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Engineering Kits

Engineering Evaluation Kits

In order to assist the design engineer concerned with EMI suppression, Fair-Rite was the first ferrite manufacturer to offer engineering evaluation kits. These kits are designed to reflect the different mechanical and frequency requirements of all types of suppression applications. Each kit contains a sampling of suppression cores for use in the original design phase or in situations where a retrofit proves necessary.

Bead, Balun and Broadband Kit II.
Part Number 0199000011.
This kit is the latest version of the first engineering kit introduced in 1978. It has an assortment of 34 parts, consisting of small shield beads, beads on leads and multi-aperture cores. To obtain optimum performance over a broad frequency spectrum, samples are supplied in several Fair-Rite materials.

Expanded Cable and Connector EMI Suppressor Kit.
Part Number 0199000005.
This is our most popular engineering kit. As the name implies, this kit provides a broad sampling of suppression cores, specifically designed to attenuate EMI between all types of cable connected systems. To assemble the split cable suppression cores, nylon cases and steel clips are included in this kit.

Expanded Bead-on-Lead EMI Suppressor Kit.
Part Number 0199000010.
Twenty-four wired beads in three basic design geometries are included in this evaluation kit. These beads are supplied in three suppressor materials; 73, 43 and 61.

Fair-Rite EMI Suppressor Retro Kit.
Part Number 0199000008.
This evaluation kit contains two sets each of ten different split cable suppression cores, installed in their appropriate nylon cases. This evaluation kit will prove particularly useful in new and existing designs, that use flat or round connecting cables, where EMI attenuation is required.

Fair-Rite Surface Mount Bead Kit.
Part Number 0199000014.
Twelve surface mount beads in five geometries are in this engineering kit. These SM beads are for use in differential and common-mode applications. Our suppression materials 43, 44 and 73 are all included in this kit.



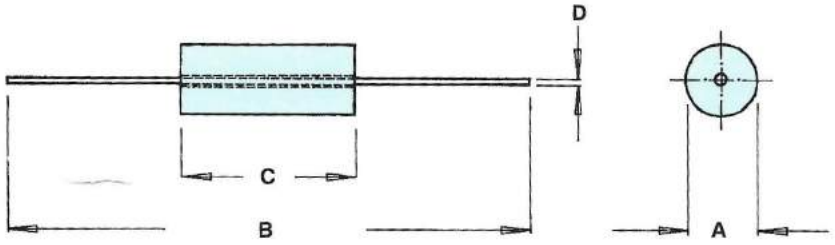
These five Fair-Rite engineering evaluation kits, priced at $ 60.- each, are available from Fair-Rite in Wallkill, NY. They can also be purchased from our distributors. See the back cover of this catalog for a complete listing of our distributors.

PO Box J, One Commercial Row, Wallkill, NY 12589
Phone (914) 895-2055 • FAX (914) 895-2629
E-Mail: ferrites@fair-rite.com

Beads on Leads

Shield beads are supplied assembled on tinned copper wire to aid automated circuit assembly.

- *Available materials: 73, 43, and 61.*
- *Parts with a "2" as the last digit of the part number are supplied taped and reeled per IEC 286-1 and EIA Standard RS-296-E. Inside tape spacing is **52.4±1.5 mm**. These parts can also be supplied not taped and reeled and are then bulk packed. The last digit of bulk packaged parts is "1".*
- *Wires are oxygen free high conductivity copper with a 95/5 tin/lead coating.*
- *For performance data on these parts, see page 53 of section "How to Choose Ferrite Components for EMI Suppression".*
- *Beads are controlled for impedance limits only. They are tested for impedance with a single turn, using a Hewlett Packard HP 4193A Vector Impedance Meter for beads in 73 and 43 material and the HP 4191A RF Impedance Analyzer for 61 material beads.*
- *The Expanded Bead-on-Lead EMI Suppressor Kit (part number 0199000010) is available for prototype evaluation. See page 84.*



Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number*	A	B	C	D	Wt (g)	Impedance (Ω) 73		43		61	
						10 MHz	25 MHz	25 MHz	100 MHz	100 MHz	250 MHz
27 - - 001112	**3.5±0.25** .138	**62.0±1.5** 2.440	**4.45±0.25** .175	**0.65** 22 AWG	.4	38 Min.	61±20%	39 Min.	68±20%	45 Min.	80±20%
27 - - 015112	**3.5±0.25** .138	**62.0±1.5** 2.440	**5.25±0.25** .206	**0.65** 22 AWG	.4	44 Min.	68±20%	43 Min.	82±20%	55 Min.	100±20%
27 - - 005112	**3.5±0.25** .138	**62.0±1.5** 2.440	**6.0±0.25** .236	**0.65** 22 AWG	.4	50 Min.	78±20%	48 Min.	91±20%	60 Min.	113±20%
27 - - 003112	**3.5±0.25** .138	**62.0±1.5** 2.440	**6.7±0.25** .263	**0.65** 22 AWG	.5	56 Min.	86±20%	52 Min.	100±20%	70 Min.	125±20%
27 - - 004112	**3.5±0.25** .138	**62.0±1.5** 2.440	**7.6±0.3** .300	**0.65** 22 AWG	.5	64 Min.	99±20%	60 Min.	110±20%	75 Min.	144±20%
27 - - 002112	**3.5±0.25** .138	**62.0±1.5** 2.440	**8.9±0.3** .350	**0.65** 22 AWG	.6	75 Min.	115±20%	70 Min.	133±20%	90 Min.	168±20%
27 - - 007112	**3.5±0.25** .138	**62.0±1.5** 2.440	**9.5±0.3** .374	**0.65** 22 AWG	.6	88 Min.	135±20%	77 Min.	150±20%	100 Min.	180±20%
27 - - 008112	**3.5±0.25** .138	**62.0±1.5** 2.440	**11.4±0.4** .450	**0.65** 22 AWG	.7	100 Min.	156±20%	93 Min.	180±20%	115 Min.	213±20%
27 - - 009112	**3.5±0.25** .138	**62.0±1.5** 2.440	**13.8±0.5** .545	**0.65** 22 AWG	.8	121 Min.	190±20%	114 Min.	220±20%	140 Min.	258±20%
2743012201+	**9.8±0.3** .385	**62.0±1.5** 2.440	**11.4±0.4** .449	**0.8** 20 AWG	4.5	–	–	154 Min.	271±20%	–	–
2743013211+	**9.8±0.3** .385	**62.0±1.5** 2.440	**14.0±0.5** .550	**0.8** 20 AWG	5.5	–	–	188 Min.	331±20%	–	–
2743014221+	**9.8±0.3** .385	**62.0±1.5** 2.440	**16.5±0.5** .650	**0.8** 20 AWG	6.5	–	–	224 Min.	391±20%	–	–

* *Insert desired material in 3rd & 4th digit positions.*
\+ *Not available taped and reeled.*

Multi-Aperture Cores

Multi-aperture cores are used in balun (balance-unbalance) transformers and find wide application as broadband transformers in communication and CATV circuits.

- *Available materials: 65, 61, 43 and 73. (65 material is not recommended for new designs.)*
- *All multi-aperture cores are supplied burnished.*
- *For additional technical information on the use of these cores, see section "Use of Ferrites in Broadband Transformers" found on page 31.*
- *Beads are controlled for impedance limits only. They are tested for impedance with a single turn through two holes, using a Hewlett Packard HP 4193A Vector Impedance Meter.*

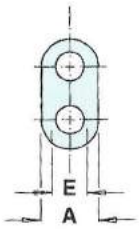
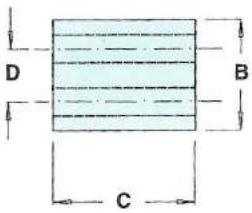


Figure 1



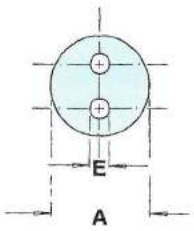
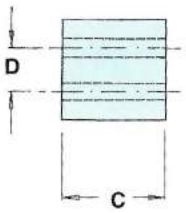
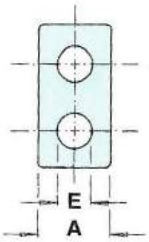


Figure 2





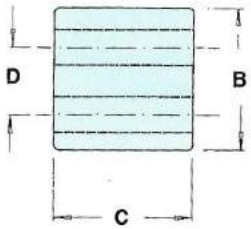


Figure 3

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number**	Fig.	A	B	C*	D	E	Wt (g)	Impedance (Ω) 73	43	61	65
								25 MHz	100 MHz	100 MHz	100 MHz
28 - - 002302	1	2.0±0.15 .079	3.45±0.25 .136	2.35±0.25 .093	1.45±0.1 .057	0.75±0.25 .034	.1	35 Min.	35 Min.	30 Min.	30 Min.
28 - - 002702	1	4.2 - 0.25 .160	7.0±0.25 .276	3.1±0.25 .122	2.9±0.1 .114	1.7+ 0.2 .071	.3	30 Min.	40 Min.	35 Min.	35 Min.
28 - - 002402	1	4.2 - 0.25 .160	7.0±0.25 .276	6.2±0.25 .244	2.9±0.1 .114	1.7+ 0.2 .071	.5	60 Min.	80 Min.	70 Min.	70 Min.
28 - - 001802	2	6.35±0.25 .250	–	6.15±0.25 .242	2.75±0.2 .108	1.1 + 0.3 .050	.8	85 Min.	105 Min.	95 Min.	95 Min.
28 - - 001702	2	6.35±0.25 .250	–	12.0±0.35 .471	27.5±0.2 .108	1.1 + 0.3 .050	1.6	160 Min.	205 Min.	185 Min.	185 Min.
28 - - 001502	1	7.5±0.35 .295	13.3±0.6 .525	6.6±0.25 .260	5.7±0.25 .225	3.8±0.25 .150	1.7	40 Min.	70 Min.	55 Min.	55 Min.
28 - - 000302	1	7.5±0.35 .295	13.3±0.6 .525	10.3±0.3 .407	5.7±0.25 .225	3.8±0.25 .150	2.6	60 Min.	110 Min.	85 Min.	85 Min.
28 - - 000102	1	7.5±0.35 .295	13.3±0.6 .525	13.4±0.3 .528	5.7±0.25 .225	3.8±0.25 .150	3.5	75 Min.	140 Min.	110 Min.	110 Min.
28 - - 000202	1	7.5±0.35 .295	13.3±0.6 .525	14.35±0.5 .565	5.7±0.25 .225	3.8±0.25 .150	3.7	85 Min.	145 Min.	120 Min.	120 Min.
28 - - 006802	1	7.5±0.35 .295	13.3±0.6 .525	27.0±0.75 1.062	5.7±0.25 .225	3.8±0.25 .150	7.0	155 Min.	240 Min.	225 Min.	225 Min.
2843010402	3	9.5±0.25 .375	19.45±0.4 .765	12.7±0.5 .500	9.9±0.25 .390	4.75±0.2 .187	7.5	–	160 Min.	–	–
2843010302	3	9.5±0.25 .375	19.45±0.4 .765	25.4±0.7 1.000	9.9±0.25 .390	4.75±0.2 .187	18	–	320 Min.	–	–
2843009902	3	14.25±0.3 .560	28.7±0.6 1.130	28.7±0.7 1.130	14.0±0.3 .550	6.35±0.15 .250	48	–	400 Min.	–	–
2861010002	3	15.0±0.4 .590	30.2±0.6 1.190	28.7±0.7 1.130	14.0±0.3 .550	6.8±0.2 .268	46	–	–	480 Min.	–

** *Insert desired material in 3rd & 4th digit positions.*

* *This dimension may be modified to suit specific applications.*

Fair-Rite Products Corp.
PO Box J, One Commercial Row, Wallkill, NY 12589
Phone (914) 895-2055 • FAX (914) 895-2629
E-Mail: ferrites@fair-rite.com

PC Beads

Muliple single turn printed circuit beads or multi-turn printed circuit beads are available in four sizes in Fair-Rite 43 material. The beads are supplied with tinned copper jumper wires which complete the desired winding configuration on the printed circuit board.

- *Available in 43 material.*
- *Jumper wires are oxygen free high conductivity copper with a 95/5 tin/lead coating.*
- *For performance data on PC Beads, see page 59 of section "How to Choose Ferrite Components for EMI Suppression".*
- *Beads are controlled for impedance limits only. They are tested for impedance with a single turn through two end holes, using a Hewlett Packard HP 4193A Vector Impedance Meter.*
- *Wires on top of the beads are covered with a layer of an epoxy.*

Typical Printed Circuit Board Layouts



2943776101
Figure 1-A **3 Turns**

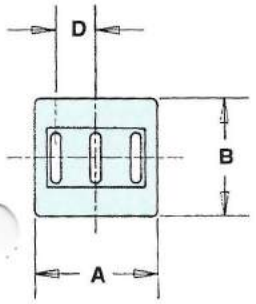


Figure 1

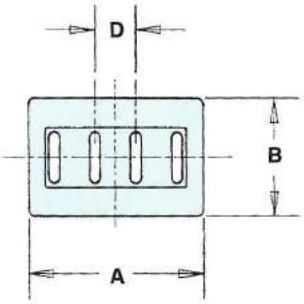
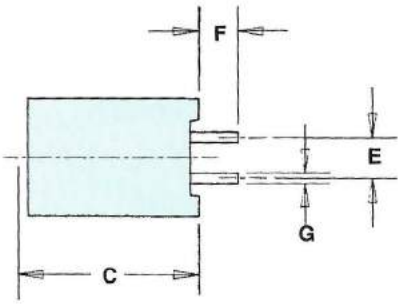
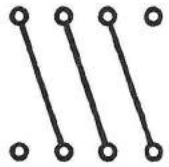


Figure 2





2943778301
Figure 3-A **4 Turns**

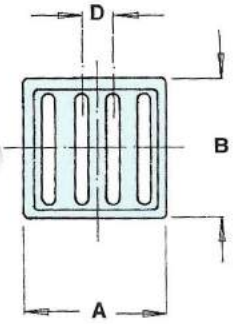


Figure 3

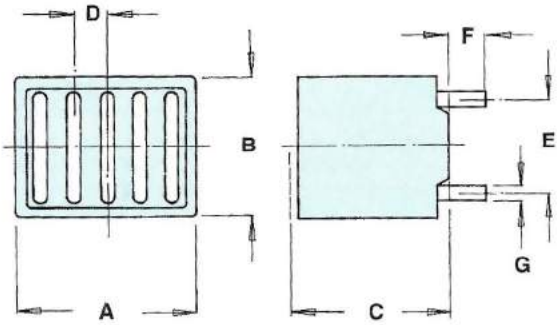
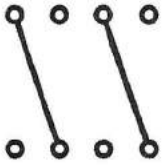


Figure 4



2943778301
Figure 3-B **2 x 2 Turns**



2943770301
Figure 4-A **5 Turns**

Dimensions ***(Bold numbers are in millimeters,*** *light numbers are nominal in inches.)*

Part Number	Fig.	A	B	C Max.	D	E	F Min.	G	Wt (g)	Impedance (Ω) 25 MHz	Impedance (Ω) 100 MHz
2943776101	1	**8.0 - 0.35** .308	**7.6 - 0.5** .290	**11.4** .450	**2.54±0.1** .100	**2.54±0.1** .100	**2.3** .090	**0.65** 22 AWG	2.6	150 Min.	230 Min.
2943778101	2	**11.2 - 0.5** .430	**5.75 - 0.5** .216	**11.4** .450	**2.54±0.1** .100	**2.54±0.1** .100	**2.3** .090	**0.65** 22 AWG	2.7	150 Min.	230 Min.
2943778301	3	**11.2 - 0.5** .430	**11.2 - 0.5** .430	**11.4** .450	**2.54±0.1** .100	**7.6±0.2** .300	**2.3** .090	**0.65** 22 AWG	6.0	175 Min.	270 Min.
2943770301	4	**13.45±0.25** .530	**11.2 - 0.5** .430	**11.4** .450	**2.54±0.1** .100	**7.6±0.2** .300	**2.3** .090	**0.65** 22 AWG	7.4	175 Min.	270 Min.

Wound Beads

Six and eleven hole beads, in 43 material and 61 material, are available as beads and wound with tinned copper wire in several winding configurations.

- *Available materials: 43 and 61.*
- *Parts with a "1" as the last digit of the part number are supplied bulk packed. Parts 29 - - 666651 and 29 - - 666631 can be supplied radially taped and reeled per EIA Standard 468-B. This packing method will change the last digit of the part number to a "4".*
- *Wire used for winding is oxygen free high conductivity copper with a tin plating.*
- *For performance data on Wound Beads, see page 58 of section "How to Choose Ferrite Components for EMI Suppression".*
- *Beads are controlled for impedance limits only. They are tested for impedance using a Hewlett Packard HP 4193A Vector Impedance Meter for beads in 43 material and the HP 4191A RF Impedance Analyzer for 61 material beads.*
- *The Expanded Bead-on-Lead EMI Suppressor Kit (part number 0199000010) is available for prototype evaluation. See page 84.*

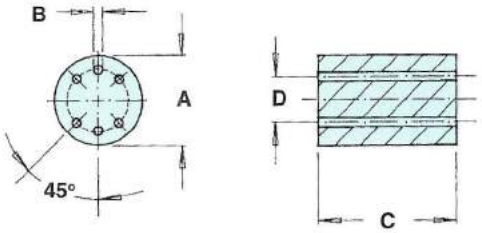


Figure 1

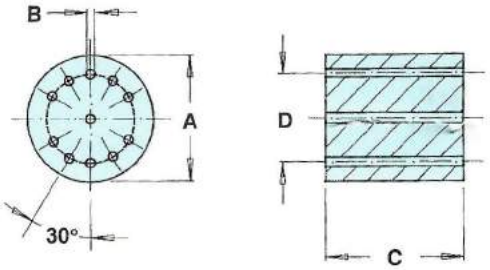


Figure 2

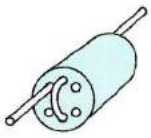


Figure 1-1



Figure 1-2

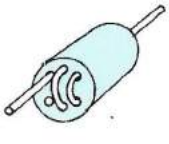


Figure 1-3

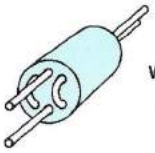


Figure 1-4

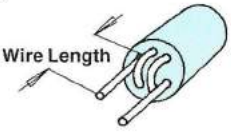


Figure 1-5



Figure 2-1

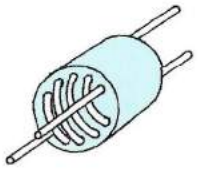


Figure 2-2

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Impedance (Ω)

Part Number*	Fig.	A	B	C	D_{Ref}	Wt (g)	43			61		
							10 MHz	50 MHz	100 MHz	50 MHz	100 MHz	200 MHz
26 - - 666611①	1	**6.0±0.25** .236	**0.75+0.15** .032	**10.0±0.25** .394	**3.5** .138	1.2	170 Min.	320 Min.	375 Min.	250 Min.	425 Min.	325 Min.
2643777711②	2	**10.0±0.25** 3.94	**0.9+0.15** .038	**10.0±0.25** .394	**7.5** .295	3.3	300 Min.	725 Min.	400 Min.	–	–	–

① *Tested with 1½ Turns* ② *Tested with 2½ turns*

Part Number*	Fig.	Turns	Wire Size	Wire Length	Wt (g)	43			61		
						10 MHz	50 MHz	100 MHz	50 MHz	100 MHz	200 MHz
29 - - 666661	1-1	1½	**0.53** 24 AWG	**38.0±3.0** 1.500	1.3	170 Min.	320 Min.	375 Min.	250 Min.	425 Min.	325 Min.
29 - - 666651	1-2	2	**0.53** 24 AWG	**38.0±3.0** 1.500	1.3	240 Min.	520 Min.	480 Min.	525 Min.	600 Min.	300 Min.
29 - - 666671	1-3	2½	**0.53** 24 AWG	**38.0±3.0** 1.500	1.4	320 Min.	680 Min.	580 Min.	750 Min.	675 Min.	275 Min.
29 - - 666681	1-4	2 x 1½	**0.53** 24 AWG	**38.0±3.0** 1.500	1.4	170 Min.	320 Min.	350 Min.	325 Min.	425 Min.	300 Min.
29 - - 666631	1-5	3	**0.53** 24 AWG	**38.0±3.0** 1.500	1.4	400 Min.	800 Min.	550 Min.	950 Min.	625 Min.	250 Min.
2943777741	2-1	4½	**0.65** 22 AWG	**38.0±3.0** 1.500	3.8	750 Min.	1000 Min.	400 Min.	–	–	–
2943777721	2-2	2 x 2½	**0.65** 22 AWG	③	3.9	300 Min.	725 Min.	400 Min.	–	–	–

* *Insert desired material in 3rd & 4th digit positions.*

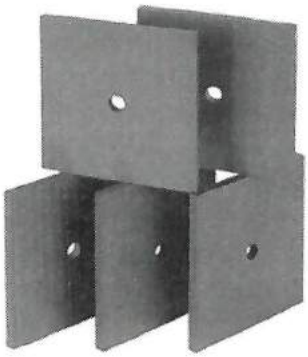
③ *Wire length of one winding is **38.0±3.0** (1.500). Wire length of second winding is **28.5±3.0** (1.125)*

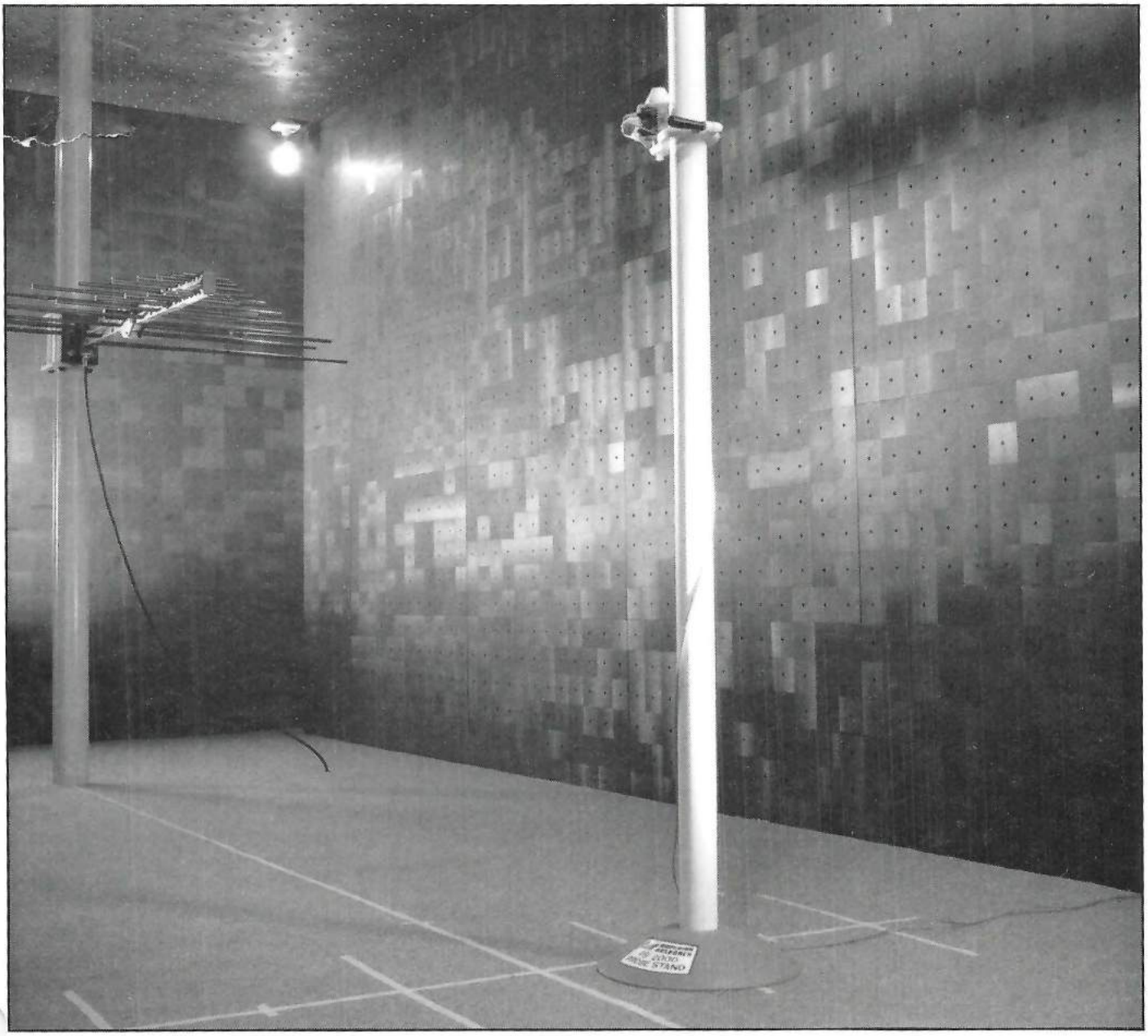
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Tile Absorber

Ferrite Tile Absorber

for EMC Test Chamber
Applications from 30-1500 MHz





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Tile Absorber

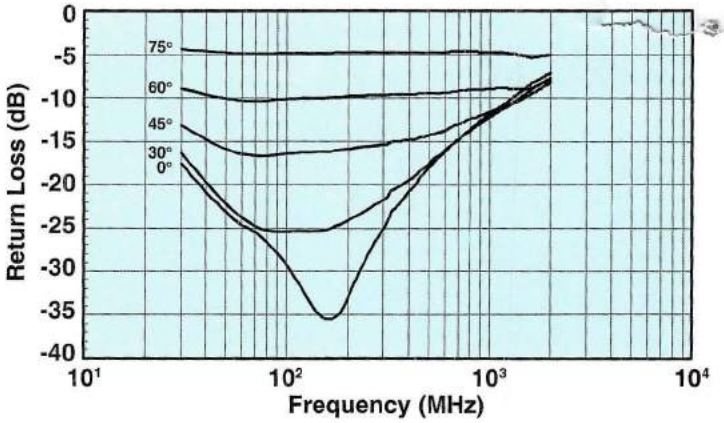
Fair-Rite's 42 material tile absorbers provide plane wave electromagnetic attenuation from 30 - 1500 MHz for use in anechoic chambers for radiated emissions and immunity measurements.

Fair-Rite's tile absorbers were developed using our 42 nickel zinc ferrite material which has been optimized to produce exceptionally consistent, broadband absorption at frequencies down to 26 MHz. The tiles are immune to fire, humidity and chemicals, providing a reliable and compact solution for attenuating plane wave reflections in shielded enclosures.

Physical Characteristics of 42 Material

Specific Gravity	5.2	
Young's Modulus	1.8×10^4	kgf/mm²
Tensile Strength	4.9	kgf/mm²
Compressive Strength	42	kgf/mm²
Flexural Strength	6	kgf/mm²
Vickers Hardness	740	
Coeff. of Thermal Expansion	9	10^{-6}/°C
Initial Permeability (relative)	2100	μ_r
Relative Permittivity	14	ε_r
Resistivity	5×10^6	ohm-cm
Curie Temperature	> 95	°C
Composition	Nickel-Zinc Ferrite	
Power Handling (CW)	400	V/m

Wide-Angle Return Loss – TM Polarization

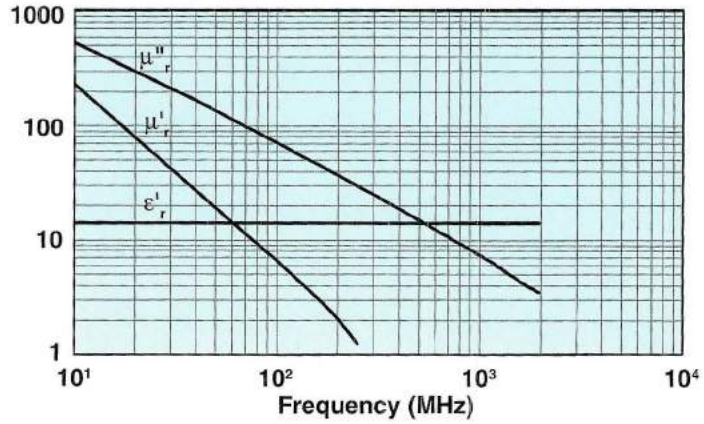


TE Polarization similar. Normal incidence return loss shown above (0°)

Normal Incidence Return Loss (dB)

	Freq (MHz)						
Part Number	30	100	200	400	600	1000	1500
3642011601	-18	-25	-30	-25	-20	-12	-9

Tile Material Properties
Relative Permeability (μ_r) & Permittivity (ε_r)



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Flat Cable Suppression Cores

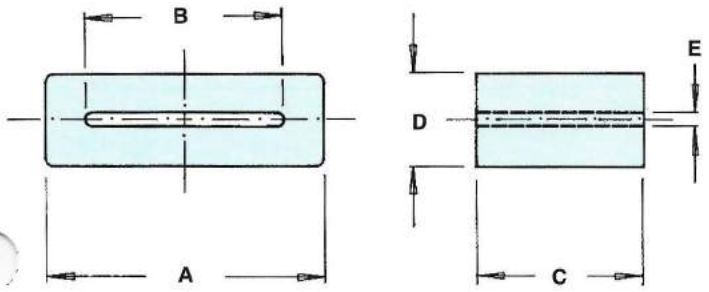


Figure 1

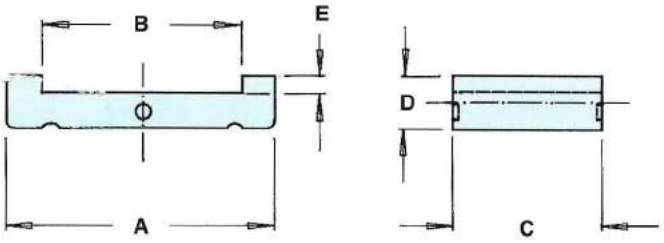


Figure 3

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Flat Cable Suppression Cores

Cases

Dimensions *(**Bold numbers are in millimeters,** light numbers are in inches.)*

Part Number Case	Fig.	A	B	C	D	E	Case Material	Part Number Case & 2 Ferrite Parts
0199166651	1	**49.5** 1.950	**34.3** 1.350	**32.3** 1.270	**8.1** .320	**20.0** .787	Nylon 6/6 Flammability Rating: UL94-V2	0443166651
0199163951	1	**67.8** 2.670	**52.6** 2.070	**32.3** 1.270	**8.1** .320	**38.0** 1.496	Nylon 6/6 Flammability Rating: UL94-V2	0443163951
0199164051	1	**80.8** 3.180	**65.5** 2.580	**32.3** 1.270	**8.1** .320	**50.8** 2.000	Nylon 6/6 Flammability Rating: UL94-V2	0443164051

Clips

Dimensions *(**Bold numbers are in millimeters,** light numbers are in inches.)*

Part Number Clip	Fig.	A	B	C	D	E	F	G	H	J	Clip Material
0199001401	2	**16.1** .635	**11.0** .433	**12.7** .500	**11.4** .450	**8.0** .315	–	–	–	–	**0.5**(.020) High Carbon Steel Finish: Zinc Electroplate
0199010301	3	**21.2** .835	**11.0** .433	**12.7** .500	**16.5** .650	**8.0** .315	**7.5** .295	**4.0** .157	**6.0** .236	**3.0** .118	**0.5**(.020) High Carbon Steel Finish: Zinc Electroplate
0199016051	4	**16.7** .657	**15.9** .626	**15.9** .626	**24.6** .969	**4.35** .171	**3.2** .126	**6.4** .252	–	–	Nylon 6/6 Flammability Rating: UL94-V2
0199016551	4	**16.7** .657	**32.2** 1.27	**15.9** .626	**40.5** 1.59	**4.35** .171	**3.2** .126	**6.4** .252	–	–	Nylon 6/6 Flammability Rating: UL94-V2

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Flat Cable Suppression Cores

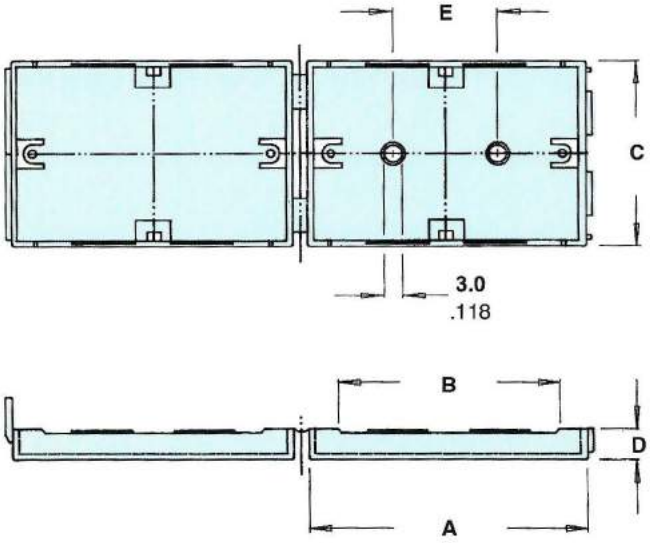


Figure 1

Case has rows of serrated teeth that grip and center the core around the cable. (Patented)

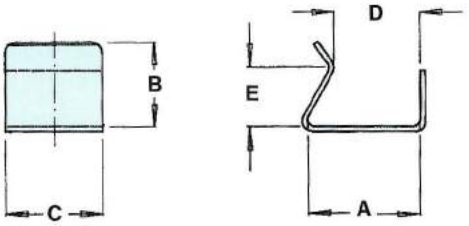


Figure 2

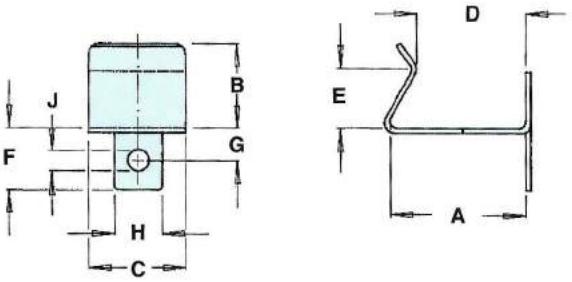


Figure 3

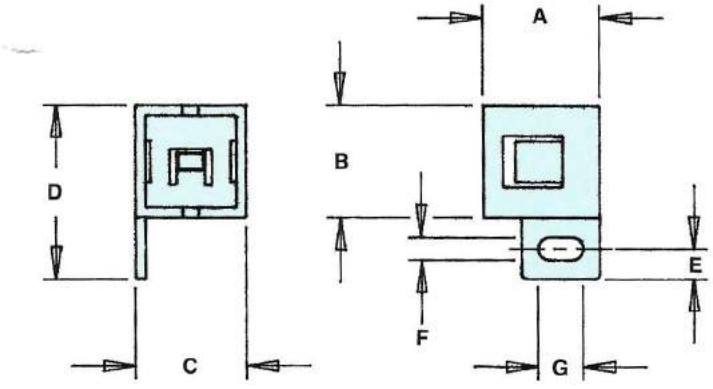


Figure 4

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Round Cable Suppression Cores

Suppression cores for round cables are available for a range of cable diameters. Installed around a cable, these 43 and 44 material cores, attenuate any form of EMI emission.

Nylon cases make the assembly of the core halves a snap. Cores are easily installed in equipment where a retrofit proves necessary. See pages 76 and 77 for available nylon cases.

- *Available materials: 43 and 44*
- *For performance data on Round Cable Suppression Cores, see page 60 of section "How to Choose Ferrite Components for EMI Suppression".*
- *Cores are controlled for impedance limits only. They are tested for impedance with a single turn, using a Hewlett Packard HP 4193A Vector Impedance Meter.*
- *The Expanded Cable and Connector EMI Suppressor Kit (part number 0199000005) and the Fair-Rite EMI Suppressor Retro Kit (part number 0199000008) contain a selection of these suppression cores. See page 84.*

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number	Fig.	Max. Cable Diameter	A	B	C*	D	Wt (g)	Impedance (Ω) 25 MHz	100 MHz	Case P/N*	Case Fig.*
2643166751	1	.100	**7.65 - 0.25** .296	**2.3+0.25** .095	**7.8 - 0.5** .297	**3.9 - 0.25** .148	1.1	48 Min.	93±20%	–	–
2644173951	3	.190	**10.0±0.25** .394	**5.1±0.2** .200	**19.8±0.5** .780	**4.6±0.15** .181	2.6	50 Min.	100±20%	0199173951	3
2644164951	3	.190	**12.3±0.45** .485	**5.1±0.2** .200	**25.4±0.75** 1.000	**6.15±0.2** .242	7.1	130 Min.	235±20%	0199164951	3
2643165451	1	.250	**15.0±0.25** .590	**6.6±0.3** .260	**15.25±0.6** .600	**7.5±0.15** .295	7.3	75 Min.	155±20%	–	–
2643164251	1	.250	**15.0±0.25** .590	**6.6±0.3** .260	**28.6±0.8** 1.125	**7.5±0.15** .295	14	130 Min.	275±20%	0199164251	1
2643164281	3	.250	**15.0±0.25** .590	**6.6±0.3** .260	**28.6±0.8** 1.125	**7.5±0.15** .295	11	123 Min.	260±20%	0199164281	3
2643625006	2	.300	**15.9±0.4** .626	**7.9±0.3** .311	**14.3±0.4** .563	**7.95±0.2** .313	5.0	40 Min.	113±20%	0199625006	2
2643665806	2	.365	**17.5±0.5** .689	**9.5±0.3** .374	**12.7±0.4** .500	**8.75±0.25** .344	5.2	33 Min.	88±20%	0199665806	2
2643167251	1	.390	**18.65±0.4** .735	**10.15±0.3** .400	**28.6±0.8** 1.125	**9.4±0.15** .370	18	110 Min.	225±20%	0199167251	1
2643800506	2	.500	**21.0±0.5** .827	**13.2±0.4** .520	**11.9±0.4** .469	**10.5±0.25** .413	6.0	28 Min.	75±20%	0199800506	2
2643164151	1	.500	**25.9±0.5** 1.020	**13.05±0.3** .514	**28.6±0.8** 1.125	**12.95±0.25** .510	38	125 Min.	250±20%	0199164151	1
2643806406	2	.590	**25.4±0.6** 1.000	**15.5±0.5** .610	**12.7±0.4** .500	**12.7±0.3** .500	9.7	34 Min.	90±20%	0199806406	2
2644173551	1	.720	**25.9±0.5** 1.020	**18.8±0.3** .740	**38.9±0.4** 1.532	**13.0±0.25** .512	33	75 Min.	194±20%	0199173551	2

* *Refer to pages 76 and 77 for dimensions and figures for Round Cable Suppression Core Cases.*

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Round Cable Suppression Cores

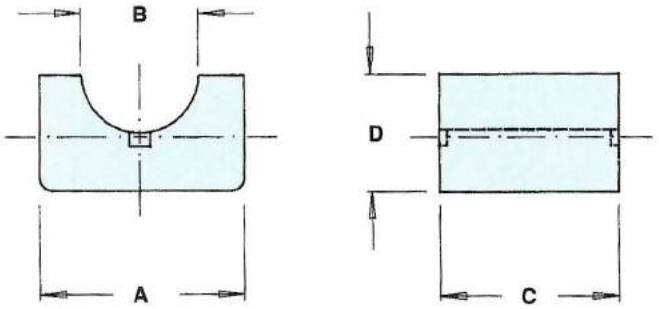


Figure 1

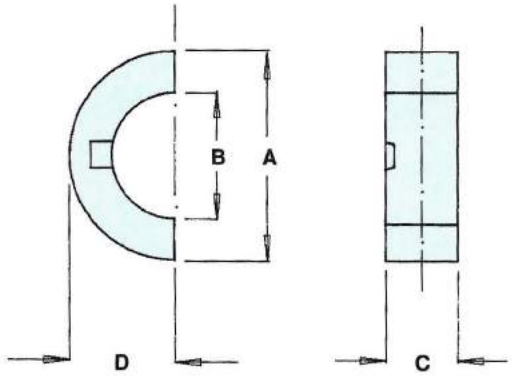


Figure 2

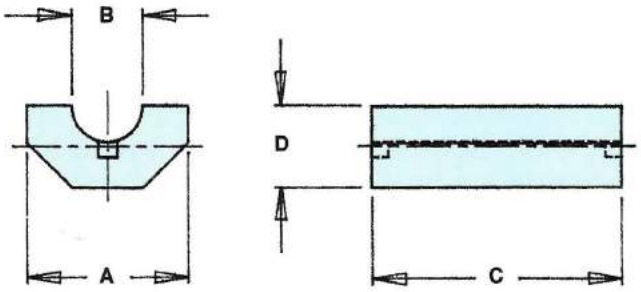


Figure 3

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Round Cable Suppression Cores

Cases

Dimensions *(**Bold numbers are in millimeters,** light numbers are in inches.)*

Part Number Case	Fig.	A	B	C	D	E	Case Material	Part Number Case & 2 Ferrite Parts
0199164251	1	**17.9** .705	**7.0** .275	**32.3** 1.270	**9.2** .362	**9.0** .354	Nylon 6/6 Flammability Rating: UL94-V2	0443164251
0199167251	1	**22.1** .870	**10.2** .402	**32.3** 1.270	**11.7** .461	**9.0** .354	Nylon 6/6 Flammability Rating: UL94-V2	0443167251
0199164151	1	**29.0** 1.142	**13.4** .528	**32.5** 1.280	**14.8** .583	**18.0** .709	Nylon 6/6 Flammability Rating: UL94-V2	0443164151
0199173551	1	**29.2** 1.150	**19.4** .764	**42.0** 1.65	**14.7** .579	–	Nylon 6/6 Flammability Rating: UL94-V2	0444173551
0199625006	2	**24.7** .972	**7.6** .299	**22.8** .898	**10.2** .402	**17.8** .701	Nylon 6/6 Flammability Rating: UL94-V2	0443625006
0199665806	2	**26.3** 1.035	**9.2** .362	**21.4** .843	**11.0** .433	**16.4** .646	Nylon 6/6 Flammability Rating: UL94-V2	0443665806
0199800506	2	**29.7** 1.169	**12.8** .504	**20.6** .811	**12.7** .500	**15.6** .614	Nylon 6/6 Flammability Rating: UL94-V2	0443800506
0199806406	2	**34.3** 1.350	**15.0** .591	**21.2** .835	**15.0** .591	**16.2** .638	Nylon 6/6 Flammability Rating: UL94-V2	0443806406
0199173951	3	**12.8** .504	**4.2** .167	**25.0** .984	**5.6** .220	–	Nylon 6/6 Flammability Rating: UL94-V2	0444173951
0199164951	3	**17.3** .680	**5.3** .210	**36.2** 1.42	**8.41** .331	–	Nylon 6/6 Flammability Rating: UL94-V2	0444164951
0199164281	3	**20.0** .788	**6.9** .270	**39.4** 1.55	**9.78** .385	–	Nylon 6/6 Flammability Rating: UL94-V2	0443164281

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Round Cable Suppression Cores

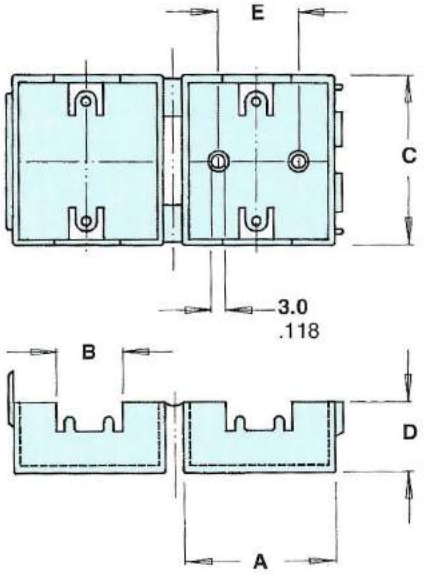


Figure 1

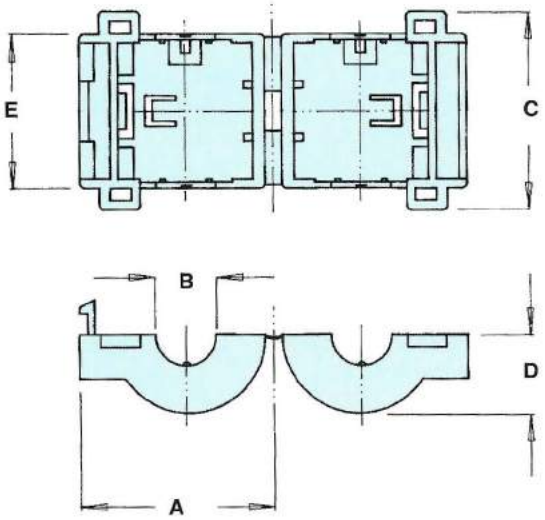


Figure 2

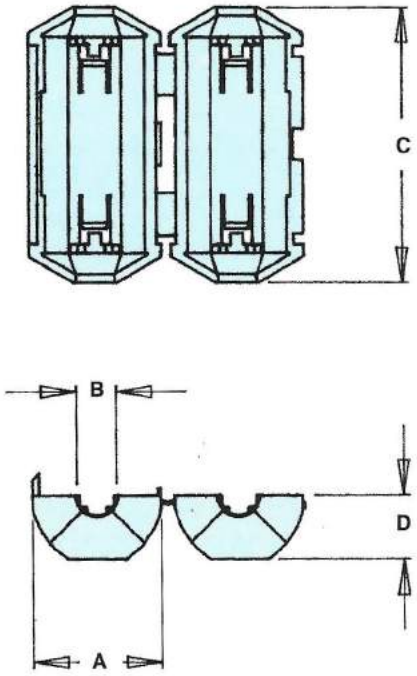


Figure 3

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Connector Suppression Plates

To reduce conducted EMI, "D" type and DIP/Connector suppression plates are available in several sizes and pin layouts.

- *Available in 44 material.*
- *For performance data on Connector Suppression Plates, see page 61 of section "How to Choose Ferrite Components for EMI Suppression".*
- *Impedance specification applies to all holes. They are tested for impedance with a single turn, using a Hewlett Packard HP 4193A Vector Impedance Meter.*
- *The Expanded Cable and Connector EMI Suppressor Kit (part number 0199000005) contains a selection of these cores. See page 84.*

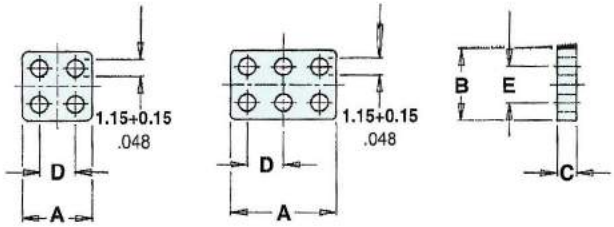


Figure 1-A Figure 1-B

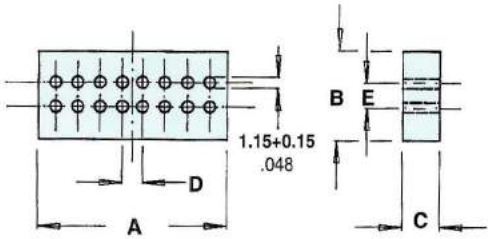


Figure 2

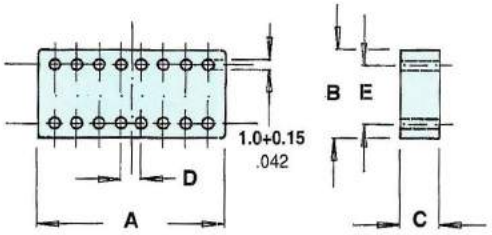


Figure 3

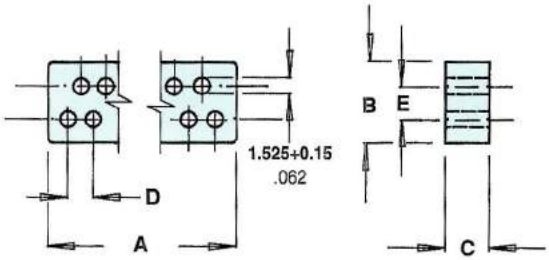


Figure 4

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number	Fig.	Number of Holes	A	B	C*	D	E	Wt (g)	Impedance (Ω) 25 MHz	Impedance (Ω) 100 MHz
2644245901	1-A	4	**4.9±0.13** .193	**4.9±0.13** .193	**1.65 - 0.25** .060	**2.54±0.1** .100	**2.54±0.1** .100	.2	7 Min.	14 Min.
2644245601	1-A	4	**4.9±0.13** .193	**4.9±0.13** .193	**6.6 - 0.5** .250	**2.54±0.1** .100	**2.54±0.1** .100	.8	29 Min.	61 Min.
2644245701	1-B	6	**7.45±0.13** .293	**4.9±0.13** .193	**1.65 - 0.25** .060	**2.54±0.1** .100	**2.54±0.1** .100	.3	7 Min.	14 Min.
2644245801	1-B	6	**7.45±0.13** .293	**4.9±0.13** .193	**6.6 - 0.5** .250	**2.54±0.1** .100	**2.54±0.1** .100	1.2	29 Min.	61 Min.
2644373841	2	16	**20.3±0.5** .800	**9.95±0.2** .392	**3.3 - 0.25** .125	**2.54±0.1** .100	**2.54±0.1** .100	2.9	24 Min.	40 Min.
2644373941	3	16	**21.6±0.5** .850	**11.45±0.25** .450	**1.65 - 0.25** .060	**2.54±0.1** .100	**7.5+0.25** .300	1.6	17 Min.	33 Min.
2644236101	4	9	**14.4±0.15** .567	**7.75 - 0.25** .300	**3.55 - 0.25** .135	**2.75±0.1** .108	**2.85±0.1** .112	1.5	24 Min.	41 Min.
2644236401	4	9	**14.4±0.15** .567	**7.75 - 0.25** .300	**7.1 - 0.5** .270	**2.75±0.1** .108	**2.85±0.1** .112	3.1	49 Min.	82 Min.
2644236301	4	15	**22.55±0.25** .888	**7.75 - 0.25** .300	**3.55 - 0.25** .135	**2.75±0.1** .108	**2.85±0.1** .112	2.3	24 Min.	41 Min.
2644236501	4	15	**22.55±0.25** .888	**7.75 - 0.25** .300	**7.1 - 0.5** .270	**2.75±0.1** .108	**2.85±0.1** .112	4.6	49 Min.	82 Min.
2644236001	4	25	**36.3±0.4** 1.430	**7.75 - 0.25** .300	**3.55 - 0.25** .135	**2.75±0.1** .108	**2.85±0.1** .112	3.6	24 Min.	41 Min.
2644236601	4	25	**36.3±0.4** 1.430	**7.75 - 0.25** .300	**7.1 - 0.5** .270	**2.75±0.1** .108	**2.85±0.1** .112	7.2	49 Min.	82 Min.

** This dimension may be modified to suit specific applications.*

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Miscellaneous Suppression Cores

Fair-Rite has tooled several core geometries for use as EMI attenuators.

- *Available in 43 material.*
- *For technical information on Miscellaneous Suppression Cores, see section "How to Choose Ferrite Components for EMI Suppression" found on page 42.*
- *Cores are controlled for impedance limits only. They are tested for impedance with a single turn, using a Hewlett Packard HP 4193A Vector Impedance Meter.*

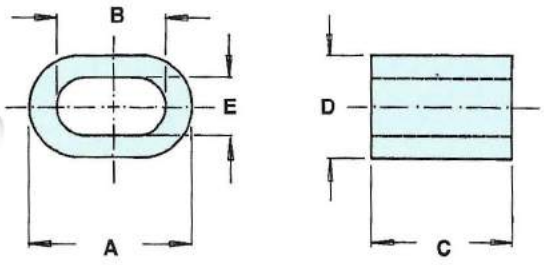


Figure 1

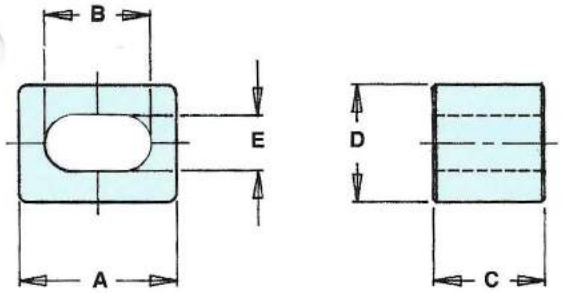


Figure 2

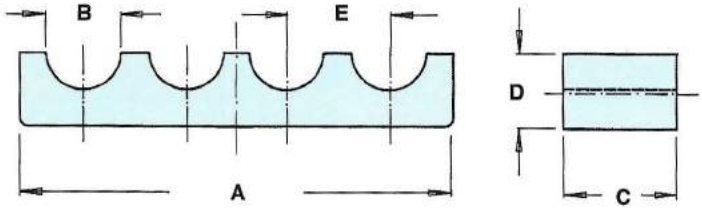


Figure 3

Dimensions ***(Bold numbers are in millimeters,*** *light numbers are nominal in inches.)*

Impedance (Ω)

Part Number	Fig.	A	B	C*	D	E	Wt (g)	25 MHz	100 MHz
2643167851	1	**38.85±0.75** 1.530	**26.15±0.75** 1.030	**28.6±0.7** 1.125	**26.0±0.6** 1.025	**12.95±0.25** .510	85	75 Min.	135 Min.
2643166251	2	**26.7±0.7** 1.052	**17.8±0.5** .701	**18.8±0.4** .740	**19.5±0.5** .770	**9.15±0.50** .360	34	60 Min.	96 Min.
2643165151	3	**82.6±1.6** 3.250	**13.1±0.3** .516	**28.0±0.7** 1.100	**12.95±0.25** .510	**19.05±0.4** .750	109	130 Min.	225 Min.

** This dimension may be modified to suit specific applications.*

SM Beads

Surface mount beads and common-mode surface mount beads are available from Fair-Rite in several sizes. Their rugged construction decreases dc resistance and increases current carrying capacity compared with plated beads.

The Common-Mode surface mount bead provides a common path for the magnetic flux generated by the current to the load and the return current from the load. The current compensation results in zero magnetic flux in the core.

- *Available materials: 43, 44 and 73.*
- *12mm taped SM Beads are supplied taped and reeled per EIA Standard 481-1-A and IEC 286-3. 16mm and 24mm taped SM Beads are supplied taped and reeled per EIA Standard 481-2 and IEC 286-3.*
- *Parts can also be supplied not taped and reeled and then are bulk packed. This packing method will change the last digit of the part number to a "6".*
- *The copper conductors have a 30-60 µinch nickel barrier and a minimum 95/5 tin/lead coating thickness of 200 µinch.*
- *SM Beads meet the solderability specifications when tested in accordance with MIL-STD-202, method 208. After dipping the mounting side of the bead, the solder surface shall be at least 95% covered with a smooth solder coating. The edges of the copper strip are not specified as solderable surfaces.*
- *After preheating the beads to within 100°C of the soldering temperature, the parts meet the resistance to soldering requirements of EIA-186-10E, temperature 260±5°C and time 10±1 seconds.*
- *Suggested land patterns are in accordance with the recommendations of "Surface Mount Land Patterns (Configuration and Design Rules) ANSI/IPC-SM-782".*
- *For performance data on SM Beads, see pages 56 and 57 of section "How to Choose Ferrite Components for EMI Suppression".*
- *SM Beads are controlled for impedance limits only. They are tested for impedance with a single turn, using a Hewlett Packard HP 4191A RF Impedance Analyzer with spring clip fixture HP 16092A. The 2744555577 wound bead is tested for impedance using a Hewlett Packard 4191A RF Impedance Anaylzer with spring clip fixture HP 16092A.*
- *The maximum current rating for these beads is 5 amps.*
- *Common-mode beads can withstand a minimum breakdown voltage of 500VDC.*
- *The Surface Mount Bead Kit (part number 0199000014) is available for prototype evaluation. See page 84.*

Dimensions ***(Bold numbers are in millimeters,*** *light numbers are nominal in inches.)*

Part Number*	Fig.	A	B	C	D	E	Wt (g)	Tape Width	Parts/Reel
27- - 019447	1	**2.85±0.2** .112	**3.05±0.1** .120	**5.1 - 0.85** .184	**1.5±0.5** .059	–	.15	**12**	2800
27- - 021447	1	**2.85±0.2** .112	**3.05±0.1** .120	**9.6 - 0.95** .359	**1.5±0.5** .059	–	.30	**16**	2800
27- - 037447	1	**2.70±0.2** .106	**4.6±0.2** .181	**9.25 - 0.7** .350	**1.2±0.2** .047	–	.45	**16**	2800
27- - 044447	1	**1.52 Max.** .060 Max.	**3.1±0.1** .122	**5.65±0.45** .222	**1.55±0.25** .061	–	.09	**12**	4500
2744041447	2	**2.85±0.2** .112	**5.6±0.2** .220	**5.0 - 0.6** .185	**1.35±0.25** .053	**2.54±0.1** .100	.30	**12**	2400
2744045447	2	**2.85±0.2** .112	**5.6±0.2** .220	**8.9 - 0.8** .335	**1.35±0.25** .053	**2.54±0.1** .100	.53	**16**	2400

* *Insert desired material in 3rd & 4th digit positions.*

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Typical Performance Data

Connector Suppression Plates, page 78

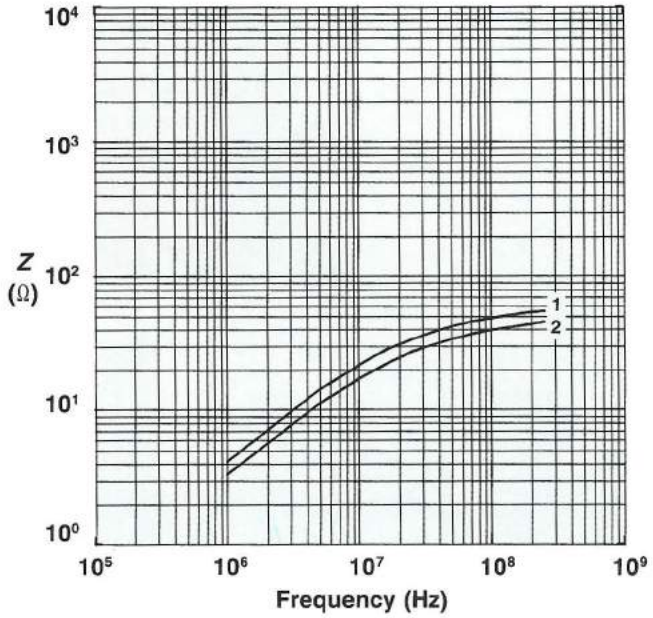


Figure 57 Impedance vs. Frequency for "D" type connector suppression plates, 2644236101, 2644236301 and 2644236001.

1 Inner Holes (7, 13 and 23 respectively)
2 Outer Holes (2)

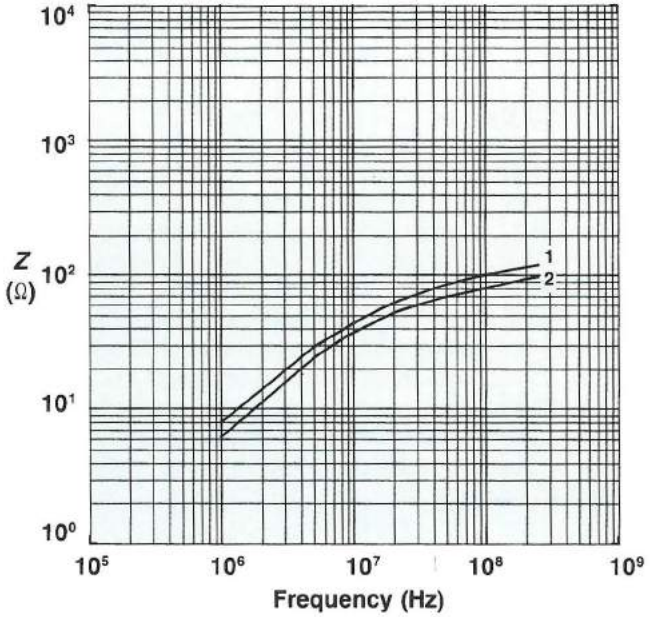


Figure 58 Impedance vs. Frequency for "D" type connector suppression plates, 2644236401, 2644236501 and 2644236601.

1 Inner Holes (7, 13 and 23 respectively)
2 Outer Holes (2)

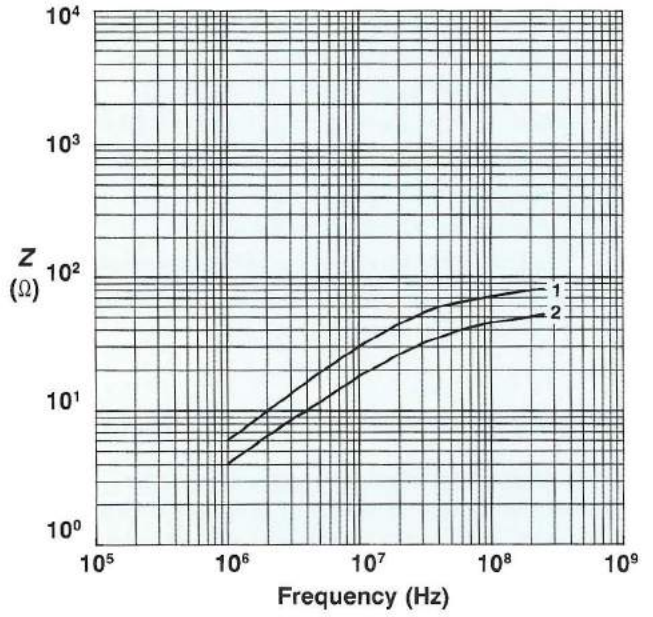


Figure 59 Impedance vs. Frequency for DIP/connector suppression plate 2644373841.

1 Inner Holes (12)
2 Outer Holes (4)

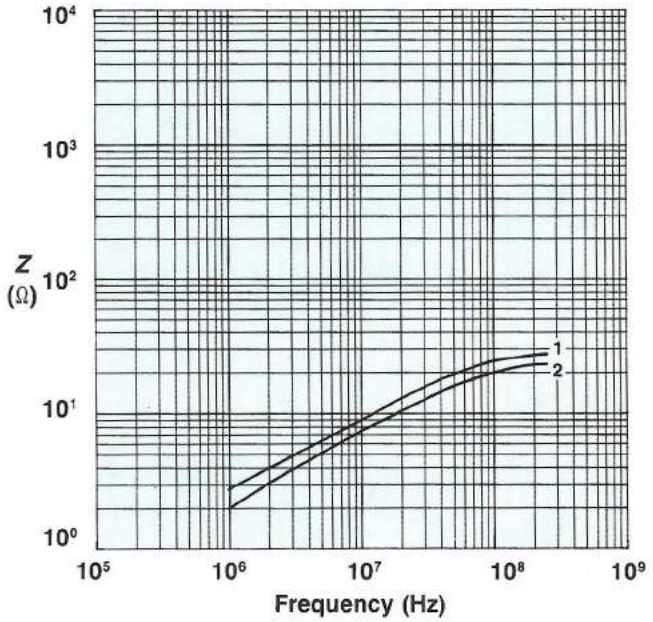
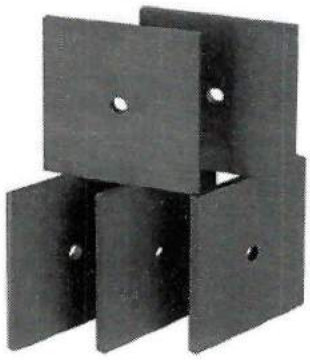


Figure 60 Impedance vs. Frequency for DIP/connector suppression plate 2644373941.

1 Inner Holes (12)
2 Outer Holes (4)

Ferrite Tile Absorber

for EMC Test Chamber Applications



Introduction

Fair-Rite's tile absorbers provide an attractive alternative to traditional large, foam-type absorber materials for new anechoic chambers or for upgrading older rooms for radiated emission and immunity measurements. While ferrite tiles are a relatively recent development, they have come into use wherever high absorption (-15 to -25 dB at <100 MHz) and compact size (6mm vs 2400mm for foam absorbers) are required. There are now hundreds of installations worldwide in compact and 3/10 meter FCC certified chambers. Ferrites themselves are inherently immune to fire, humidity and chemicals providing a reliable and compact solution for attenuating plane wave reflections in shielded enclosures.

Theory of Operation

The basic physics of operation for any planar electromagnetic absorber involves fundamental concepts as shown in Figure 1 . When an electromagnetic wave traveling through free-space encounters a different medium (at Z=0), the wave will be reflected, transmitted, and/or absorbed. It is of course, the magnitude of the reflected signal which is usually of interest in this application. For ferrite tiles, the thickness is tuned so that the relative phases of the reflected and exiting wave cancel to form a resonant condition. This resonant condition appears as a deep "null" in the return loss response. This resonance is also a function of the frequency dependent electrical properties of the ferrite material such as relative permeability (μ_r) and permittivity (ε_r) which interact to determine the reflection coefficient (Γ), impedance (Z) and return loss (RL) according to the following formulas:

$$Z_f = \sqrt{\frac{\mu_r}{\varepsilon_r}} \bullet \tanh\left[\left(\frac{j2\pi d}{\lambda}\right)\left(\sqrt{\mu_r \varepsilon_r}\right)\right] \quad \text{(ohm)}$$

$$\Gamma = \frac{Z_f - Z_0}{Z_f + Z_0}$$

$$RL = 20 \log_{10} (\Gamma) \quad \text{(dB)}$$

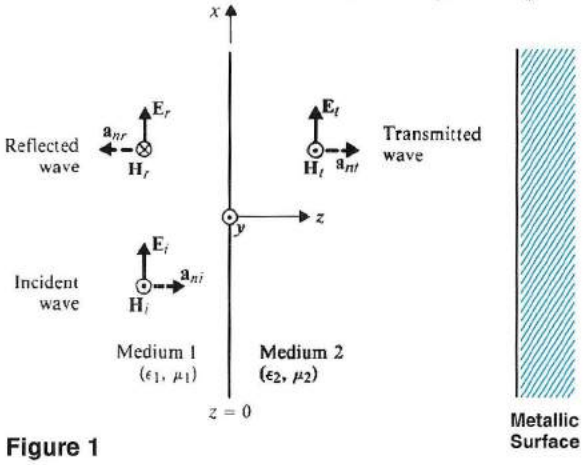


Figure 1

Where :

- μ_1 = relative permeability of medium 1 (air)
- ε_1 = relative permittivity of medium 1 (air)
- μ_2 = relative permeability of medium 2 (ferrite)
- ε_2 = relative permittivity of medium 2 (ferrite)
- Γ = reflection coefficient of metal backed ferrite tile
- Z_f = input impedance of metal backed ferrite tile
- Z_o = impedance of free space (air)
- E_i, H_i = components of incident plane wave
- E_r, H_r = reflected components of incident plane wave
- E_t, H_t = transmitted components of incident plane wave
- d = thickness of medium 2 (ferrite)

Increasing Bandwidth

For some chamber applications increased absorber bandwidth may be desired to comply with high frequency testing needs. One technique shown in figure 2 increases the bandwidth of ferrite tile installations by mounting the tile over a dielectric spacer (typically wood) of appropriate thickness. When both tile and spacer thicknesses are optimized, the frequency response is shifted upward to improve return loss performance from 600-1500 MHz (see figure 3). Of course, if increased bandwidth up to 20 GHz is desired, several absorber vendors provide completely engineered hybrid absorbers using specially designed pyramidal and wedge shaped dielectric absorbers matched to ferrite tiles.

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Ferrite Tile Absorber

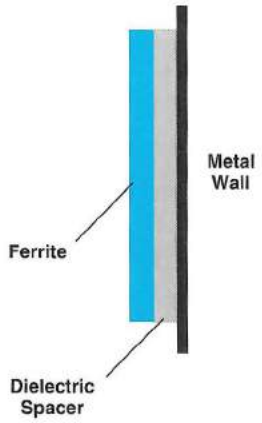
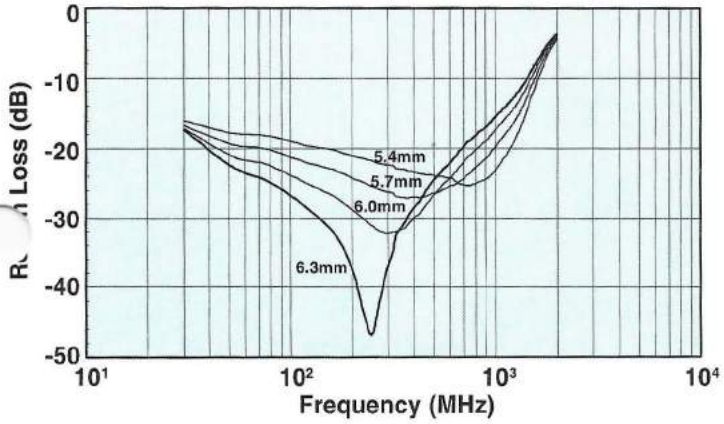


Figure 2

Typical Return Loss with Dielectric Spacer



Spacer Thickness = **13mm**

Figure 3

Wide Angle Absorption

One of the most overlooked aspects of using any absorber is the rolloff of absorption with increasing angle of incidence. Most published absorber data contains only normal incidence return loss (dB) which is typically where the maximum absorption is obtained. Normal incidence is defined as plane wave radation arriving perpendicular (0°) to the plane of the absorbing surface. The curves in figure 4 were generated using equations described in IEEE document "Recommended Practice for RF Absorber Evaluation in the range 30 MHz to 5 GHz". Since the reflections occuring in anechoic chambers seldom illuminate absorber materials at 0°, it is important to consider the reflection angles generated by each chamber geometry and size for best results. For most chambers, the range of angles is in the 40-60° range, however it is usually desirable to operate at < 50°.

Return loss vs angle of incidence for TM polarization is shown in figure 4. Return loss curves for TE polarization (not shown) are similar.

Wide-Angle Return Loss – TM Polarization

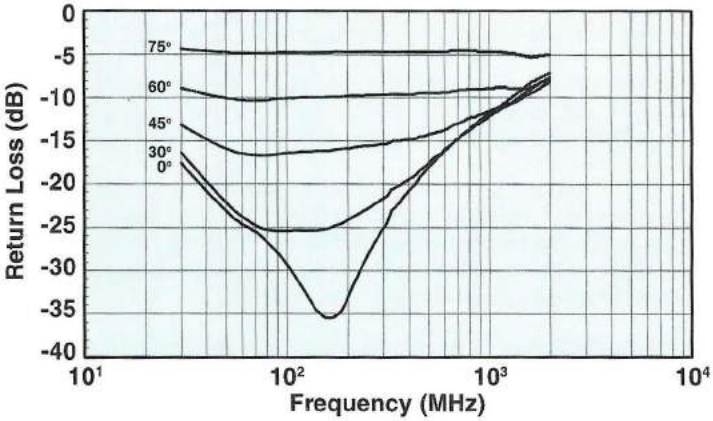


Figure 4

Precision Dimensions

Studies have shown that maximum low-frequency performance is obtained when tile to tile gaps are minimized. Fair-Rite precisely machines each of the six surfaces to ±**0.13mm** (.005") to ensure a tight tile to tile fit for easier installation with less cutting required. Figure 5 illustrates the effect of gaps on tile performance when installed with: no gap (**0mm**), **.25mm** and **1.0mm**. It is critical to maintain contact between tiles for best results. The final results of the completed test chamber will also be degraded by other factors such as lights, gaps around door openings, and exposed metallic conduit.

Reflectivity vs. Tile – Tile Gap Size

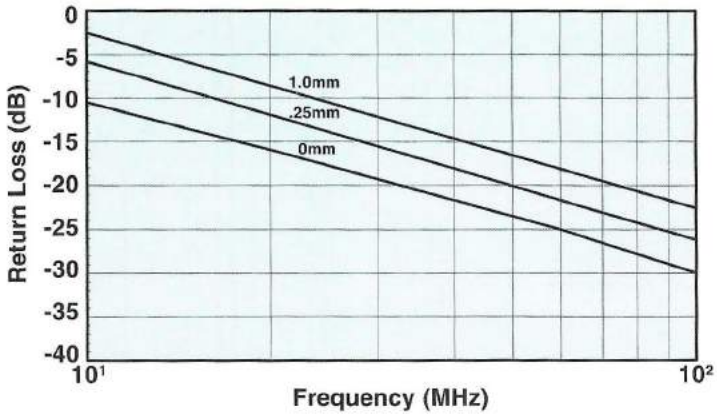


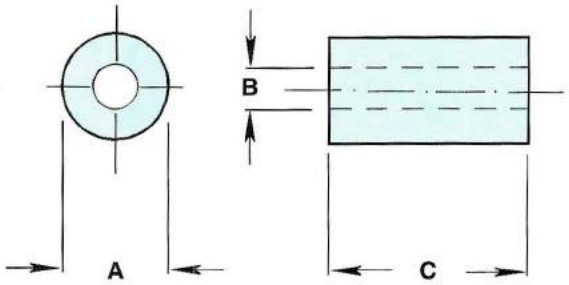
Figure 5

Shield Beads

Listed in ascending order of "B" dimension

Fair-Rite offers a broad selection of shield beads to guaranteed impedance specifications over a wide frequency range.

- *Available materials: 73, 43, and 61.*
- *Beads with a "1" as the last digit of the part number are not burnished, those with the last digit "2" are supplied burnished to break the sharp edges.*
- *Beads can be supplied Parylene coated upon request. The last digit of Parylene coated parts is a "4". The minimum coating thickness for beads is **0.05mm** (.0002"). See page 6 for material characteristics of Parylene C.*
- *The "H" column gives for each bead size the calculated dc bias field in oersted for 1 turn and 1 ampere direct current. The actual dc H field in the application is this value of H times the actual NI (ampere - turn) product. For the effect of the dc bias on the impedance of the bead material, see the graphs on page 49 of this catalog.*
- *For performance data on shield beads, see pages 54 and 55 of section "How to Choose Ferrite Components for EMI Suppression".*
- *Beads are controlled for impedance limits only. They are tested for impedance with a single turn, using a Hewlett Packard HP 4193A Vector Impedance Meter for beads in 73 and 43 material and the HP 4191A RF Impedance Analyzer for 61 material beads.*
- *For any shield bead requirement not listed in the catalog, feel free to contact our customer service group for availability and pricing.*



Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number**	A	B	C*	Wt (g)	H (Oe)	Impedance(Ω) 73		43		61	
						10 MHz	25 MHz	25 MHz	100 MHz	100 MHz	250 MHz
2673901301	0.95 - 0.05 .036	0.45+0.1 .020	3.8±0.2 .150	.01	6.0	13 Min.	24±20%	–	–	–	–
2673903301	1.0 - 0.05 .038	0.45+0.15 .021	5.6±0.25 .220	.01	5.7	19 Min.	35±20%	–	–	–	–
26 - - 004601	1.1 - 0.1 .041	0.65+0.1 .028	4.1 - 0.3 .156	.01	4.7	10 Min.	29±20%	10 Min.	31±20%	–	–
26 - - 004701	1.45 - 0.15 .054	0.7+0.1 .029	2.3±0.15 .090	.01	4.0	10 Min.	17±20%	10 Min.	26±20%	–	–
2643004101	3.5±0.2 .138	0.75+0.1 .031	4.45±0.35 .175	.11	2.6	–	–	39 Min.	70±20%	–	–
2643004201	3.5±0.2 .138	0.75+0.1 .031	8.9±0.5 .350	.22	2.6	–	–	78 Min.	140±20%	–	–
2673030101	1.22 - 0.13 .045	0.8+0.1 .033	5.3 - 0.45 .200	.01	4.1	9 Min.	17±20%	–	–	–	–
2673025301	1.25 - 0.1 .047	0.8+0.1 .033	3.8±0.2 .150	.01	4.0	8 Min.	15±20%	–	–	–	–
2673010101	1.95 - 0.25 .072	0.8+0.1 .033	10.0 - 0.4 .384	.08	3.3	44 Min.	77±20%	–	–	–	–
2643706001	3.5±0.25 .138	0.8+0.1 .033	2.7 - 0.45 .097	.06	2.5	–	–	21 Min.	45±20%	–	–
2673025001	1.42±0.05 .056	0.85+0.1 .034	3.8±0.2 .150	.02	3.6	10 Min.	20±20%	–	–	–	–
2643020501	1.65±0.025 .065	0.85+0.1 .034	3.68 - 0.25 .140	.02	3.4	–	–	17 Min.	35±20%	–	–

** * Insert desired material in 3rd & 4th digit positions.*
** This dimension may be modified to suit specific applications.*

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Shield Beads

Listed in ascending order of "B" dimension

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number**	A	B	C*	Wt (g)	H (Oe)	Impedance(Ω) 73		43		61	
						10 MHz	25 MHz	25 MHz	100 MHz	100 MHz	250 MHz
26 - - 004801	**2.1 - 0.15** .080	**0.85+0.1** .034	**2.9 - 0.45** .105	.03	3.1	16 Min.	28±20%	14 Min.	31±20%	–	–
2673028602	**2.13 - 0.1** .082	**0.85+0.1** .034	**5.6±0.15** .220	.09	2.7	25 Min.	50±20%	–	–	–	–
2673012401	**1.55 - 0.1** .059	**0.95+0.15** .040	**4.2 - 0.25** .160	.02	3.3	9 Min.	15±20%	–	–	–	–
26 - - 002201	**1.95 - 0.2** .072	**1.05+0.1** .043	**10.4±0.25** .410	.08	2.9	30 Min.	55±20%	27 Min.	58±20%	–	–
26 - - 000501	**2.0 - 0.15** .076	**1.05+0.1** .043	**1.7 - 0.35** .060	.01	2.8	7 Min.	12±20%	7 Min.	22±20%	–	–
26 - - 000201	**2.0 - 0.15** .076	**1.05+0.1** .043	**3.8±0.25** .150	.03	2.8	15 Min.	27±20%	13 Min.	31±20%	–	–
26 - - 000101	**3.5±0.2** .138	**1.3±0.1** .051	**3.25±0.25** .128	.10	2.0	20 Min.	35±20%	21 Min.	40±20%	22 Min.	43±20%
26 - - 000301	**3.5±0.2** .138	**1.3±0.1** .051	**6.0±0.25** .236	.18	2.0	35 Min.	62±20%	37 Min.	60±20%	40 Min.	70±20%
26 - - 000701	**3.5±0.2** .138	**1.3±0.1** .051	**12.7±0.35** .500	.38	2.0	70 Min.	125±20%	71 Min.	125±20%	110 Min.	188±20%
2643200101	**5.1±0.25** .200	**1.45+0.25** .062	**3.4 - 0.45** .125	.19	1.5	–	–	24 Min.	41±20%	–	–
26 - - 022401	**5.1±0.25** .200	**1.45+0.25** .062	**6.35±0.25** .250	.38	1.5	43 Min.	68±20%	44 Min.	82±20%	54 Min.	93±20%
26 - - 021801	**5.1±0.25** .200	**1.45+0.25** .062	**11.1±0.35** .437	.67	1.5	75 Min.	120±20%	77 Min.	131±20%	95 Min.	163±20%
26 - - 023801	**5.1±0.25** .200	**1.45+0.25** .062	**22.85±0.75** .900	1.4	1.5	–	–	154 Min.	266±20%	190 Min.	326±20%
2643001501	**3.5±0.2** .138	**1.6±0.1** .063	**3.25±0.25** .128	.10	1.7	–	–	17 Min.	35±20%	–	–
2643025601	**3.5±0.2** .138	**1.6±0.1** .063	**6.0±0.25** .236	.18	1.7	–	–	30 Min.	55±20%	–	–
2643023201	**2.85±0.1** .112	**1.65+0.15** .068	**3.75±0.25** .147	.06	1.8	–	–	12 Min.	30±20%	–	–
2673018001	**2.85±0.1** .112	**1.65+0.15** .068	**6.65±0.25** .262	.12	1.8	23 Min.	41±20%	–	–	–	–
2673004901	**2.85±0.1** .112	**1.65+0.15** .068	**10.45±0.25** .410	.18	1.8	32 Min.	58±20%	–	–	–	–
2643013801	**3.5±0.2** .138	**1.65+0.25** .070	**4.05±0.25** .160	.12	1.6	–	–	19 Min.	38±20%	–	–
26 - - 001601	**3.55±0.15** .140	**1.65+0.25** .070	**3.3 - 0.4** .122	.09	1.6	13 Min.	24±20%	15 Min.	30±20%	–	–
2643001301	**3.55±0.15** .140	**1.65+0.25** .070	**5.95±0.25** .234	.18	1.6	–	–	25 Min.	48±20%	–	–
2673015301	**4.1 - 0.25** .156	**1.8±0.15** .071	**6.85±0.25** .270	.26	1.5	33 Min.	59±20%	–	–	–	–
2643005701	**5.1±0.25** .200	**2.3±0.2** .090	**12.7±0.35** .500	.81	1.2	–	–	62 Min.	120±20%	–	–
26 - - 000801	**7.5±0.25** .296	**2.25+0.25** .094	**7.55±0.25** .297	1.0	1.0	38 Min.	60±20%	50 Min.	92±20%	–	–
2643300101	**7.6±0.25** .300	**2.25+0.25** .094	**15.1±0.75** .595	2.1	1.0	–	–	92 Min.	165±20%	–	–
2673200201	**5.2±0.15** .205	**2.65±0.25** .105	**20.6±0.75** .812	1.3	1.1	70 Min.	125±20%	–	–	–	–
26 - - 003201	**6.0 - 0.9** .210	**2.65±0.25** .105	**12.7±0.5** .500	.87	1.1	47 Min.	85±20%	50 Min.	88±20%	–	–
2643250402	**6.35±0.15** .250	**2.95+0.45** .125	**12.7±0.5** .500	1.2	.91	–	–	55 Min.	102±20%	–	–
2643250302	**6.35±0.15** .250	**2.95+0.45** .125	**15.9±0.5** .625	1.5	.91	–	–	68 Min.	122±20%	–	–
2643250202	**6.35±0.15** .250	**2.95+0.45** .125	**25.4±0.75** 1.000	2.5	.91	–	–	108 Min.	200±20%	–	–

** * Insert desired material in 3rd & 4th digit positions.*
** This dimension may be modified to suit specific applications.*

Shield Beads

Listed in ascending order of "B" dimension

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number	A	B	C*	Wt (g)	H (Oe)	Impedance(Ω) 73		43		61	
						10 MHz	25 MHz	25 MHz	100 MHz	100 MHz	250 MHz
2643375102	**9.5±0.25** .375	**4.5+0.75** .192	**6.35±0.35** .250	1.4	.60	–	–	28 Min.	50±20%	–	–
2643375002	**9.5±0.25** .375	**4.5+0.75** .192	**14.5±0.6** .570	3.1	.60	–	–	62 Min.	115±20%	–	–
2643006302	**9.5±0.25** .375	**4.75+0.3** .193	**10.4±0.25** .410	2.2	.60	–	–	42 Min.	80±20%	–	–
2643023402	**9.5±0.25** .375	**4.75+0.3** .193	**15.9±0.45** .625	3.4	.60	–	–	66 Min.	120±20%	–	–
2643023002	**9.5±0.25** .375	**4.75+0.3** .193	**19.05±0.7** .750	4.1	.60	–	–	80 Min.	145±20%	–	–
2643002402	**9.65±0.25** .380	**5.0±0.2** .197	**5.05 - 0.45** .190	1.1	.59	–	–	21 Min.	43±20%	–	–
2643480102	**12.3±0.4** .485	**4.95±0.25** .200	**12.7±0.4** .500	4.8	.52	–	–	67 Min.	121±20%	–	–
2643480002	**12.3±0.4** .485	**4.95±0.25** .200	**25.4±0.75** 1.000	9.5	.52	–	–	132 Min.	236±20%	–	–
2643012702	**9.65±0.15** .380	**6.35±0.15** .250	**7.35±0.25** .290	1.3	.51	–	–	19 Min.	38±20%	–	–
2643540702	**14.3±0.45** .562	**6.35±0.25** .250	**5.3 - 0.45** .200	2.6	.43	–	–	24 Min.	50±20%	–	–
2643540102	**14.3±0.45** .562	**6.35±0.25** .250	**10.15±0.4** .400	5.1	.43	–	–	49 Min.	89±20%	–	–
2643540202	**14.3±0.45** .562	**6.35±0.25** .250	**13.8 - 0.7** .530	6.8	.43	–	–	62 Min.	118±20%	–	–
2643540002	**14.3±0.45** .562	**6.35±0.25** .250	**28.6±0.75** 1.125	14	.43	–	–	137 Min.	250±20%	–	–
2643540302	**14.3±0.45** .562	**7.1±0.25** .280	**15.25±0.4** .600	7.5	.41	–	–	60 Min.	118±20%	–	–
2643800302	**12.7±0.25** .500	**7.15±0.2** .282	**4.9 - 0.25** .188	1.7	.43	–	–	21 Min.	42±20%	–	–
2643540402	**14.3±0.45** .562	**7.25±0.15** .286	**28.6±0.75** 1.125	14	.40	–	–	114 Min.	215±20%	–	–
2643801102	**12.7±0.25** .500	**7.9±0.2** .312	**6.35±0.2** .250	2.1	.40	–	–	21 Min.	41±20%	–	–
2643801902	**12.7±0.25** .500	**7.9±0.2** .312	**12.7±0.4** .500	4.3	.40	–	–	35 Min.	73±20%	–	–
2643625002	**16.25 - 0.75** .625	**7.9±0.25** .312	**14.3±0.35** .562	8.7	.36	–	–	56 Min.	113±20%	–	–
2643625102	**16.25 - 0.75** .625	**7.9±0.25** .312	**28.6±0.75** 1.125	17	.36	–	–	104 Min.	213±20%	–	–
2643625202	**16.25 - 0.75** .625	**7.9±0.25** .312	**50.8±1.0** 2.000	31	.36	–	–	188 Min.	384±20%	–	–
2643665902	**17.45±0.4** .687	**9.5±0.25** .375	**6.35±0.25** .250	4.5	.32	–	–	21 Min.	44±20%	–	–
2643665802	**17.45±0.4** .687	**9.5±0.25** .375	**12.7±0.5** .500	9.0	.32	–	–	44 Min.	88±20%	–	–
2643665702	**17.45±0.4** .687	**9.5±0.25** .375	**28.6±0.75** 1.125	20	.32	–	–	100 Min.	200±20%	–	–
2643626302	**19.0 - 0.65** .735	**10.15±0.25** .400	**14.65 - 0.75** .562	12	.29	–	–	50 Min.	96±20%	–	–
2643626402	**19.0 - 0.65** .735	**10.15±0.25** .400	**28.6±0.75** 1.125	23	.29	–	–	102 Min.	196±20%	–	–
2643626502	**19.0 - 0.65** .735	**10.15±0.25** .400	**50.8±1.0** 2.000	41	.29	–	–	180 Min.	348±20%	–	–
2643801502	**25.4±0.65** 1.000	**12.7±0.35** .500	**6.35±0.25** .250	9.9	.23	–	–	27 Min.	53±20%	–	–
2643102402	**25.9±0.75** 1.020	**12.8±0.25** .505	**21.3±0.5** .840	35	.22	–	–	88 Min.	183±20%	–	–
2643102002	**25.9±0.75** 1.020	**12.8±0.25** .505	**28.6±0.8** 1.125	46	.22	–	–	116 Min.	235±20%	–	–

**This dimension may be modified to suit specific applications.*

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Shield Beads

Listed in ascending order of "B" dimension

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number	A	B	C*	Wt (g)	H (Oe)	Impedance(Ω) 73		43		61	
						10 MHz	25 MHz	25 MHz	100 MHz	100 MHz	250 MHz
2643800602	**20.95±0.4** .825	**13.2±0.3** .520	**6.35±0.2** .250	5.8	.24	–	–	19 Min.	44±20%	–	–
2643800502	**20.95±0.4** .825	**13.2±0.3** .520	**11.9±0.4** .468	11	.24	–	–	36 Min.	82±20%	–	–
2643801802	**22.1±0.4** .870	**13.7±0.3** .540	**6.35±0.2** .250	6.5	.23	–	–	20 Min.	45±20%	–	–
2643101902	**28.5±0.6** 1.122	**13.8±0.3** .543	**28.6±0.8** 1.125	56	.21	–	–	116 Min.	230±20%	–	–
2643801402	**25.4±0.6** 1.000	**15.5±0.5** .610	**8.1±0.3** .320	11	.20	–	–	28 Min.	55±20%	–	–
2643806402	**25.4±0.6** 1.000	**15.5±0.5** .610	**12.7±0.4** .500	17	.20	–	–	42 Min.	90±20%	–	–
2643251002	**39.1±0.75** 1.540	**16.75±0.5** .660	**22.2±0.8** .875	84	.16	–	–	108 Min.	230±20%	–	–
2643801002	**29.0±0.75** 1.142	**19.0±0.5** .748	**7.5±0.25** .295	12	.17	–	–	22 Min.	47±20%	–	–
2643801202	**29.0±0.75** 1.142	**19.0±0.5** .748	**13.85±0.4** .545	23	.17	–	–	41 Min.	92±20%	–	–
2643804502	**31.1±0.75** 1.225	**19.05±0.5** .750	**16.3 - 0.75** .627	33	.17	–	–	48 Min.	100±20%	–	–
2643802702	**35.55±0.75** 1.400	**22.85±0.5** .900	**12.7±0.5** .500	32	.14	–	–	38 Min.	80±20%	–	–
2643626102	**50.8±1.0** 2.000	**25.4±0.5** 1.000	**25.4±0.75** 1.000	158	.11	–	–	102 Min.	224±20%	–	–
2643625902	**50.8±1.0** 2.000	**25.4±0.5** 1.000	**28.7±0.75** 1.130	178	.11	–	–	116 Min.	254±20%	–	–
2643626202	**50.8±1.0** 2.000	**25.4±0.5** 1.000	**38.1±0.75** 1.500	237	.11	–	–	154 Min.	336±20%	–	–
2643626002	**50.8±1.0** 2.000	**25.4±0.5** 1.000	**50.8±1.0** 2.000	315	.11	–	–	192 Min.	360±20%	–	–
2643803802	**61.0±1.3** 2.400	**35.55±0.75** 1.400	**12.7±0.5** .500	105	.09	–	–	46 Min.	108±20%	–	–

**This dimension may be modified to suit specific applications.*

Flat Cable Suppression Cores

Fair-Rite offers a line of flat cable suppression cores to attenuate radiated EMI emissions from ribbon cables. These cores, made from 43 material, can accommodate a range of cable sizes and conductors.

See pages 72 and 73 for nylon cases and steel and nylon clips to assist in the assembly of the split cable core halves.

- *Available in 43 material.*
- *For performance data on Flat Cable Suppression Cores, see page 60 of section "How to Choose Ferrite Components for EMI Suppression."*
- *Cores are controlled for impedance limits only. They are tested for impedance with a single turn, using a Hewlett Packard HP 4193A Vector Impedance Meter.*
- *The Expanded Cable and Connector EMI Suppressor Kit (part number 0199000005) and the Fair-Rite EMI Suppressor Retro Kit (part number 0199000008) contain a selection of these suppression cores. See page 84.*

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number	Fig.	Max. Cable Width	A	B	C*	D	E	Wt (g)	Impedance (Ω) 25 MHz	100 MHz	Clip P/N**	Case P/N**
2643171351	5	.250	**11.4±0.25** .450	**6.6±0.15** .260	**7.6±0.25** .300	**3.3 - 0.25** .125	**0.15+0.15** .009	1.4	40 Min.	80±20%	–	–
2643172751	3	.385	**14.5±0.2** .571	**10.0±0.13** .394	**10.0±0.13** .394	**2.5±0.15** .098	**0.5+0.25** .030	1.5	25 Min.	59±20%	–	–
2643173851	3^	.480	**16.5±0.25** .650	**12.5±0.2** .492	**10.25±0.25** .404	**2.0±0.15** .079	**0.5+0.25** .030	1.3	26 Min.	60±20%	–	–
2643170251	4	.490	**22.75±0.65** .895	**12.7±0.5** .500	**12.7±0.5** .500	**3.3 - 0.25** .125	**1.15+0.25** .050	3.5	31 Min.	71±20%	–	–
2643169551	1	.550	**19.95±0.4** .785	**14.2±0.25** .560	**10.15±0.5** .400	**6.35±0.25** .250	**0.9±0.15** .035	5.7	28 Min.	65±20%	–	–
2643168751	1	.680	**25.4±0.75** 1.000	**17.8±0.5** .700	**12.7±0.4** .500	**10.15±0.25** .400	**2.55±0.25** .100	13	35 Min.	85±20%	–	–
2643173351	2	.770	**24.5±0.4** .965	**20.0±0.4** .787	**12.0±0.3** .472	**5.0±0.25** .197	**0.75+0.25** .035	6.6	25 Min.	55±20%	–	–
2643168651	4	1.010	**38.85±0.75** 1.530	**26.15±0.75** 1.030	**28.6±0.7** 1.125	**13.0±0.3** .512	**6.35±0.25** .255	45	80 Min.	185±20%	–	–
2643164551	1	1.030	**38.1±1.0** 1.500	**26.65±0.75** 1.050	**12.3±0.4** .485	**12.05±0.4** .475	**1.9±0.4** .075	25	38 Min.	98±20%	–	–
2643171051	3	1.030	**38.1±1.0** 1.500	**26.65±0.75** 1.050	**12.7±0.4** .500	**6.35±0.25** .250	**0.85±0.2** .033	14	40 Min.	105±20%	0199001401 0199016051	–
2643163851	1	1.030	**38.1±1.0** 1.500	**26.65±0.75** 1.050	**25.4±0.75** 1.000	**12.05±0.4** .475	**1.9±0.4** .075	51	76 Min.	195±20%	–	–
2643166851	3	1.030	**38.1±1.0** 1.500	**26.65±0.75** 1.050	**25.4±0.75** 1.000	**6.35±0.25** .250	**0.85±0.2** .033	27	80 Min.	210±20%	0199001401	–
2643172551	2	1.040	**33.5±0.65** 1.319	**27.0±0.5** 1.063	**8.0±0.4** .315	**6.5±0.25** .256	**1.25+0.7** .063	6.8	14 Min.	42±20%	–	–
2643169351	1	1.060	**33.65±0.75** 1.325	**27.5±0.5** 1.083	**13.2±0.5** .520	**6.7±0.4** .265	**1.35±0.25** .053	12	28 Min.	75±20%	–	–
2643167051	3^	1.080	**40.9±0.75** 1.600	**28.2±0.75** 1.100	**12.7±0.25** .500	**15.0±0.25** .590	**8.5±0.15** .335	23	37 Min.	88±20%	–	–
2643166451	3	1.080	**38.35±1.0** 1.510	**27.95±1.0** 1.100	**28.6±0.7** 1.125	**9.0±0.3** .355	**3.3±0.25** .130	35	72 Min.	170±20%	0199010301	–
2643168051	3^	1.280	**52.9±1.0** 2.083	**33.0±0.7** 1.299	**31.25±1.0** 1.230	**12.5±0.4** .492	**3.5±0.4** .138	84	106 Min.	243±20%	–	–
2643167551	3^	1.280	**52.9±1.0** 2.083	**33.0±0.7** 1.299	**63.5±1.8** 2.500	**12.5±0.4** .492	**3.5±0.4** .138	170	210 Min.	460±20%	–	–

** This dimension may be modified to suit specific applications.*
^ Part does not have clip slots as shown in figure.
*** Refer to pages 72 and 73 for dimensions and figures for Flat Cable Suppression Core Clips and Cases.*

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Flat Cable Suppression Cores

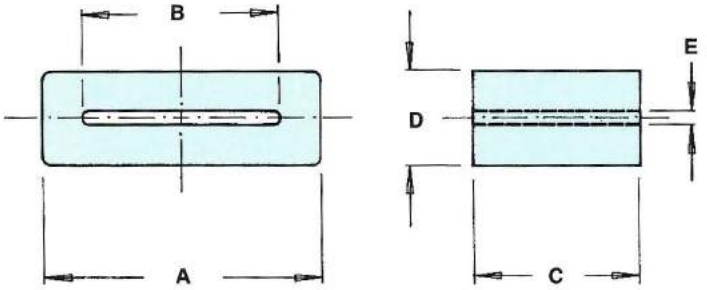


Figure 1

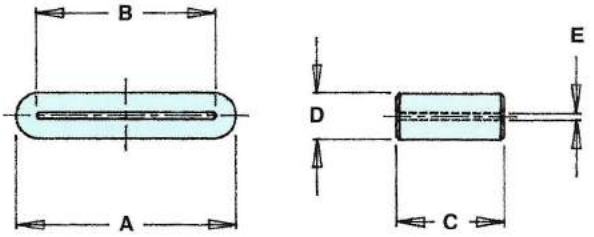


Figure 2

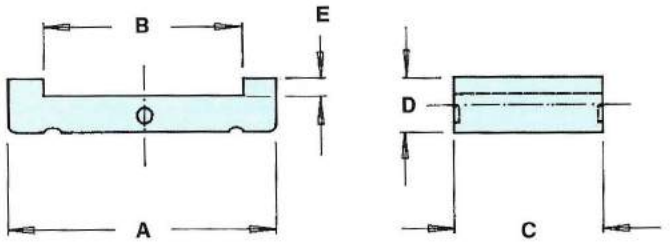


Figure 3

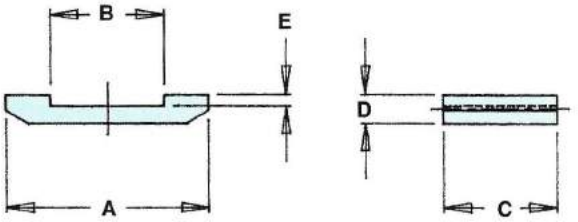


Figure 4

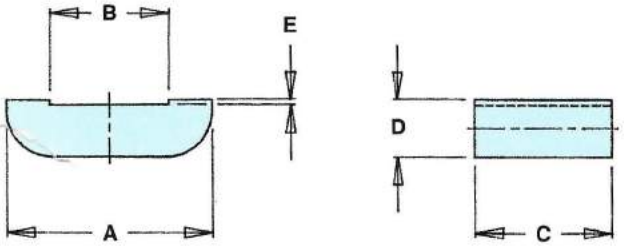


Figure 5

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Flat Cable Suppression Cores

Dimensions *(**Bold numbers are in millimeters,** light numbers are nominal in inches.)*

Part Number	Fig.	Max. Cable Width	A	B	C*	D	E	Wt (g)	Impedance (Ω) 25 MHz	100 MHz	Clip P/N**	Case P/N**
2643170951	3	1.330	**45.1±0.75** 1.775	**34.4±0.7** 1.355	**12.7±0.4** .500	**6.35±0.25** .250	**0.85±0.2** .033	16	34 Min.	100±20%	0199001401 0199016051	–
2643166551	1	1.330	**45.1±0.75** 1.775	**34.4±0.7** 1.355	**28.6±0.7** 1.125	**12.45±0.4** .490	**1.5±0.3** .060	71	76 Min.	195±20%	–	0199166
2643166651	3	1.330	**45.1±0.75** 1.775	**34.4±0.7** 1.355	**28.6±0.7** 1.125	**6.35±0.25** .250	**0.85±0.2** .033	36	77 Min.	225±20%	0199001401 0199016551	0199166651
2643168251	3	2.030	**63.5±1.3** 2.500	**52.1±1.1** 2.050	**12.7±0.4** .500	**6.35±0.25** .250	**0.85±0.2** .033	22	31 Min.	104±20%	0199001401 0199016051	–
2643163951	3	2.030	**63.5±1.3** 2.500	**52.1±1.1** 2.050	**28.6±0.8** 1.125	**6.35±0.25** .250	**0.85±0.2** .033	50	70 Min.	235±20%	0199001401 0199016551	0199163951
2643167751	3	2.550	**76.2±1.5** 3.000	**65.3±1.3** 2.570	**12.7±0.4** .500	**6.35±0.25** .250	**0.85±0.2** .033	27	29 Min.	110±20%	0199001401 0199016051	–
2643164051	3	2.550	**76.2±1.5** 3.000	**65.3±1.3** 2.570	**28.6±0.8** 1.125	**6.35±0.25** .250	**0.85±0.2** .033	60	60 Min.	215±20%	0199001401 0199016551	01991640
2643171151	3	3.060	**88.9±1.8** 3.500	**78.2±1.5** 3.080	**12.7±0.4** .500	**6.5±0.35** .256	**0.95±0.3** .038	31	26 Min.	95±20%	0199001401 0199016051	–
2643168351	3	3.060	**88.9±1.8** 3.500	**78.2±1.5** 3.080	**28.6±0.8** 1.125	**6.5±0.35** .256	**0.95±0.3** .037	70	60 Min.	215±20%	0199001401 0199016551	–

** This dimension may be modified to suit specific applications.*
*** Refer to pages 72 and 73 for dimensions and figures for Flat Cable Suppression Core Clips and Cases.*

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Specifying the Core

Most ferrite manufacturers specify their EMI product line in terms of impedance at select frequencies.

Fair-Rite Products specifies impedances at two frequencies for each material. The impedance of the cores are controlled to meet a minimum at the lower frequency and at the higher frequency is toleranced at ±20%. The measuring equipment is a HP 4193A, unless the frequency is above 100 MHz. at which time a HP 4191-A is used. Impedance values measured on other equipment, even if it is Hewlett-Packard, may not correlate.

Figure 25 shows the equivalent circuit of an interference source with an internal impedance of Zs, generating an interference signal through the series impedance of the suppressor core Zsc into the load impedance Z_L.

Most manufacturers are specifying cores for EMI applications in terms of impedance, but often the end user needs to know the attenuation. The relationship that exists between these two parameters is:

$$\text{Attenuation} = 20 \log_{10} Z_s + Z_{sc} + Z_L / Z_s + Z_L \quad \text{dB} \quad \text{eq.[12]}$$

where: Z_s = source impedance
Z_{sc} = suppressor core impedance
Z_L = load impedance

This relationship is dependent on the impedance of the source generating the noise and the impedance of the load receiving it. These values are usually complex numbers that can be infinite in scope and not easily obtained by the designer therefore it is recommended that the attenuation calculations be verified in the actual circuit by appropriate measurements.

Selecting a value of one ohm for both the load and the source impedance, as may be the case when the source is a switch mode power supply and the load many low impedance circuits, simplifies the equation and allows comparison of ferrite cores in term of attenuation.

Under these conditions, the equation reduces to:

$$A = 20 \text{ Log}_{10} |Z_{sc}|/2 \quad \text{dB} \qquad \text{eq.[13]}$$

$Z_{sc} >> 1$ ohm

Some Examples

In the circuit shown in Figure 26a, a metal enclosure is used to eliminate radiated interference generated by the commutation of the dc motor. This enclosure, however, will not prevent the conduction of noise on the power cables of the dc motor. This conducted noise in turn might affect other circuits with either conducted or radiated interference.

When a metal enclosure is used in conjuction with ferrite suppression cores and feed-through capacitors, as shown in Figure 26b, the conducted noise is eliminated from the circuit. (1)

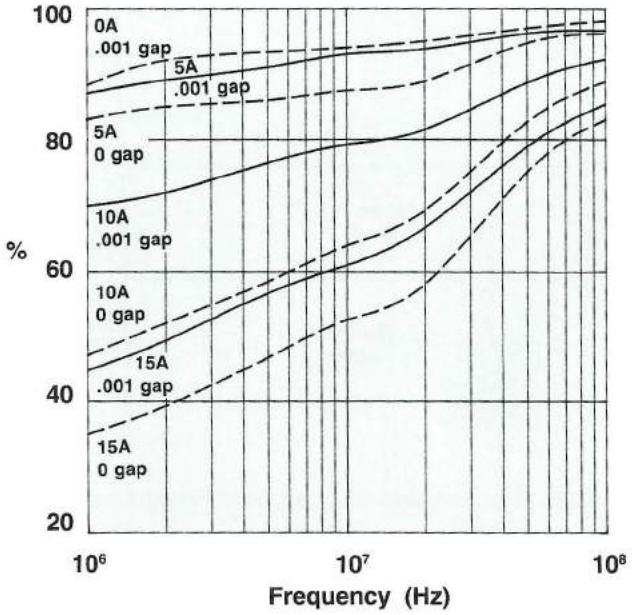


Figure 24 Percent of Original Zero Gap, Zero Bias Impedance vs. Frequency, dc bias and gap for 43 material flat cable suppression core 2643166851.

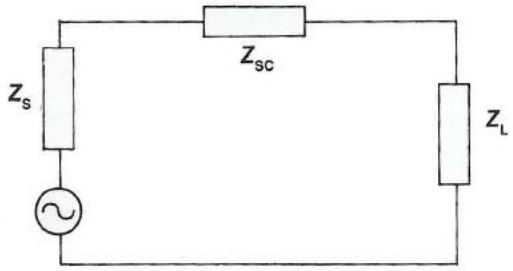


Figure 25 Equivalent Circuit

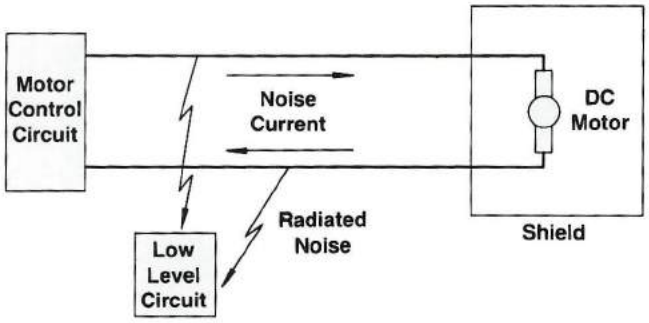


Figure 26a Commutation noise is interfering with low-level circuits.

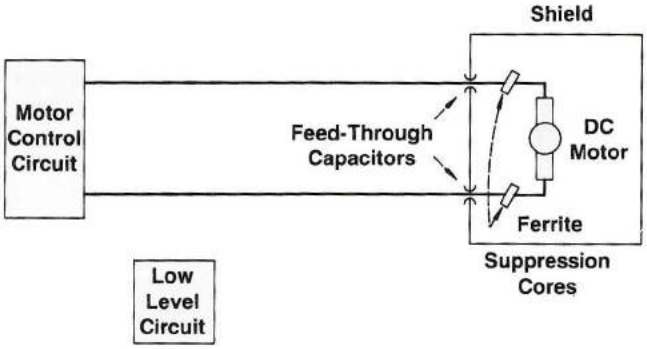


Figure 26b Ferrite suppression cores used in conjunction with feed-through capacitors to eliminate interference.

In applications that must accommodate dc, ferrite materials are influenced by the level of dc magnetization. This might require the use of a suppressor core with an airgap in its magnetic circuit.

In Figure 27a, a ferrite core is used to suppress common-mode noise, effectively reducing ground-loop coupling without affecting the circuit load current . Figure 27b illustrates the use of a ferrite core to suppress conducted noise, without introducing significant circuit losses at low frequencies.(2)

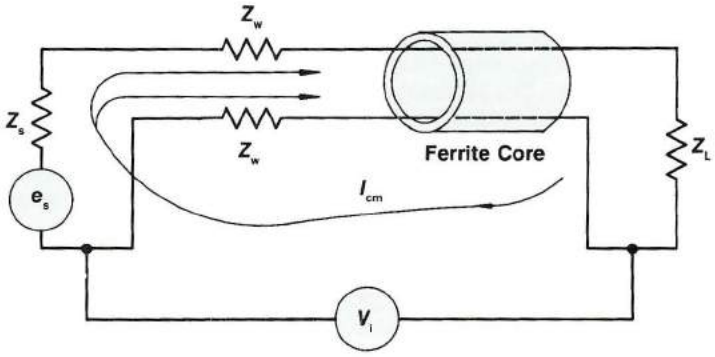


Figure 27a Ferrite core used for suppressing common-mode noise.

I_{cm} = Common-mode current
Z_w = Impedance of wire

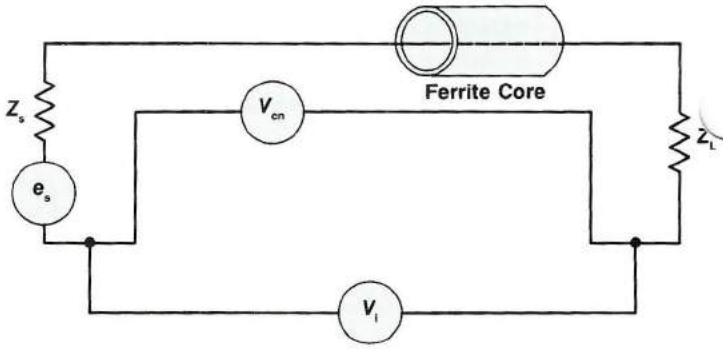


Figure 27b Ferrite core used to suppress conducted noise.

Z_L = Load Impedance
V_i = Common-mode voltage
V_{cn} = Conducted noise voltage

(1) Ott, Henry W, NOISE REDUCTION TECHNIQUES IN ELECTRONIC SYSTEMS. Second Edition John Wiley & Sons. New York, 1988.

(2) Violette, J.L. Norman, White, Donald, R.J., and Violette, Michael F., ELECTROMAGNETIC COMPATIBILITY HANDBOOK, Van Nostrand Reinhold Company Inc, New York, 1987.

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Typical Performance Data

Beads on Leads, page 85

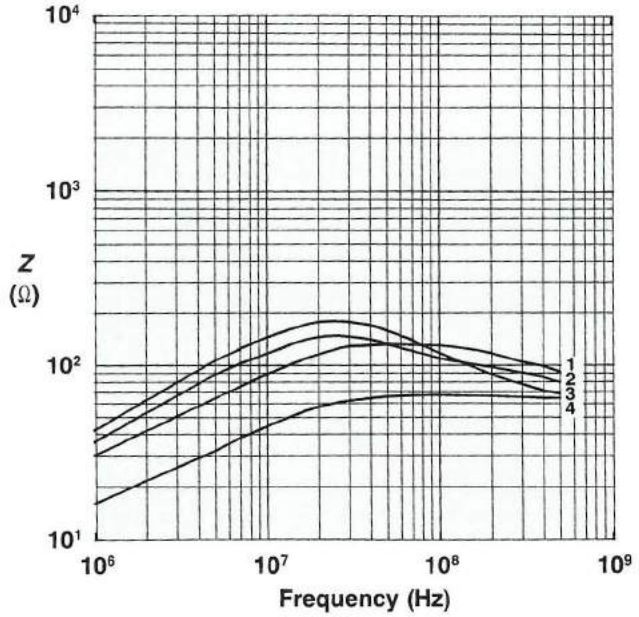


Figure 28 Impedance vs. Frequency for 73 material beads on leads.

1 2773002112 **3** 2773008112
2 2773007112 **4** 2773001112

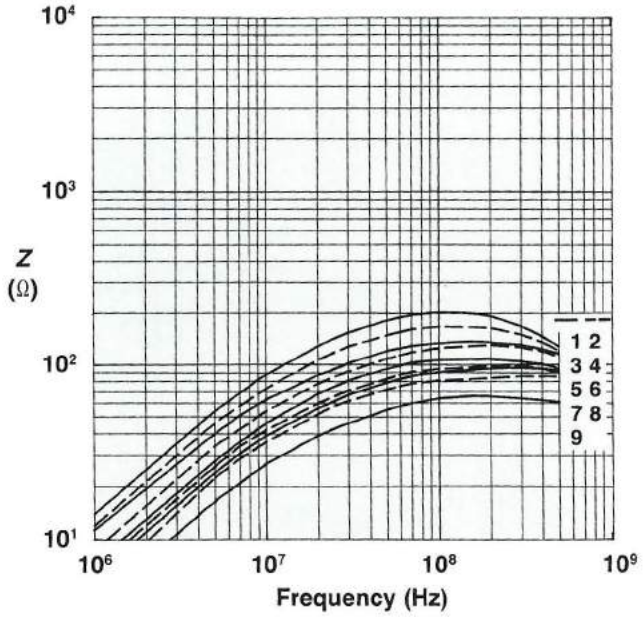


Figure 29 Impedance vs. Frequency for 43 material beads on leads.

1 2743009112 **4** 2743002112 **7** 2743005112
2 2743008112 **5** 2743004112 **8** 2743015112
3 2743007112 **6** 2743003112 **9** 2743001112

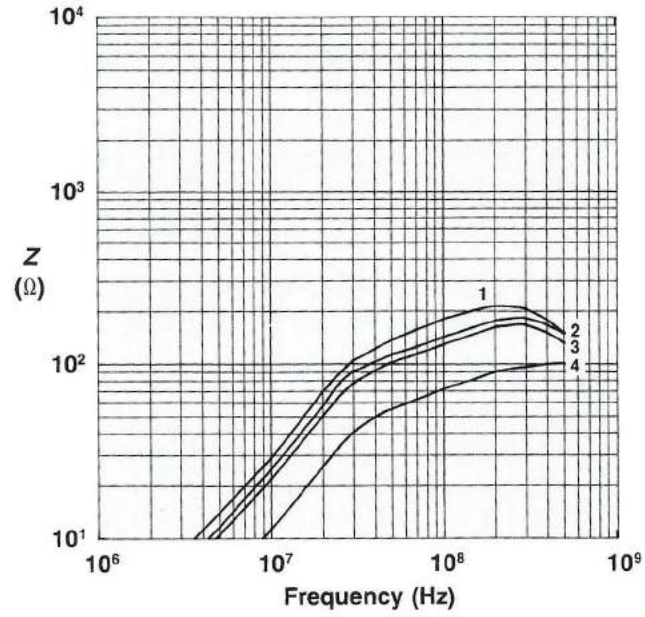


Figure 30 Impedance vs. Frequency for 61 material beads on leads.

1 2761008112 **3** 2761002112
2 2761007112 **4** 2761001112

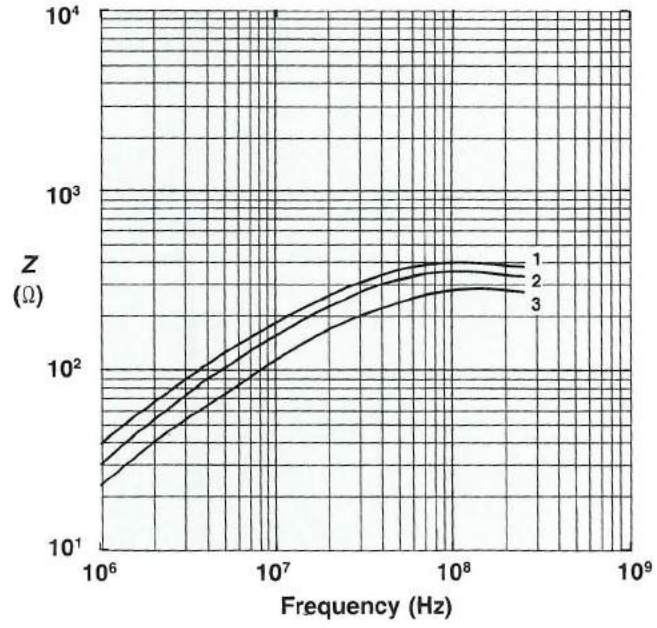


Figure 31 Impedance vs. Frequency for large diameter 43 material beads on leads.

1 2743014221 **2** 2743013211 **3** 2743012201

Typical Performance Data

Shield Beads, pages 64 - 67

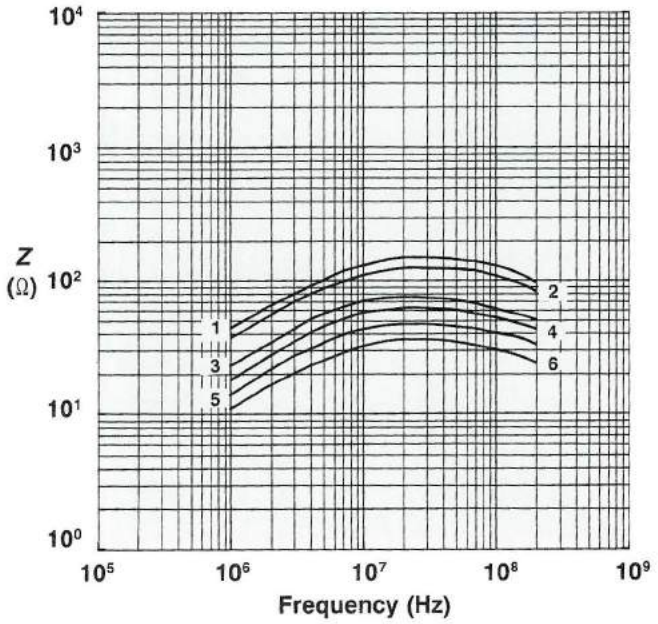


Figure 32 Impedance vs. Frequency for 73 material shield beads.

1 2673021801	3 2673000801	5 2673002201
2 2673000701	4 2673000301	6 2673000101

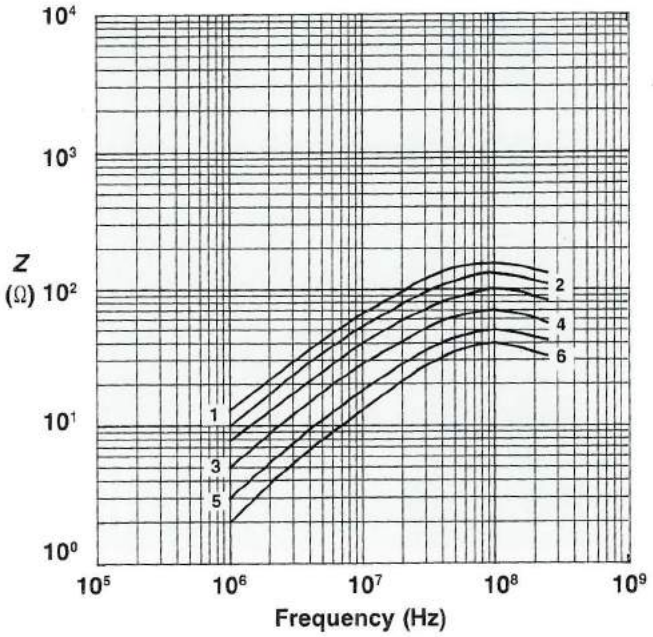


Figure 33 Impedance vs. Frequency for 43 material shield beads.

1 2643021801	3 2643000801	5 2643000101
2 2643000701	4 2643000301	6 2643001501

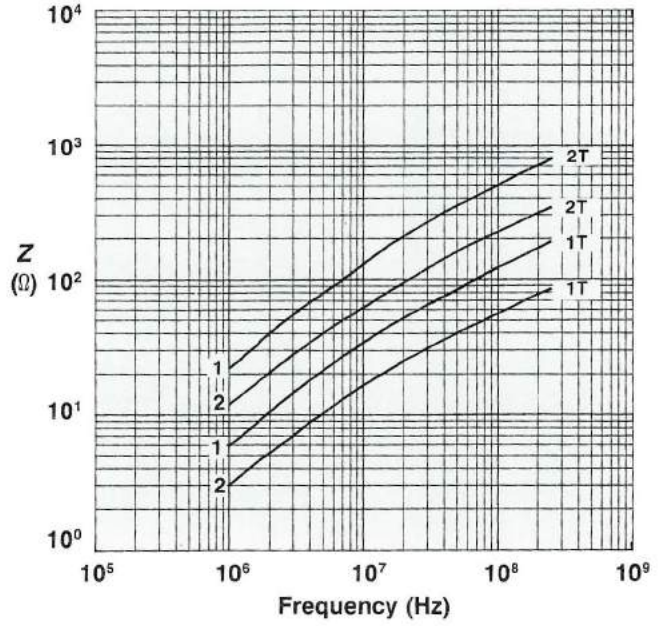


Figure 34 Impedance vs. Frequency for larger shield beads wound with one and two turns.

1 2643803802	2 2643801002

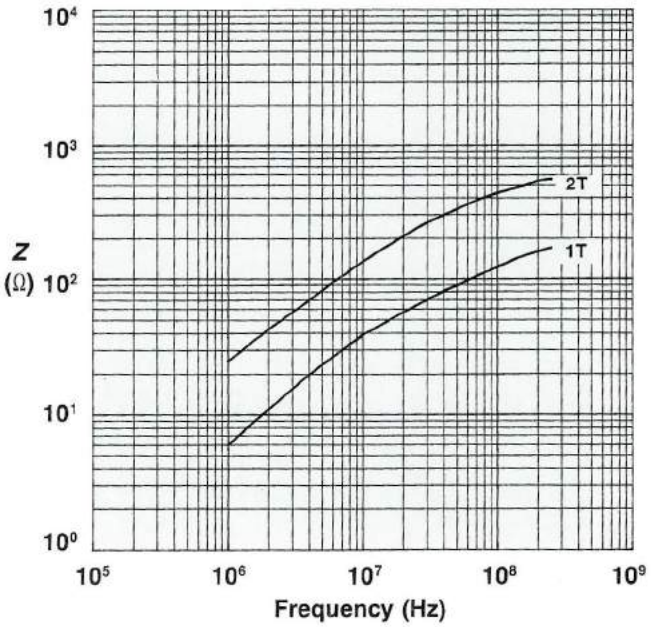


Figure 35 Impedance vs. Frequency for larger shield bead 2643804502 wound with one and two turns.

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Typical Performance Data

Shield Beads, pages 64 - 67

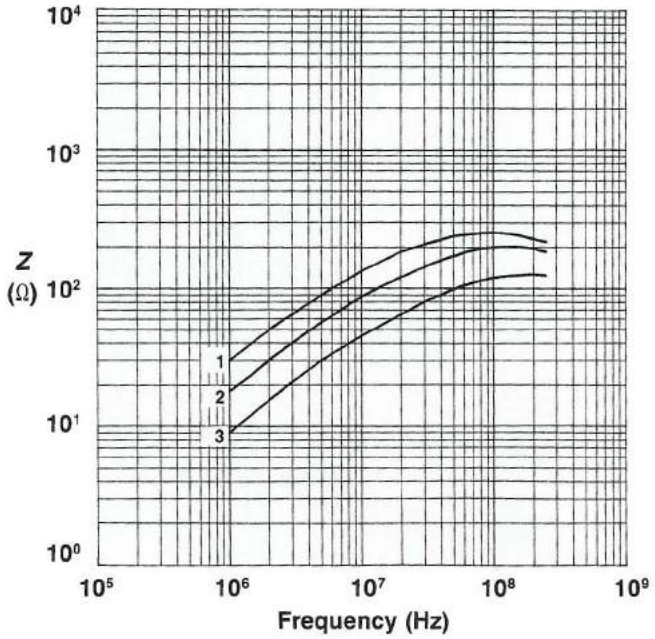


Figure 36 Impedance vs. Frequency for larger shield beads with the same OD and ID but different lengths.

1 2643625202 2 2643625102 3 2643625002

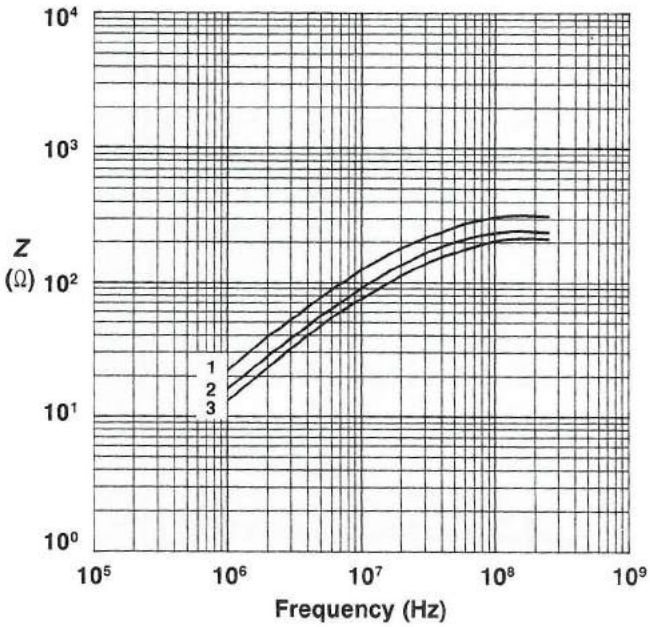


Figure 37 Impedance vs. Frequency for larger shield beads with the same OD and ID but different lengths.

1 2643626202 2 2643625902 3 2643626102

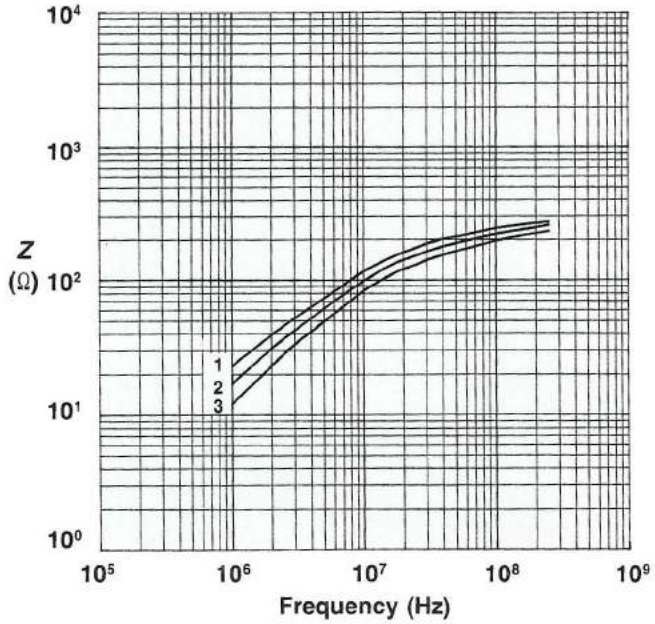
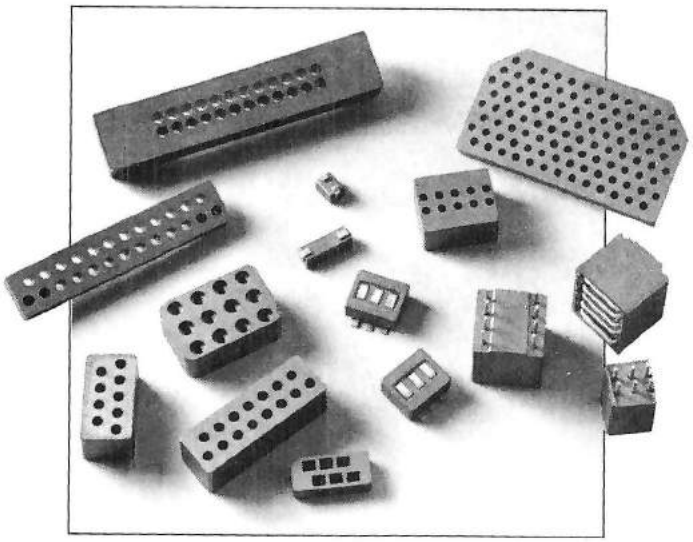


Figure 38 Impedance vs. Frequency for larger shield beads with Impedances at 100 MHz of 200 Ω or more.

1 2643540002 2 2643102002 3 2643665702



Typical Performance Data

SM Beads, pages 80 - 83

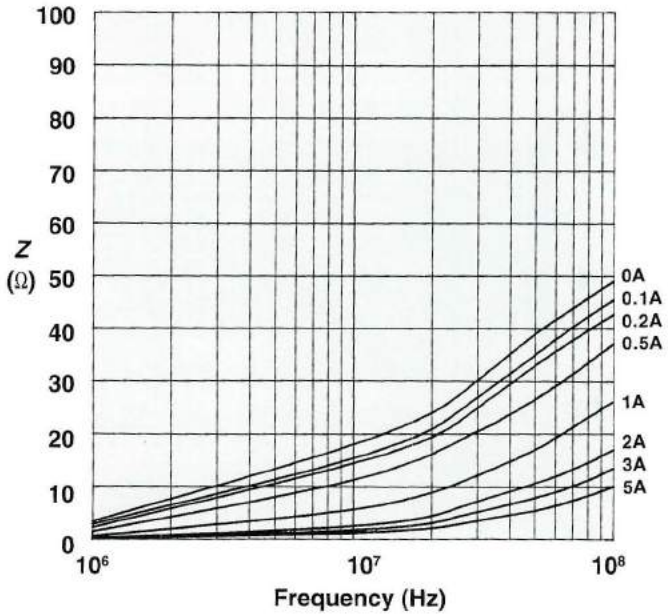


Figure 39 Impedance vs. Frequency with dc bias as parameter for the SM Bead 2743019447.

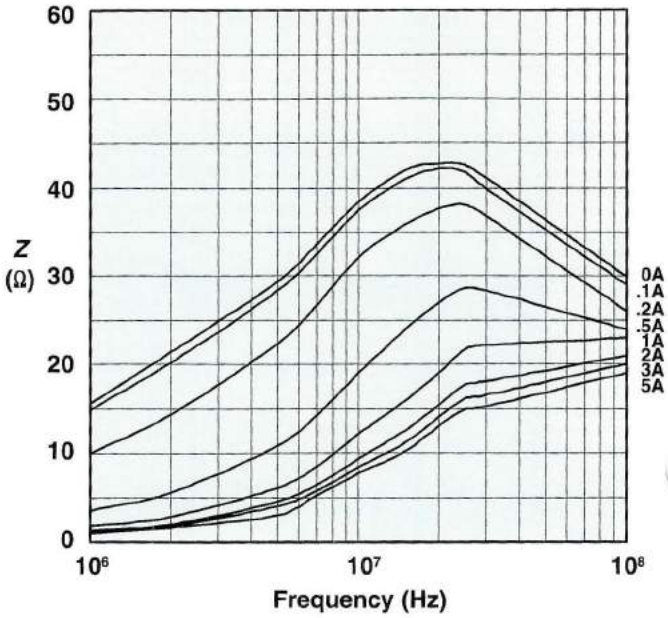


Figure 40 Impedance vs. Frequency with dc bias as parameter for the SM Bead 2773019447.

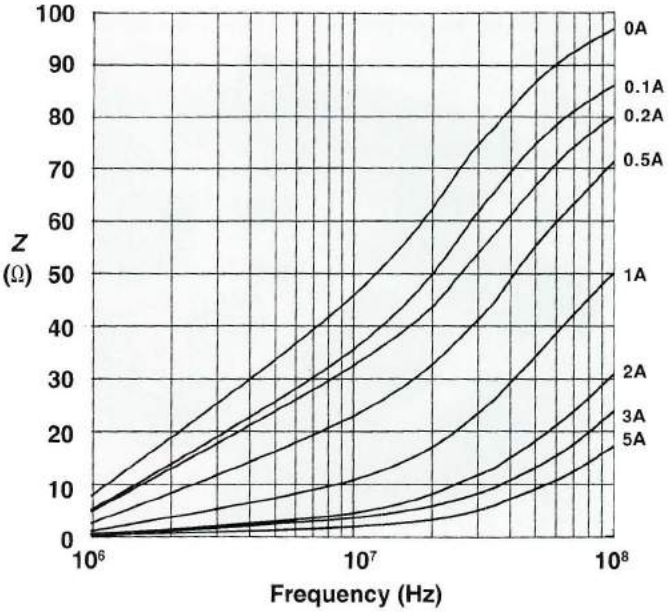


Figure 41 Impedance vs. Frequency with dc bias as parameter for the SM Bead 2743021447.

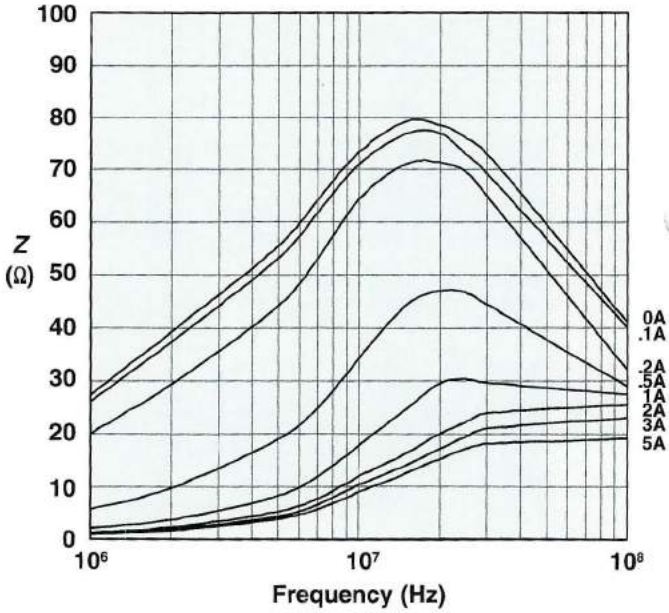


Figure 42 Impedance vs. Frequency with dc bias as parameter for the SM Bead 2773021447.

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Typical Performance Data

SM Beads, pages 80 - 83

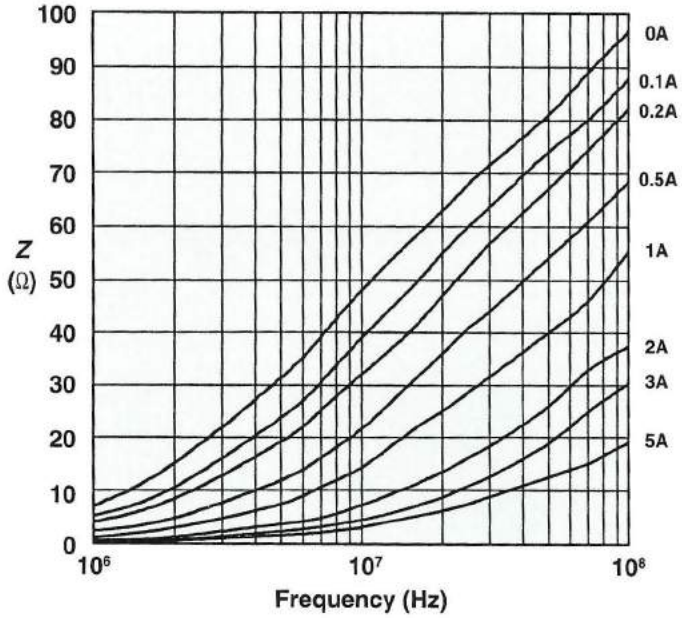


Figure 43 Impedance vs. Frequency with dc bias as parameter for the SM Bead 2743037447.

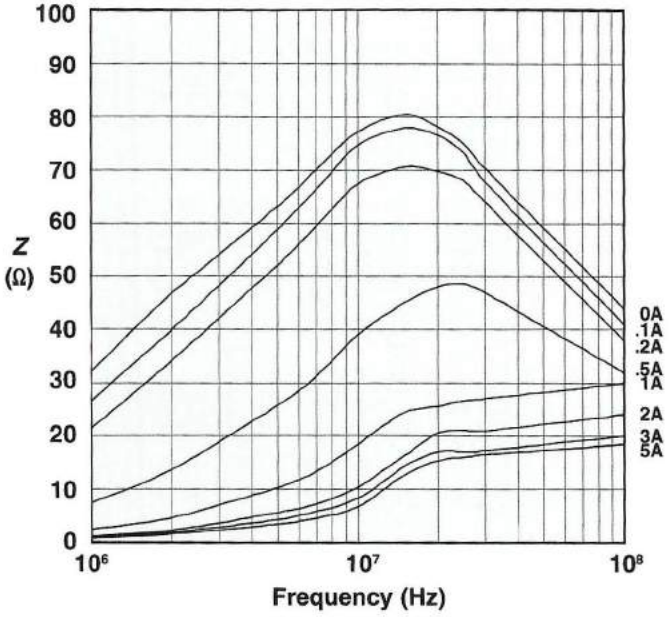


Figure 44 Impedance vs. Frequency with dc bias as parameter for the SM Bead 2773037447.

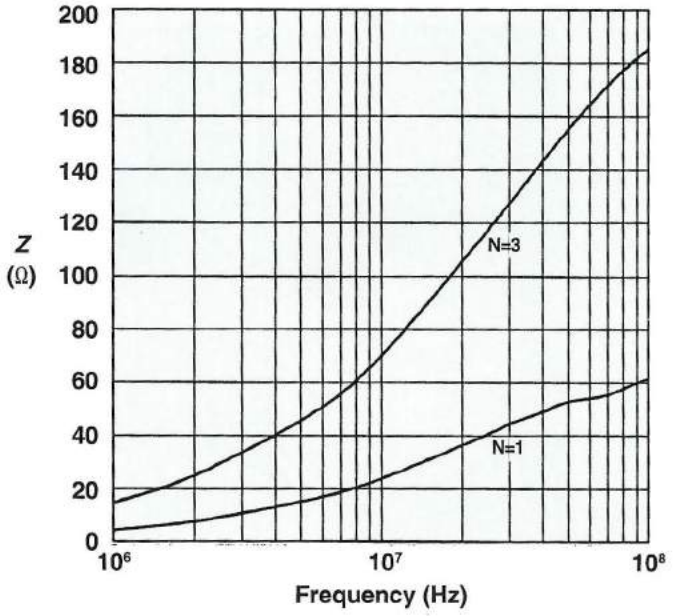


Figure 45 Impedance vs. Frequency for the SM Bead 2743040446 with one and three turns.

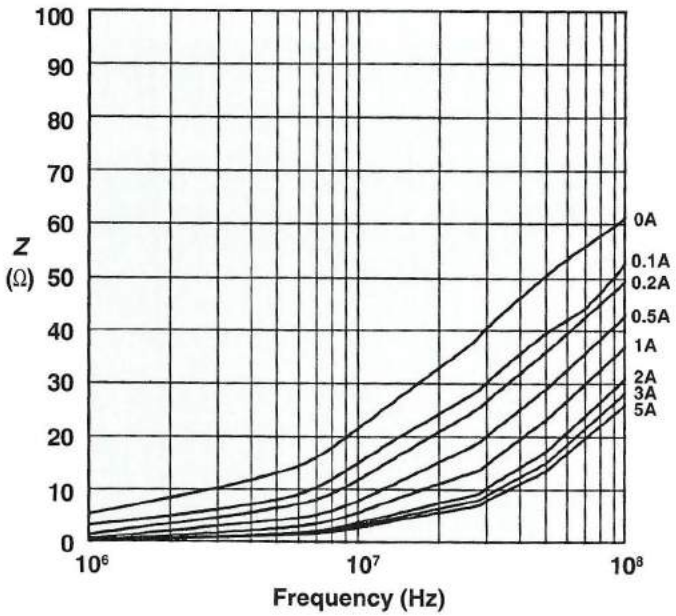


Figure 46 Impedance vs. Frequency with dc bias as parameter for the SM Bead 2743040446.

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Typical Performance Data

Wound Beads, page 88

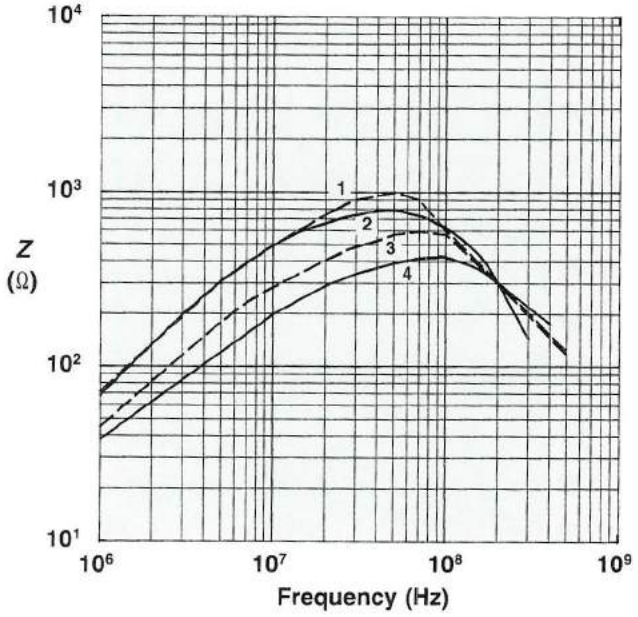


Figure 47 Impedance vs. Frequency for wound six hole beads in 43 material.
1 2943666631 **3** 2943666651
2 2943666671 **4** 2943666661

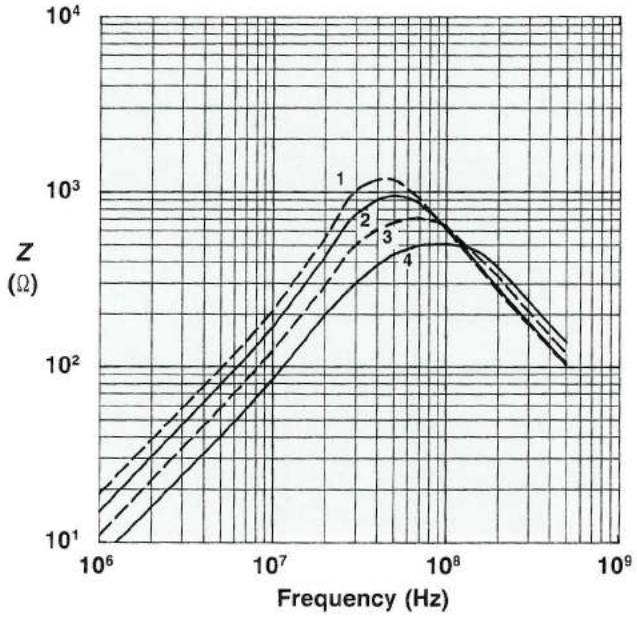


Figure 48 Impedance vs. Frequency for wound six hole beads in 61 material.
1 2961666631 **3** 2961666651
2 2961666671 **4** 2961666661

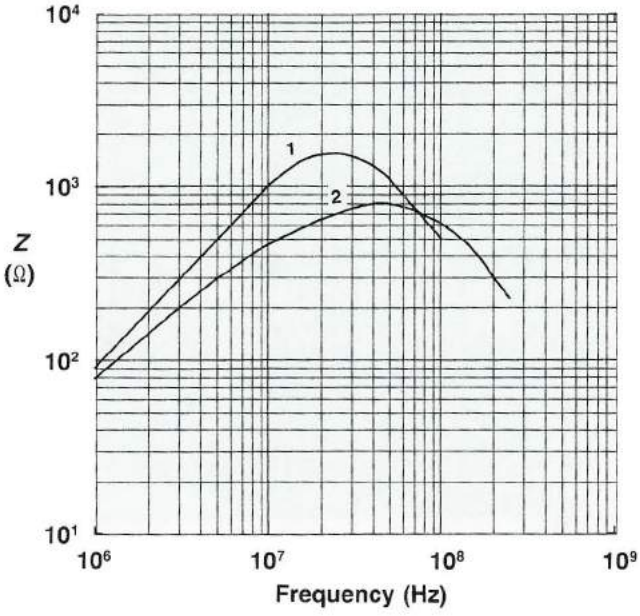
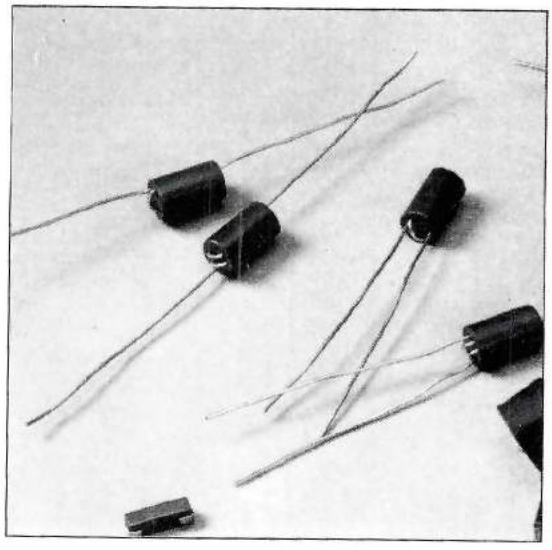


Figure 49 Impedance vs. Frequency for wound eleven hole beads in 43 material.
1 2943777741 **2** 2943777721 (2½T)



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Typical Performance Data

PC Beads, page 87

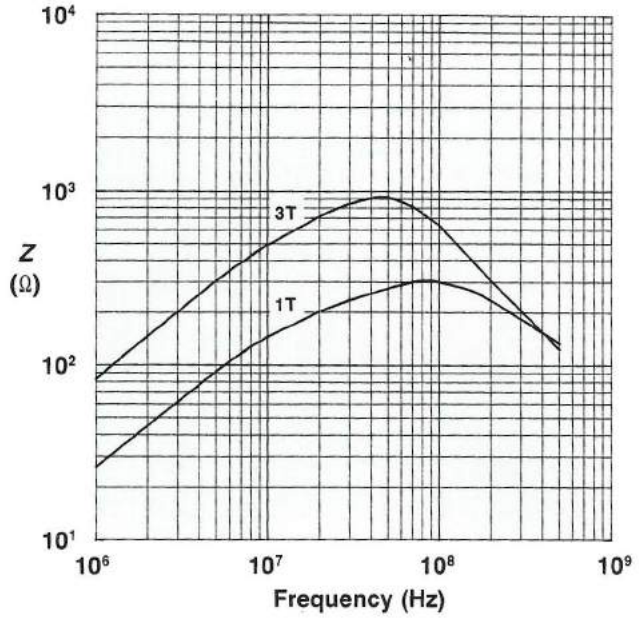


Figure 50 Impedance vs. Frequency for PC Bead 2943776101 for one and three turns.

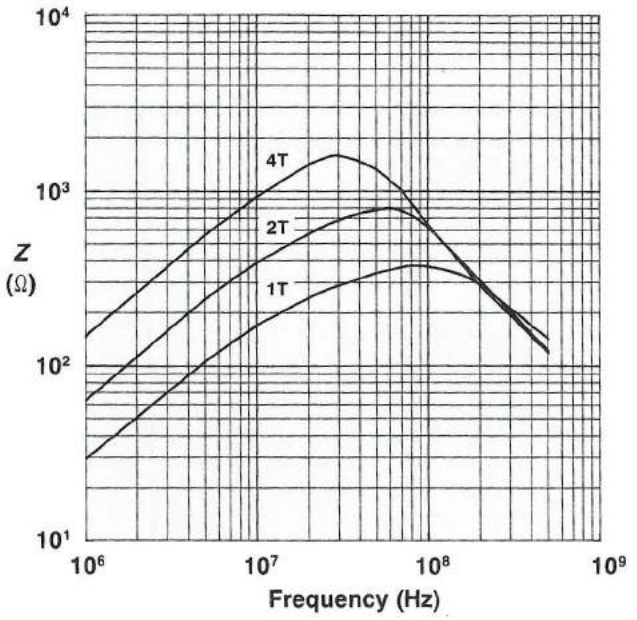


Figure 51 Impedance vs. Frequency for PC Bead 2943778301 for one, two and four turns.

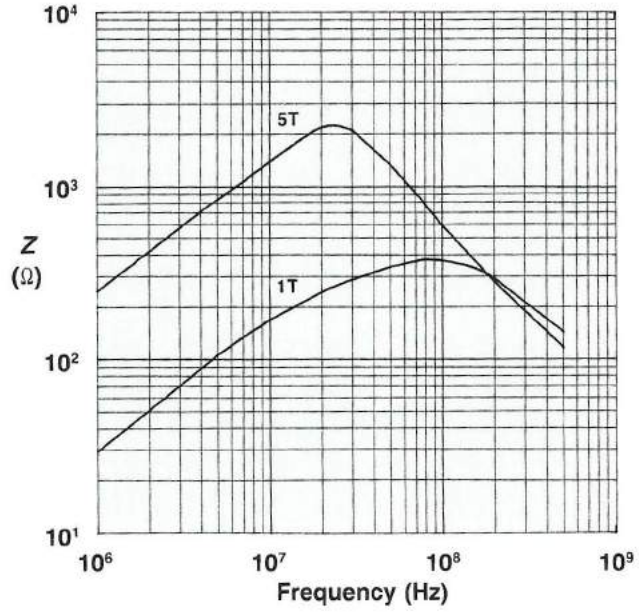
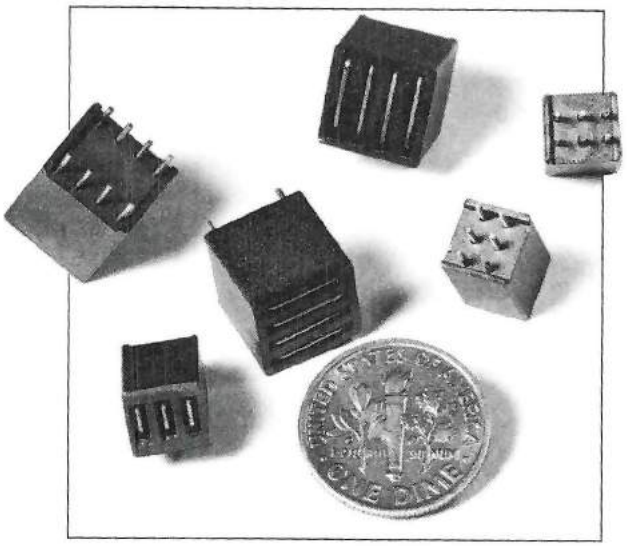


Figure 52 Impedance vs. Frequency for PC Bead 2943770301 for one and five turns.



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Typical Performance Data

Cable Suppression Cores, pages 68 - 77

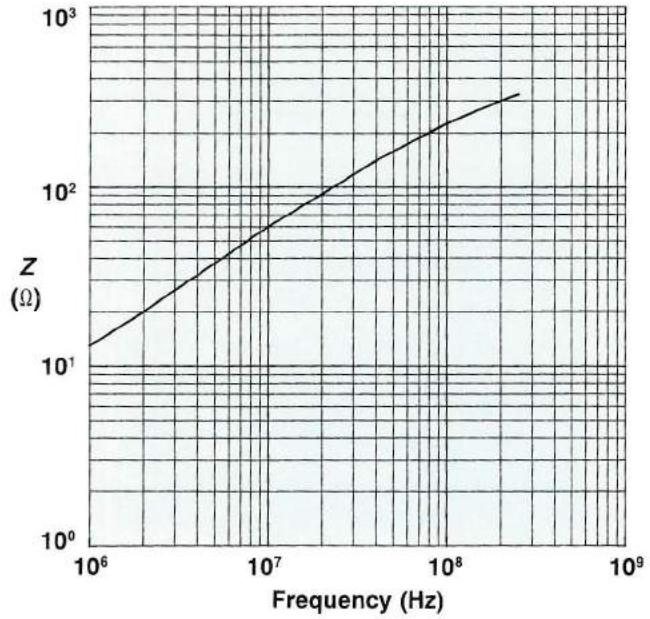


Figure 53 Impedance vs. Frequency for the one-piece flat cable suppression core 2643163851.

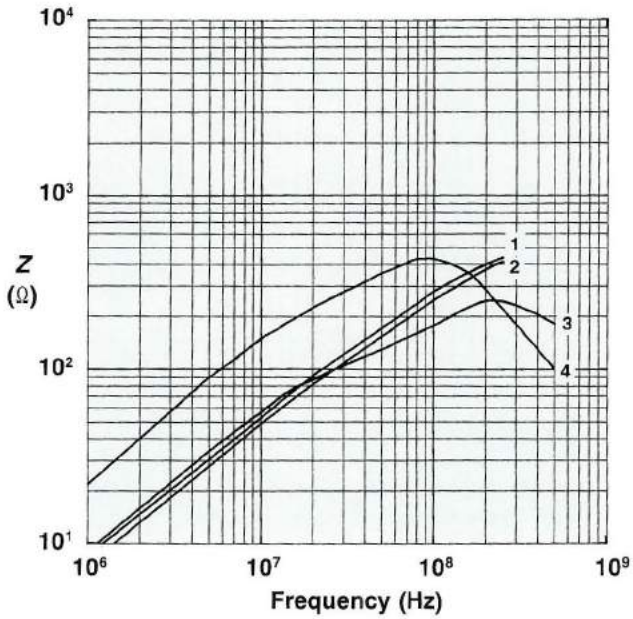


Figure 54 Impedance vs. Frequency for split flat cable suppression cores.

1 2643163951 **3** 2643166451
2 2643164051 **4** 2643167551

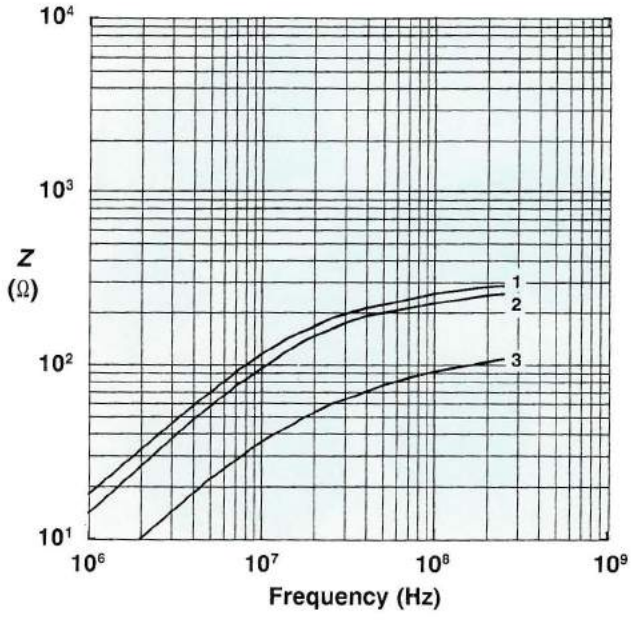


Figure 55 Impedance vs. Frequency for split round cable suppression cores.

1 2643164251 **2** 2643164151 **3** 2643166751

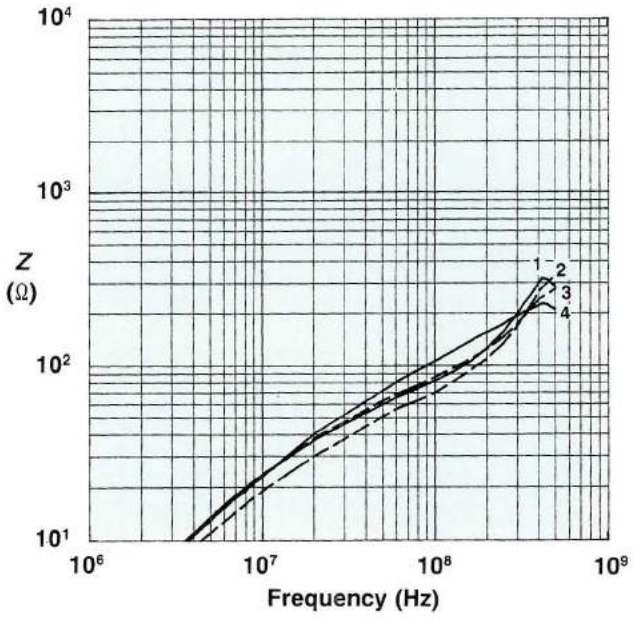


Figure 56 Impedance vs. Frequency for split round cable suppression cores.

1 2643806406 **3** 2643665806
2 2643800506 **4** 2643625006

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Typical Performance Data

Material 77

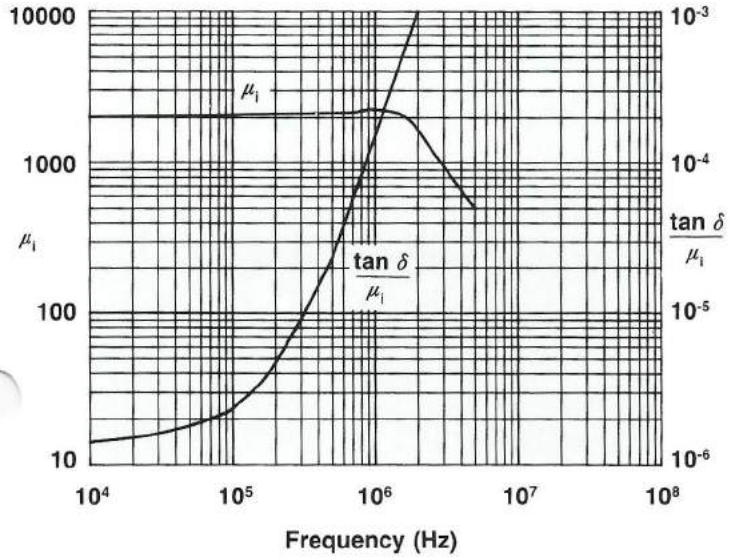


Figure 29 Initial Permeability and Loss Factor vs. Frequency.

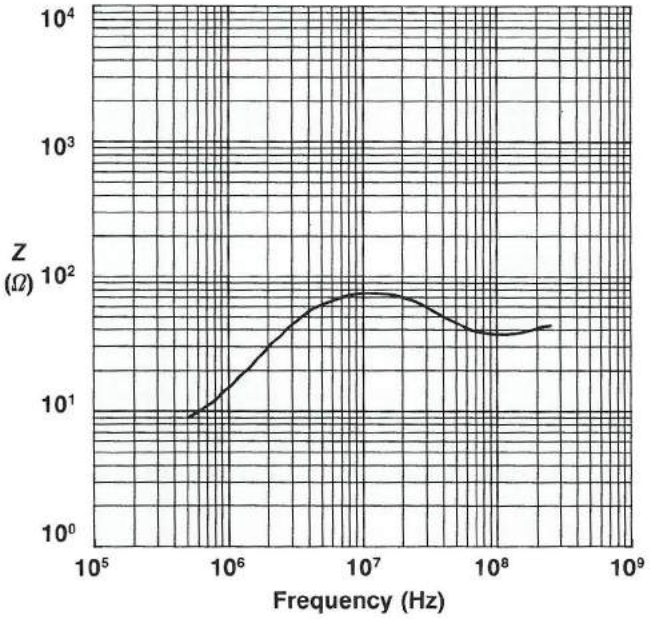


Figure 30 Impedance vs. Frequency of the shield bead 2677006302.

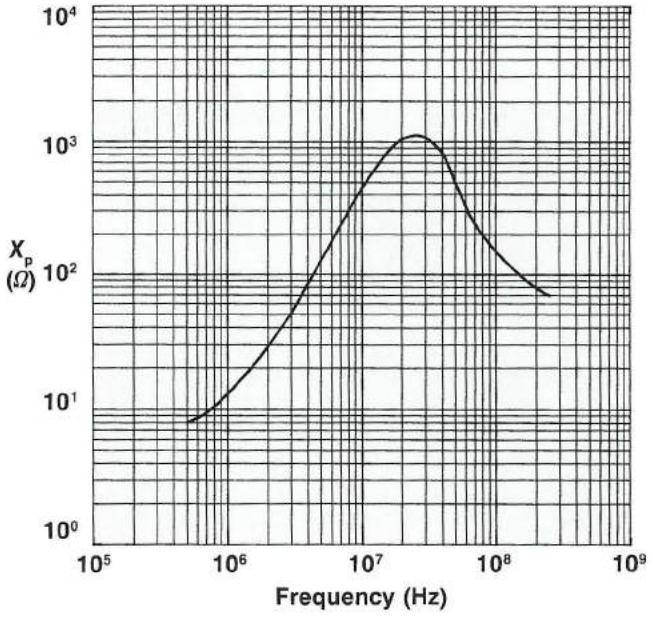


Figure 31 Parallel Reactance vs. Frequency of the shield bead 2677006302.

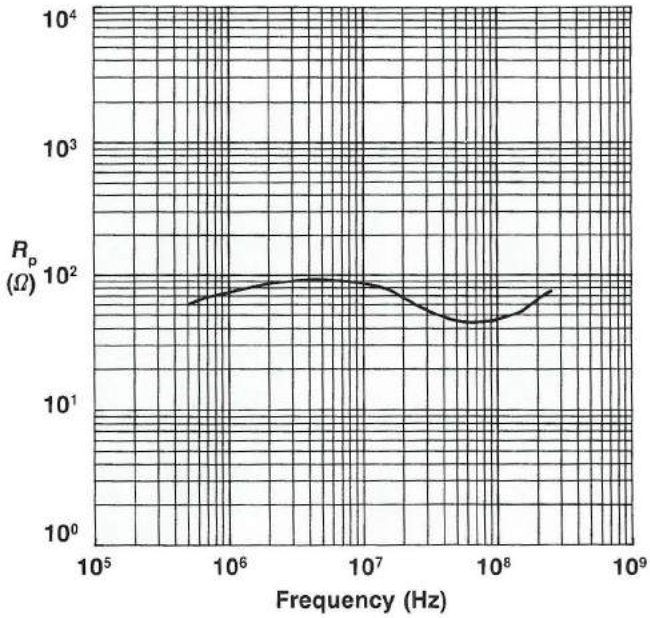


Figure 32 Parallel Resistance vs. Frequency of the shield bead 2677006302.

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Technical Information

How to Choose Ferrite Components for EMI Suppression.

Introduction

The following pages will focus on Soft Ferrites used in the application of electromagnetic interference (EMI) suppression. Although the end use is an important issue and some applications are mentioned, this technical section is not intended to be a design manual, but rather, an aide to the designer in understanding and choosing the optimum ferrite component for the particular application. The reader will discover that ferrite suppressor cores are not too difficult to understand, are very simple to use, in either initial designs or retrofits, and are comparatively economical in both price and space. Ferrite suppressors have been successfully employed for attenuating EMI in computers and related products, switching power supplies, electronic automotive ignition systems, and garage doors openers, to name just a few.

Use of Ferrite Suppressor Cores

The United States was one of the first countries to recognize the potential problems caused by electromagnetic pollution. As a result the FCC was charged with the responsibility of promulgating rules and regulations to control and enforce limits on high frequency interference.

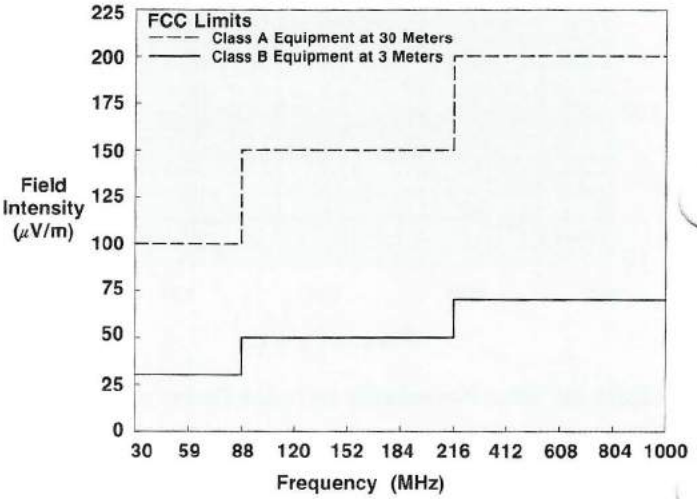
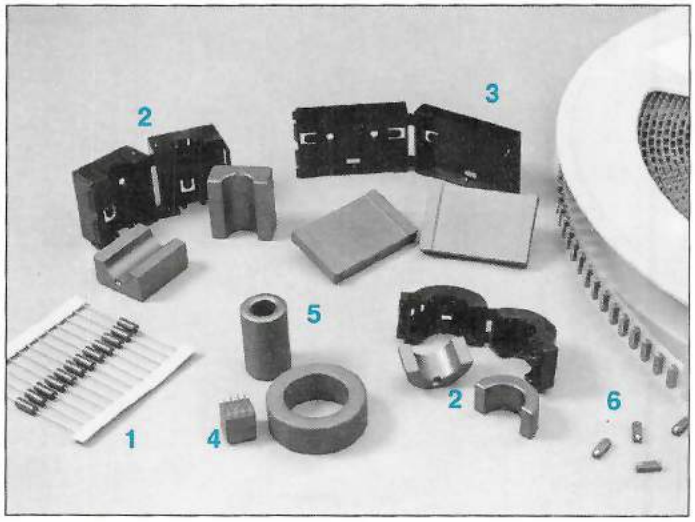


Figure 1 FCC Radiation Limits for class A & B equipment.



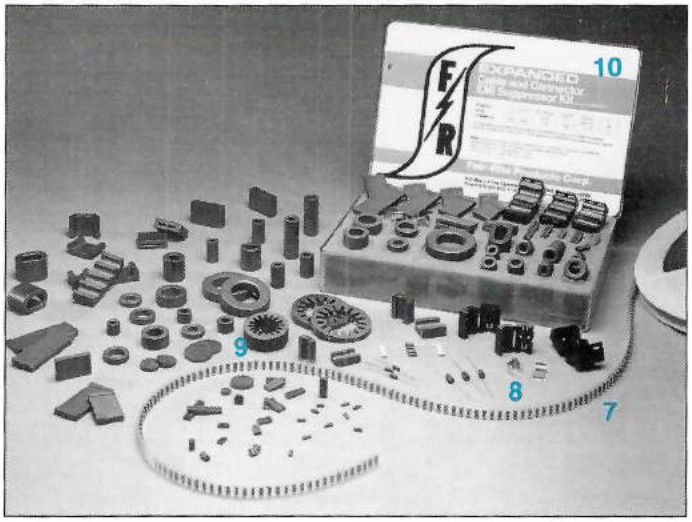


Figure 2, 3 Variety of EMI Suppression Cores including: (1) Beads on Leads, (2) Split Round Cable Suppression Cores and Cases, (3) Split Flat Cable Suppression Cores and Cases, (4) Printed Circuit (PC) Beads, (5) Toroidal Type Shield Beads, (6) Surface-Mount (SM) Beads, (7) on Reel, (8) Wound Beads, (9) Connector Suppression Discs and Plates and (10) One of five Engineering Kits containing a Large Variety of Samples of EMI Suppressor Cores.

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