

PERFORMANCE SPECIFICATION SHEET

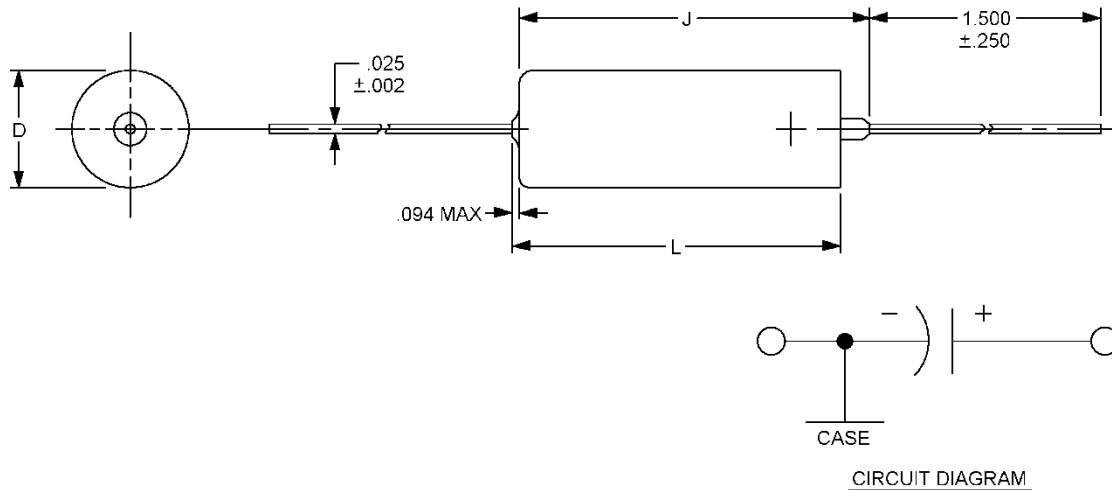
CAPACITOR, FIXED, ELECTROLYTIC (SOLID ELECTROLYTE), TANTALUM
(POLARIZED, SINTERED SLUG), HIGH FREQUENCY, ESTABLISHED RELIABILITY,
STYLE CSR21

FAILURE RATE LEVELS "M", "P", AND "R" ARE INACTIVE
FOR NEW DESIGN AFTER 2 FEBRUARY 1984.

FAILURE RATE LEVEL "S" IS INACTIVE
FOR NEW DESIGN AFTER 15 AUGUST 1984.

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

The requirements for acquiring the product described herein
shall consist of this specification sheet and [MIL-PRF-39003](#).



Inches	mm
.002	0.05
.025	0.64
.094	2.39
.250	6.35
1.500	38.10

FIGURE 1. Dimensions and configuration.



MIL-PRF-39003/9H

Case size	Dimensions		
	L ± .031 (0.79)	D + .016 (0.41) - .015 (0.38)	J max
C	.686 (17.42)	.289 (7.34)	.822 (20.88)
D	.786 (19.96)	.351 (8.92)	.922 (23.42)

NOTES:

1. Dimensions are in inches.
2. Metric equivalents (in parentheses) are in millimeters and are given for general information only.
3. The case insulation shall extend .015 inch (0.38 mm) minimum beyond each end. However, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.
4. Lead length may be a minimum of 1-inch long for use in tape and reel automatic insertion equipment, when specified.

FIGURE 1. Dimensions and configuration – Continued.

REQUIREMENTS:

Dimensions and configuration: See [figure 1](#).

Case type: Tubular, insulated.

Material: Metal (alloy unspecified).

Type of seal: Hermetic.

Leads: Type N of [MIL-STD-1276](#), tin-lead plating, electrodeposited or hot-solder dipped.

DC related voltage: See [table I](#). Above +85°C voltage derating is required (see [MIL-PRF-39003](#)).

DC leakage (DCL): See [table I](#).

Capacitance (Cap.) (nom): See [table I](#).

Cap. tolerance: 5, 10, and 20 percent, see [table I](#).

Dissipation factor (DF): See [table I](#).

Equivalent series resistance (ESR at 100 kHz): See [table I](#).

Operating temperature: -55°C to +125°C.

Failure rate level: See [table I](#).

TABLE I. Electrical characteristics and dash numbers.

DC rated voltage	Capaci- tance (nom)	Capaci- tance tolerance	DC leakage at			DF 1 kHz +25°C	ESR 100 kHz +25°C (max) Ω	Ripple current 40 kHz +25°C A (max)	Derated ripple current 1 kHz +25°C A (max)	Case size	Dash number M39003/09- ^{1/} Failure rate level for percent per 1000 hours							
			+25°C	+85°C	+125°C						M	P	R	S	G	B	C	D
			μA	μA	μA						(1.0)	(0.1)	(0.01)	(0.001)	(1.0)	(0.1)	(0.01)	(0.001)
6	150	5	4.5	90	113	10	0.065	3.3	2	C	0001-	0101-	0201-	0301-	5001-	2001-	3001-	4001-
6	150	10	4.5	90	113	10	0.065	3.3	2	C	0002-	0102-	0202-	0302-	5002-	2002-	3002-	4002-
6	150	20	4.5	90	113	10	0.065	3.3	2	C	0003-	0103-	0203-	0303-	5003-	2003-	3003-	4003-
6	180	5	5.5	110	138	10	0.060	3.4	2.4	C	0004-	0104-	0204-	0304-	5004-	2004-	3004-	4004-
6	180	10	5.5	110	138	10	0.060	3.4	2.4	C	0005-	0105-	0205-	0305-	5005-	2005-	3005-	4005-
6	270	5	6.5	130	163	10	0.050	4.1	3.4	D	0006-	0106-	0206-	0306-	5006-	2006-	3006-	4006-
6	270	10	6.5	130	163	10	0.050	4.1	3.4	D	0007-	0107-	0207-	0307-	5007-	2007-	3007-	4007-
6	330	5	7.5	150	188	12	0.045	4.3	3.8	D	0008-	0108-	0208-	0308-	5008-	2008-	3008-	4008-
6	330	10	7.5	150	188	12	0.045	4.3	3.8	D	0009-	0109-	0209-	0309-	5009-	2009-	3009-	4009-
6	330	20	7.5	150	188	12	0.045	4.3	3.8	D	0010-	0110-	0210-	0310-	5010-	2010-	3010-	4010-
10	82	5	4	80	100	8	0.085	2.9	1.8	C	0011-	0111-	0211-	0311-	5011-	2011-	3011-	4011-
10	82	10	4	80	100	8	0.085	2.9	1.8	C	0012-	0112-	0212-	0312-	5012-	2012-	3012-	4012-
10	100	5	5	100	125	8	0.075	3	2.2	C	0013-	0113-	0213-	0313-	5013-	2013-	3013-	4013-
10	100	10	5	100	125	8	0.075	3	2.2	C	0014-	0114-	0214-	0314-	5014-	2014-	3014-	4014-
10	100	20	5	100	125	8	0.075	3	2.2	C	0015-	0115-	0215-	0315-	5015-	2015-	3015-	4015-
10	120	5	6	120	150	8	0.070	3.2	2.5	C	0016-	0116-	0216-	0316-	5016-	2016-	3016-	4016-
10	120	10	6	120	150	8	0.070	3.2	2.5	C	0017-	0117-	0217-	0317-	5017-	2017-	3017-	4017-
10	180	5	9	180	226	8	0.060	3.7	3.4	D	0018-	0118-	0218-	0318-	5018-	2018-	3018-	4018-
10	180	10	9	180	226	8	0.060	3.7	3.4	D	0019-	0119-	0219-	0319-	5019-	2019-	3019-	4019-
10	220	5	10	200	250	10	0.055	3.9	3.4	D	0020-	0120-	0220-	0320-	5020-	2020-	3020-	4020-
10	220	10	10	200	250	10	0.055	3.9	3.4	D	0021-	0121-	0221-	0321-	5021-	2021-	3021-	4021-
10	220	20	10	200	250	10	0.055	3.9	3.4	D	0022-	0122-	0222-	0322-	5022-	2022-	3022-	4022-
15	56	5	4	80	100	6	0.100	2.6	1.8	C	0023-	0123-	0223-	0323-	5023-	2023-	3023-	4023-
15	56	10	4	80	100	6	0.100	2.6	1.8	C	0024-	0124-	0224-	0324-	5024-	2024-	3024-	4024-
15	68	5	5	100	125	6	0.095	2.7	2.2	C	0025-	0125-	0225-	0325-	5025-	2025-	3025-	4025-
15	68	10	5	100	125	6	0.095	2.7	2.2	C	0026-	0126-	0226-	0326-	5026-	2026-	3026-	4026-
15	68	20	5	100	125	6	0.095	2.7	2.2	C	0027-	0127-	0227-	0327-	5027-	2027-	3027-	4027-
15	120	5	9	180	226	8	0.070	3.5	2.8	D	0028-	0128-	0228-	0328-	5028-	2028-	3028-	4028-
15	120	10	9	180	226	8	0.070	3.5	2.8	D	0029-	0129-	0229-	0329-	5029-	2029-	3029-	4029-
15	150	5	10	200	250	8	0.065	3.6	3.1	D	0030-	0130-	0230-	0330-	5030-	2030-	3030-	4030-
15	150	10	10	200	250	8	0.065	3.6	3.1	D	0031-	0131-	0231-	0331-	5031-	2031-	3031-	4031-
15	150	20	10	200	250	8	0.065	3.6	3.1	D	0032-	0132-	0232-	0332-	5032-	2032-	3032-	4032-
20	27	5	2.5	50	63	5	0.145	2.2	1.2	C	0033-	0133-	0233-	0333-	5033-	2033-	3033-	4033-
20	27	10	2.5	50	63	5	0.145	2.2	1.2	C	0034-	0134-	0234-	0334-	5034-	2034-	3034-	4034-
20	33	5	3.5	70	88	5	0.130	2.3	1.4	C	0035-	0135-	0235-	0335-	5035-	2035-	3035-	4035-
20	33	10	3.5	70	88	5	0.130	2.3	1.4	C	0036-	0136-	0236-	0336-	5036-	2036-	3036-	4036-
20	33	20	3.5	70	88	5	0.130	2.3	1.4	C	0037-	0137-	0237-	0337-	5037-	2037-	3037-	4037-
20	39	5	4	80	100	5	0.120	2.4	1.7	C	0038-	0138-	0238-	0338-	5038-	2038-	3038-	4038-
20	39	10	4	80	100	5	0.120	2.4	1.7	C	0039-	0139-	0239-	0339-	5039-	2039-	3039-	4039-
20	47	5	4.5	90	113	6	0.110	2.5	1.8	C	0040-	0140-	0240-	0340-	5040-	2040-	3040-	4040-
20	47	10	4.5	90	113	6	0.110	2.5	1.8	C	0041-	0141-	0241-	0341-	5041-	2041-	3041-	4041-
20	47	20	4.5	90	113	6	0.110	2.5	1.8	C	0042-	0142-	0242-	0342-	5042-	2042-	3042-	4042-
20	56	5	5.5	110	138	6	0.100	2.9	2.2	D	0043-	0143-	0243-	0343-	5043-	2043-	3043-	4043-
20	56	10	5.5	110	138	6	0.100	2.9	2.2	D	0044-	0144-	0244-	0344-	5044-	2044-	3044-	4044-
20	68	5	7	140	175	6	0.095	3	2.4	D	0045-	0145-	0245-	0345-	5045-	2045-	3045-	4045-
20	68	10	7	140	175	6	0.095	3	2.4	D	0046-	0146-	0246-	0346-	5046-	2046-	3046-	4046-
20	68	20	7	140	175	6	0.095	3	2.4	D	0047-	0147-	0247-	0347-	5047-	2047-	3047-	4047-
20	82	5	8	160	200	6	0.085	3.1	2.5	D	0048-	0148-	0248-	0348-	5048-	2048-	3048-	4048-
20	82	10	8	160	200	6	0.085	3.1	2.5	D	0049-	0149-	0249-	0349-	5049-	2049-	3049-	4049-
20	100	5	10	200	250	8	0.075	3.3	2.5	D	0050-	0150-	0250-	0350-	5050-	2050-	3050-	4050-
20	100	10	10	200	250	8	0.075	3.3	2.5	D	0051-	0151-	0251-	0351-	5051-	2051-	3051-	4051-
20	100	20	10	200	250	8	0.075	3.3	2.5	D	0052-	0152-	0252-	0352-	5052-	2052-	3052-	4052-

See footnote and end of table.

TABLE I. Electrical characteristics and dash numbers -Continued.

DC rated voltage	Capacitance (nom)	Capacitance tolerance	DC leakage at			DF 1 kHz +25°C	ESR 100 kHz +25°C (max) Ω	Ripple current 40 kHz +25°C A (max)	Derated ripple current 1 kHz +25°C A (max)	Case size	Dash number M39003/09- ^{1/} Failure rate level for percent per 1000 hours							
			+25°C	+85°C	+125°C						M (1.0)	P (0.1)	R (0.01)	S (0.001)	G (1.0)	B (0.1)	C (0.01)	D (0.001)
35	22	5	4	80	100	4	0.160	2.1	1.5	C	0053-	0153-	0253-	0353-	5053-	2053-	3053-	4053-
35	22	10	4	80	100	4	0.160	2.1	1.5	C	0054-	0154-	0254-	0354-	5054-	2054-	3054-	4054-
35	22	20	4	80	100	4	0.160	2.1	1.5	C	0055-	0155-	0255-	0355-	5055-	2055-	3055-	4055-
35	27	5	4.5	90	113	4	0.145	2.4	1.9	D	0056-	0156-	0256-	0356-	5056-	2056-	3056-	4056-
35	27	10	4.5	90	113	4	0.145	2.4	1.9	D	0057-	0157-	0257-	0357-	5057-	2057-	3057-	4057-
35	33	5	5.5	110	138	5	0.130	2.5	1.9	D	0058-	0158-	0258-	0358-	5058-	2058-	3058-	4058-
35	33	10	5.5	110	138	5	0.130	2.5	1.9	D	0059-	0159-	0259-	0359-	5059-	2059-	3059-	4059-
35	33	20	5.5	110	138	5	0.130	2.5	1.9	D	0060-	0160-	0260-	0360-	5060-	2060-	3060-	4060-
35	39	5	7	140	175	5	0.120	2.6	2	D	0061-	0161-	0261-	0361-	5061-	2061-	3061-	4061-
35	39	10	7	140	175	5	0.120	2.6	2	D	0062-	0162-	0262-	0362-	5062-	2062-	3062-	4062-
35	47	5	8	160	200	5	0.110	2.7	2.2	D	0063-	0163-	0263-	0363-	5063-	2063-	3063-	4063-
35	47	10	8	160	200	5	0.110	2.7	2.2	D	0064-	0164-	0264-	0364-	5064-	2064-	3064-	4064-
35	47	20	8	160	200	5	0.110	2.7	2.2	D	0065-	0165-	0265-	0365-	5065-	2065-	3065-	4065-
50	5.6	5	2.2	45	56	3	0.300	1.5	0.6	C	0066-	0166-	0266-	0366-	5066-	2066-	3066-	4066-
50	5.6	10	2.2	45	56	3	0.300	1.5	0.6	C	0067-	0167-	0267-	0367-	5067-	2067-	3067-	4067-
50	6.8	5	2.2	45	56	3	0.275	1.6	0.7	C	0068-	0168-	0268-	0368-	5068-	2068-	3068-	4068-
50	6.8	10	2.2	45	56	3	0.275	1.6	0.7	C	0069-	0169-	0269-	0369-	5069-	2069-	3069-	4069-
50	6.8	20	2.2	45	56	3	0.275	1.6	0.7	C	0070-	0170-	0270-	0370-	5070-	2070-	3070-	4070-
50	8.2	5	2.5	50	63	3	0.250	1.6	0.9	C	0071-	0171-	0271-	0371-	5071-	2071-	3071-	4071-
50	8.2	10	2.5	50	63	3	0.250	1.6	0.9	C	0072-	0172-	0272-	0372-	5072-	2072-	3072-	4072-
50	10	5	2.5	50	63	3	0.230	1.7	1.1	C	0073-	0173-	0273-	0373-	5073-	2073-	3073-	4073-
50	10	10	2.5	50	63	3	0.230	1.7	1.1	C	0074-	0174-	0274-	0374-	5074-	2074-	3074-	4074-
50	10	20	2.5	50	63	3	0.230	1.7	1.1	C	0075-	0175-	0275-	0375-	5075-	2075-	3075-	4075-
50	12	5	3	60	75	3	0.210	1.8	1.3	C	0076-	0176-	0276-	0376-	5076-	2076-	3076-	4076-
50	12	10	3	60	75	3	0.210	1.8	1.3	C	0077-	0177-	0277-	0377-	5077-	2077-	3077-	4077-
50	15	5	4	80	100	3	0.190	1.9	1.4	C	0078-	0178-	0278-	0378-	5078-	2078-	3078-	4078-
50	15	10	4	80	100	3	0.190	1.9	1.4	C	0079-	0179-	0279-	0379-	5079-	2079-	3079-	4079-
50	15	20	4	80	100	3	0.190	1.9	1.4	C	0080-	0180-	0280-	0380-	5080-	2080-	3080-	4080-
50	18	5	4.5	90	113	4	0.175	2.0	1.4	C	0081-	0181-	0281-	0381-	5081-	2081-	3081-	4081-
50	18	10	4.5	90	113	4	0.175	2.0	1.4	C	0082-	0182-	0282-	0382-	5082-	2082-	3082-	4082-
50	22	5	5.5	110	138	4	0.160	2.3	1.7	D	0083-	0183-	0283-	0383-	5083-	2083-	3083-	4083-
50	22	10	5.5	110	138	4	0.160	2.3	1.7	D	0084-	0184-	0284-	0384-	5084-	2084-	3084-	4084-
50	22	20	5.5	110	138	4	0.160	2.3	1.7	D	0085-	0185-	0285-	0385-	5085-	2085-	3085-	4085-

^{1/} Dash number shall include a letter that indicates user preference for surge current/high temperature solder or the dash will be deleted.

Stability at low and high temperatures: In accordance with MIL-PRF-39003.

Step 1 (+25°C):

DCL: See table I.

Capacitance: Within tolerance of table I value.

DF: See table I.

Step 2 (-55°C):

Capacitance: Shall not change more than ± 10 percent of step 1 measured value.

DF: 2 times step 1 measured value or table I, whichever is greater.

Step 3 (+25°C):

DCL: See [table I](#).

Capacitance: Shall not change more than ± 2 percent of step 1 measured value.

DF: See [table I](#).

Step 4 (+85°C):

DCL: See [table I](#).

Capacitance: Shall not change more than ± 8 percent of step 1 measured value.

DF: 1.5 times step 1 measured value or [table I](#), whichever is greater.

Step 5 (+125°C):

DCL: See [table I](#).

Capacitance: Shall not change more than ± 12 percent of step 1 measured value.

DF: 1.5 times step 1 measured value or [table I](#), whichever is greater.

Step 6 (+25°C):

DCL: See [table I](#).

Δ Cap.: Shall not change more than ± 2 percent of step 1 measured value.

DF: See [table I](#).

Surge voltage: In accordance with [MIL-PRF-39003](#).

DCL: See [table I](#).

Capacitance: Shall not change more than ± 2 percent of initial measured value.

DF: See [table I](#).

Life: [MIL-STD-202-108](#).

240, 1,000, and 2,000 hours:

At +25°C (as applicable):

DCL: 200 percent of initial limit.

Capacitance: Shall not change more than ± 5 percent of initial measured value.

DF: See [table I](#).

ESR: (after 240 and 2,000 hours): See [table I](#).

At +85°C:

DCL: See [table I](#).

At +125°C:

DCL: See [table I](#).

4,000, 6,000, 8,000, and 10,000 hours (exponential only):

At +25°C (as applicable):

DCL: 400 percent of initial limit.

Capacitance: Shall not change more than ± 10 percent of initial measured value.

DF: See [table I](#).

ESR: (after 10,000 hours): See [table I](#).

At +85°C:

DCL: 200 percent of initial limit.

At +125°C:

DCL: 200 percent of initial limit.

Marking: In accordance with [MIL-PRF-39003](#).

Part or Identifying Number (PIN): M39003/09-(dash number from [table I](#)).

Substitutability data: Substitutability for failure rate levels and capacitance tolerances shall be in accordance with [MIL-PRF-39003](#).

APPLICATION NOTES:

1. Rated ripple current is the rms value of the maximum allowable alternating current of a specified frequency, at which the capacitor may be operated continuously at a specified temperature. Derate ripple current for ambient temperature in accordance with the curve shown on [figure 2](#).
2. For derating the frequency, use the derated ripple currents at 1 kHz given in [table I](#). Below 1 kHz these same currents are applicable provided the peak ac voltage does not result in voltage reversal or exceeds the rated dc voltage. Between 1 kHz and 40 kHz the ripple current may be interpolated linearly with frequency. The ripple current is applicable at frequencies above 40 kHz.
3. Although style CSR21 capacitors are rated to operate with the specified levels of rms ripple current, they are basically polar devices. Care must be exercised to assure that sufficient dc bias is applied to prevent ac voltage reversal in excess of specified reverse voltage ratings (see [MIL-HDBK-198](#)).
4. When two or more style CSR21 capacitors are used in parallel, ripple current may not divide equally as a result of unequal ESR's of the capacitors. It is imperative that each capacitor be operated within the specified limit of rms ripple current.

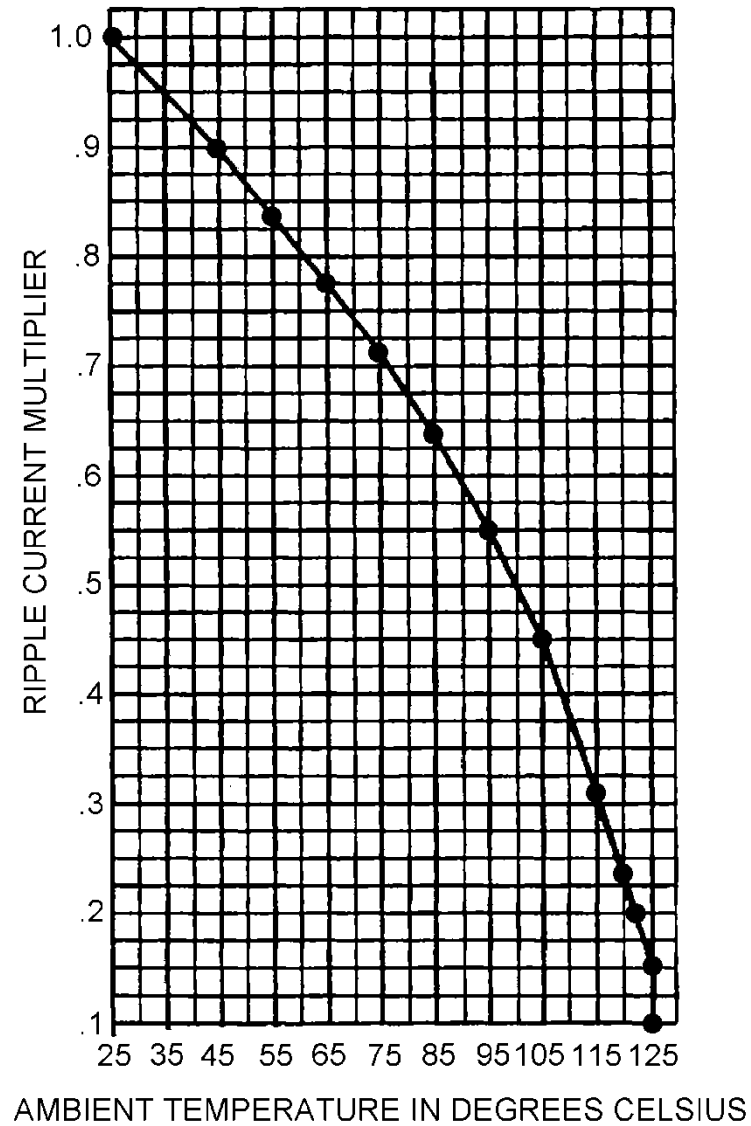


FIGURE 2. Ripple current derating with respect to temperature.

Reference documents. In addition to [MIL-PRF-39003](#), this specification sheet references the following documents.

| [MIL-STD-202-108](#)
[MIL-STD-1276](#)
[MIL-HDBK-198](#)

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where modifications from this revision were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

Custodians:
Army – CR
Navy – EC
Air Force – 85
DLA - CC

Preparing activity:
DLA – CC

(Project 5910-2022-018)

Review activities:
Navy – AS, MC, OS, SH
| Air Force – 19

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/>.