DB-4002-A 118-148 MHz
DB-4002-B 144-174 MHz
DB-4002-C 406-420 MHz
DB-4002-D 450-512 MHz

HIGH Q CAVITY FILTERS

INSTALLATION & TUNING INSTRUCTIONS

GENERAL. Decibel Products' High Q Cavity Filters are designed to provide additional selectivity to a receiving system or to reduce the sideband noise output of a transmitter. Each cavity is supplied with three sets of coupling loops. The insertion loss values for these coupling loop sets are approximately 0.5 dB, 1.0 dB, and 3.0 dB.

CAVITY INSTALLATION. The cavity can be mounted in practically any location. However, for best results, it should be mounted vertically in a place where it will be protected from rapid temperature changes and where it will not be exposed to the elements.

The cavity has a bracket provided for attachment to a wall or panel. The following procedure should be used.

1. Remove the mounting bracket from the cavity by means of the 3/8" x 1/2" bolt.
2. Using the bracket as a template, drill five 9/32" mounting holes.
3. Attach the bracket to the mounting surface using five 1/4" bolts.
4. Mount the cavity on the bracket using the original 3/8" x 1/2" bolt.

When the correct loops have been selected, (see Table I for color coding of loops) install the loops as follows:

1. Insert the loops in the holes in the side of the cavity such that the end of the loops can be secured to the top of the cavity by means of the 6-32 x 1/2 inch screw and lockwasher.
2. Secure the UHF panel connectors to the cavity by means of the 4—40 screws and lockwashers provided.

TABLE I — LOOP COLOR CODE MARKING

Model No.	Freq. Range	.5 dB Loops	1.0 dB Loops	3.0 dB Loops
DB-4002-A	118-148 MHz	2 Yellow dots	2 Blue dots	2 Brown dots
DB-4002-B	144-174 MHz	1 Yellow dot	1 Blue dot	1 Brown dot
DB-4002-C	406-420 MHz	2 Green dots	2 Orange dots	2 Black dots
DB-4002-D	450-512 MHz	1 Green dot	1 Orange dot	1 Black dot

RECEIVER SELECTIVITY IMPROVEMENT

1. Insert the filter between the receiver input and the antenna (or between a signal generator and the receiver if bench tuning). (A 50 ohm pad should be used between the signal generator and the cavity to insure a proper impedance match).
2. With a signal on the proper frequency being fed to the receiver, tune the cavity until a peak reading is obtained on the limiter. (Care should be taken to insure that the grid current of the limiter is well below limiting). Clockwise rotation of the upper tuning knob increases the resonant frequency of the cavity.
3. If a multiple cavity filter is being used, tune each cavity for maximum limiter reading. Because of the interaction between the cavities it will be necessary to retune each cavity three or four times to insure proper final adjustments.
4. When the tuning is completed tighten the upper and lower tuning knobs while still observing limiter reading to be sure cavity is properly tuned. The cavity tuning is very sharp due to its high Q.

TRANSMITTER NOISE AND SPURIOUS RADIATION REDUCTION

Method 1. Minimum reflected power method.*

(a) Install the filter between the transmitter and a matched dummy load.

(b) Insert an inline wattmeter between the transmitter and the cavity capable of indicating reflected power from the cavity.

(c) Set the transmitter to "tune".

(d) Key the transmitter and tune the cavity for minimum reflected power. This is an indication of proper cavity resonance.

*This tuning method should not be used with the antenna connected to the system. A condition could exist where a reactive mismatch due to the antenna would be cancelled by the off-resonance reactance of the cavity filter. This would leave the filter, although apparently tuned, in an off resonance condition presenting a higher insertion loss to the transmitted signal. Multiple cavity filters are more critical in this respect.

(e) Multiple cavity filters may be tuned by the above method remembering that because of interaction between cavities each cavity may have to be retuned three or four times to insure proper final adjustment.

(f) Switch the transmitter from "tune" to "operate" and repeat (d) and (e).

(g) Remove the wattmeter from the line and connect the transmitter and filter to the antenna. No further tuning should be necessary.

Method 2 — Maximum power method

(a) Install the filter between the transmitter and the antenna.

(b) Insert a wattmeter between the antenna and the filter.

(c) Set the transmitter to "tune" and the wattmeter to read "forward".

(d) Key the transmitter and adjust the cavity(s) for maximum power to the antenna. (For multiple cavity filters retune each cavity three or four times for proper final adjustment).

(e) Set the transmitter from "tune" to "operate" and again retune the cavity(s) for maximum power to the antenna.

(f) Tighten knobs on cavities and remove wattmeter.

NOTE: With some transmitters it may be necessary, because of impedance mismatches, to optimize the length of cable between the transmitter and the first cavity in the filter.

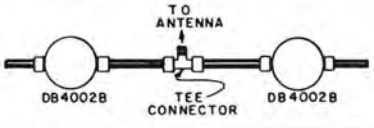
The need for this optimization will be apparent when the output power from the transmitter is reduced by more than the amount absorbed in the cavity(s) due to insertion loss.

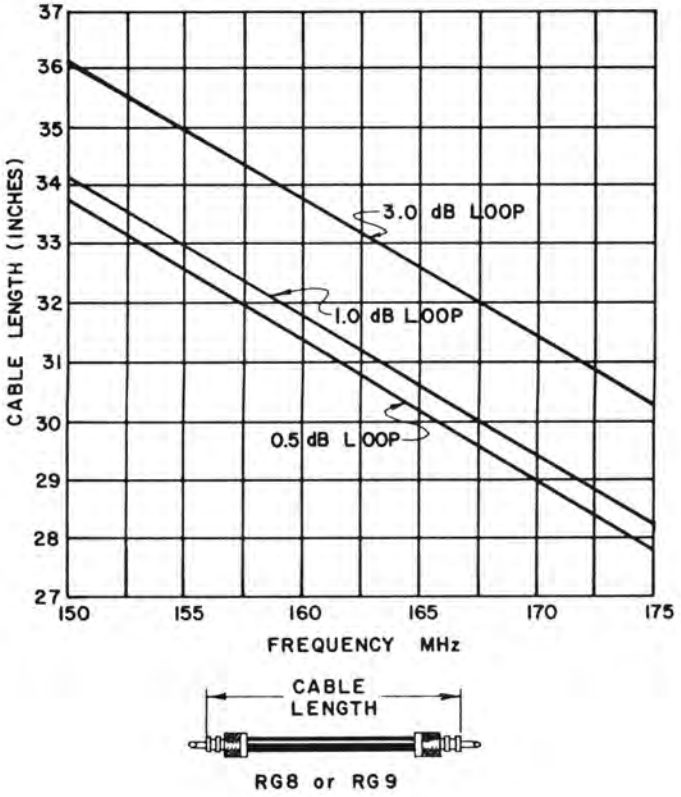
For example: If the cavity has 1.0 dB loops installed but it appears that 1.5 or 2.0 dB is lost through the cavity at resonance.

The optimum length of cable between the transmitter and the cavity may be found empirically by the following method:

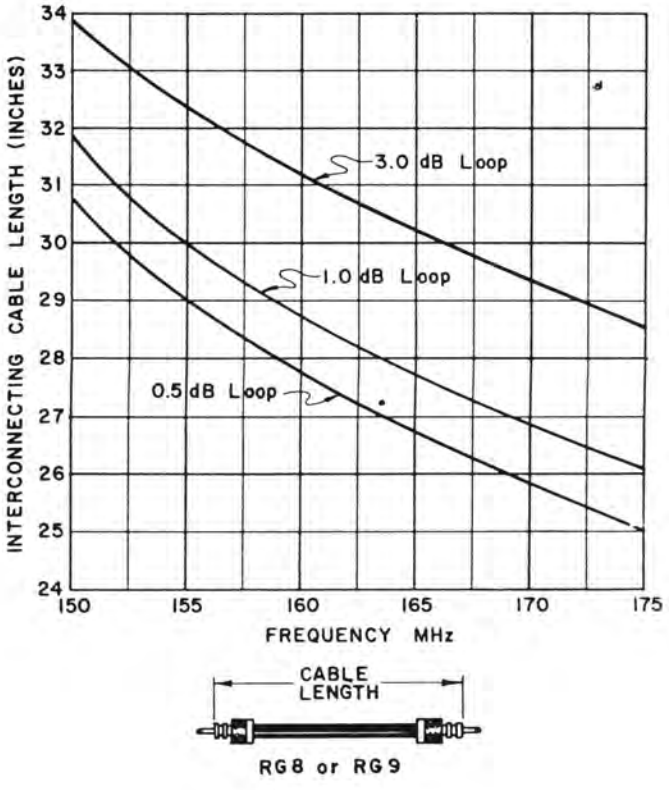
1. Tune the transmitter to its antenna according to the instruction book.
2. Insert the cavity(s), which have been tuned by either of the previous methods, between the transmitter and the antenna. If there is a mismatch problem the cavity will detune the transmitter.
3. Using either short lengths of cable or UG646 elbows increase cable lengths between the transmitter and cavity(s) until there is little or no interaction or detuning between the transmitter and the cavity(s). i.e., the amount of power lost in the cavity is approximately the same as the loop values.
4. Replace the cable containing the UG646 elbows and/or short lengths with a continuous length of cable of equivalent electrical length (1 elbow is approximately 1½" of RG 8 or 9). The system should now be optimized.

CABLE LENGTHS BETWEEN DB4002B CAVITY AND ANTENNA TEE CONNECTOR FOR DUPLEX OPERATION





INTERCONNECTING CABLE LENGTHS FOR QUARTER-WAVE COUPLING DB-4002B CAVITIES



DB4002 11" (279.4 mm) BANDPASS CAVITIES 118-174 and 406-512 MHz

DECIBEL

Four models are offered, DB4002-A for 118-148 MHz, DB4002-B for 144-174 MHz, DB4002-C for 406-420 MHz, and DB4002-D for 450-512 MHz. Installed between the antenna and the transmitter or receiver, the cavities reduce interference that is frequency rejectable.

Each cavity is supplied with adjustable loops which can be set to a nominal insertion loss of 0.5, 1.0 or 3.0 dB.

The cavity should be mounted in a vertical position on a flat surface that is unexposed to the elements.

Design and Construction

The DB4002 provides greater selectivity than smaller or aluminum-made cavities. It has an 11" (279.4 mm) diameter and, with all current carrying surfaces made of copper or silver-plated brass, it has a very high "Q" factor. This is especially important when the attenuated frequency is close to the passed frequency.

To tune the cavity, the tuning knob is turned to vary the piston length in the center coaxial conductor. Contact is maintained by beryllium copper fingerstock with spring compression.

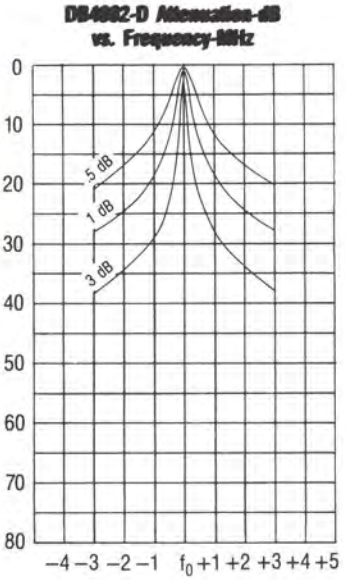
An Invar rod - with nearly zero expansion - assures frequency stability over a wide temperature range.

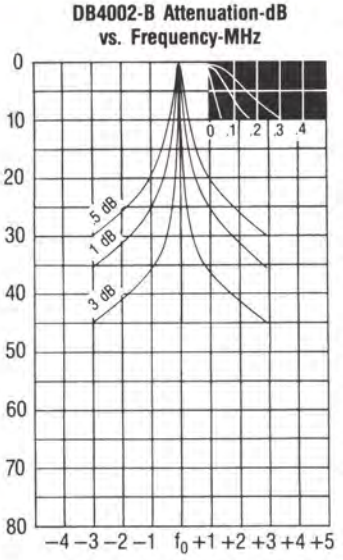
For greater selectivity, two or more cavities can be used in series.

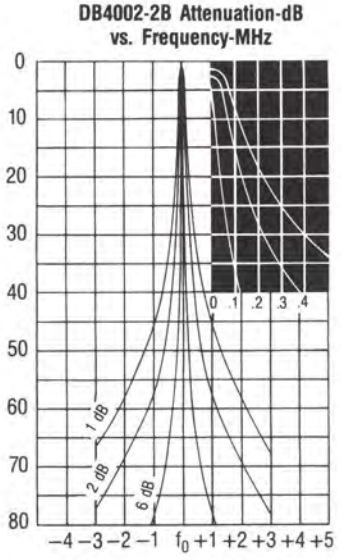
Ordering Information

Order DB4002-A or DB4002-2A two cavity for 118-148 MHz, DB4002-B or DB4002-2B two cavity for 144-174 MHz, DB4002-C or DB4002-2C for 406-420 MHz, and DB4002-D or DB4002-2D for 450-512 MHz. A mounting bracket is included, also instructions for field tuning the cavity.

The three curves correspond to the adjustable loops supplied with the cavity (0.5, 1.0 and 3.0 dB). The black insets expand the frequency scale in the region of 0 to 0.5 MHz.







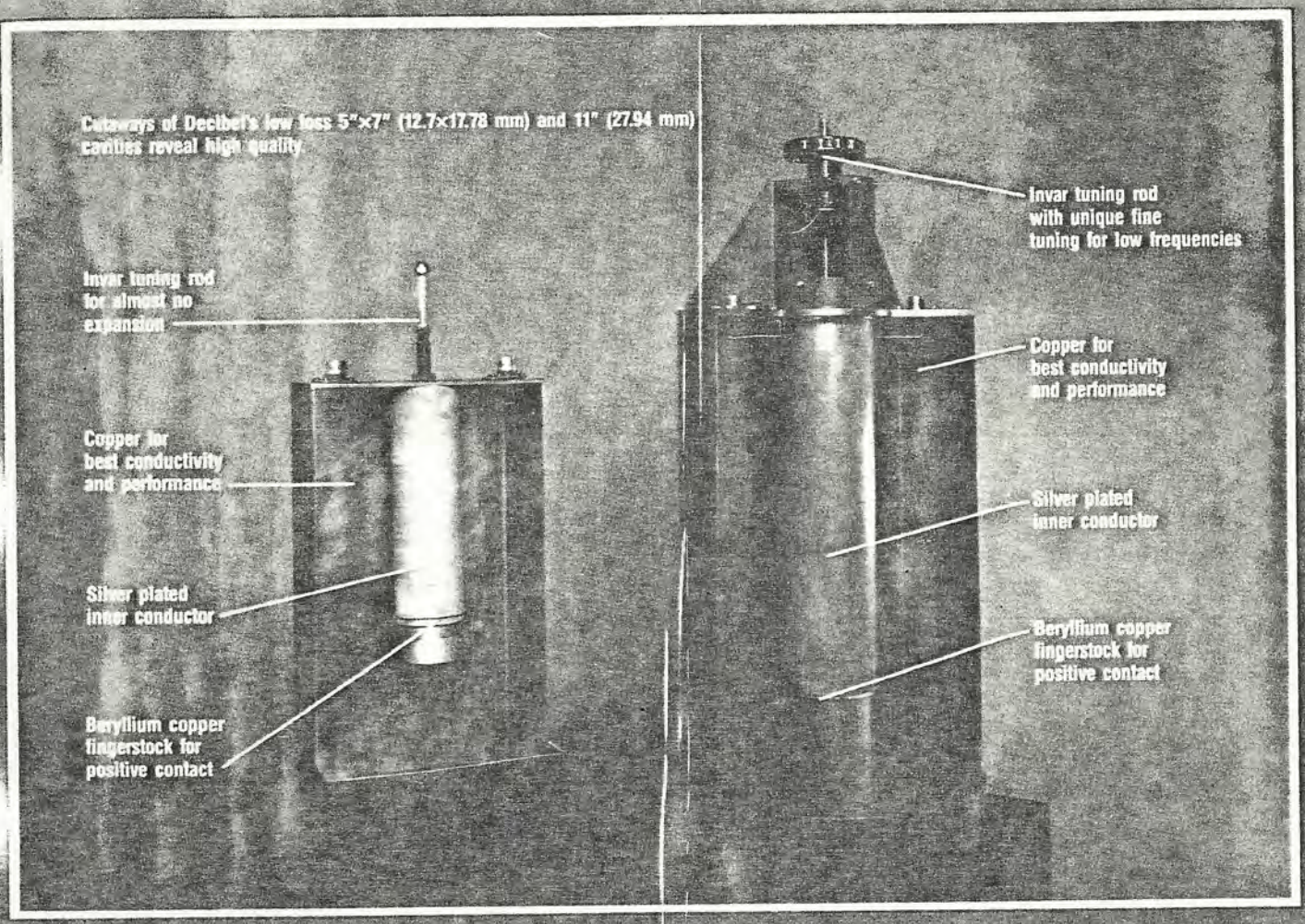
Mechanical Data	
	All models
Materials:	
Outer conductor	Copper
Inner conductor	Copper & Brass
End Plates	Copper & Brass
Coupling loops	Copper
Tuning rod	Invar
Dimensions — in. (mm)	
Individual cavity 11 (279.4) dia. × 31 (787.4)	
Maximum, outside (with tuning rod extended) 12 (304.8)×12 (304.8)×35 (889)	
Connector terminations	UHF Female
Finish	Decibel Tek Black™
Net weight — lbs. (kg)	39 (17.69)
Shipping weight — lbs. (kg)	48 (21.77)

Electrical Data	
Frequency Ranges — MHz	118-148, 144-174, 406-420, 450-512
Insertion loss (desired frequency) loops supplied — dB	.5, 1.0 & 3.0
Attenuation (undesired frequency) - dB	See curves
Nominal impedance — ohms	50
Maximum power input (continuous) with insertion loss per cavity — watts	
At 0.5 dB	400
At 1.0 dB	350
At 3.0 dB	200
Temperature range (for negligible frequency shift) — C°	−30 to +60
Cavity electrical length — wavelength	0.25 @ 118-174 MHz, 0.75 @ 406-512 MHz

3184 QUEBEC ST. • P.O. BOX 569610 • DALLAS TX 75356-9610 • PHONE (214)631-0310 • TELEX 73-0212 • FAX (214)631-4706

30-512 MHz

DECIBEL



Filters—the Quest for Quality!

Decibel's high Q cavities are the basic building blocks of Decibel's high quality filters, duplexers, combiners, etc.

To achieve superior performance, Decibel uses good workmanship and many special techniques and materials. Some of the more important ones include:

☐ The tuning piston is made of a threaded Invar steel rod with almost no expansion, which keeps it tuned in all temperatures.

☐ Copper cavities, completely soldered, are used for highest performance. Less costly aluminum cavities are also used when requirements are less stringent.

☐ Current carrying elements are made of copper or silver plated brass, including the center conductor.

☐ Beryllium copper fingerstock with spring compression is used to maintain positive contact between the fixed and moving parts of the center conductor.

☐ Unique resonators with helical steel or copper pistons are used in some of Decibel's cavities to achieve a 3 to 1 size reduction.

Decibel has also updated products and added new ones, such as SHAPE FACTORED FILTERS®, to meet frequency requirements and customer expectations.

Of course, Decibel's new products — like its standard ones — maintain Decibel's quest for the highest quality.

If you want quality, you want Decibel filters, cavities, duplexers and combiners.