

MILITARY SPECIFICATION

FILTERS; HIGH PASS, LOW PASS, BAND PASS,
 BAND SUPPRESSION, AND DUAL FUNCTIONING,
 GENERAL SPECIFICATION FOR

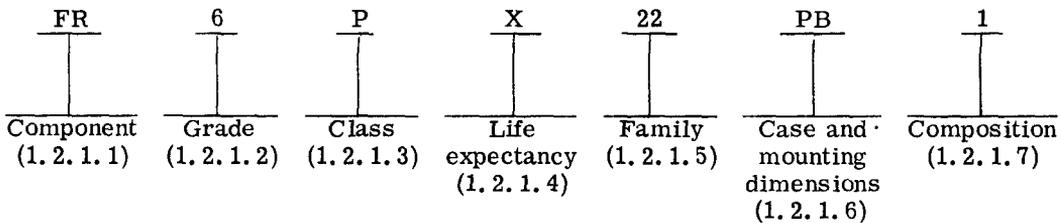
This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for passive frequency-selective networks, such as dual functioning, band suppression, band pass, low pass, and high pass (or any combination thereof) electric-wave filters, including those employing electromechanical and piezoelectric elements, for use over the frequency range of 0 to 150 megahertz. Filters covered by this specification are intended for use where operation under various environmental conditions is required. This specification covers filters weighing not more than 50 pounds and requiring root-mean-square test voltage ratings not greater than 5,000 volts.

1.2 Classification.

1.2.1 Type designation. The type designation shall be in the following form, and as specified (see 3.1 and 6.1). The type designation does not describe a discrete item. For complete identification, the part number and type designation shall be referenced.



1.2.1.1 Component. Filters are identified by the two-letter symbol "FR".

1.2.1.2 Grade. The grade is identified by a single digit in accordance with table I, denoting the type of enclosure and the vibration frequency level (see 4.7.13).

TABLE I. Grade.

Symbol	Type of enclosure	Vibration frequency level
		Hz
4	Metal-encased	10 - 55
5	Encapsulated	10 - 55
6	Metal-encased	10 - 2,000
7	Encapsulated	10 - 2,000
8	Metal-encased	10 - 500
9	Encapsulated	10 - 500

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Electronic Systems Command, ATTN: ELEX 8111, Department of the Navy, Washington, D. C. 20360 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

1.2.1.3 Class. The class is identified by a single letter in accordance with table II, denoting the maximum operating temperature (see 6.6) for the realization of the life expectancy indicated in table II.

TABLE II. Class.

Symbol	Maximum operating temperature °C
P	65
Q	85
R	105
S	125
V	Above 125

1.2.1.4 Life expectancy. The life expectancy is identified by a single letter in accordance with table III.

TABLE III. Life expectancy.

Symbol	Life (hours, minimum)
X	10,000
Y	2,500

1.2.1.5 Family. The family is identified by a two-digit symbol in accordance with table IV.

TABLE IV. Family.

Family	Application
11	Filter, low pass
12	Filter, low pass and band pass (combination)
13	Filter, low pass and high pass (combination)
22	Filter, band pass
24	Filter, band pass and band suppression (combination)
33	Filter, high pass
44	Filter, band suppression

1.2.1.6 Case and mounting dimensions (see 6.4). The case and mounting dimensions are designated by a two-letter symbol in accordance with figures 1 to 6 inclusive.

1.2.1.6.1 Envelope and mounting dimensions for grades 5, 7, and 9 filters. Envelope dimensions for grades 5, 7, and 9 filters shall not exceed the maximum dimensions specified on figure 1, and the mounting dimensions shall be identical to the dimensions specified for the equivalent cased-filter size.

1.2.1.7 Composition. The composition of the filter is identified by a single-digit symbol denoting the principal resonators in accordance with table V.

TABLE V. Composition.

Symbol	Principal resonators
1	LC
2	Crystal
3	Other electromechanical

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

- NN-P-71 - Pallet, Material Handling, Wood, Stringer Construction, 2 Way and 4 Way (Partial).
- QQ-S-781 - Strapping, Steel, and Seals.
- PPP-B-566 - Boxes, Folding, Paperboard.
- PPP-B-585 - Boxes, Wood, Wirebound.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-B-676 - Boxes, Setup.
- PPP-T-60 - Tape: Packaging, Waterproof.
- PPP-T-76 - Tape, Packaging, Paper (for Carton Sealing).

MILITARY

- MIL-E-1 - Electron Tubes, General Specification for.
- MIL-P-116 - Preservation-Packaging, Methods of.
- MIL-E-15090 - Enamel, Equipment, Light-gray (Formula No. 111).

(See supplement 1 for list of applicable specification sheets.)

STANDARDS

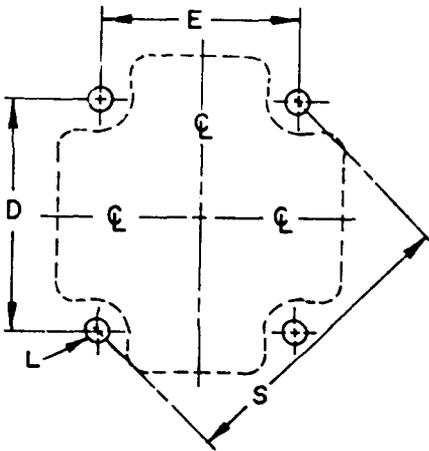
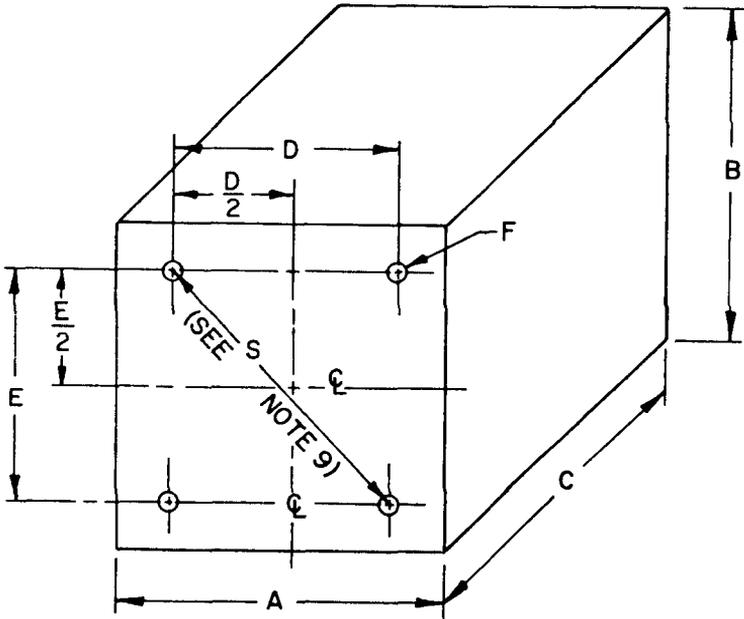
MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-147 - Palletized Unit Loads.
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of.
- MIL-STD-810 - Environmental Test Methods.
- MIL-STD-1188 - Commercial Packaging of Supplies and Equipment.
- MIL-STD-1285 - Marking of Electrical and Electronic Parts
- MIL-STD-45662- Calibration Systems Requirements.

FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)



INSPECTION TEMPLATE (SEE NOTE 14)

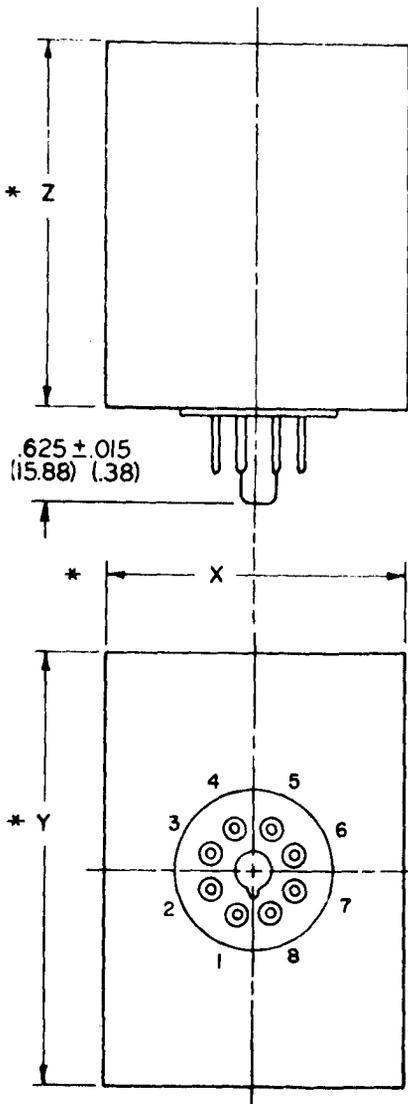
FIGURE 1. Envelope and mounting dimensions.

Case symbol	Envelope dimensions			Mounting dimensions			Template	
	A	B	C	D	E	S	F (Stud)	L
AF	0.750 (19.05)	0.750 (19.05)	1.125 (28.58)	-	-	0.562 (14.27)	.112-40x.375	0.147 (3.73)
AG	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	-	-	0.750 (19.05)	.112-40x.375	0.147 (3.73)
AH	1.312 (33.32)	1.312 (33.32)	1.750 (44.45)	-	-	1.250 (31.75)	.138-32x.375	0.173 (4.39)
AJ	1.625 (41.28)	1.625 (41.28)	2.375 (60.33)	1.188 (30.18)	1.188 (30.18)	1.680 (42.67)	.138-32x.375	0.173 (4.39)
EA	1.938 (49.23)	1.812 (46.02)	2.750 (69.85)	1.375 (34.93)	1.250 (31.75)	1.858 (47.19)	.138-32x.375	0.173 (4.39)
EB	1.938 (49.23)	1.812 (46.02)	2.438 (61.93)	1.375 (34.93)	1.250 (31.75)	1.858 (47.19)	.138-32x.375	0.173 (4.39)
FA	2.312 (58.72)	2.062 (52.37)	3.125 (79.38)	1.688 (42.88)	1.438 (36.53)	2.217 (56.31)	.138-32x.375	0.173 (4.39)
FB	2.312 (58.72)	2.062 (52.37)	2.500 (63.50)	1.688 (42.88)	1.438 (36.53)	2.217 (56.31)	.138-32x.375	0.173 (4.39)
GA	2.750 (69.85)	2.375 (60.33)	3.812 (96.82)	2.125 (53.98)	1.750 (44.45)	2.753 (69.93)	.138-32x.375	0.173 (4.39)
GB	2.750 (69.85)	2.375 (60.33)	2.812 (71.42)	2.125 (53.98)	1.750 (44.45)	2.753 (69.93)	.138-32x.375	0.173 (4.39)
HA	3.062 (77.77)	2.625 (66.68)	4.250 (107.95)	2.297 (58.34)	1.859 (47.22)	2.955 (75.06)	.164-32x.375	0.199 (5.05)
HB	3.062 (77.77)	2.625 (66.68)	3.188 (80.98)	2.297 (58.34)	1.859 (47.22)	2.955 (75.06)	.164-32x.375	0.199 (5.05)
JA	3.562 (90.47)	3.062 (77.77)	4.875 (123.83)	2.625 (66.68)	2.125 (53.98)	3.377 (85.78)	.164-32x.375	0.199 (5.05)
JB	3.562 (90.47)	3.062 (77.77)	3.875 (98.43)	2.625 (66.68)	2.125 (53.98)	3.377 (85.78)	.164-32x.375	0.199 (5.05)
KA	3.938 (100.03)	3.375 (85.73)	5.250 (133.35)	3.000 (76.20)	2.438 (61.93)	3.866 (98.20)	.190-32x.500	0.228 (5.79)
KB	3.938 (100.03)	3.375 (85.73)	4.312 (109.52)	3.000 (76.20)	2.438 (61.93)	3.866 (98.20)	.190-32x.500	0.228 (5.79)
LA	4.312 (109.52)	3.688 (93.68)	5.562 (141.27)	3.312 (84.12)	2.688 (68.28)	4.266 (108.36)	.190-32x.500	0.228 (5.79)
LB	4.312 (109.52)	3.688 (93.68)	4.500 (114.30)	3.312 (84.12)	2.688 (68.28)	4.266 (108.36)	.190-32x.500	0.228 (5.79)
MA	4.688 (119.08)	4.000 (101.60)	6.000 (152.40)	3.688 (93.68)	3.000 (76.20)	4.754 (120.75)	.250-20x.625	0.316 (8.03)
MB	4.688 (119.08)	4.000 (101.60)	4.938 (125.43)	3.688 (93.68)	3.000 (76.20)	4.754 (120.75)	.250-20x.625	0.316 (8.03)
NA	5.062 (128.57)	4.312 (109.52)	6.812 (173.02)	4.062 (103.17)	3.312 (84.12)	5.243 (133.17)	.250-20x.625	0.316 (8.03)
NB	5.062 (128.57)	4.312 (109.52)	5.500 (139.70)	4.062 (103.17)	3.312 (84.12)	5.243 (133.17)	.250-20x.625	0.316 (8.03)
OA	5.500 (139.70)	4.500 (114.30)	6.750 (171.45)	3.750 (95.25)	3.000 (76.20)	4.802 (121.97)	.250-20x.625	0.316 (8.03)
YY	All metal cases not included above							
ZZ	All encapsulated units not included above							

NOTES:

- Cases AF through OA inclusive shall have studs and terminals on same face. Stud size and length shall be as shown in dimension F.
- Dimensions are in inches.
- Metric equivalents are in parentheses.
- Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
- Tolerances on dimensions A and B are +.000, -.062 (+.00, -1.57 mm) for cases AF, AG, AH, and AJ; +.000, -.125 (+.00, -3.18 mm) for all other cases.
- Tolerances on dimensions C are +.000, -.125 (+.00, -3.18 mm) for cases AF, AG, AH, and AJ; +.000, -.185 (+.00, -4.78 mm) for all other cases.
- Tolerances on dimensions D and E are ± 0.016 (.41 mm) for cases AJ to JB inclusive; ± 0.031 (.79 mm) for cases KA to LB inclusive; and ± 0.047 (1.19 mm) for cases MA to OA inclusive. The centerlines of the drawing are the centerlines of the case; D/2 and E/2 are reference dimensions.
- Tolerances for cases YY and ZZ shall be as follows: Dimensions not exceeding those for the AJ case shall have the same tolerances as the AJ cases. For larger dimensions up to case size OA, the tolerances in notes 5, 6, and 7 shall apply. For case sizes larger than OA, tolerances shall be as specified. Dimensions A, B, and C for ZZ cases are considered maximum dimensions (see 3.1 and 6.1).
- Tolerances on dimension S for two-stud mounting are ± 0.016 (.41 mm) for cases AF to AH inclusive. For four-stud mounting, the difference between the two diagonal S dimensions shall not exceed 1.5 times the tolerance specified for dimensions D and E in note 7.
- Screw-stud lengths are measured from the mounting surface and have a length tolerance of ± 0.062 (1.57 mm) on studs .500 (12.70 mm) long or less, and ± 0.125 (3.18 mm) on studs over .500 (12.70 mm) long. Mounting screw inserts may be supplied instead of studs for case sizes AF, AG, and AH, or units of equivalent volume and shall have a minimum depth equivalent to eight full threads (grades 4, 6, and 8 only) of the same diameter as the stud of the corresponding case size. Inserts shall meet all stud requirements.
- Rectangular cases may have corner radii of not to exceed one-quarter of the smallest envelope dimensions.
- When mounted, tilt of units (overhand only) measured horizontally or vertically, shall not exceed .016 (.41 mm) per inch of height but need not be less than .016 (.41 mm) for any height, and shall be referenced to the maximum specified case dimensions.
- The above case sizes are preferred NATO types, NEPR-20, and shall be used in the design of all NATO equipment.
- Templates used for verifying mounting stud dimensions shall be a minimum of .375 (9.52 mm) inch thick and have nominal D, E, S, and L dimensions shown for each case size. The tolerance for template dimensions D, E, and S should be ± 0.001 (.03 mm) inch, and shall be ± 0.0005 (.013 mm) inch for dimension L.

FIGURE 1. Envelope and mounting dimensions - Continued.



Ref	Inches			Millimeters			Degrees	Notes
	Min	Nom	Max	Min	Nom	Max		
A	—	0.687	—	—	17.45	—		
B	0.090	0.093	0.096	2.286	2.362	2.438		6
J	0.320	—	—	8.13	—	—		
L	0.427	0.437	0.447	10.85	11.10	11.35		7
M	—	—	0.135	—	—	—		
N	—	—	0.050	—	—	—		
P	0.550	0.560	0.570	13.97	14.22	14.47		8
Q	0.490	0.500	0.510	12.45	12.70	12.95		
R ₁	—	0.031r	—	—	0.79r	—		
R ₂	—	—	0.050r	—	—	1.27r		
R ₃	—	0.040r	—	—	1.02r	—		
S	0.040	0.047	0.055	1.02	1.19	1.39		
U ₁	0.305	0.312	0.317	7.75	7.92	8.05		
U ₂	0.300	0.308	0.315	7.62	7.82	8.00		
V ₁	0.352	0.362	0.372	8.95	9.19	9.44		
V ₂	0.343	0.353	0.363	8.72	8.97	9.22		
W ₁	0.085	0.090	0.095	2.159	2.286	2.413		
W ₂	0.075	0.080	0.085	1.905	2.032	2.159		
a	—	—	—	—	—	—	22.1	
b	—	—	—	—	—	—	45	

For the purpose of establishing interchangeability, the dimensional limits as here given shall be standard for the orientation of base pins and index guide of Group No. 1 bases. (Formerly known as Octal Bases.)

It should be noted that the vertical dimensions are referred to the underside of a base as differentiated from the general practice in this standard of dimensioning from the outer rim.

PIN AND INDEX GUIDE DIMENSIONS FOR OCTAL BASES

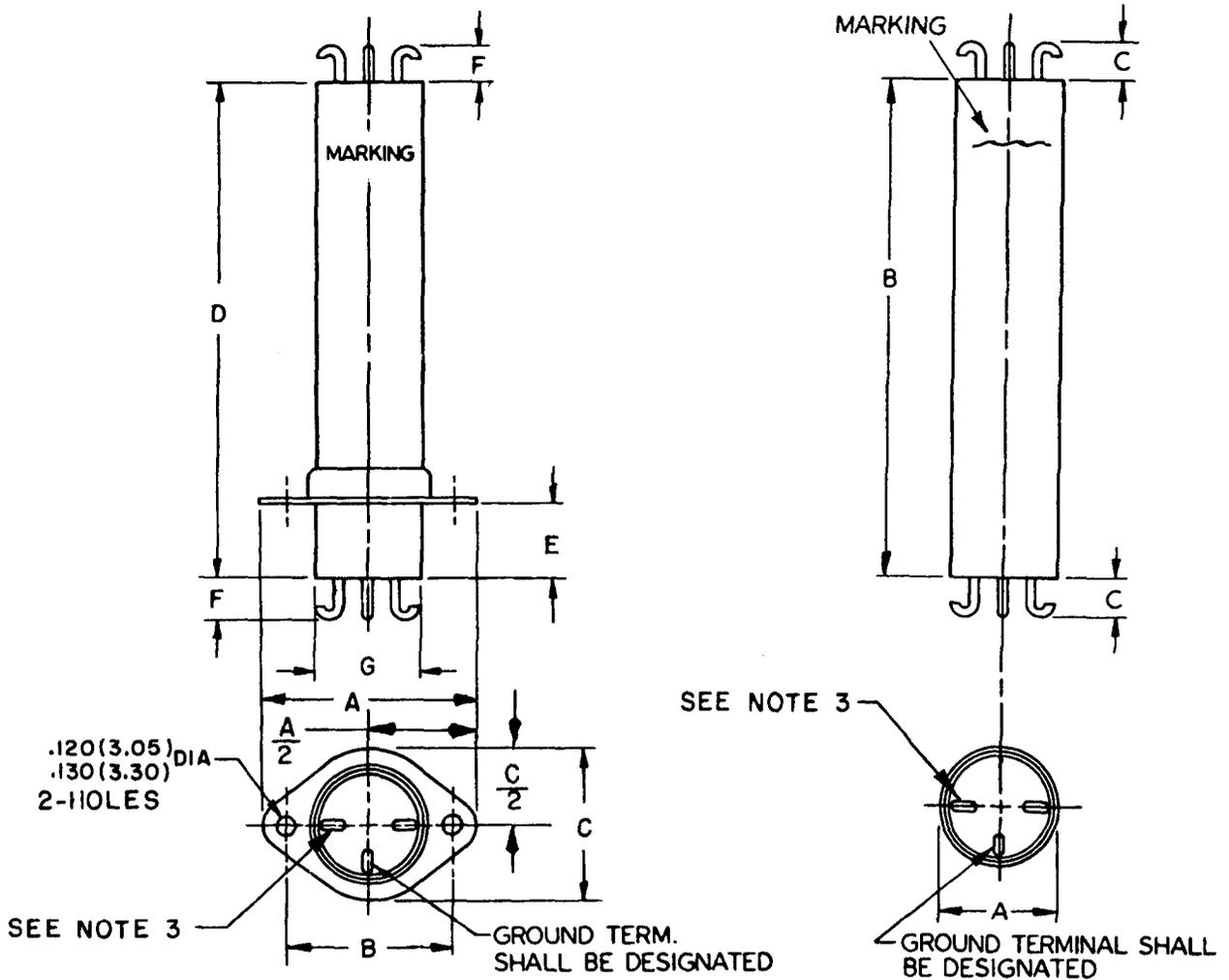
NOTES:

- Dimensions are in inches.
- Metric equivalents are in parentheses.
- Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
- Dimensions fixing the contact pin positions refer to their fixed ends and are given for information only. Pin positions may be checked by means of alignment gage No. GB8-1 in accordance with EIA Standard RS-209-A-1. For bases with coaxial lead, use gage GB8-1 with pin 4 pin hole, .1600 ± .0005 (4.064 ± .013 mm) diameter to a depth of 1.25 (31.8 mm) minimum.
- Underside of base.
- Dimension B does not include increase in pin diameter due to solder.
- Dimension L may be increased by .030 (.76 mm) maximum for solder.
- Any projection on the under-surface of the base other than those shown, such as a rim or external barriers, shall have a height not exceeding .045 (1.14 mm).
- Pin numbering is viewed from the pin ends. The drawing shows the numbering of the pins as seen from their free ends.
- External mounting support required for plug in type filters having no means of support other than socket.
- The numbers indicated above each base drawing refer to the Group Number of Pin and Index Guide dimensional Limits.

FIGURE 2. Case and mounting dimensions for PA, PB, PC, PY, and PZ.

Case symbol	Dimensions		
	X	Y	Z
PA	1.750 (44.45)	1.750 (44.45)	3.000 (76.20)
PB	2.062 (52.37)	2.937 (74.60)	2.562 (65.07)
PC	2.562 (65.07)	4.937 (125.40)	2.562 (65.07)
PY	All sizes not included above		
PZ	All encapsulated units not included above and all open type units.		

*Tolerances on X, Y, and Z are ±.062.



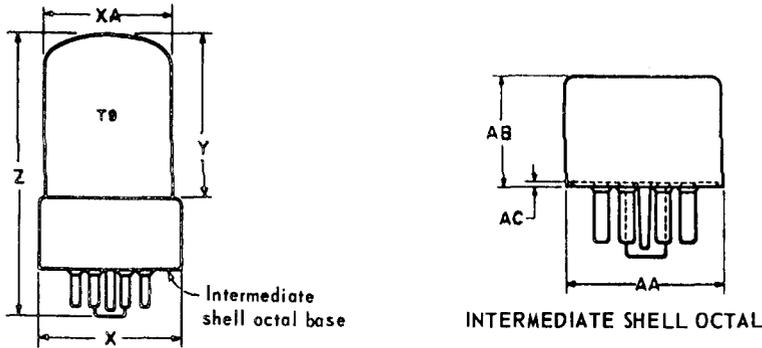
Case symbol	Mounting dimensions flange mount						
	A±.015 (.38)	B±.005 (.13)	C±.016 (.41)	D ±.015 (.38)	E±.031 (.79)	F±.015 (.38)	G±.005 (.13)
QC	1.423 (36.14)	1.125 (28.58)	1.016 (25.81)	2.766 (70.26)	.625 (15.88)	.266 (6.76)	.775 (19.68)
QD	1.000 (25.40)	.750 (19.05)	.625 (15.88)	2.250 (57.15)	.625 (15.88)	.266 (6.76)	.437 (11.10)
QY	All sizes not included above.						

Case symbol	Mounting dimensions clamp mount		
	A±.015 (.38)	B±.031 (.79)	C±.015 (.38)
QA	.775 (19.68)	3.500 (88.90)	.266 (6.76)
QB	.438 (11.13)	2.188 (55.58)	.141 (3.58)
QZ	All sizes not included above		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. Terminal positions are optional.
4. Metric equivalents are in parentheses.

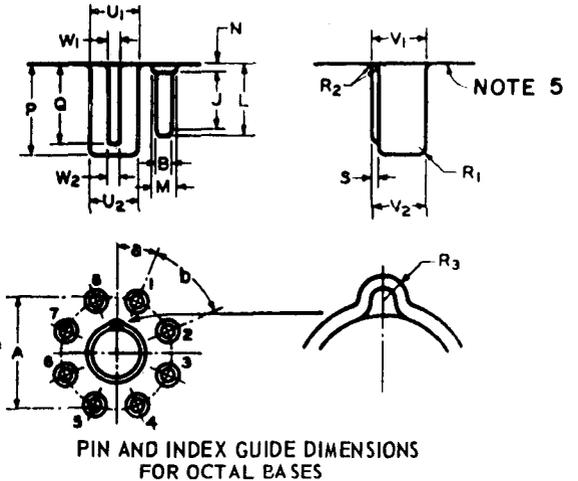
FIGURE 3. Case and mounting dimensions for QA, QB, QC, QD, QY, and QZ.



Dimensions

Case symbol	X max	XA max	Y max	Z max	AA	AB	AC max
SA	1.281 (32.54)	1.187 (30.15)	2.312 (58.72)	2.875 (73.03)	1.235 (31.37) 1.275 (32.29)	.843 (21.41)	.020 (0.51)
SB	1.250 (31.75)	1.187 (30.15)	2.250 (57.15)	2.875 (73.03)	1.235 (31.37) 1.275 (32.39)	.843 (21.41)	.020 (0.51)
SY	ALL SIZES NOT INCLUDED ABOVE						

Ref	Inches			Millimeters			Degrees	Notes
	Min	Nom	Max	Min	Nom	Max		
A	—	0.687	—	—	17.45	—	—	6
B	0.090	0.093	—	2.286	2.362	2.438	—	
J	—	—	—	8.13	—	—	—	7
L	0.320	—	—	10.85	11.10	11.35	—	
M	—	—	—	—	—	3.42	—	8
N	—	—	0.050	—	—	1.27	—	
P	—	0.560	0.570	13.97	14.22	14.47	—	8
Q	0.490	0.509	0.510	12.46	12.70	12.95	—	
R ₁	—	0.031r	—	—	0.79r	—	—	8
R ₂	—	—	0.050r	—	—	1.27r	—	
R ₃	—	0.040r	—	—	1.02r	—	—	8
S	0.040	0.047	0.056	1.02	1.19	1.39	—	
U ₁	0.305	0.312	0.317	7.75	7.92	8.05	—	8
U ₂	0.300	0.308	0.315	7.62	7.82	8.00	—	
V ₁	0.352	0.362	0.372	8.95	9.19	9.44	—	8
V ₂	0.343	0.353	0.363	8.72	8.97	9.22	—	
W ₁	0.085	0.090	0.095	2.169	2.286	2.413	—	8
W ₂	0.075	0.080	0.085	1.905	2.032	2.169	—	
a	—	—	—	—	—	—	22.5	45
b	—	—	—	—	—	—	45	



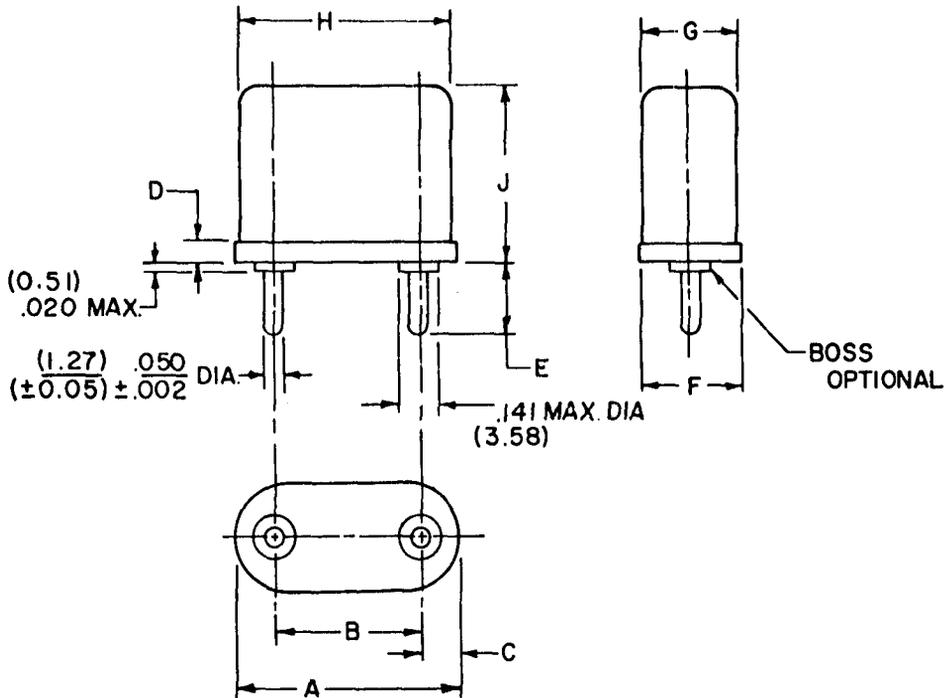
For the purpose of establishing interchangeability, the dimensional limits as here given shall be standard for the orientation of base pins and index guide of Group No. 1 bases. (Formerly known as Octal Bases.)

It should be noted that the vertical dimensions are referred to the underside of a base as differentiated from the general practice in this standard of dimensioning from the outer rim.

NOTES:

- Dimensions are in inches.
- Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
- Metric equivalents are in parentheses.
- Dimensions fixing the contact pin positions refer to their fixed ends and are given for information only. Pin positions may be checked only by means of alignment gage No. GB8-1 in accordance with EIA Standard RS-209-A-1. For bases with coaxial lead, use gage GB8-1 with pin 4 pin hole, .1600 ± .0005 (4.064 ± .013 mm) diameter to a depth of 1.25 (31.75 mm) minimum.
- Underside of base.
- Dimension B does not include increase in pin diameter due to solder.
- Dimension L may be increased by .030 (.76 mm) maximum for solder.
- Any projection on the under-surface of the base other than these shown, such as a rim or external barriers, shall have a height not exceeding .045 (1.14 mm).
- Pin numbering is viewed from the pin ends. The drawing shows the numbering of the pins as seen from their free ends.
- The numbers indicated above each base drawing refer to the Group Number of Pin and Index Guide Dimensional Limits.

FIGURE 4. Case and mounting dimensions for SA, SB, and SY.



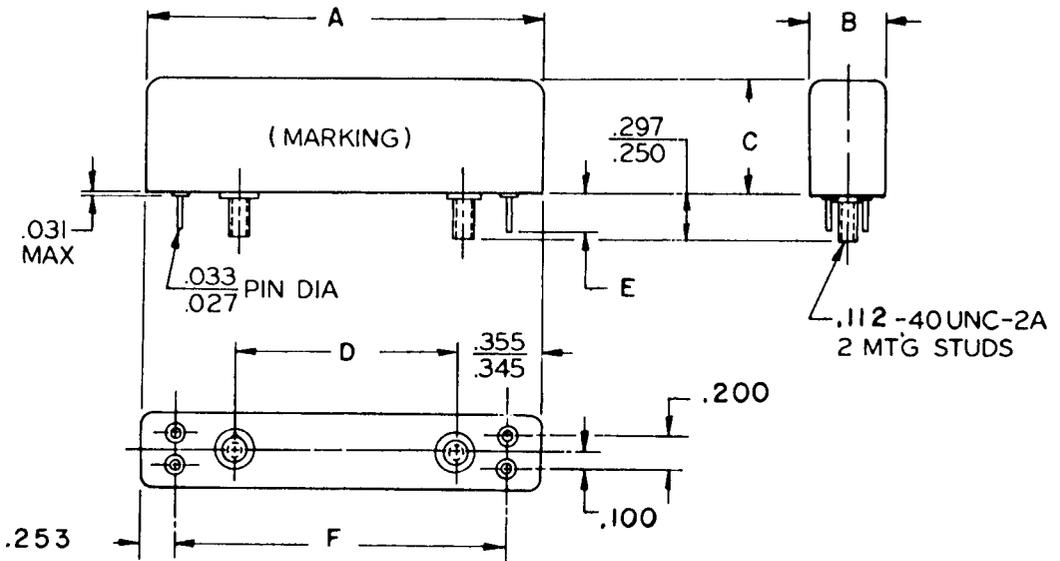
Case symbol	Dimensions								
	A	B	C	D	E	F	G	H	J
RA	.418(10.62)	.192(4.88)	.182(4.62)	.045(1.14)	.150(3.81)	.166(4.22)	.147(3.73)	.399(10.13)	.515(13.08)
RB	.750(19.05)	.486(12.34)	.132(3.35)	.065(1.65)	.238(6.05)	.345(8.76)	.315(8.00)	.720(18.29)	1.516(38.51)
RC	.750(19.05)	.486(12.34)	.352(8.98)	.065(1.65)	.238(6.05)	.345(8.76)	.315(8.00)	.720(18.29)	.765(19.43)
RY	All sizes not included above.								

Case tolerances			
Ltr	RA	RB	RC
A	-.005(.13)	-.005(.13)	+.010(.25)
B	±.008(.20)	±.008(.20)	±.008(.20)
C	±.005(.13)	±.005(.13)	±.005(.13)
D	±.010(.25)	±.010(.25)	±.005(.13)
E	+.010(.25) -.015(.38)	+.010(.25) -.015(.38)	1.50(38.10) min
F	-.005(.13)	-.005(.13)	+.010(.25)
G	+.002(.05) -.005(.13)	+.002(.05) -.005(.13)	+.002(.05) -.005(.13)
H	+.002(.05) -.005(.13)	+.002(.05) -.005(.13)	+.002(.05) -.005(.13)
J	±.010(.25)	±.010(.25)	+.010(.25) -.015(.38)

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are in parentheses.
3. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.

FIGURE 5. Case and mounting dimensions for RA, RB, RC, and RY.



Case symbol	Mounting dimensions					
	A \pm .015 (.38)	B \pm .015 (.38)	C MAX	D \pm .005 (.13)	E \pm .031 (.79)	F \pm .005 (.13)
TA	2.704 (68.68)	.485 (12.32)	.753 (19.13)	1.500 (38.10)	.281 (7.14)	2.200 (55.88)
TY	All sizes not included above					

INCHES	MM
.027	.69
.031	.79
.033	.84
.100	2.54
.200	5.08
.250	6.35
.253	6.43
.297	7.54
.345	8.76
.355	9.02

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are in parentheses.
3. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
4. Unless otherwise specified, tolerances are \pm .005 (.13 mm).

FIGURE 6. Case and mounting dimensions for TA and TY.

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

ELECTRONIC INDUSTRIES ASSOCIATION

RS-209-A-63 - Standard for Electron Tubes.

(Application for copies should be addressed to the Electronic Industries Association, 2001 Eye Street, N.W., Washington, D.C. 20006.)

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI-C42.100- Standard Dictionary of Electrical and Electronic Terms.

(Application for copies should be addressed to the American National Standards Institute Inc., 1430 Broadway, New York, N.Y. 10018.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Specification sheets. The individual part requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between requirements of this specification and the specification sheet, the latter shall govern (see 6.1).

3.2 Qualification. Filters furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.5 and 6.2).

3.3 Material. The material shall be as specified herein. When a definite material is not specified, a material shall be used which will enable the filters to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 Substitution of material. If the supplier desires to substitute another material for a specified material or fabricated part, he shall submit a statement to the Government describing the proposed substitution, together with evidence to substantiate his claims that such substitute is suitable. At the discretion of the Government, test samples may be required to prove the suitability of the proposed substitute. Before such substitutions are made, approval for each substitution shall be obtained in writing from the Government.

3.3.2 Flammable materials. So far as practicable, materials used in the construction of filters shall be nonflammable and nonexplosive.

3.3.3 Corrosive materials. Corrosive materials used in any of the manufacturing processes shall be removed or neutralized so that no corrosion will result from such use. So far as practicable, materials used in the construction of filters shall be noncorrosive.

3.4 Design and construction.

3.4.1 Mounting and terminal screws and nuts. Screw threads shall be class 2A or 2B, as applicable, in accordance with FED-STD-H28. After receiving a finish, screw threads, class 2A fit, shall be capable of accepting a nut of class 2B with maximum installation torque in accordance with the following:

<u>Screw size</u>	<u>Maximum torque (pound-inches)</u>
.112-40 - - - - -	3
.138-32 - - - - -	5
.164-32 - - - - -	6
.190-32 - - - - -	8
.250-20 - - - - -	8
.3125-18 - - - - -	8

Nuts shall run down to within two threads of mounting surface. All mounting and terminal screws, nuts, and washers shall be corrosion-resistant material or shall be protected against corrosion.

3.4.2 Terminals.

3.4.2.1 Solder terminals. Solder terminals may be of any shape, and shall be capable of being readily soldered. The height of the solder terminals shall be considered as the maximum distance from the terminal mounting surface to the highest point, including the additional height obtained if semiflexible terminals are straightened. (It is not intended that the "hook" in the "button-hook" type terminal should be straightened from its normal hooked position). The type of terminal and the maximum size of round wire which the terminal will accept externally shall be as specified (see 3.1).

3.4.2.2 Screw terminals. When external screw terminals are specified (see 3.1 and 6.1), they shall be supplied with two nuts, two flat washers, and one lockwasher. Radially-tapped permanent stud terminals shall be supplied with one screw and one lockwasher. For cased filters, the height of the terminal assembly shall be the distance from the free end of the screw to the terminal mounting surface. The type of terminal, size of screw thread, and, for all screw terminals, the exposed length of threads $\pm 1/16$ inch shall be as specified (e.g., screw, No. .164-32 x .375) (see 3.1).

3.4.2.3 Pin-type terminals. Pin-type terminals, for use with vacuum tube type sockets, shall conform with standard 7-pin button base E7-1, 8-pin octal base, or standard 9-pin button base E9-1 of MIL-E-1.

3.4.3 Mounting studs. When external mounting studs are specified (see 3.1 and 6.1), they shall be supplied with a locknut; or with a flat washer, a lockwasher, and a nut.

3.4.4 Internal lead wires. Internal lead wires shall be attached to the internal components and terminals or case in such a manner as to provide adequate electrical connection and mechanical strength.

3.4.5 Paint color. When a paint finish is specified (see 3.1), the color of the paint shall be light-gray, semigloss, in accordance with MIL-E-15090 (Formula No. 111). Unless otherwise specified, the supplier shall omit paint from the mounting and terminal area surface.

3.5 Terminal strength. When filters are tested as specified in 4.7.2, no part of the terminals shall loosen or rupture and no other damage shall result. Bends shall not be considered as damage unless surface cracking is evident. Except for flexible leads, permanent rotation of any terminal shall not exceed 10° . Rotation of the external portion of the metallic portion of a hook type terminal, such as a buttonhook, exceeding 10° shall not constitute a failure.

3.6 Solderability (when specified, see 3.1). When filters are tested as specified in 4.7.3, the dipped surface leads shall be at least 95 percent covered with continuous new solder coating. The remaining 5 percent of the lead surface may show only small pinholes or voids and these shall not be concentrated in one area. Bare base metal and areas where the solder dip fails to cover the original coating are indications of poor solderability, and shall be cause for rejection.

3.7 Resistance to soldering heat (when specified, see 3.1). When filters are tested as specified in 4.7.4, there shall be no evidence of loosening of the terminals, mechanical damage, or evidence of damage to the filters.

3.8 Sealing (see 4.7.5).

3.8.1 All filters. When tested as specified in 4.7.5.1, filters shall show no continuous flow of air bubbles or leakage of compound from the body of the filter.

3.8.2 Liquid-filled filters. When tested as specified in 4.7.5.2, filters shall show no evidence of liquid leakage.

3.9 Dielectric withstanding voltage. When filters are tested as specified in 4.7.6, there shall be no arcing, flashover, breakdown of insulation, or evidence of damage.

3.10 Barometric pressure (reduced) (filters designed for operation above 10,000 feet). When filters are tested as specified in 4.7.7, there shall be no breakdown, flashover, or impairment of any characteristic qualities sufficient to cause failure of the filter.

3.11 Insulation resistance. When measured as specified in 4.7.8, the insulation resistance between each terminal and case or mounting shall be not less than 10,000 megohms or 1,000 megohms, as specified (see 3.1).

3.12 Electrical characteristics. When filters are tested as specified in 4.7.9, the applicable electrical characteristics shall be as specified (see 3.1).

3.13 Stability at temperature extremes. When tested as specified in 4.7.10, filters shall meet the following requirements:

Dielectric withstanding voltage - - - - - Shall be as specified in 3.9.

Electrical characteristics- - - - - Shall be as specified (see 3.1).

3.14 Life (at elevated ambient temperature). When filters are tested as specified in 4.7.11, there shall be no excessive peeling, flaking, chipping, cracking, crazing, or other impairment of the protective coating, no leakage of filling material, and no evidence of other physical damage such as cracks, bursting, or bulging of the case. Following the test, these requirements shall be met:

Dielectric withstanding voltage - - - - - Shall be as specified in 3.9.

Insulation resistance - - - - - Shall be as specified (see 3.11).

Electrical characteristics- - - - - Shall be as specified (see 3.1).

3.15 Temperature rise (when specified, see 3.1). When filters are tested as specified in 4.7.12, the temperature rise above the specified maximum ambient temperature (see 3.1) shall not exceed the value specified (see 3.1), and there shall be no excessive peeling, flaking, chipping, cracking, crazing, or other impairment of the protective coating, no leakage of filling material, and no evidence of other physical damage such as cracks, bursting, or bulging of the case.

3.16 Vibration. When filters are tested as specified in 4.7.13, there shall be no excessive peeling, flaking, chipping, cracking, crazing, or other impairment of the protective coating, no leakage of filling material, and no evidence of other physical damage such as cracks, bursting or bulging of the case. Following the test, these requirements shall be met:

Dielectric withstanding voltage - - - - - Shall be as specified in 3.9.

Electrical characteristics- - - - - Shall be as specified (see 3.1).

3.17 Shock. When filters are tested as specified in 4.7.14, there shall be no excessive peeling, flaking, chipping, cracking, crazing, or other impairment of the protective coating, no leakage of filling material, and no evidence of other physical damage such as cracks, bursting, or bulging of the case. Following the test, these requirements shall be met:

- Dielectric withstanding voltage - - - - - Shall be as specified in 3.9.
- Electrical characteristics - - - - - Shall be as specified (see 3.1).

3.18 Thermal shock. When filters are tested as specified in 4.7.15, there shall be no excessive peeling, flaking, chipping, cracking, crazing, or other impairment of the protective coating, no leakage of filling material, and no evidence of other physical damage such as cracks, bursting, or bulging of the case, or corrosion affecting the mechanical or electrical operation. Following the test, these requirements shall be met:

- Dielectric withstanding voltage - - - - - Shall be as specified in 3.9.
- Insulation resistance - - - - - Shall be as specified (see 3.11).

3.19 Immersion. When filters are tested as specified in 4.7.16, there shall be no excessive peeling, flaking, chipping, cracking, crazing, or other impairment of the protective coating, no leakage of filling material, and no evidence of other physical damage such as cracks, bursting, or bulging of the case, or corrosion affecting the mechanical or electrical operation. Following the test, these requirements shall be met:

- Dielectric withstanding voltage - - - - - Shall be as specified in 3.9.
- Insulation resistance - - - - - Shall be as specified (see 3.11).

3.20 Moisture resistance. When filters are tested as specified in 4.7.17, there shall be no excessive peeling, flaking, chipping, cracking, crazing, or other impairment of the protective coating, no leakage of filling material, and no evidence of other physical damage such as cracks, bursting, or bulging of the case, or corrosion affecting the mechanical or electrical operation. Following the test, these requirements shall be met:

- Dielectric withstanding voltage - - - - - Shall be as specified in 3.9.
- Insulation resistance - - - - - Shall be as specified (see 3.11).

3.21 Salt spray (when specified, see 3.1). When filters are tested as specified in 4.7.18, there shall be no evidence of degradation of the coating material, leakage of the potting or filling material, corrosion of metallic parts, legibility of marking, or other physical damage.

3.22 Acceleration (when specified, see 3.1). When filters are tested as specified in 4.7.19, the insertion loss shall be as specified (see 3.1).

3.23 Flammability (external flame)(grades 5, 7, and 9 only). When filters are tested as specified in 4.7.20, there shall be no evidence of violent burning which results in an explosive-type flame, and the coating material used on the filters shall be self-extinguishing. Material shall be considered self-extinguishing if the following conditions are met:

- a. The duration of visible flame shall not exceed 3 minutes after removal of the applied flame.
- b. There shall be no explosion, nor shall there be any violent burning which results in an explosive-type flame.
- c. There shall be no dripping of flaming material from the filter under test.

3.24 Resistance to solvents. When filters are tested as specified in 4.7.21, there shall be no evidence of mechanical damage and the markings shall remain legible. The paint or exterior finish shall not soften, peel, or show other signs of deterioration.

3.25 Fungus. All external materials shall be nonnutrient to fungus growth or shall be suitably treated to retard fungus growth. The manufacturer shall certify that all external materials are fungus resistant (see 4.7.22) or shall perform the test as specified in 4.7.22. There shall be no evidence of fungus growth on external surfaces.

3.26 Marking. Marking of filters shall conform to MIL-STD-1285 and shall include the part number, type designation, source code, date code, lot symbol, trademark, discrimination characteristics, terminal identification, and source and load impedance. Where lack of space prohibits the inclusion of the discrimination characteristics, the nominal center frequency shall be marked on the case for band pass and band suppression filters, and the cutoff frequency shall be marked on the case for low pass and high pass filters. Any marking of a classified nature shall not be included. The following is an example of the complete marking:

M18327/007-001	- Part number.
FR6PX22PB1	- Type designation.
12345 7133A	- Source code, date code, and lot symbol.
ZZZ	- Trademark.
17.4kHz-3dB MAX	- Discrimination characteristics.
IN 1-2 600Ω	- Terminal identification, and source and
OUT 3-4 600Ω	load impedance.

3.27 Workmanship. Filters shall be processed in such a manner as to be uniform in quality and shall be free from cracks, bursting of the case, leakage of filling material, or other defects that will affect life, serviceability, and appearance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Test equipment and inspection facilities. Test and measuring equipment, and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662.

4.2 Classification of inspections. The inspections specified herein are classified as follows:

- a. Qualification inspection (see 4.5).
- b. Quality conformance inspection (see 4.6).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in "GENERAL REQUIREMENTS" of MIL-STD-202.

4.4 Test voltage. The test voltage shall be sufficiently free of distortion and noise to permit measurements to be made to the degree of accuracy required herein.

4.5 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.2) on sample units produced with equipment and procedures normally used in production. Identification data required shall be in accordance with the appendix.

4.5.1 Qualification of filters based on complete testing.

4.5.1.1 Sample size. Eight filters shall be subjected to the qualification inspection for complete testing. Two additional sample units shall be required for group IV if the fungus test is performed.

4.5.1.2 Inspection routine. Sample units shall be subjected to the inspections specified in table VI, in the order shown. All sample units shall be subjected to the inspections of group I. The samples shall then be divided as specified in table VI for groups II, III, and IV.

TABLE VI. Qualification inspection.

Inspection	Grades		Requirement paragraph	Test paragraph	Number of sample units to be inspected
	4, 6 8	5, 7 9			
<u>Group I</u>					
Visual and mechanical inspection (external) <u>1/</u> - - - - -	X	X	3. 1, 3. 3, 3. 3. 1, 3. 4 to 3. 4. 3 incl., 3. 4. 5., 3. 26, and 3. 27	4. 7. 1. 1	}
Terminal strength <u>2/</u> - - - - -	X	X	3. 5	4. 7. 2	
Solderability (when specified) - - - - -	X	X	3. 6	4. 7. 3	
Resistance to soldering heat (when specified) - - - - -	X	X	3. 7	4. 7. 4	
Sealing - - - - -	X	X	3. 8	4. 7. 5	
Dielectric withstanding voltage - - - - -	X	X	3. 9	4. 7. 6	
Barometric pressure (reduced) - - - - -	X	X	3. 10	4. 7. 7	
Insulation resistance - - - - -	X	X	3. 11	4. 7. 8	
Electrical characteristics - - - - -	X	X	3. 12	4. 7. 9	
Stability at temperature extremes - - - - -	X	X	3. 13	4. 7. 10	
<u>Group II</u>					
Life (at elevated ambient temperature)	X	X	3. 14	4. 7. 11	2
<u>Group III</u>					
Temperature rise (when specified) <u>1/ 3/</u> - - - - -	X	X	3. 15	4. 7. 12	}
Vibration - - - - -	X	X	3. 16	4. 7. 13	
Shock - - - - -	X	X	3. 17	4. 7. 14	
Thermal shock - - - - -	X	X	3. 18	4. 7. 15	
Immersion - - - - -	X	X	3. 19	4. 7. 16	
Moisture resistance <u>4/</u> - - - - -	X	X	3. 20	4. 7. 17	

See footnotes at end of table.

TABLE VI. Qualification inspection - Continued.

Inspection	Grades		Requirement paragraph	Test paragraph	Number of sample units to be inspected
	4, 6, 8	5, 7, 9			
<u>Group III - Continued</u>					
Salt spray (when specified) 4/ - -	X	X	3.21	4.7.18	} 6
Acceleration (when specified)- - -	X	X	3.22	4.7.19	
Electrical characteristics - - - -	X	X	3.12	4.7.9	
Visual and mechanical inspection (external) 1/ - - - - - - - - -	X	X	3.1, 3.3, 3.3.1, 3.4 to 3.4.3 incl., 3.4.5, 3.26, and 3.27	4.7.1.1	
Resistance to solvents - - - - -	X	X	3.24	4.7.21	
Flammability (external flame) (grades 5, 7, and 9 only)- - - - - - - -	-	X	3.23	4.7.20	
Visual and mechanical inspection (internal) - - - - - - - - - - -	X	X	3.1, 3.3, 3.3.1, 3.3.2, 3.4.4, and 3.27	4.7.1.2	} 3
<u>Group IV</u>					
Fungus 5/- - - - - - - - - - - -	X	X	3.25	4.7.22	} 2

1/ Nondestructive tests.

2/ For grades 4, 6, and 8 the torque test is applicable only to terminals with screw threads.

3/ Two sample units only.

4/ When salt spray is specified, the six sample units shall be divided into two equal groups. Each group shall be inspected independently for moisture resistance and salt spray. When these examinations are performed in the foregoing manner, separate test data shall be submitted for each group.

5/ Test shall not be performed if the manufacturer provides certification that all external materials are fungus resistant.

4.5.1.3 Failures. One or more failures shall be cause for refusal to grant qualification approval.

4.5.2 Qualification of filters based on similarity to qualified filters. Only filters which have passed the complete tests of the qualification inspection shall be used as a basis for comparison for qualification based on similarity. Qualification by similarity shall be restricted to filters that meet the criteria specified for similar filters (see 6.7.5). Unless otherwise specified (see 3.1) filters being qualified by similarity shall be subjected to the tests in table VII. However, tests in group III of table VI not previously specified for the filter which was qualified on the basis of complete testing (see 4.5.1) shall be performed on the filter being qualified by similarity if the requirement is applicable.

TABLE VII. Qualification inspection based on similarity.

Inspection	Requirement paragraph	Test paragraph
Dielectric withstanding voltage - - - - -	3.9	4.7.6
Insulation resistance - - - - -	3.11	4.7.8
Electrical characteristics - - - - -	3.12	4.7.9
Temperature rise (when specified) (1 sample unit) -	3.15	4.7.12
Visual and mechanical inspection - - - - -	3.1, 3.3, 3.3.1, 3.4 to 3.4.3 incl., 3.4.5, 3.26, and 3.27	4.7.1.1

4.5.2.1 Sample size. Three filters shall be subjected to qualification based on similarity.

4.5.2.2 Inspection routine. The sample shall be subjected to the qualification inspection in table VII, in the order shown.

4.5.2.3 Failures. One or more failures shall be cause for refusal to grant qualification approval.

4.5.3 Retention of qualification. After the end of each 12-month period, the manufacturer shall compile a summary of the results of quality conformance inspection in the form of a retention of qualification report, and forward it to the qualifying activity within 30 days from the end of the reporting period as the basis of continued qualification approval. In addition, the manufacturer shall immediately notify the qualifying activity whenever the group B inspection data indicates failure of the qualified product to meet the requirements of this specification. Continuation shall be based on the evidence that over the 12-month period, the following has been met:

- a. The manufacturer has not modified the design of the item.
- b. Lot rejection for group A inspection does not exceed the AQL of table VIII.
- c. The requirements for group B inspection are met. When group B requirements are not met and the manufacturer has taken corrective action satisfactory to the Government, group B retesting shall be instituted. A summary of the retesting shall be forwarded to the qualifying activity within 30 days after completion of the test.

Failure to submit the report within 30 days after the end of each 12-month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the supplier shall immediately notify the qualifying activity at any time during the 12-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification.

In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during 2 consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit a representative filter of each type, grade, class, etc., to testing in accordance with the qualification inspection requirements.

TABLE VIII. Group A inspection.

Inspection	Requirement paragraph	Test paragraph	AQL (percent defective)	
			Major	Minor
Visual and mechanical inspection (external) - - - - -	3.1, 3.3, 3.3.1, 3.4 to 3.4.3 incl., 3.4.5, 3.26, and 3.27	4.7.1.1	1.0	4.0
Sealing 1/- - - - -	3.8	4.7.5	} 1.0	---
Dielectric withstanding voltage- - -	3.9	4.7.6		---
Insulation resistance- - - - -	3.11	4.7.8		---
Insertion loss (at reference frequency)	3.12	4.7.9.2		---

1/ Any filter which shows evidence of leakage may be given remedial treatment if evidence is submitted to show that such remedial treatment is adequate and that all of the other filters in the lot have been given similar remedial treatment where required.

4.6 Quality conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspection.

4.6.1.1 Inspection lot. An inspection lot shall consist of all filters covered by a single specification sheet, produced under essentially the same conditions, offered for inspection at one time, and shall include completely assembled filters that fall within the requirement of similarity that is defined in 20.3 of the appendix.

4.6.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table VIII, in the order shown.

4.6.1.2.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for general inspection level II. The acceptable quality level (AQL) shall be as specified in table VIII. Major and minor defects shall be as defined in MIL-STD-105.

4.6.1.2.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.6.1.3 Group B inspection. Group B inspection shall consist of the inspections specified in table IX, in the order shown, and shall be made on sample units which have been subjected to and have passed the group A inspection.

TABLE IX. Group B inspection.

Inspection	Requirement paragraph	Test paragraph
Discrimination - - - - -	3.12	4.7.9.3
Special characteristics- - - - -	3.12	4.7.9.4
Terminal impedance (when specified)- - - - -	3.12	4.7.9.1
Stability at temperature extremes- - - - -	3.13	4.7.10

4.6.1.3.1 Sampling plan. The sampling plan shall be in accordance with MIL-STD-105 for special inspection level S-3. The sample size shall be based on the inspection lot size from which the sample was selected for group A inspection. The AQL shall be 4.0 percent defective.

4.6.1.3.2 Disposition of sample units. Sample units which have passed all the group B inspection may be delivered on the contract or purchase order, if the lot is accepted.

4.6.2 Inspection of packaging. Except when commercial packaging is specified, the sampling and inspection of the preservation and interior package marking shall be in accordance with the group A and B quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification and the marking requirements of MIL-STD-129. The inspection of commercial packaging shall be as specified in the contract (see 6.1).

4.7 Methods of inspection.

4.7.1 Visual and mechanical inspection.

4.7.1.1 External. Filters shall be examined to verify that the materials, external design and construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.3, 3.3.1, 3.4 to 3.4.3 inclusive, 3.4.5, 3.26, and 3.27).

4.7.1.2 Internal. Filters shall be disassembled and examined to verify that the materials, internal design and construction, and workmanship are in accordance with the applicable requirements. For qualification inspection, examination of filters, which are normally furnished filled, shall be performed on one additional sample unit furnished unfilled (see 3.1, 3.3, 3.3.1, 3.3.2, 3.4.4, and 3.27).

4.7.2 Terminal strength (see 3.5). Filters shall be tested in accordance with 4.7.2.1 to 4.7.2.3 inclusive, as applicable (see 3.1). After completion of each applicable test, the tested terminal shall be examined for loosening, rupturing, and other mechanical damage.

4.7.2.1 Pull test. Filters shall be tested in accordance with method 211, MIL-STD-202. The following details shall apply:

- a. Test condition letter - A.
- b. Magnitude of applied force shall be as follows:
 - 1. Solid-wire lead terminals (other than printed circuit terminals) - In accordance with table X.
 - 2. Solder terminals - In accordance with table X.
 - 3. Printed circuit and pin-type terminals - 2 pounds.

TABLE X. Pull.

Cross-sectional area of electrode at its smallest point at which lead from external circuit connects	Force
<u>Circular mils</u>	<u>Pounds</u>
< 2,000 - - - - -	2.0
> 2,000 - - - - -	5.0

- c. Direction and application of applied force:
 - 1. Solid-wire lead terminals (other than printed circuit terminals) - The force shall be applied in the direction of the axis of termination, and gradually increased from zero pounds to the magnitude specified in table X (see 3.1).
 - 2. Solder terminals - The force shall be applied to each terminal at the point where the lead from the external circuit connects to it, and shall be gradually increased from zero pounds to the magnitude specified in table X (see 3.1).

3. Printed circuit and pin-type terminals - The force shall be applied in the direction of the axis of the terminal as shown in figure 7, and shall be gradually increased from zero to 2 pounds.

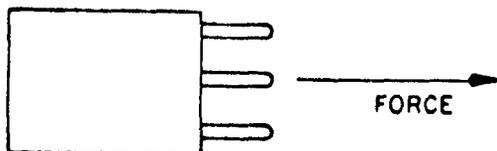


FIGURE 7. Direction of force to be applied to each pin on the unit.

4.7.2.2 Flat terminal bend test. Filters shall be tested in accordance with method 211, MIL-STD-202.

- a. Test condition letter - B.
- b. Number of bending cycles - 5.

4.7.2.3 Twist test (solid-wire load terminals other than printed circuit terminals). Filters shall be tested in accordance with method 211, MIL-STD-202. Terminals shall be subjected to the twist test following completion of their subjection to the pull test specified in 4.7.2.1.

- a. Test condition letter - D.
- b. Number of 360 degree rotations - Five (total of 1800 angular degrees).

4.7.2.4 Torque test. Filters shall be tested in accordance with method 211, test condition E, MIL-STD-202. For grades 4, 6, and 8, this test is applicable only to terminals with external screw threads.

4.7.3 Solderability (when specified, see 3.1) (see 3.6). Filters shall be tested in accordance with method 208, MIL-STD-202. The following detailed requirements shall be as specified (see 3.1):

- a. The number of terminations of each filter to be tested.
- b. Special preparation of terminations, if applicable.
- c. Application of standard solderable wire (if greater than No. 18 AWG size, or solid wire greater than 0.045 inch diameter).
- d. Depth of immersion if other than 0.05 inch.
- e. Solder dip dwell time.
- f. Examination of terminations which have been subjected to the test.

4.7.4 Resistance to soldering heat (when specified, see 3.1) (see 3.7). Filters shall be tested in accordance with method 210, MIL-STD-202. The following detailed requirements shall be as specified (see 3.1):

- a. Use of heat sinks.
- b. Solder terminations that are not to be tested, if applicable.
- c. Special preparation of specimens, if applicable.
- d. Immersion of terminations in flux, if applicable.
- e. Depth of immersion in the molten solder.
- f. Test condition letter.
- g. Cooling time prior to final examinations and measurements.
- h. Examinations and measurements before and after test, as applicable.
- i. Method of internal inspection.

4.7.5 Sealing (see 3.8). Filters shall be tested in accordance with 4.7.5.1, and 4.7.5.2, when applicable. When specified (see 3.1), the alternate test specified in 4.7.5.1.1 shall be used in lieu of the test specified in 4.7.5.1.

4.7.5.1 All filters. Filters shall be immersed for 2 to 3 minutes in a bath of water or any other suitable liquid of no greater density, and maintained at a temperature of at least 85°C. The temperature of the filter shall not exceed 40°C at the time of immersion.

4.7.5.1.1 Alternate test. When specified (see 3.1), the filters shall be immersed in a container of water containing approximately 1 percent aerosol which shall then be placed in a vacuum chamber. A vacuum resulting in an absolute pressure not greater than 3.4 inches of mercury shall be drawn over the bath and held for a minimum of 3 minutes.

4.7.5.2 Liquid-filled filters. Grade 4 liquid-filled filters shall be heated in an oven for not less than 3 hours for filters weighing 20 pounds or less, and for not less than 6 hours for filters weighing over 20 pounds.

4.7.5.2.1 Oven temperature. The oven shall be maintained at a temperature equal to or greater than the sum of the specified maximum ambient temperature and the allowable temperature rise for the class (see 3.1).

4.7.6 Dielectric withstanding voltage (see 3.9). Filters shall be tested in accordance with method 301, MIL-STD-202. The following details shall apply:

- a. Magnitude of test voltage.
 1. Initial test - As specified (see 3.1).
 2. Tests subsequent to initial test - 90 percent of initial test voltage.
- b. Nature of potential - Alternating current (ac).
- c. Duration of application of test voltage.
 1. Initial test - 60 seconds.
 2. Tests subsequent to initial test - 5 seconds.
- d. Points of application of test voltage - As specified (see 3.1).
- e. Examinations after dielectric withstanding voltage test - Filters shall be examined for evidence of arcing, flashover, breakdown of insulation, and damage.

4.7.7 Barometric pressure (reduced) (filters designed for operation above 10,000 feet) (see 3.10). Filters shall be tested in accordance with method 105, MIL-STD-202. The following details shall apply:

- a. Method of mounting - By normal means.
- b. Test condition letter - B, unless otherwise specified (see 3.1).
- c. Tests during subjection to reduced pressure - Dielectric withstanding voltage as specified in 4.7.6, except that the magnitude of the applied voltage shall be 90 percent of that specified in the initial test and the duration of application of the applied voltage shall be 5 seconds.
- d. Examination after test - Filters shall be examined for evidence of arcing, flashover, breakdown of insulation, and damage.

4.7.8 Insulation resistance (see 3.11). Filters shall be tested in accordance with method 302, MIL-STD-202. The following details shall apply:

- a. Test condition letter - A, unless otherwise specified (see 3.1).
- b. Points of measurement - Between the terminals and mountings or terminals and case.

4.7.9 Electrical characteristics (see 3.12). The electrical characteristics specified shall be determined with rated voltage applied over the specified frequency range with the specified source and load impedance (see 3.1). Insertion loss and discrimination characteristics shall be included for all filters. Special characteristics, such as impedance, phase shift in the pass band, special stability, transient response, harmonic and intermodulation distortion limits, and reflection coefficient and return loss shall be measured, when specified (see 3.1).

4.7.9.1 Terminal impedance (when specified, see 3.1). Terminal input impedance shall be measured with a rated load connected across the output terminals of the filter. Terminal output impedance shall be measured with a rated source impedance connected across the input terminals of the filter. Impedances including vector angles shall be measured at the specified frequencies (see 3.1) by a bridge or equivalent method approved by the Government.

4.7.9.2 Insertion loss (see 6.7.4) (at reference frequency). The reference frequency, and the source and load impedances shall be as specified (see 3.1). With a constant input voltage, E_g , across the generator, the load voltage, with and without the filter in the circuit, shall be recorded at the reference frequency. The insertion loss, in decibels, shall be calculated using the following formula:

$$IL_{fr} = 20 \log \frac{E_1}{E_2} \text{ dB, } E_1 > E_2.$$

Where:

IL_{fr} = Insertion loss at reference frequency in decibels, with E_g constant.

E_1 = The load voltage with the filters not in the circuit at the reference frequency.

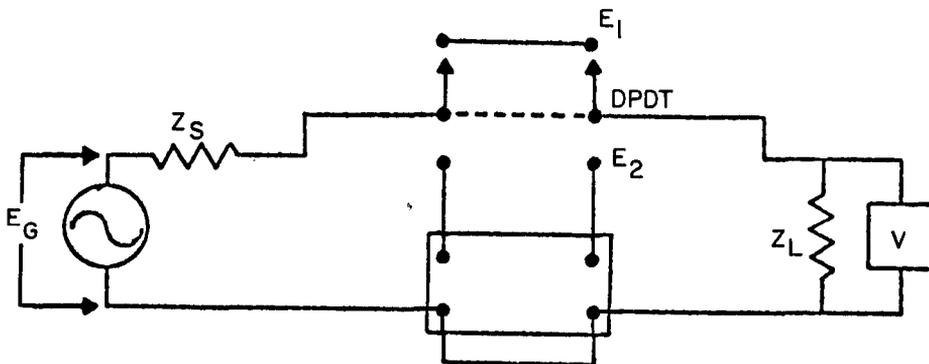
E_2 = The load voltage with the filters in the circuit at the reference frequency.

$E_1 > E_2$.

A typical test circuit is shown in figure 8.

4.7.9.3 Discrimination (see 6.4). Insertion loss at frequencies other than the reference frequency shall be measured using a test circuit such as that shown on figure 8. Measurements shall be made at frequencies or over frequency bands, as specified (see 3.1). The algebraic difference between the insertion loss at a specified frequency and the insertion loss at the reference frequency, shall be defined as the discrimination (α) at the specified frequency.

4.7.9.4 Special characteristics. Special characteristics shall be measured as specified (see 3.1).



Z_S = Source impedance.

Z_L = Load impedance.

E_G = Constant voltage across generator.

E_1 = The load voltage with the filter not in the circuit at the reference frequency.

E_2 = The load voltage with the filter in the circuit at the same frequency.

FIGURE 8. Typical measurement circuit for insertion loss and discrimination.

4.7.10 Stability at temperature extremes (see 3.13). Filters shall be exposed to a temperature of $-55^{\circ} +0^{\circ}$
 -3° C for the minimum number of hours specified (see 3.1) from table XI. At the end of this exposure period and while the filters are at this temperature, the electrical characteristics shall be measured as specified in 4.7.9. The filters shall then be exposed at the maximum operating temperature for the class $+3^{\circ}$
 -0° C for the minimum number of hours specified from table XI (see 3.1). At the end of this exposure period and while the filters are at this temperature, the electrical characteristics (see 3.1) shall again be measured as specified in 4.7.9. The filters shall then be subjected to the dielectric withstanding voltage test specified in 4.7.6.

TABLE XI. Exposure time at temperature extremes.

Weight of filter	Minimum time
<u>Pounds</u>	<u>Hours</u>
0.3 and below - - - - -	1
Above 0.3 to 3 inclusive - - - - -	2
Above 3 to 30 inclusive - - - - -	4
Above 30 to 50 inclusive - - - - -	8

4.7.11 Life (at elevated ambient temperature) (see 3.14). Filters shall be tested in accordance with method 108, MIL-STD-202. The following details and exceptions shall apply:

- a. Distance of temperature measurements from specimens - 6 inches.
- b. Test temperature and tolerance - Maximum operating temperature for the class.
Tolerance shall be $+10^{\circ}$
 -5° C.
- c. Operating conditions - Rated voltage at the reference frequency operating into the rated source and load impedances.
 1. Composition 1 filters (see 1.2.1.7) which dissipate less than 0.1 watt average output need not be subjected to the foregoing phase of the life test.
 2. DC operating voltages or requirements shall be applied as specified (see 3.1).
- d. Test condition letter (see 1.2.1.4):
 1. F - for filters with life expectancy X.
 2. D - for filters with life expectancy Y.
- e. Measurement after exposure - Dielectric withstanding voltage, insulation resistance, and electrical characteristics shall be measured as specified in 4.7.6, 4.7.8, and 4.7.9, respectively. Filters shall then be examined externally and internally for evidence of leakage and physical damage. Before measurements, all units shall be removed from the test chamber and stabilized at room temperature.

4.7.12 Temperature rise (when specified, see 3.1) (see 3.15). Filters rated at more than 0.8 watt average output shall be tested using one or more thermocouples, as required, attached to the outside of the filter. Rated voltage (see 3.1) shall be applied to the filter for a sufficient period until two consecutive thermocouple measurements taken 30 minutes apart are the same. The temperature rise shall be the difference between the temperature obtained and the ambient temperature existing at this time. The filters shall then be examined for evidence of leakage and physical damage.

4.7.13 Vibration (see 3.16). Filters shall be tested in accordance with 4.7.13.1 or 4.7.13.2, as specified (see 3.1).

4.7.13.1 Vibration (grades 4 and 5). Filters shall be tested in accordance with method 201, MIL-STD-202. The following details shall apply:

- a. Tests and measurements prior to vibration - Not applicable.
- b. Method of mounting - Filters shall be rigidly mounted by their normal mounting means.
- c. Electrical load as specified (see 3.1).
- d. Tests and measurements after vibration - Dielectric withstanding voltage and electrical characteristics shall be measured as specified in 4.7.6 and 4.7.9, respectively. Filters shall then be examined for evidence of leakage and physical damage.

4.7.13.2 Vibration, high frequency (grades 6, 7, 8, and 9). Filters shall be tested in accordance with method 204, MIL-STD-202. The following details shall apply:

- a. Method of mounting - Filters shall be rigidly mounted by their normal mounting means.
- b. Electrical load - As specified (see 3.1).
- c. Test condition letter:
 1. A - for grades 8 and 9.
 2. B - for grades 6 and 7.
- d. Measurements after test - Dielectric withstanding voltage and electrical characteristics shall be measured as specified in 4.7.6 and 4.7.9, respectively. Filters shall then be examined for evidence of leakage and physical damage.

4.7.14 Shock (see 3.17). Filters shall be tested in accordance with 4.7.14.1 or 4.7.14.2, as specified (see 3.1).

4.7.14.1 Shock (specified pulse). Filters shall be tested in accordance with method 213, MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting - By normal means.
- b. Test condition letter - I.
- c. Measurements after shock - Dielectric withstanding voltage and electrical characteristics shall be measured as specified in 4.7.6 and 4.7.9, respectively. Filters shall then be examined for evidence of leakage and physical damage.

4.7.14.2 High-impact shock (when specified, see 3.1). Filters shall be tested in accordance with method 207, MIL-STD-202. The following details shall apply:

- a. Mounting fixture - Figure 207-5 of method 207.
- b. Measurements after test - Dielectric withstanding voltage and electrical characteristics shall be measured as specified in 4.7.6 and 4.7.9, respectively. Filters shall then be examined for evidence of leakage and physical damage.

4.7.15 Thermal shock (see 3.18). Filters shall be tested in accordance with method 107, MIL-STD-202. The following details and exceptions shall apply:

- a. Test condition letter - A, except that step 3 shall be at the maximum operating temperature for the class (see 6.6).
- b. Measurements after cycling - Filters shall be subjected to the dielectric withstanding voltage and insulation resistance tests as specified in 4.7.6 and 4.7.8, respectively, and shall then be examined for evidence of leakage and physical damage.

4.7.16 Immersion (see 3.19). Filters shall be tested in accordance with method 104, MIL-STD-202. The following details and exceptions shall apply:

- a. Test condition letter:
 1. A - for grades 5, 7, and 9.
 2. B - for grades 4, 6, and 8.
- b. Measurements after final cycle - Filters shall be washed under running tapwater and dried. After the drying period, filters shall be subjected to the dielectric withstanding voltage and insulation resistance tests specified in 4.7.6 and 4.7.8, respectively, and shall then be examined for evidence of leakage and physical damage.

4.7.17 Moisture resistance (see 3.20). Filters shall be tested in accordance with method 106, MIL-STD-202. The following details and exceptions shall apply:

- a. Conditioning - For grades 4, 6, and 8 filters, the 24-hour initial drying period prior to the first cycle may be omitted.
- b. Initial measurements - Not applicable.
- c. Polarization voltage - Unless otherwise specified (see 3.1), polarization is applicable. The polarizing voltage shall be applied during steps 1 to 6 inclusive, between all ungrounded terminals and the mounting means. The polarizing voltage shall be positive with respect to the mounting means.
- d. Loading voltage - Not applicable.
- e. Final measurements - Upon completion of step 6 of the final cycle the filters shall be removed from the humidity chamber and shall be conditioned for 4 to 24 hours at the inspection conditions specified in 4.3. After this conditioning period, the filters shall be subjected to the dielectric withstanding voltage and insulation resistance tests specified in 4.7.6 and 4.7.8, respectively, and shall then be examined for evidence of leakage and physical damage.

4.7.18 Salt spray (when specified, see 3.1) (see 3.21). Filters shall be tested in accordance with method 101, MIL-STD-202. The following detailed requirements shall be as specified (see 3.1).

- a. Special mounting, if applicable.
- b. Test condition letter, as specified, see 3.1.
- c. Measurements after exposure.

4.7.19 Acceleration (when specified, see 3.1) (see 3.22). Filters shall be tested in accordance with method 212, MIL-STD-202. The following detailed requirements shall be as specified (see 3.1).

- a. Special mounting, if applicable.
- b. Electrical loading, if applicable.
- c. Test condition letter (see 3.1):
 1. If test condition A is specified, the value of "g" (see 3.1).
 2. If test condition B is specified, the directions of application of acceleration and value of "g" (see 3.1).
 3. If test condition C is specified, the value of acceleration (see 3.1).
- d. Measurements.

4.7.20 Flammability (external flame) (grades 5, 7, and 9 only) (see 3.23). Filters, whose displaced volume is greater than 0.3 cubic inch, shall be tested in accordance with method 111, MIL-STD-202. The following details shall apply:

- a. Point of impingement of applied flame - One of the lower free corners of the filter, so that the flame is just in contact with the filter. The free corners of the filter are those corners which are the greatest distance from the mounting studs or brackets.
- b. Allowable time for burning of visible flame on specimen - 3 minutes.
- c. Measurements during and after test - Filters shall be observed for explosion, violent burning which results in an explosive type flame, or dripping of flaming material.

4.7.21 Resistance to solvents (see 3.24). Filters shall be tested in accordance with method 215, MIL-STD-202. The following details shall apply:

- a. The marked portion of the filter shall be brushed.
- b. Filters shall be examined for mechanical damage.

4.7.22 Fungus (see 3.25). Unless certification is provided, filters shall be tested in accordance with method 508 of MIL-STD-810. Filters shall be examined for evidence of fungus.

5. PACKAGING

5.1 Preservation. Preservation shall be level A, C, or as specified (see 6.1 and 5.4.3.4).

5.1.1 Level A.

5.1.1.1 Cleaning. Filters shall be cleaned in accordance with MIL-P-116, process C-1.

5.1.1.2 Drying. Filters shall be dried in accordance with MIL-P-116.

5.1.1.3 Preservative application. Preservatives shall not be used.

5.1.1.4 Unit packs. Each filter shall be individually unit packed in accordance with the methods of MIL-P-116 specified herein insuring compliance with the applicable requirements of that specification.

5.1.1.4.1 Metal encased filters. Metal encased filters (grades 4, 6, and 8) shall be unit packed in accordance with method III. The unit container shall conform to PPP-B-566, PPP-B-676, or PPP-B-636.

5.1.1.4.2 Encapsulated filters. Encapsulated filters (grades 5, 7, and 9) shall be unit packed in accordance with submethod IA-15. The container shall conform to PPP-B-566, PPP-B-676, or PPP-B-636.

5.1.1.5 Intermediate packs. Intermediate packs are not required.

5.1.2 Level C. The level C preservation for filters shall conform to the MIL-STD-794 requirements for this level.

5.2 Packing. Packing shall be level A, B, or C or as specified (see 6.1 and 5.4.3.4).

5.2.1 Level A. The packaged filters shall be packed in fiberboard containers conforming to PPP-B-636, class weather resistant, style optional, special requirements. In lieu of the closure and waterproofing requirement in the appendix of PPP-B-636, closure and waterproofing shall be accomplished by sealing all seams, corners and manufacturer's joints with tape, two inches minimum width, conforming to PPP-T-60, class 1 or PPP-T-76. Banding (reinforcement requirements) shall be applied in accordance with the appendix to PPP-B-636 using nonmetallic or tape banding only.

5.2.2 Level B. The packaged filters shall be packed in fiberboard containers conforming to PPP-B-636, class domestic, style optional, special requirements. Closures shall be in accordance with the appendix thereto.

5.2.3 Level C. The level C packing for filters shall conform to the MIL-STD-794 requirements for this level.

5.2.4 Unitized loads. Unitized loads, commensurate with the level of packing specified in the contract or order, shall be used whenever total quantities for shipment to one destination equal 40 cubic feet or more. Quantities less than 40 cubic feet need not be unitized. Unitized loads shall be uniform in size and quantities to the greatest extent practicable.

5.2.4.1 Level A. Filters, packed as specified in 5.2.1, shall be unitized on pallets in conformance with MIL-STD-147, load type I, with a fiberboard cap (storage aid 4) positioned over the load.

5.2.4.2 Level B. Filters, packed as specified in 5.2.2, shall be unitized as specified in 5.2.4.1 except that the fiberboard caps shall be class domestic.

5.2.4.3 Level C. Filters, packed as specified in 5.2.3, shall be unitized as specified in MIL-STD-794 except that conformance to MIL-STD-147 is not required.

5.3 Marking. In addition to any special or other identification marking required by the contract (see 6.1 and 5.4.3.4), each unit pack, exterior container and unitized load shall be marked in accordance with MIL-STD-129.

5.4 General.

5.4.1 Exterior containers. Exterior containers (see 5.2.1, 5.2.2 and 5.2.3) shall be of a minimum tare and cube consistent with the protection required and shall contain equal quantities of identical stock numbered items to the greatest extent practicable.

5.4.2 Packaging inspection. The inspection of these packaging requirements shall be in accordance with 4.6.2.

5.4.3 Army procurements.

5.4.3.1 Level A unit packs. All unit containers shall be either weather (or water) resistant or overwrapped with waterproof barrier materials (see 5.1.1.4.1).

5.4.3.2 Level A and Level B packing. For level A packing the fiberboard containers shall not be banded but shall be placed in a close fitting box conforming to PPP-B-601, overseas type; PPP-B-621, class 2, style 4 or PPP-B-585, class 3, style 2 or 3. Closure and strapping shall be in accordance with applicable container specification except that metal strapping shall conform to QQ-S-781, type I, finish A. When the gross weight exceeds 200 pounds or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, 3 x 4 inch skids (laid flat) shall be applied in accordance with the requirements of the container specification. If not described in the container specification, the skids shall be applied in a manner which will adequately support the item and facilitate the use of material handling equipment. For level B packing, fiberboard boxes shall be weather resistant as specified in level A and the containers shall be banded (see 5.2.1 and 5.2.2).

5.4.3.3 Level A and B unitization. For level A and B unitization, soft wood pallets conforming to NN-P-71, type IV, size 2 shall be used. Weather resistant fiberboard caps shall also be used for level B unitization. The loads for both levels shall be bonded to the pallets by strapping conforming to QQ-S-781, type I, finish A or shrink film (see 5.2.5.1 and 5.2.5.2).

5.4.3.4 Commercial packaging. Commercial packaging (including preservation, packing and marking) shall be in accordance with the requirements of MIL-STD-1188.

6. NOTES

6.1 Ordering data.

6.1.1 Filters covered by existing specification sheets. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Title, number, and date of the applicable specification sheet, the complete type designation (see 1.2.1), and the military part number (see 3.1).
- c. Whether hardware is required for screw terminals or for mounting studs, or for both (see 3.4.2.2 and 3.4.3).
- d. Inspection of commercial packaging (see 4.6.2).
- e. Levels of preservation and packing required (see 5.1, and 5.2).
- f. Method of preservation, if other than submethod IA-15 (see 5.1.1.4.2 and 5.4.3.1).
- g. Special marking, if required (see 5.3).

6.1.2 Filters not covered by existing specification sheets. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type designation (see 1.2.1).
- c. Mechanical design and construction data per table XII.
- d. Levels of preservation and packing required (see 5.1, 5.2 and 5.4.3.4).
- e. Method of preservation, if other than submethod IA-15 (see 5.1.1.4.2 and 5.4.3.1).
- f. Special marking, if required (see 5.3).

6.2 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for the opening of bids, qualified for inclusion in the applicable qualified products list, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the Naval Electronic Systems Command; however, information pertaining to qualification of products may be obtained from the Defense Electronics Supply Center (DESC-E), 1507 Wilmington Pike, Dayton, Ohio 45444. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification" (see 6.2.1).

6.2.1 Copies of "Provisions Governing Qualification" may be obtained upon application to Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.3 Use of military specification component parts. Manufacturers of filters covered by this specification should give first consideration to using component parts covered by applicable military specifications.

6.4 Case and mounting dimensions. Equipment designers should give first consideration to using the various case and mounting dimensions on figures 1 through 6.

6.5 Basic filter mechanical design. A basic filter mechanical design consists of filters qualified to all tests of table VI, as well as those related filters qualified on the basis of similarity.

6.6 Maximum operating temperature. The maximum operating temperature is defined as the maximum ambient temperature plus temperature rise; however, since generally the temperature rise of filters is negligible, the maximum operating temperature and maximum ambient temperature in most cases are the same.

6.7 Definitions, electrical parameters. Definitions have been restricted to the terms used in this specification. For the definition of all other terms, refer to American National Standards Institute Definitions of Electrical Terms.

6.7.1 Source impedance. Source impedance is the impedance of the circuit from which the filter is driven.

6.7.2 Load impedance. Load impedance is the impedance presented by the load.

6.7.3 Reference frequency. Reference frequency is the frequency at which insertion loss is measured and to which all discrimination measurements are referred.

6.7.4 Insertion loss. Insertion loss resulting from the insertion of a filter in a transmission system is the ratio of the voltage delivered before the insertion to that part of the system following the filter, to the voltage delivered to the same part after the insertion at the reference frequency.

6.7.5 Similar filter. A similar filter is defined as a filter which, when compared to the qualified filter, meets the following criteria:

- a. Same or lower operating temperature.
- b. Same or lower ambient temperature.
- c. Same type external and internal mountings; similar shape; same type case construction; normal wall thickness within 25 percent when a case is used.
- d. Linear envelope dimensions not greater than 150 percent nor less than 70 percent of the corresponding dimensions; total volume of case not greater than 250 percent. (For grades 5, 7, and 9 filters, the envelope dimensions shall be considered as the case dimensions.)

- e. Same grade.
- f. For use at same or lower altitudes.
- g. Same terminal construction and material, including insulating and gasketing parts.
- h. Same or greater wire size (cross-sectional area) and same coating material.
- i. Same processing and material for case, finish, and marking.
- j. Same potting, insulation, impregnation, and filling.
- k. Band pass and band suppression filters or dual functioning filters containing either band pass or band suppression filters shall have percentage band widths no smaller than the original qualified units.
- i. The same or fewer of the same electrical tests required with equal or less stringent requirements.

6.8 International standardization agreements. Certain provisions of this specification are the subject of International Standardization Agreement (STANAG). When amendment, revision, or cancellation of this specification is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken respecting the international agreement concerned.

6.9 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - ER
Navy - EC
Air Force - 85

Preparing activity:

Navy - EC

Agent:

DLA - ES

Review activities:

Army - AR, MI
Navy - AS, OS
Air Force - 11, 17, 99
DLA - ES

(Project 5915-0218)

User activities:

Army - ME
Navy - MC
Air Force - 19

APPENDIX

SUBMISSION FOR QUALIFICATION INSPECTION

10. SCOPE

10.1 This appendix details the data required for qualification inspection of filters covered by this specification.

20. SUBMISSION

20.1 Filters covered by existing specification sheets.20.1.1 Identification data required.

- a. Part number of the filter described in a specification sheet.
- b. Mechanical design and construction data specified in table XII.

TABLE XII. Mechanical design and construction data.

1. Dimensions and mounting: <ol style="list-style-type: none"> a. Nominal wall thickness. b. Case volume. c. External mounting. d. Internal mounting.
2. Construction and materials: <ol style="list-style-type: none"> a. Terminal construction and material (including insulating and gasketing parts). b. Wire size and coating material. c. Case material and finish. d. Potting, insulating, impregnation, and filling materials.
3. Components: <ol style="list-style-type: none"> a. Capacitors: <ol style="list-style-type: none"> 1. Mechanical construction. 2. Dielectric material. 3. Voltage rating. b. Inductors and transformers: <ol style="list-style-type: none"> 1. Core material. 2. Permeability finish. 3. Number of terminations. 4. Electrical application. 5. Turns of wire. 6. Finish. c. Crystals: <ol style="list-style-type: none"> 1. Cut and mode. d. Resistors: <ol style="list-style-type: none"> 1. Wattage rating. 2. Type and style. e. Materials of internal parts other than those specified above.

20.2 Filters not covered by existing specification sheets.20.2.1 Identification data required.

- a. Type designation.
- b. Mechanical design and construction data specified in table XII.

- c. For filters that are comparable with and the requirements of which can be added to an existing specification sheet, the information of figure 9 shall be submitted to DESC-E. For a filter that cannot be added to an existing *specification sheet*, a complete specification sheet shall be submitted, encompassing the information required by figure 9. The specification sheet shall be in the format of existing specification sheets and shall be suitable for reproduction by the photo-offset method.

20.2.2 Acceptance of data. The data required by 20.2.1 must be accepted by DESC-E before authorization to conduct qualification tests will be granted.

20.3 Qualification of filters based on similarity to qualified filters. The identification data required by figure 10, "Filter similarity comparison sheet", shall be submitted.

30. EXTENSION OF QUALIFICATION

30.1 *Extension of qualification is not applicable. Qualification of a filter covers only the item identified by a specific part number.*

Instructions

Enter all information, including numerical values as required below, using as your guide applicable MIL-F-18327 scope, requirement, and methods of examination and test paragraphs.

MIL-F-18327 specification, if any, to which the filter can be added:

MIL-F-18327/_____.
(enter identification number)

This item cannot be added to any existing MIL-F-18327 specification sheet.

Type designation (see MIL-F-18327, 1.2 thru 1.2.1.7): FR _____
(enter symbols)

In the space below, provide outline drawings in as many views as are required to show all of the principle exterior features of this filter, including case, mounting, and terminal dimensions 1/, tolerances 2/, and terminal identification 3/ (see MIL-F-18327, figures 1 through 6 as applicable, and the figure on sheet 1 of the MIL-F-18327 specification sheet, if any, to which this filter is applicable.):

1/ Dimensions shall be given in decimal fractions, accurate to three decimal places.

2/ State dimensions as nominal value, with tolerances as specified in MIL-F-18327, figures 1 through 6, as applicable, and tables and notes thereto; Examples: $1.750^{+0.000}$, 2.500 ± 0.016 , -0.125

3/ Input, output, and common terminals, as applicable, shall be identified by means of a note to the above figure.

FIGURE 9. Filter information sheet.

Solderability test (see MIL-F-18327, 4.7.3). Method 208, MIL-STD-202.

Requirements for use of heat sinks (specify details).
 Solder terminations that are not to be tested (specify details).
 Special preparation (enter details of special preparation requirements).
 Depth of immersion (if other than 0.05 inch) _____ inches.
 (enter value)

Test condition letter _____
 (enter letter)

Dwell time (see 4.5, method 208, MIL-STD-202).

5 ± 1/2 seconds 7 ± 1/2 seconds

Cooling time prior to final examination and measurements _____ minutes, seconds.
 (enter time) (cross out one)

Examinations and measurements before and after test as applicable (specify details).
 Method of internal inspection (specify details).

Resistance to soldering heat (see MIL-F-18327, 4.7.4). Method 210, MIL-STD-202.

Test condition letter.
 Requirements for use of heat sinks (specify details).
 Solder terminations that are not to be tested, if applicable (specify details).
 Special preparation of specimens, if applicable (specify details).
 Immersion of terminations in flux, if applicable (specify details).
 Depth of immersion in the molten solder.
 Cooling time prior to final examinations and measurements.
 Examinations before and after test, as applicable (specify details).
 Method of internal inspection (specify details).

Sealing test: In accordance with MIL-F-18327, 4.7.5. Check applicable block.

4.7.5.1 4.7.5.1.1 4.7.5.2

Dielectric withstanding voltage test (check applicable blocks): In accordance with MIL-F-18327, 4.7.6. Method 301, MIL-STD-202.

Magnitude of test voltage: _____ volts, rms.
 (enter value)

Duration of application of test voltage:

Sixty seconds.

Other than 60 seconds (specify time): _____ seconds.
 (enter value)

Points of application of test voltage: Between _____
 (specify points)

Barometric pressure (reduced) (see MIL-F-18327, 4.7.7). Method 105, MIL-STD-202, test condition ____ (check applicable block):

B Other _____
 (specify condition letter)

Magnitude of test voltage: _____ volts, rms.
 (enter value)

Duration of application of test voltage: 5 seconds.

Points of application of test voltage: Between _____
 (specify points)

FIGURE 9. Filter information sheet - Continued.

NOTE: Use reference sketch information below to determine entries to be made in discrimination table.

Filter type	Reference Sketch						Discrimination (record frequencies and values above)			
	Frequency increasing → f ₁ f ₂ f ₃ f ₄ f ₅ f ₆						Frequency Range(s):	Discrimination values in:		
Low pass	Loss (inc.) ↓							f ₁ to f ₂ , inclusive	dB, MAX.	
								f ₃ to f ₄ , inclusive	dB, MIN.	
High pass		Loss (inc.) ↓							f ₃ to f ₄ , inclusive	dB, MIN.
									f ₅ to f ₆ , inclusive	dB, MAX.
Band pass	Loss (inc.) ↓							f ₁ to f ₂ , inclusive	dB, MIN.	
								f ₃ to f ₄ , inclusive	dB, MAX.	
								f ₅ to f ₆ , inclusive	dB, MIN.	
Band Suppression	Loss (inc.) ↓							f ₁ to f ₂ , inclusive	dB, MAX.	
								f ₃ to f ₄ , inclusive	dB, MIN.	
								f ₅ to f ₆ , inclusive	dB, MAX.	

Additional electrical characteristics (see MIL-F-18327, 4.7.9). For definitions of electrical terms not included in MIL-F-18327, see ANSI C42.100. Specify for each additional test all details of the test requirement, including the test setup configuration, requirement values and tolerances, and method of conducting test, including any formula required to be used in deriving calculated values from measured values.

FIGURE 9. Filter information sheet - Continued.

Stability at temperature extremes test (see MIL-F-18327, 4.7.10).

Low exposure temperature: -55°C .

High (maximum operating temperature, see MIL-F-18327, 1.2.1.3) temperature: $\frac{\text{(enter value)}}{\text{degrees C}}$

Exposure time at temperature extremes (see MIL-F-18327, table XI): $\frac{\text{(enter value)}}{\text{hours}}$

Life test (see MIL-F-18327, 4.7.11). Method 108, MIL-STD-202, test condition ___ (check applicable block):

D (for filters with life expectancy Y).

F (for filters with life expectancy X).

Operating conditions:

Test temperature (see MIL-F-18327, 1.2.1.3): $\frac{\text{(enter value)}}{\text{degrees C}}$

DC potential (check applicable block).

DC potential: $\frac{\text{(enter value)}}{\text{volts dc}}$ applied to filter.

DC potential not applied to filter.

Temperature rise (see MIL-F-18327, 4.7.12). Check applicable block.

Temperature rise: $\frac{\text{(enter value)}}{\text{degrees C}}$

Temperature rise not applicable (temperature rise is negligible).

Vibration test (see MIL-F-18327, 4.7.13). Check applicable blocks.

Low frequency (see MIL-F-18327, 4.7.13.1). Method 201, MIL-STD-202.
Electrical load:

Not applicable

Applicable as follows:

AC voltage: $\frac{\text{(enter value)}}{\text{volts, rms}}$

DC potential:

DC potential: $\frac{\text{(enter value)}}{\text{volts, dc}}$

DC potential not applicable.

Shock test (see MIL-F-18327, 4.7.14). Check applicable block.

Specified pulse (see MIL-F-18327, 4.7.14.1). Method 213, MIL-STD-202, test condition I.

High impact (see MIL-F-18327, 4.7.14.2). Method 207, MIL-STD-202.

FIGURE 9. Filter information sheet - Continued.

Thermal shock test (see MIL-F-18327, 4.7.15). Method 107, MIL-STD-202, test condition letter _____
(check applicable block).

- | | | |
|------------------------------|------------------------------|------------------------------|
| <input type="checkbox"/> A | <input type="checkbox"/> B | <input type="checkbox"/> C |
| <input type="checkbox"/> A-1 | <input type="checkbox"/> B-1 | <input type="checkbox"/> C-1 |
| <input type="checkbox"/> A-2 | <input type="checkbox"/> B-2 | <input type="checkbox"/> C-2 |
| <input type="checkbox"/> A-3 | <input type="checkbox"/> B-3 | <input type="checkbox"/> C-3 |

Immersion test (see MIL-F-18327, 4.7.16). Method 104, MIL-STD-202, test condition _____ (check applicable block).

- A (for grades 5, 7, and 9) B (for grades 4, 6, and 8)

Moisture resistance test (see MIL-F-18327, 4.7.17). Method 106, MIL-STD-202.

Polarizing voltage (check applicable block):

- Applicable, if other than 100 Vdc, polarizing voltage shall be _____ volts dc.
(enter value)
- Polarizing voltage not applicable.

Salt spray test (see MIL-F-18327, 4.7.18). Method 101, MIL-STD-202, test condition letter _____
(check applicable block).

- A (96 hours)
 B (48 hours)

Special mounting, if applicable (specify details).
Measurements after exposure, if applicable (specify details).

Acceleration test (see MIL-F-18327, 4.7.19). Method 212, MIL-STD-202, test condition letter _____
(check applicable block):

- A B C

Electrical loading, if applicable: _____ volts dc RMS
(value) (cross one out)

For test condition A, if specified: _____ "g" units.
(enter value)

For test condition B, if specified: Directions of application of acceleration (specify details).
For test condition C, if specified: _____ "g" units.
(value)

Flammability test (see MIL-F-18327, 4.7.20). Method 111, MIL-STD-202 (check applicable block).

- Applicable to this filter. Not applicable to this filter.

Resistance to solvents test (see MIL-F-18327, 4.7.21). Method 215, MIL-STD-202 (check applicable block).

- Applicable to this filter. Not applicable to this filter.

Fungus test (see MIL-F-18327, 4.7.22). Method 508, MIL-STD-810 (check applicable block).

- Applicable to this filter. Not applicable to this filter.

FIGURE 9. Filter information sheet - Continued.

Characteristic	Characteristic of filters being submitted for qualification based on similarity	Characteristic of filters having qualification
Operating temperature	65°C <input type="checkbox"/> 105°C <input type="checkbox"/> 85°C <input type="checkbox"/> 125°C <input type="checkbox"/> above 125°C <input type="checkbox"/>	65°C <input type="checkbox"/> 105°C <input type="checkbox"/> 85°C <input type="checkbox"/> 125°C <input type="checkbox"/> above 125°C <input type="checkbox"/>
Ambient temperature (operating temperature-temperature rise)		
External mounting Internal mounting Nominal wall thickness Envelope dimensions Case volume Grade	Grade 4 <input type="checkbox"/> Grade 7 <input type="checkbox"/> Grade 5 <input type="checkbox"/> Grade 8 <input type="checkbox"/> Grade 6 <input type="checkbox"/> Grade 9 <input type="checkbox"/>	Grade 4 <input type="checkbox"/> Grade 7 <input type="checkbox"/> Grade 5 <input type="checkbox"/> Grade 8 <input type="checkbox"/> Grade 6 <input type="checkbox"/> Grade 9 <input type="checkbox"/>
Altitude	10,000 ft <input type="checkbox"/> 50,000 ft <input type="checkbox"/>	10,000 ft <input type="checkbox"/> 50,000 ft <input type="checkbox"/>
Terminal construction, material and finish (including insulating and gasketing parts)		
Wire size Coating material		
Case material	Metal <input type="checkbox"/> Other (specify) <input type="checkbox"/>	Metal <input type="checkbox"/> Other (specify) <input type="checkbox"/>
Case finish	Light-gray, semigloss <input type="checkbox"/>	Light-gray, semigloss <input type="checkbox"/>
Case marking	Type designation <input type="checkbox"/> Manufacturer's name <input type="checkbox"/> Trademark or code symbol <input type="checkbox"/> Terminal identification <input type="checkbox"/> Source and load impedance <input type="checkbox"/> Discrimination characteristics (frequency) <input type="checkbox"/>	Type designation <input type="checkbox"/> Manufacturer's name <input type="checkbox"/> Trademark or code symbol <input type="checkbox"/> Terminal identification <input type="checkbox"/> Source and load impedance <input type="checkbox"/> Discrimination characteristics (frequency) <input type="checkbox"/>

FIGURE 10. Filter similarity comparison sheet.

Characteristic	Characteristic of filters being submitted for qualification based on similarity	Characteristic of filters having qualification
Potting Insulation Impregnation Filling		
Capacitors: Mechanical construction (extended foil, lead in tab, etc.) Dielectric material (glass, ceramic, etc.) Voltage rating		
Inductors and transformers: Core material, permeability, finish, number of terminations, electrical application, turns of wire		
Crystals: (cut and mode)		
Resistors: (wattage rating, type, and style)		
Materials of internal parts other than those listed above		
Percentage bandwidth: (bandpass, band suppression and dual functioning filter)		
Electrical tests:	Terminal input impedance <input type="checkbox"/> Terminal output impedance <input type="checkbox"/> Insertion loss <input type="checkbox"/> Discrimination <input type="checkbox"/> Special characteristics (specify) <input type="checkbox"/>	Terminal input impedance <input type="checkbox"/> Terminal output impedance <input type="checkbox"/> Insertion loss <input type="checkbox"/> Discrimination <input type="checkbox"/> Special characteristics (specify) <input type="checkbox"/>

NOTE: This data is furnished for the purpose of facilitating qualification testing and shall not be disclosed outside the Government or be duplicated, used or disclosed in whole or in part, for any purpose other than to evaluate the product submitted for qualification testing. This restriction does not limit the Government right to use information contained in such data if it is obtained from another source.

FIGURE 10. Filter similarity comparison sheet. - Continued