CAVITY BANDPASS FILTERS

■ **30 TO 12,000 MHz** ■ **0.1 TO 3.0% BANDWIDTHS**

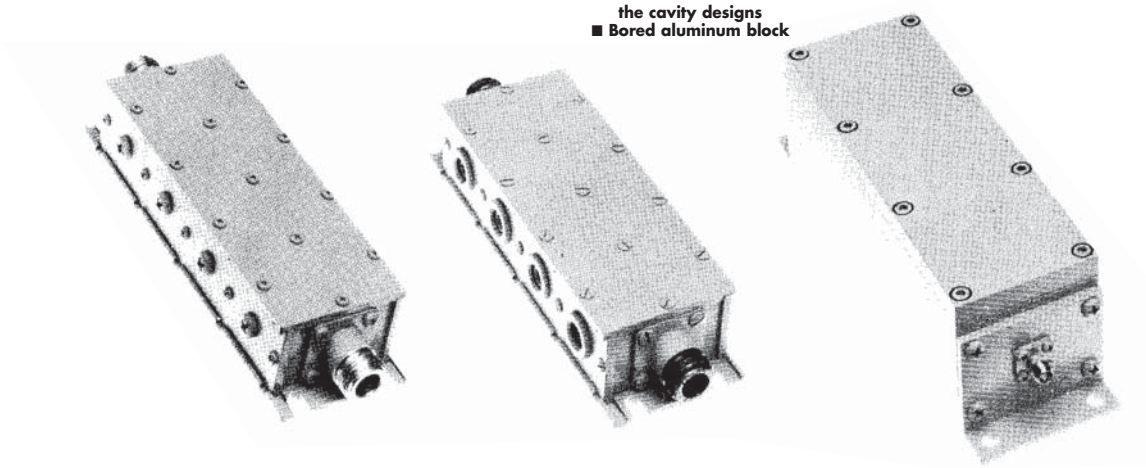
Telonic Cavity Bandpass Filters exhibit lower losses and narrower bandwidths than Telonic Tubular Filters, as well as higher frequency ranges. For extremely high stability over the operating temperature range, most Cavity Filters can be temperature compensated. Where the normal attenuation characteristic is not appropriate, traps, or "band-reject sections" may be added for special applications.

These filters utilize helical resonators, coaxial resonators or resonant cavities. Resonant elements are subject to higher frequency spurious responses which can usually be suppressed with a Telonic Lowpass Filter, if required.

SERIES TSF
■ 30 to 400 MHz
■ Helical resonators
■ Slotted aluminum box

SERIES TCF
■ 400 to 3,000 MHz
■ Coaxial 1/4"- wavelength resonators
■ Slotted aluminum box

SERIES TCC
■ 500 to 2,500 MHz
■ Coaxial 1/4"- wavelength resonators
■ Lowest insertion loss of the cavity designs
■ Bored aluminum block



ELECTRICAL SPECIFICATIONS		TSF	TCF	TCC
Cutoff Frequency Range	Normal Spec. Limit	30 to 400 MHz (See Note 1)	0.4 to 3.0 GHz (See Note 1)	0.5 to 2.5 GHz (See Note 1)
	*Areas of Interest	20 to 600 MHz	0.3 to 4.0 GHz	
Minimum 3 db Relative Bandwidth (in % of center frequency)	Normal Spec. Limit	1.0% to 3.0% (See Note 1)	0.3% to 3.0% (See Note 1)	0.3% to 3.0% (See Note 1)
	*Areas of Interest	0.2% to 3.5%	0.2% to 3.5%	0.1% to 3.5%
Other Relative Bandwidths	*Areas of Interest	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)
Maximum insertion loss At Center Frequency	Normal Spec. Limit	See page 20	See page 20	See page 20
	*Areas of Interest	Spl. Requirements	Spl. Requirements	Spl. Requirements
Nominal Impedance (in and out)	Normal Spec. Limit	50 ohms	50 ohms	50 ohms
	*Areas of Interest	50 to 100 ohms	60 ohms	60 ohms
Maximum VSWR at Center Frequency	Normal Spec. Limit	1.5:1	1.5:1	1.5:1
	*Areas of Interest	1.2:1	1.2:1	1.1:1
Minimum VSWR Bandwidth	Normal Spec. Limit	See Table 1	See Table 1	See Table 1
	*Areas of Interest	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)
Stop Band Attenuation	Normal Spec. Limit	See Page 20	See Page 20	See Page 20
	*Areas of Interest	Spl. Requirements	Spl. Requirements	Spl. Requirements
Number of Sections	Normal Spec. Limit	2 to 6	2 to 6	2 to 6
	*Areas of Interest	up to 10	up to 10	up to 10
Average Input Power (watts max. to 10,000 ft.)	Normal Spec. Limit	300 (3 dB rel. bw MHz) / (Loss Constant) (Fc MHz)	See Peak	20% of Peak
	*Areas of Interest	5 to 20	10 to 100	100 to 1000
Input Peak Power (watts max. to 10,000 ft.)	Normal Spec. Limit	1500 (3 dB rel. bw MHz) / (Fc MHz)	1500 (3 dB rel. bw MHz) / (Fc MHz)	10,000 (3 dB rel. bw MHz) / (Fc MHz)
	*Areas of Interest	20 to100	20 to200	100 to1000
ENVIRONMENTAL SPECIFICATIONS				
OPERATING Shock	Normal Spec. Limit	5G	5G	25G
	*Areas of Interest	15G	15G	75G
OPERATING Vibration	Normal Spec. Limit	5G	5G	10G
	*Areas of Interest	15G	15G	30G
OPERATING Humidity	Normal Spec. Limit	Up to 90%	Up to 90%	Up to 90%
	*Areas of Interest	up to 100% with Condensation	up to 100% with Condensation	up to 100% with Condensation
OPERATING Altitude	Normal Spec. Limit	Unlimited	Unlimited	Unlimited
OPERATING Temp. Range	Normal Spec. Limit	0°C to 50°C	0°C to 50°C	0°C to 50°C
	*Areas of Interest	−54°C to + 125°C	−54°C to + 125°C	−54°C to + 125°C
STORAGE Shock	Normal Spec. Limit	15G	15G	75G
	*Areas of Interest	75G	75G	150G
STORAGE Vibration	Normal Spec. Limit	10G	10G	30G
	*Areas of Interest	20G	20G	60G
STORAGE Temp. Range	Normal Spec. Limit	−54°C to + 71°C	−54°C to + 100°C	−54°C to + 100°C
	*Areas of Interest	−62°C to +150°C	−62°C to +150°C	−62°C to +150°C

NOTE 1: See page 6 for standard tolerance and definition of center frequency and bandwidth.

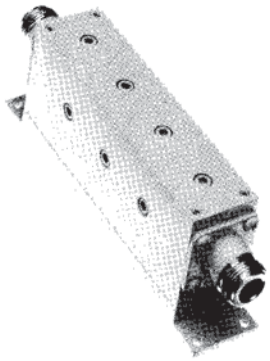
The specifications for the example shown here are as follows:

This model is a fixed frequency cavity bandpass filter. It has a nominal center frequency of 1680 MHz and a minimum 3 db relative bandwidth of 42 MHz. The maximum insertion loss at 1680 MHz is 0.47 db (see page 20). The nominal input and output impedance is 50 ohms. The maximum VSWR at center frequency is 1.5:1. From Table 1, 0.8 x 42 MHz (minimum 3 db bandwidth) is 33.6 MHz for a VSWR of 1.5:1 or less from 1663.2 MHz to 1696.8 MHz.

TCA 1680 — 42 — 4 E E □

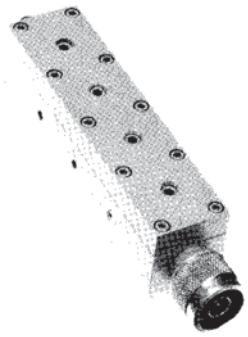
- TCA — Series
- 1680 — Nominal Center Frequency
- 42 — Minimum 3 db Bandwidth
- 4 — Number of Sections
- E — See page 21 for Connector Code: Input Conn.
- E — See page 21 for Connector Code: Output Conn.
- □ — Suffix Number to be Assigned by the Factory to Identify the Specific Customer and Application.

SERIES TCA
■ 1.0 to 3.0 GHz
■ Coaxial 1/4"- wavelength resonators
■ Bored aluminum block

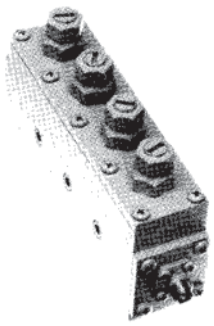


SERIES TCG
■ 2.0 to 6.0 GHz
■ Coaxial 1/4"- wavelength resonators
■ Bored aluminum block

SERIES TCH
■ 6.0 to 12.0 GHz
■ TM010 resonant cavity
■ Bored aluminum block



SERIES TCB
■ 1.0 to 2.4 GHz
■ Coaxial 1/4"- wavelength resonators
■ Adjustable center frequency
■ Bored aluminum block

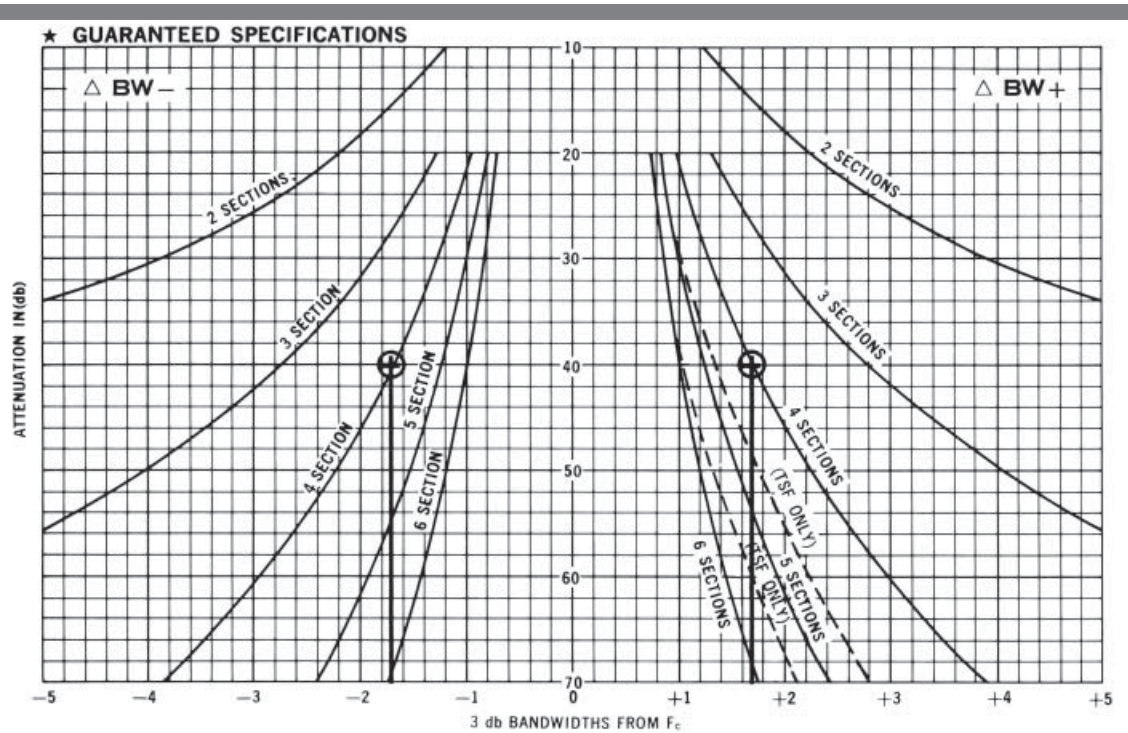


TCA	TCG	TCH	TCB
1.0 to 3.0 GHz (See Note 1)	2.0 to 6.0 GHz (See Note 1)	6.0 to 12.0 GHz (See Note 1)	1.0 to 2.4 GHz Tuning Range up to 10% (See Note 1)
0.8 to 4.0 GHz	1.0 to 6.0 GHz	6.0 to 12.0 GHz (See Note 1)	1.0 to 3.0 GHz
0.3% to 3.0% (See Note 1)	0.3% to 2.0% (See Note 1)	0.1% to 1.0% (See Note 1)	0.3% to 3.0% (See Note 1)
0.2% to 3.5%	0.2% to 3.0%	0.1% to 2.0% (See Note 1)	0.2% to 3.5%
Spl. Requirements (See page 7)	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)
See page 20	See page 20	———	———
Spl. Requirements	Spl. Requirements	Spl. Requirements (See page 20)	Spl. Requirements (See page 20)
50 ohms	50 ohms	50 ohms	50 ohms
60 ohms			60 ohms
1.5:1	1.5:1 to 4 GHz 2.0:1 to 6 GHz	2.0:1	1.5:1
1.2:1		1.5:1	
See Table 1	See Table 1		See Table 1
Spl. Requirements (See page 7)	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)	Spl. Requirements (See page 7)
See Page 20	See Page 20	See Page 20	See Page 20
Spl. Requirements	Spl. Requirements	Spl. Requirements	Similar to TCA
2 to 6	2 to 6	2 to 4	2 to 4
up to 10	up to 10	1 to 8	
See Peak	See Peak	10% of Peak	See Peak
15 to 150	15 to 150	5 to 200	2 to 150
1500 (3 dB rel. bw MHz) / (Fc MHz)	1500 (3 dB rel. bw MHz) / (Fc MHz)	15,000 (3 dB rel. bw MHz) / (Fc MHz)	1,000 (3 dB rel. bw MHz) / (Fc MHz)
45 to 300	45 to 300	100 to 5000	2 to 300
25G	25G	25G	5G
75G	75G	150G	15G
10G	10G	10G	5G
30G	30G	60G	10G
Up to 90%	Up to 90%	Up to 90%	Up to 90%
up to 100% with Condensation	up to 100% with Condensation	up to 100% with Condensation	up to 100% with Condensation
Unlimited	Unlimited	Unlimited	Unlimited
0°C to 50°C	0°C to 50°C	0°C to 50°C	0°C to 50°C
−54°C to + 125°C	−54°C to + 125°C	−54°C to + 125°C	−54°C to + 125°C
75G	75G	75G	5G
150G	150G	300G	25G
30G	30G	30G	5G
60G	60G	120G	15G
−54°C to + 100°C	−54°C to + 100°C	−54°C to + 100°C	−54°C to + 100°C
−62°C to +150°C	−62°C to +150°C	−62°C to +150°C	−62°C to +150°C

***Submit specific requirements for quotation**

CAVITY BANDPASS FILTERS

ATTENUATION



STOP BAND ATTENUATION:

This graph shows the minimum stop band attenuation in db for Telonic cavity bandpass filters with less than 3 db insertion loss. Filters with higher loss must be quoted by the factory.

The rejection frequency is plotted in "3 db bandwidths from center frequency." The exact relationships are:

(I) 3 db bandwidths from Fc

$$= \frac{\text{Rej. freq. MHz} - \text{Fc MHz}}{\text{Min. 3 db BW MHz}}$$

or **(II)** Min. 3 db bandwidth in MHz

$$= \frac{\text{Rej. freq. MHz} - \text{Fc MHz}}{\text{3 db BWs from Fc}}$$

Any one of the following parameters may be identified if the other three and the center frequency are known.

(1) Min. 3 db bandwidth (in MHz).

(2) Number of sections.

(3) Rejection Frequency (in MHz).

(4) Attenuation Level (in db).

Always verify that the frequency and bandwidth you have selected are within the limitations shown for that series of filter.

For example:

Given:

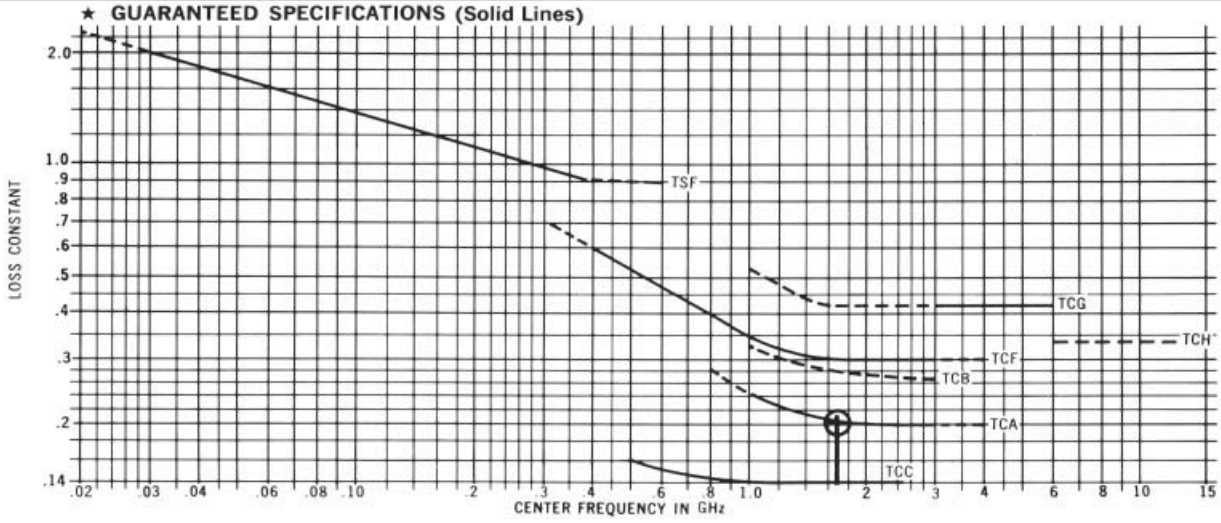
Center frequency = 1,680 MHz
Minimum 3 db BW = 42 MHz
Number of sections = 4
Find: Minimum attenuation level at 1,608 MHz and 1,752 MHz.
From (1) above: 3 db BWs from Fc

$$= \frac{1608 - 1680}{42} = -1.71$$

and $$\frac{1752 - 1680}{42} = +1.71$$

Reading directly from the graph at the points –1.71 and +1.71 we find the minimum attenuation level of 40 db.

INSERTION LOSS



INSERTION LOSS:

$$\text{Max. loss at Fc} = \frac{K\,(N + 0.5)}{\%\ \text{BW}} + 0.1\ \text{db}$$

Where: K = Loss constant
N = Number of sections

$$\%\ \text{BW} = \frac{100 \times \text{min. 3 dB BW MHz}}{\text{Nominal Fc MHz}}$$

The insertion loss graph defines the loss constant used to calculate the insertion loss specification. It also illustrates the relative insertion loss and frequency ranges of standard Telonic cavity bandpass filters.

For example:

TCA 1680-42-4EE
No. of sections = 4
Fc = 1,680 MHz = 1.68 GHz

$$\%\ \text{BW} = \frac{100 \times 42}{1680} = 2.5$$

Loss constant = 0.205 (Read directly from the TCA insertion loss curve at 1.68 GHz.)

Therefore: Max insertion loss at Fc

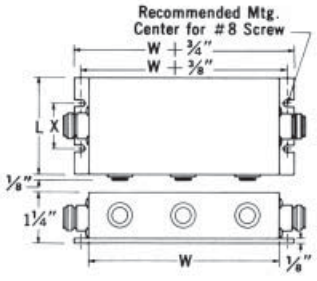
$$= \frac{0.205\,(4 + 0.5)}{2.5} + 0.1 = 0.47\ \text{db}$$

OUTLINE DRAWINGS

TSF

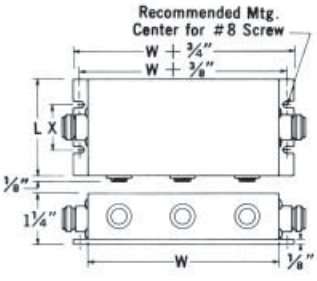
CONNECTORS: See table 2, below.

Finish: Light Blue Paint or Lacquer



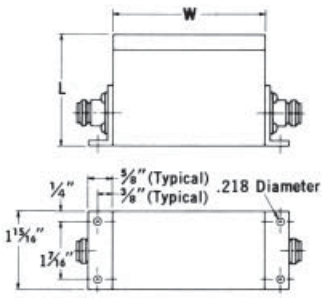
FREQUENCY	"L"	"X"
30 to 50 MHz	— 3 7/8" —	2.625
50 to 60 MHz	— 2 7/8" —	1.625
60 to 100 MHz	— 2 3/8" —	1.125
100 to 400 MHz	— 1 7/8" —	1.125

TCF



FREQUENCY	"L"	"X"
400 to 600 MHz	— 4 7/8" —	3.625
600 to 900 MHz	— 3 7/8" —	2.625
900 to 1400 MHz	— 2 7/8" —	1.625
1400 to 1800 MHz	— 2 3/8" —	1.125
1800 to 3000 MHz	— 1 7/8" —	1.125

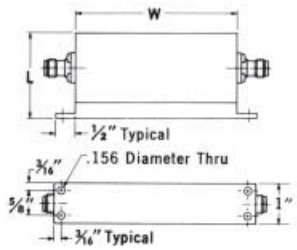
TCC



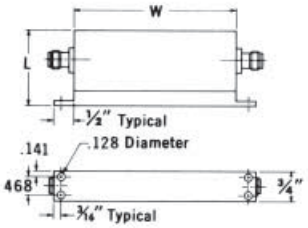
MECHANICAL SPECIFICATIONS

	TSF	TCF	TCC
Approx. Weight in oz.	.8 LW + 3.5	.8 LW + 4	2 LW + 6
"L" Dimension	See Chart	See Chart	[2.4/Fc GHz] + .750 approx.
"W" Dimension	¼ + [1 ⅛ x (No. of Sect.)]	¼ + [1 ⅛ x (No. of Sect.)]	3/16 + [1 7/8 x (No. of Sect.)] approx.

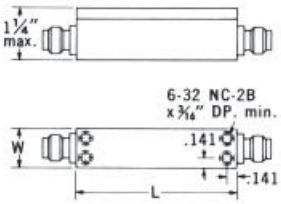
TCA



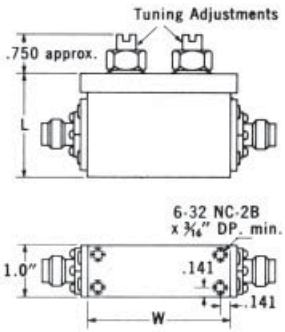
TCG



TCH



TCB



MECHANICAL SPECIFICATIONS

TCA	TCG	TCH	TCB
LW + 4	.8 LW + 3	LW + 2	LW + 6
[2.6/Fc GHz] + .750 (approx.)	[3.0/Fc GHz] + .750 approx.	[9.5(No. of Sect.)/Fc GHz] + .370 approx.	[2.6/Fc GHz] + .750 approx.
3/16 + [15/16 x (No. of Sect.)] approx.	19/32 + [11/16 x (No. of Sect.)] approx.	[8.9/Fc GHz] + .120 approx.	3/16 + [15/16 x (No. of Sect.)] approx.

Table 1 VSWR Bandwidth

NO. OF SECTIONS	2	3	4	5	6 OR MORE
VSWR Bandwidth / Min. 3 db Bandwidth	0.4	0.7	0.8	0.85	0.9

Table 2 CONNECTOR CODE

*A — BNC Jack	E — N Jack	S — SMA Jack
*B — BNC Plug	F — N Plug	T — SMA Plug
C — TNC Jack		X — Special
D — TNC Plug		

* BNC Connectors not standard above 1000 MHz