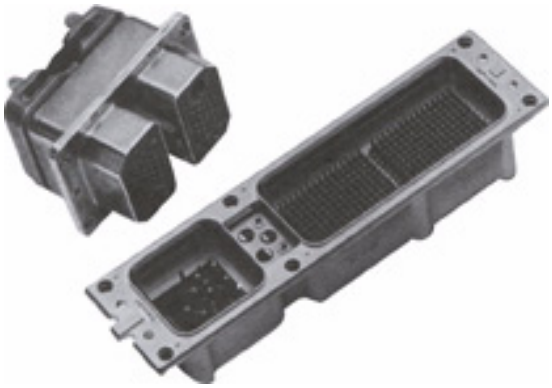


The "AN"Filter Connector is designed in configurations intermateable and intermountable with MIL-C-5015 connectors and provides electromagnetic interference protection for critical circuits. The filter connector has the same dimensions as the non-filtered standard MIL-spec connectors with the exception of back shell length. It uses non-removable solder cup terminated contacts. The shells are impact extruded or machined bar stock aluminum and are available in several conductive platings. Applications include power transmission, medical communications, and ground support equipment.



The Front-Repairable Transient Protection Connector
The front repairable concept originates from specialized customer requirements demanding a method of repairing and/or replacing an inoperable contact due to either over-testing or a desire to have a different transient protection device on a circuit. The capability to replace a device within the connector will allow system maintenance, and makes design changes a matter of replacing a contact rather than replacing a connector.

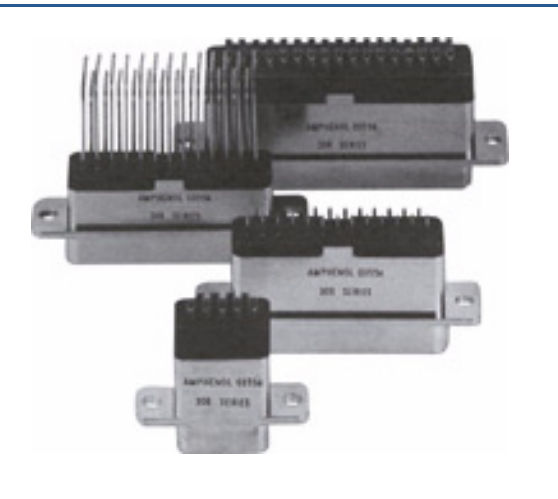
Amphenol® EMI/Transient Protection
specials



ARINC Filtered Connectors

Amphenol's 485 series filtered ARINC connectors provide EMI and EMP protection for military and commercial avionic equipment. These connectors offer the cost advantages of planar ceramic technology in conjunction with Amphenol's stress isolation techniques, giving superior thermal and physical shock capabilities. Removable contacts and diode contacts result in maximum flexibility and repairability.

Ask for 485 Series (ARINC 404/600 Filtered Rack and Panel Connectors), Brochure 485. For further information consult Amphenol, Canada.



MIL-C-24308 Filtered Connectors

Amphenol's 308 series is a line of filtered MIL-C-24308 style D-subminiature connectors for military and aerospace applications. Constructed with planar ceramic capacitors using Amphenol's stress isolation technologies, the 308 Series is a compact and highly rugged connector available in medium and high density versions.

Ask for 308 Series (Filtered MIL-C-24308 D-Subminiature Connectors), Brochure 308. For further information consult Amphenol, Canada.