

ALSEP
ACCEPTABLE PARTS LIST

ATM-241 REV. "D"

JULY 27, 1970

PREPARED BY
PARTS AND MATERIALS GROUP
ALSEP RELIABILITY DEPARTMENT
BENDIX AEROSPACE SYSTEMS DIVISION
ANN ARBOR, MICHIGAN

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THIS ATM 241 REVISION D SUPERSEDES ALL PREVIOUS ISSUES OF ATM 241

During the period of time between the original issue and its application to ALSEP design the availability of the cited acceptable parts has changed and requirements for parts which could not be met by those on the earlier list have been identified. The criteria for acceptability has not changed, that is, the parts which have been added meet requirements of: (1) proven product history, (2) screening techniques applied by the vendor to assure product quality on a 100% sample basis, and (3) a design and manufacturing process to assure performance in a hard vacuum (i.e. true hermetic seal).

Summary of Changes in the "D" Revision are:

1. Added Derating for
Integrated circuit (Para C)
2. Added Para D
Screening of Parts in
Categories 5 & 6
3. Added Para F
Limited Usage Parts
4. Page 19-I:
Added: T. I. /NATIONAL Low Power and Medium Power TTL
(SM 54LXX and SM 54XX)
5. Deleted Section 9 - Miscellaneous Parts and Section 10 - Limited Usage Parts



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This report contains a list of electronic common parts which are recommended for application in ALSEP equipment. The principle factors in listing these parts is the reliability and availability status. Recommended stress levels are indicated.

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- A. Introduction
- B. Order of Preference
- C. Recommendations on Derating
- D. Screening of Parts in Categories 5 and 6
- E. Subcontractor's Non-standard Parts Approval Request (NSPAR)
- F. Limited Usage Parts

ATTACHMENTS: (I) Acceptable Parts Lists

- 1. Capacitors
- 2. Resistors
- 3. Diodes
- 4. Transistors
- 5. Connectors
- 6. Relays
- 7. Transformers
- 8. Integrated Circuit

(II) Parts Data Sheets:

(III) Summary of Electronics part type used in ALSEP.

NOTE: Detailed information for these parts as well as general application factors are contained in BSC 42275 "Parts Application and Reliability Bulletin" Vols. I & II and ATM 507 "ALSEP Parts Data Book."

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A: Introduction:

In selecting parts for ALSEP equipment, principle emphasis is to be given to those types of parts which have documented reliability history. This emphasis is needed because the stringent reliability goal and the compressed schedule will not allow a reliability determination to be made at the piece-part level.

Established Reliability (E.R.) parts have been documented under Minuteman specifications (North American Aviation (NAA) purchase documents or more recently a series of MIL specs, MIL-R-38100) and subsequently certain tri-service coordinated MIL specs (generally in the MIL-X-39000 series) as shown on Table I. Bendix experience has indicated that the MIL-R-38100 series which was an "interim" series did not receive enough industry support and is now being phased out.

Additional high-reliability parts and devices, produced for various DOD and NASA programs have been described by NASA (Marshall Space Flight Center (MSFC), Jet Propulsion Lab (JPL) and others) documents and are sometimes more applicable and/or available than the 39000 series parts or NAA spec parts.

Many of the vendors furnishing parts to various DOD and NASA programs have developed their own means of characterising hi-rel products, which may then be furnished to several customers. Motorola's "Meg-a-Life," Fairchild's "FACT" program and Raytheon's "X-L" series are examples of this.

It is to be noted that the end-result of many of these hi-rel programs is to sort out a premium product from a well-controlled product line having adequate yields and a well-established market. It has been shown that the market for hi-rel products cannot support a completely distinct production facility. While this furnishes an economical solution to hi-rel product availability, it creates a concern that the supplier may have established a number of grades with subtle differences in reliability potential.

B: Order of Preference:

Notwithstanding the subtle differences in reliability potential, the following order of preference has been established:

Ref Desig	PART TYPE	ER Spec. No. Mil-I-1-	Failure Rate %/KHR	Conf Level %	Accel Factor G	Requal for FR			Interval Level			GP A Lot Rej Size Limit	GP B Lot Size Limit	GP B Life Test Time	Disp GP B SAMPLES	Conditioning Tests (100% of Lot)			Extended Life Tests			
						L	M	P	R	S	T					Time	% Stress	Temp	Time	% Drift		
	Capacitors					5	1	1	01	03	003			Hours	(2)	(3)	Hrs	°C	Hrs			
CYP	Glass	23269A	1.0-.001	90	A	-	3	6	9	12		5%	N.S.	250	A	N.D.	50	1500V	+25	30K (5)	2%	
CMR	Mica	39001	1.0-.0001	90	B	-	3	6	9	12	24	8%	1 wk	250	A	N.D.	48	1000V	+125	50K (5)	1%	
CSR	Tantalum, solid	39003	5.0-.001	60	-	3	3	6	9	12		5%	1 wk	250	A	D	40 (4)	100%	+05	10K	10%	
CLP	" non-solid	39006	5.0-.001	60	-	3	3	6	9	12		5%	1 wk	250	A	D	24-100	Surge V	+125	10K	25% (5)	
CPV	Paper (-plastic)	34157D	5.0-.001	90	C	3	3	6	9	12		5%	N.S.	250	E	N.D.	15 sec (2)	200%	+15-35	6K	init. tol.	
CZB	Feedthrough	39001	5.0-.001	90	C	(1)	6	9	12	15		5%	1 mo	250	B	N.D.	1 sec	250%	+25	10K (5)	5%	
CKK	Ceramic, G. P	39014	1.0-.001	90	D	-	3	6	9	12		2%	1 wk	250	A	D	100	200%	Max R.	32K (7)	20%	
CHR	Paper-P Metal	39022	5.0-.001	90	C	3	3	6	9	12		8%	1 mo	250	A	N.D.	5 Cyc	Max Temp	M202/102D	10K (5)	10%	
LTR	Coil, R.F.	39010	1.0-.001	60	-	-	3	6	9	12		5%	N.S.	250 (3)	A	N.D.	7.5 (0) cyc	0	-65, +125	10K	init. tol.	
RS	Connector, P. W. B.	23353	5.0-.001	60	-	4	6	10	12	18		N.S.	N.S.	100 (5)	G	N.D.	(None)			10K	ARcc 50%	
CR	Crystal Unit, quartz	39020	5.0-.01	60	-	3	6	9	12	-		N.S.	N.S.	500	C	D	500	0	+85	5K	Indiv. Spec	
*	Relay	39016	1.0-.01 (1)			(1)	6	24	-			10%	1 wk	100K ops	D	N.D.	25000 ops	2	Rated Load	Min R. Max R	100K ops	Rc 2x
	*MS39016/I																					
	Resistors, fixed																					
RNR	Film	55182B	1.0-.001	60	-	-	3	6	9	12		1%	1 mo	250 (5)	A	N.S.	1 (5)	500% 200%	20-45	10K	2%	
RBR	W. W. accurate	39005	"	"	-	-	3	6	9	12		5%	1 mo	250	A	N.D.	100	100%	+125	10K	1%	
RWR	W. W. power	39007	"	"	-	-	3	6	9	12		5%	1 mo	250 (5)	A	N.D.	100	100%	+25	10K	1.5%	
RCR	Composition, 5%	39008	"	"	-	-	3	6	9	12		5%	1 wk	250 (5)	A	N.D.	None (Max. Res	100%		10K	15%	
RER	W. W. pwr, chas.	39009	"	"	-	-	6	9	12	15		5%	1 mo	250 (5)	B	N.D.	96	100%	+25	10K	2%	
RLR	Film, insul	39017	"	"	-	-	3	6	9	12		2%	1 mo	250 (5)	A	N.D.	24	150%	+25	10K	4%	
RTB	Resistor, var, ww	39015	"	"	-	-	6	9	12	15		10%	1 mo	250 (5)	E	N.D.	96	1W	+25	10K	3%	
TFP	Transformers, inductors	39013	5.0-.01	60	-	3	6	9	12	-		5%	N.S.	250 (8)	C	E	None	-	-	10K	±50% elec	
TPR	Transformers, pulse	39026	5.0-.01	60	-	3	6	9	12	-		N.S.	-	250 (5)	C	D	1 min (AQL)	200%	+25	10K	Δ<50%	
																					(25-50% DF)	
ABBREVIATIONS: I.N.A. = INFORMATION NOT AVAILABLE cons = operations																						
NOTES:		K = 1,000	N.S. = Not Specified																			
① Acceleration factor		① As lot-by-lot qualification																				
Tested at Max Rated Temp		③ (N.D.) D means samples are deliverable																				
Code Ratio % Stress		④ 6K hrs at accelerated conditions																				
A	5:1	150	⑥ 2K " " "																			
B	25:1	150	⑦ Also requires temp cycling and X-ray inspection																			
C	5:1	140	⑧ 4K hrs at accelerated conditions																			
D	8:1	200	⑨ Group C Life Tests																			
E			⑫ Cycled -1/2 hr "on", 1/2 hr "off"																			
			⑩ Except 16 #10, - 60% and 110 #20%																			
			⑪ Per 10,000 operations																			
			⑬ Also requires seal test / X-ray inspection																			
			⑭ Lot can be accepted at 250 hours																			
② Group B Sampling Plan (Acc No. 1)																						
		Code → A B C D- E F G																				
		FR %																				
	5	110	17	36	-	Sam															32	
	1	110	50	50	71	Ple	50	50														
	1	150	75	76	50	By	80	80														
	.01	300	225	226	80	Lot	200	200														
	.001	750	450	-	-	Size	500	335														
	.0001	1500																				

Table 1. Summary of Selected Features of ER Specifications



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1. NAA spec parts (and MIL-R-38100)
2. MSFC parts, JPL parts
3. ER series specs (and MIL-S-19500 TX series)
4. Industry Hi-Rel, (Mega-Life; FACT, etc.)
5. MIL-spec with added burn-in and screening
6. Non MIL-spec with MIL-STD lot acceptance testing and 100% burn-in.

The order above correlates inversely with the delivery cycle expected being longer with the first items in the list, and it is noted that it may be necessary to permit vendor to ship prior to completion of Lot Acceptance Tests (such as group "B" and "C" test of NAA or ER specs) in order to expedite delivery. None of the Group "A" (100% tests) shall be reduced or waived. It is recommended that before selecting a preferred item, consideration be given to permitting vendor to ship prior to completion of Lot Acceptance Tests rather than accepting a product to a lower-rated spec, because of the risk of accepting parts rejected from the preferred category.

C: Recommendations on Derating:

The stress levels tabulated indicate a maximum upper limit for the majority of applications based on 100% duty cycle. These are summarized in the table below:

Capacitors

Ceramic	50% Voltage
Mica	50% Voltage
Paper/Plastic	50% Voltage
Electrolytic, Wet	60% Voltage
Solid	60% Voltage*

*Requires series impedance of 3 ohms per volt.

Resistors

Film	50% Power
Wirewound	50% Power
Composition	50% Power, also $\Delta R = 25\%$ allowable

Diodes, Silicon

50% Voltage, 50% current
Max. $T_J = 140^\circ\text{C}$



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Integrated Circuits

- (1) Power supply voltages are derated as follows:
Derated minimum voltage = $V_{nom} - 0.6 (V_{nom} - V_{min})$
Derated maximum voltage = $V_{nom} + 0.6 (V_{max} - V_{nom})$
- (2) For logic circuits, the derated fan-in and fan-out loading shall be 75% or less of the manufacturer's rating.
- (3) For linear circuits the derated current loading shall be 75% or less of the manufacturer's rating.
- (4) Limit junction temperatures to 100°C for silicon devices.

Transistors, silicon

50% Voltage, 50% current

Max. $T_J = 140^\circ\text{C}$

Transformers & Coils

15°C rise

The derating shall be computed after recommended operating temperature derating has been made.



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D: Screening of Parts in Categories 5 and 6

Screening of parts in Categories 5 and 6 shall be performed by citing screening requirements for similar parts from specifications shown in Categories 1 through 4 using the same order of preference. For example, for screening a transistor, the screening procedures of MSFC-85MOXXXX(S2NXXX) would receive preference over screening per the JAN TX 2NXXX (MIL-S-19500) for a similar transistor type.

Integrated circuits for flight equipment shall be screened per MSFC spec 85M02704 level S1 or MIL-STD-883 Method 5004 Class A.

E: Subcontractor's Non-standard Parts Approval Request (NSPAR)

BxA subcontractor shall select parts in the order of preference indicated in Section B, ie, Categories 1 through 5. Category 6 is considered to be a non-standard part and will require a non-standard part approval request to Bendix.

F. Limited Usage Parts

If suitable parts for the intended ALSEP flight hardware design cannot be found in Sections 1 through 8 of Attachment I of this document, additional parts which have been (or scheduled to be) qualified on ALSEP may be located in Attachment III.

However, such parts are considered limited usage parts and are subject to NSPAR action.



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ATTACHMENT I

ACCEPTABLE PARTS LIST

ACCEPTABLE PARTS LISTS - (1) CAPACITORS, ESTABLISHED RELIABILITY

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No.	Description	Mil-C	Slash No.	Style	Voltage	Temp. °C	Value	Range	Tol.	Derating % of Rated	PRE-FERRED Vendor
							Min.	Max.			
1.1	Capacitors, Fixed: Glass Dielectric	MSFC-SPEC -400A	1A 2A	ECY10--	500	125	0.5pf	150pf	±5	50	Corning
				ECY15--	300	"	160pf	240pf	"	"	"
							160pf	1200pf	"	"	"
1.2	Mica Dielectric	39001	1 2 3	CMR01	300	125	5uuf	160uuf	±5	50	Elmenco
				CMR02	300	"	180uuf	510uuf	"	"	"
				CMR03	300	"	560uuf	.02uf	"	"	"
				M2DM10	300	125	5pf	160pf	±5	50	Elmenco
				M2DM15	300	"	180pf	510pf	"	"	"
				M2DM20	300	"	560pf	0.2UF	"	"	"
1.3	Tantalum, Solid Diel. (Polarized)	39003	1 1 1 1	CSR13	6-100	85	.56/100V	6.8/6V	±10	60	Kemet/ Sprague
				"	"	"	27/100V	.56/6V	"	"	"
				"	6-75	"	10/75V	180/6V	"	"	"
				"	"	"	15/75V	330/6V	"	"	"
1.4	Tantalum Non-solid (Polarized) (Etched Foil)	39006	1 1 1 1 1	CLR25	10-100	125	1/100V	15/10V	-15 +30	75	Sprague/G. E.
				(Max.	"	"	4/100V	60/10V		"	"
				case	"	"	13/100V	200/10V		"	"
				sizes)	"	"	25/100V	400/10V		"	"
				"	"	"	36/100V	580/10V		"	"
				16K-Foil	10-150	125	1.5/150	60/10	±20	75	G. E.
				Polar			5/150	200/10	"	"	"
							10/150	400/10	"	"	"
							15/150	580/10	"	"	"
	Tantalum, Non-solid (Non-polarized) (Etched Foil)	39006	2 2 2 2	CLR27	10-100	125	.5/100V	10/10V	-15 +30	"	"
				(Max.	"	"	2/100V	40/10V		"	"
				case	"	"	6/100V	120/10V		"	"
				sizes)	"	"	12/100V	250/10V		"	"
1.5	Ceramic Dielectric	39014	1 2 5 6 9	CKR05	200V	+150	10uuf	1000uuf	±10	60	Vitramon, Erie, and Aerovox
				CKR06	"	"	1200uuf	0.1uf	"	"	
				CKR12	50V	+125	10uuf	10Kuuf	"	50	
				CKR13	"	"	15Kuuf	0.1uf	"	"	Aerovox & Potter Vitramon
				CKR19	50V	125	12uuf	0.1uf	±10	50	
				VKR2	200	125	10	1000	±10	60	
				VKR3	200		1200	10,000	±10	60	
1.6	Paper/(-plastic)	14157	2	CPV09		125			±5	50	Sprague

ACCEPTABLE PARTS LIST - (2) RESISTORS, ESTABLISHED RELIABILITY

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2.0	Type	Spec. No. Mil-R	Slash No.	Style	Size (Nom)		Power Rating		Resistance (Ohms)			Derating % of Rated Power	PREFERRED Vendor
					Length	Dia.	Watts	at °C Temp.	Min	Max	% Tol.		
2.1	Metal Film	55182	1	RNR55E	.250	.109	.100	125	49.9	.1 Meg	1	50	MEPCO Mepco Mepco Mepco Mepco Angstrohm Angstrohm
	Metal Film	55182	1	RNR55C	.250	.109	.100	125	49.9	.1 Meg	1	50	
	Metal Film	55182	2	RNR57C*	.281	.155	.125	125	10	.2 Meg	1	50	
	Metal Film	55182	5	RNR65C	.625	.188	.250	125	49.9	1.0 Meg	1	50	
	Metal Film	55182	6	RNR70C	.750	.250	.500	125	24.9	1.0 Meg	1	50	
				S-51	.250	.109	.100	.25	49.9	.1 Meg	0.1	50	
				J-51	.250	.109	.100	.25	49.9	.1 Meg	0.1	50	
2.2	Film	38101	21	21ER--	.235	.107	.125	70	51	150K	2	50	Corning Corning Corning
		39017	1	RLR07	.250	.090	.250	70	10	10 Meg	2	50	
			2	RLR20	.375	.138	.500	70	4.3	1 Meg	2	50	
2.3	Wire Wound; Power	39007											Dale Dale Dale Dale
	Wire Wound; Power	39007	4	RWR70	.406	.093	1	25	1	1210	1	40	
	Wire Wound; Power	39007	5	RWR71	.812	.187	2	25	1	6040	1	60	
	Wire Wound; Power	39007A	8	RWR80	.406	.093	1	25	1	1210	1	40	
	Wire Wound; Power	39007A	9	RWR81	.250	.078	1	25	1	1000	1	40	
2.4	W. W. Power, Chassis Mounted	39009	1	RER65	1.375	.406	10	25	0.1	5.62K	1	50	Dale Dale
				RER60	1.125	.320	5	25	0.1	3.32K	1	50	
2.5	Composition	39008	1	RCR07	.250	.090	.250	70	10	1 Meg	5	40	A/B only A/B only
	Composition	39008	2	RCR20	.375	.138	.500	70	10	1 Meg	5	40	
2.6	W. W. Accurate	39005	1	RBR52	1.0	.375	.500	125	0.1	.806Meg	0.1	50	Aerovox Aerovox Aerovox
	W. W. Accurate	39005	3	RBR55	.750	.250	.250	125	0.1	.225Meg	0.1	50	
	W. W. Accurate	39005	4	RBR55	.500	.250	.150	125	0.1	.150Meg	0.1	50	

*Actual measured dimensions of RNR57C is 0.295L x 0.145D



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(3) Diodes

Classification of Diodes

- A. Diodes are listed in numerical order by JEDEC designation (type no.)
- B. The types of diodes indicated in column 2 are:
 - 1. General Purpose
 - 2. Reference (zener)
 - 3. Switching
 - 4. Rectifier
 - 5. Silicon Controlled Rectifiers
 - 6. Microwave
 - 7.
 - 8. Miscellaneous
- C. Hi-rel categories
 - 1. NAA North American Aviation
Purchase documents (Minuteman Program) also described in MIL-S-38103
 - 2. MSFC Marshall Space Flight Center
Preferred Parts List MSFC-PPD-600
 - 3. TX MIL-S-19500 devices containing added process conditioning (100% basis)
 - 4. JPL Jet Propulsion Laboratory Preferred Parts List
ZPP-2061-PPL
 - 5. FSC Fairchild Semiconductor devices in FACT-II Component Test Program
 - 6. MOTA Motorola Meg-A-Life device
 - 7. RCA Radio Corp. of America High Reliability types - assigned 5 digit type numbers
 - 8. GE General Electric High Reliability devices - assigned 4JA-- numbers
 - 9. LEM Lunar Excursion Module. Preferred Parts tabulated by Apollo Information Center (APIC)

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ACCEPTABLE PARTS LIST 3 DIODES

NUMERICAL LISTING OF HI-REL DIODES	TYP	N A F C	M S F C	T X L	J P L	F S C	M O T A	R C A	G E M	L E M	7 0 1	PEAK	MAX	MAX	FWD	POWE	ZEN	LN	ZEN	IMD	STH	CASE
												INV.	OUT			REV	VOLTR	25C	VOLTAGE			
												VOLTS	PUT	CUR	DROP	25C	MIN	MAX				
												I	T	I	25C							
												DC	OC	R								
												VOLTS	AMPS	MA	VOLTS	W	VOLTS	VOLTS	OHMS			
1N 21WE	6										X											
1N 21WEM	6										X											
1N 21WEMR	6										X											
1N 26	6										X											
1N 26B	6										X											
1N 31	6										X											
1N 32	6										X											
1N 53	6										X											
1N 78	6										X											
1N 78C	6										X											
1N 82A	8										X											
1N 93A	4										X											
1N 249B	4										X											
1N 250	4										X											
1N 277	1										X											
1N 483B	1										X											
1N 485	1				X																	
1N 485H	1										X											
1N 486B	1										X											
1N 540	4	X							X													
1N 547	4		X																			
1N 560	4										X											
1N 561	4										X											
1N 626	3		X																			
1N 645	4	X	X								X											
1N 647	4										X											
1N 647A	4										X											
1N 649	4		X		X				X		X											
1N 658	3										X											
1N 691	3										X											
1N 697	3										X											
1N 746A	2		X	X	X		X				X											
1N 747A	2			X	X		X				X											
1N 748A	2			X	X		X				X											
1N 749A	2			X	X		X				X											
1N 750A	2		X	X	X		X			X	X											
1N 751A	2		X	X	X		X				X											
1N 752A	2		X	X	X		X				X											
1N 753A	2	X	X	X	X		X			X	X											
1N 754A	2		X	X	X		X				X											
1N 755A	2		X	X	X		X				X											
1N 756A	2		X	X	X		X			X	X											
1N 757A	2		X	X	X		X				X											
1N 758A	2		X	X	X		X			X	X											
1N 759A	2	X	X	X	X																	
1N 761A	2		X																			

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ACCEPTABLE PARTS LIST 3 DIODES

NUMERICAL LISTING	TYPE	PACKAGE	MAX. FORWARD CURRENT	MAX. REVERSE CURRENT	MAX. POWER	MAX. ZENER VOLTAGE	MAX. ZENER CURRENT	CASE STYLE
HI-REL DIODES	PF	AFC	MA	MA	W	VOLTS	MA	UC
1N 762A	2	X						
1N 763A	2	X						
1N 764A	2	X						
1N 765A	2	X						
1N 766A	2	X						
1N 767A	2	X						
1N 768A	2	X						
1N 769A	2	X						
1N 793	3	X						
1N 816W	1	X						
1N 821	1	X						
1N 823	1							
1N 825	1							
1N 827	1	X						
1N 827A	1							
1N 829	2							
1N 830A	8							
1N 914	3							
1N 916B	3	X						
1N 933	3							
1N 935B	2	X						
1N 937B	2							
1N 938B	2							
1N 939B	2							
1N 941B	2							
1N 943B	2							
1N 944B	2							
1N 945B	2	X						
1N 962B	2							
1N 963B	2							
1N 964B	2							
1N 965B	2	X						
1N 966B	2							
1N 967B	2	X						
1N 968B	2							
1N 969B	2							
1N 970B	2							
1N 971B	2							
1N 972B	2							
1N 973B	2							
1N 974B	2							
1N 975B	2							
1N 976B	2							
1N 977B	2							
1N 978B	2							
1N 979B	2							

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ACCEPTABLE PARTS LIST 3 DIODES

NUMERICAL LISTING OF HI-REL DIODES	T OF P E	N A A F C	M S F C	T X	J P L	F S C	M O T A	R C A	G E E M	L E M	7 0 1 E	PEAK MAX INV. DUT VOLT PUT PIV	MAX REV CUR I T OC	FWD POWER VOLT R DROF 25C	ZENER VOLTAGE 25C MIN MAX	ZEN IND	SYRCASE UCTSTYL UREE
												DC VOLTAmps	MA	VOLTMW	VOLTV	VOLTOHM	
1N2790	2									X							
1N2804B	2						X				X						
1N2805B	2						X				X						
1N2806B	2						X				X						
1N2807B	2						X				X						
1N2808B	2						X				X						
1N2809B	2						X				X						
1N2810B	2						X				X						
1N2811B	2						X				X						
1N2812B	2						X										
1N2813B							X				X						
1N2814B	2						X				X						
1N2815B	2						X										
1N2816B	2						X				X						
1N2817B	2						X										
1N2818B	2						X				X						
1N2819B	2						X				X						
1N2820B	2						X				X						
1N2821B	2						X										
1N2822B	2						X				X						
1N2823B	2						X				X						
1N2824B	2						X				X						
1N2825B	2						X				X						
1N2826B	2						X				X						
1N2827B	2						X				X						
1N2828B	2						X										
1N2829B	2						X				X						
1N2830B	2						X										
1N2831B	2						X				X						
1N2832B	2						X				X						
1N2833B	2						X				X						
1N2834B	2						X				X						
1N2835B	2						X				X						
1N2836B	2						X				X						
1N2837B	2						X				X						
1N2838B	2						X				X						
1N2839B	2						X										
1N2840B	2						X				X						
1N2841B	2						X				X						
1N2842B	2						X				X						
1N2843B	2						X				X						
1N2844B	2						X				X						
1N2845B	2						X				X						
1N2846B	2						X				X						
1N2970B	2		X				X			X	X						
1N2970RB	2		X														

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ACCEPTABLE PARTS LIST 3 DIODES

NUMERICAL LISTING OF HI-REL DIODES	T F P L	N A P A	M S F C	T X	J P L	F S C	M O T A	R C A	G E	L E A	7 O 1 F	PEAK INV. VOL PIV	MAX OUT PUT 1 DC VOLTS	T OC	MAX REV CUR I R MA	FWD VOLTR DROP 25C	POWER 25C W	ZENER VOLTAGE		ZEN IMDSTR CASE UCT STYL UREE
																		MIN	MAX	
1N2971B	2		X				X				X									
1N2971RB	2		X																	
1N2972B	2		X				X			X	X									
1N2972RB	2		X																	
1N2973B	2		X				X				X									
1N2973RB	2		X																	
1N2974B	2		X				X			X	X									
1N2974RB	2		X																	
1N2975B	2		X				X				X									
1N2975RB	2		X																	
1N2976B	2		X				X			X	X									
1N2976RB	2		X																	
1N2977B	2		X				X				X									
1N2977RB	2		X																	
1N2978B	2		X				X													
1N2979B	2		X				X			X	X									
1N2979RB	2		X																	
1N2980B	2		X				X				X									
1N2980RB	2		X																	
1N2981B	2		X				X													
1N2982B	2		X				X			X	X									
1N2982RB	2		X																	
1N2983B	2		X				X													
1N2983RB	2		X																	
1N2984B	2		X				X				X									
1N2984RB	2		X																	
1N2985B	2		X				X			X	X									
1N2985RB	2		X																	
1N2986B	2						X				X									
1N2987B	2						X													
1N2988B	2						X			X	X									
1N2989B	2						X				X									
1N2990B	2						X				X									
1N2991B	2						X				X									
1N2992B	2						X				X									
1N2993B	2						X				X									
1N2994B	2						X													
1N2995B	2						X				X									
1N2996B	2						X													
1N2997B	2						X				X									
1N2998B	2						X													
1N2999B	2						X				X									
1N3000B	2						X				X									
1N3001B	2						X				X									
1N3002B	2						X				X									

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ACCEPTABLE PARTS LIST 3 DIODES

NUMERICAL LISTING HI-REL DIODES	T OF P E	N A A	M S F C	T X	J P L	F S C	M U T A	K C A	G E M	L E M	7 0 1 E	PEAK INV. VOLT PIV	MAX OUT PUT I DC VOL TAMPS	MAX REV CUR I OC R MA	FWD VOLTR DRCP 25C VOLT MW	POWER 25C VOLT MW	ZENER VOLTAGE MIN VOLT	MAX VOLT	ZEN IMOSIR CASE UCTSTYL UREE
1N3003B	2						X				X								
1N3004B	2						X				X								
1N3005B	2						X				X								
1N3006B	2						X				X								
1N3007B	2						X				X								
1N3008B	2						X				X								
1N3009B	2						X				X								
1N3010B	2						X				X								
1N3011B	2						X				X								
1N3012B	2										X								
1N3014B	2										X								
1N3016B	2		X				X				X								
1N3017B	2		X				X				X								
1N3018B	2		X				X			X	X								
1N3019B	2	X	X				X				X								
1N3020B	2		X				X			X	X								
1N3021B	2		X				X				X								
1N3022B	2	X	X				X			X	X								
1N3023B	2		X				X				X								
1N3024B	2		X				X			X	X								
1N3025B	2		X				X				X								
1N3026B	2		X				X			X	X								
1N3027B	2		X				X				X								
1N3028B	2		X				X			X	X								
1N3029B	2						X				X								
1N3030B	2						X			X	X								
1N3031B	2						X				X								
1N3032B	2						X				X								
1N3033B	2						X				X								
1N3034B	2						X				X								
1N3035B	2						X				X								
1N3036B	2						X				X								
1N3037B	2						X				X								
1N3038B	2						X				X								
1N3039B	2						X				X								
1N3040B	2						X				X								
1N3041B	2						X				X								
1N3042B	2						X				X								
1N3043B	2						X				X								
1N3044B	2										X								
1N3045B	2										X								
1N3046B	2										X								
1N3047B	2										X								
1N3048B	2										X								
1N3049B	2										X								
1N3050B	2										X								

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4. TRANSISTORS

Numerical Listing of Hi-Rel. Transistors	Type*	NAA	MSFC	TX	JPL	FSC	MOTA	RCA		LEM	701E	
2N329A	4										X	
2N335A	5	X										
2N335B	5		X									
2N337	5	X										
2N338B	5		X									
2N341	5										X	
2N388	5										X	
2N389	9										X	
2N424	9										X	
2N489	1	X										
2N491	1		X							X	X	
2N657	5									X	X	
2N657A	5		X									
2N697	5/0	X										
2N699B	5					X						
2N706	5/0									X	X	
2N708	5/0		X		X					X		
2N718A	5/0		X							X	X	
2N720A	5									X		
2N722	4		X							X		
2N760A	5										X	
2N834	5/0		X									
2N869A	4/0									X		
2N870	5					X						
2N871	5					X						
2N910	5				X	X				X		
2N911	5					X						
2N912	5					X						
2N914	5/0				X					X		
2N915	5				X	X						
2N916	5					X				X	X	
2N918	5			X	X					X		
2N930	5		X		X					X	X	
2N956	5				X							
2N995	4				X						X	
2N996	4									X		
2N1016B	9										X	
2N1016C	9									X		
2N1016D	9		X		X							
2N1050A	9										X	
2N1118	4										X	
2N1119	4/0										X	
2N1132	4/0	X			X						X	

LOW POWER				HIGH POWER				SPECIAL	
2	Ge PNP	4	Si PNP	6	Ge PNP	8	Si PNP	0	Switching
3	Ge NPN	5	Si NPN	7	Ge NPN	9	Si NPN	1	Miscellaneous

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4. TRANSISTORS

Numerical Listing of Hi-Rel Transistors	Type*	NAA	MSFC	TX	JPL	FSC	MOTA	RCA		LEM	701E	
2N1234	4										X	
2N1469	4										X	
2N1482	9									X		
2N1485	9/0										X	
2N1486	9/0		X							X		
2N1490	9/0										X	
2N1506A	9										X	
2N1514	9/0									X		
2N1613	5/0				X					X	X	
2N1675	5									X		
2N1711	5/0									X	X	
2N1722	9			X								
2N1724	9		X	X	X					X	X	
2N1889	5					X						
2N1890	5					X						
2N1893	5/0				X	X				X	X	
2N1973	5				X	X				X		
2N1974	5					X				X		
2N1975	5					X						
2N2016C	9									X		
2N2034	9				X							
2N2034A	9	X										
2N2049	5					X	X			X		
2N2060	1				X						X	
2N2102	9		X									
2N2126	9		X									
2N2150	9				X							
2N2192A	5/0									X		
2N2218	5/0						X					
2N2218A	5/0						X					
2N2219	5/0			X			X				X	
2N2219A	5/0						X					
2N2221	5/0						X					
2N2221A	5/0						X					
2N2222	5/0			X	X		X				X	
2N2226A	9				X							
2N2297	5				X							
2N2303	4					X				X		
2N2331	5/1				X							
2N2369	5				X							
2N2412	4		X		X							
2N2432	5				X							
2N2481	5/0			X			X				X	

LOW POWER

HIGH POWER

SPECIAL

2 Ge PNP	4 Si PNP	6 Ge PNP	8 Si PNP	0 Switching
3 Ge NPN	5 Si NPN	7 Ge NPN	9 Si NPN	1 Miscellaneous

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4. TRANSISTORS

Numerical Listing of Hi-Rel. Transistors	Type*	NAA	MSFC	TX	JPL	FSC	MOTA	RCA	LEM	701E
2N2484	5				X					
2N2497	1				X					
2N2604	4				X					
2N2616	5					X				
2N2645	5					X			X	
2N2708	5							X		
2N2729	5					X				
2N2801	4 0	X								
2N2857	5					X				
2N2904	4 0						X			
2N2904A	4 0						X			
2N2905	4 0						X			X
2N2905A	4 0						X			
2N2906	4 0						X			
2N2906A	4 0						X			
2N2907	4 0				X		X			X
2N2907A	4 0						X			
2N2935	5	X								
2N2970B	1			X						
2N2974B	1			X						
2N2979	1				X					
2N3037	5 0	X								
2N3038	5 0	X								
2N3043	1	X								
2N3045	1	X								
2N3048	1	X								
2N3049	1	X								
2N3050	1	X								
2N3051	1	X								
2N3052	1	X								
2N3231	1							X		
2N3250	4 0						X			
2N3250A	4 0						X			
2N3251	4 0						X			
2N3251A	4 0						X			
2N3265	9							X		
2N3299	5 0					X				
2N3300	5 0					X				
2N3301	5 0					X				
2N3302	5 0					X				
2N3375	9							X		
2N3553	9							X		
2N3632	9							X		

LOW POWER				HIGH POWER				SPECIAL	
2	Ge PNP	4	Si PNP	6	Ge PNP	8	Si PNP	0	Switching
3	Ge NPN	5	Si NPN	7	Ge NPN	9	Si NPN	1	Miscellaneous

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4. TRANSISTORS

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LOW POWER				HIGH POWER				SPECIAL	
2	Ge PNP	4	Si PNP	6	Ge PNP	8	Si PNP	0	Switching
3	Ge NPN	5	Si NPN	7	Ge NPN	9	Si NPN	1	Miscellaneous

ACCEPTABLE PARTS LIST 5.0 CONNECTORS

<u>Type</u>	<u>Contacts</u>	<u>Dimensions</u> LxW	<u>Contact</u> <u>Rating</u>	<u>Wire</u> <u>Size</u>	<u>Vendor & Type</u>
Multicontact, Recept.	14	1.520 x .520	3A	AWG 22-28	Hughes Type WSW
Multicontact, Recept.	38	1.945 x .520	3A	AWG 22-28	or WST (chassis)
Multicontact, Recept.	88	2.780 x .520	3A	AWG 22-28	Per NAA Spec
Multicontact, Recept.	132	2.790 x .697	3A	AWG 22-28	MC 414-0061E
Multicontact, Recept.	244	4.128 x .697	3A	AWG 22-28	
2 Multicontact, Plug (same as for receptacle)					Hughes Type WSW cable or WST (chassis)
Contact, pin, removable for above					Hughes WP22Y22C005
Contact Socket, removable for above					Hughes WB22Y22C005
R. F. Coaxial Plug	1	Flange 0.5000" sq.			Omni Spectra OSM214C
R. F. Coaxial Plug	1	0.750 x .312 hex		RG142B (crimp)	Omni Spectra OSM511-1
R. F. Coaxial jack	1	Flange 0.500" sq.			Omni Spectra OSM 215

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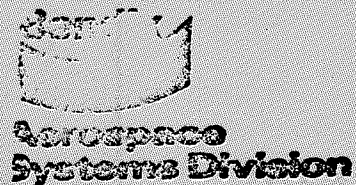
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ACCEPTABLE PARTS LIST 6.0 RELAYS

<u>Type</u>	<u>Contacts</u>	<u>Size</u>	<u>Vendor & Type</u>	<u>Procurement</u>
Magnetic Latching	DPDT	.8 x .4 x .410	Babcock BR17 Potter Brumfield Babcock BR20	NAA IID 455-0479 BxA: 2338529
Current Sensitive (circuit breaker)	DPDT	TO-5	Teledyne 421	BxA 2330151

ACCEPTABLE PARTS LIST 8.0 MICROCIRCUITS

Type	Function	Temp Range	Supply V.	Vendor	Part Number
Low Power DTL	Clocked Flip-Flop	-55/+125°C	6v	Fairchild	9040/FACT-4
Low Power DTL	Dual 3-in. Gate	-55/+125°C	6v	Fairchild	9041/FACT-4
Low Power DTL	Dual 3-in. Gate	-55/+125°C	6v	Fairchild	9042/FACT-4
Micrologic DTL	Dual 4-in. Buffer	-55/+125°C	6v	Fairchild	932/FACT-4
Micrologic DTL	Dual-Input Extender	-55/+125°C	6v	Fairchild	933/FACT-4
Operational AMP	V. G. = 45,000	-55/+125°C	± 15v	Fairchild	741/UNIQUE
Wideband DC AMP	V. G = 26,000 B. W. = .30MHZ	-55/+125°C	+ 12, -6v	Fairchild	702/FACT-4
Multivibrator	Single-shot	-55/+125°C	+4, -2	Signetics	RE160
DTL	Power Gate	-55/+125°C	+4, -2	Signetics	RE110
DTL	Binary	-55/+125°C	+4, -2	Signetics	RE124
DTL	Triple 3-in. Gate	-55/+125°C	+4, -2	Signetics	RE170
RCTL	R-S Flip-Flop	-55/+125°C	3v	Texas Inst.	SNR511
RCTL	Dual 3-in. Gate	-55/+125°C	3v	Texas Inst.	SNR514
Operational AMP	V. G. = 1200	-55/+125°C	+10, +6, -9v	Texas Inst.	SNR521A
RTL	4-in. Gate	-55/+125°C	3v	Texas Inst.	SNR1733A
RTL	Dual 2-in. Gate	-55/+125°C	3v	Texas Inst.	SNR1731A
Low Power TTL	(See Page 20-I, 21-I)	-55/+125°C		T. I. /Nat'l	SM 54LXX (BxA 2346201-xx) NASA 85M03766
Medium Power TTL	(See Page 22-I)	-55/+125°C		T. I. /Nat'l	SM 54XX BxA 2346207-xx NASA 85M03766 2121757

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8. MICROCIRCUIT - LOW POWER TTL

BxA Part Number	Low Power TTL Description	Package Style	Leads Formed and * Solder-Dipped	Minimum Marking on Device	MSFC Part No. 85M03766
2346201 -1	Quadruple 2-Input Positive NAND gates	Flatpack	Yes	54L00	SM54L00
-2	Hex Inverters			04	04
-3	Triple 3-Input Positive NAND Gates			10	10
-4	Dual 4-Input Positive NAND Gates			20	20
-5	8-Input Positive NAND Gates			30	30
-6	Dual 2-Wide AND-OR- INVERT Gates			51	51
-7	4-Wide 3-2-2-3-Input AND- OR-INVERT Gates			54	54
-8	2-Wide 4-Input AND-OR- INVERT Gates			55	55
-9	R-S Master-Slave Flip- Flops			71	71
-10	J-K Master-Slave Flip- Flops			72	72
-11	Dual J-K Master-Slave Flip-Flops			73	73
-12	Quadruple 2-Input Exclu- sive-OR Gates (Low Power)			86	86

Bendix

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ACCEPTABLE PARTS LIST
8.0 MICROCIRCUITS
LOW POWER TTL

BxA Part Number	Description	Package Style	Leads Formed and * Solder-Dipped	Minimum Marking On Device	MSFC Part No. 85M03766
2346201 - 13	8-Bit Shift Registers (Low Power)	Flatpack	Yes	54L91	SM54L91
-14	4-Bit Binary Counters (Low Power)			93	93
-15	4-Bit Right-Shift/Left Shift Registers (Low Power)			95	95
-16	Dual J-K Master-Slave Flip Flops (Common Clock)			78	78

*0.510 Inches Maximum - 0.490 Inches Minimum



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ACCEPTABLE PARTS LIST
8.0 MICROCIRCUITS
MEDIUM POWER TTL

BxA Part Number	MEDIUM POWER TTL Description	Package Style*	Leads* Formed and Solder-Dipped	Minimum Marking on Device	85M03766 MSFC Part No.
2346207-1	Quadruple 2-Input Positive NAND Gate	Flat-Pak R	Yes	5400	SM5400
2346207-2	Triple 3-Input Positive NAND Gate			5410	SM5410
2346207-3	Dual 4-Input Positive NAND Gate			5420	SM5420
2346207-4	8-Input Positive NAND Gate			5430	SM5430
2346207-5	Dual 4-Input Positive NAND Buffer			5440	SM5440
2346207-6	Dual 2-Wide, 2-Input AND-OR-Invert Gate			5450	SM5450
2346207-7	Four-Wide, 2-Input AND-OR-Invert Gate			5453	SM5453
2346207-8	Dual 4-Input Expander for SM5450			5460	SM5460
2346207-9	J-K Flip-Flop			5470	SM5470
2346207-10	J-K Master Slave Flip-Flop			5472	SM5472
2346207-11	Dual J-K Master Slave Flip-Flop			5473	SM5473
2346207-12	Dual D-Type Edge-Triggered Flip-Flop			5474	SM5474
2346207-13	Gated Full Adder			5480	SM5480
2346207-14	8-Bit Shift Register			5491	SM5491

*0.510 Inches Maximum } See Figure 1
0.490 Inches Minimum }



7/27/70

BENDIX SYSTEMS DIVISION ANN ARBOR, MICH.
Acceptable Parts List

NO. ATM-241
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BENDIX SYSTEMS DIVISION ANN ARBOR, MICH.

NO.

ATM 241

REV. NO.

D

Attachment II
Acceptable Parts Lists

PAGE

1.1.0 thru 2.6.0

ATTACHMENT II

PARTS DATA SHEETS

For convenience of the user, the parts data sheets for capacitors and resistors are included in Attachment II of ATM 241. For parts data sheets on other types of parts, the reader should refer to ATM 507, "ALSEP Parts Data Book, " or BSC 42275 "Parts Application and Reliability Bulletin, Volumes I and II. "

Individual copies of any specific data sheets may be requested from the BxA Parts and Materials Group (313) 665-7766.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITORS

SECTION: MIL-SPEC ABSTRACT

MSFC-SPEC-400

GEORGE C. MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPECIFICATION

CAPACITOR, FIXED, GLASS-DIELECTRIC,
ESTABLISHED RELIABILITY, GENERAL

SPECIFICATION FOR

This specification has been approved by the George C. Marshall Space Flight Center (MSFC) and is mandatory for use by MSFC and associated contractors.

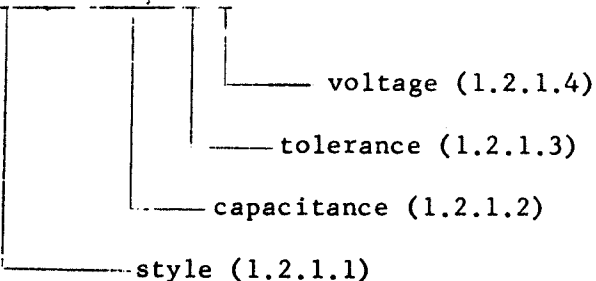
1. SCOPE

1.1 Scope. - This specification covers glass-case, glass-dielectric, hermetically sealed, fixed capacitors having an established reliability level.

1.2 Classification.

1.2.1 Part number. - The part number for capacitors shall be in the form exemplified as follows:

E C Y 1 0 4 7 0 J 3



axial lead rectangular case

10	=	1 1/32"	L. x	1 1/4"	W. x	5/64"	T.
13	=	3/16"	L. x	7/32"	W. x	7/32"	T.
15	=	15/32"	L. x	1 1/4"	W. x	7/64"	T.
17	=	9/16"	L. x	1 1/4"	W. x	7/32"	T.
20	=	4 7/64"	L. x	2 7/64"	W. x	7/64"	T.
22	=	2 9/32"	L. x	7/16"	W. x	7/32"	T.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITORS

SECTION: MIL-SPEC ABSTRACT

MSFC-SPEC-400

July 20, 1964

1.2.1.1 Style. - Capacitor style shall be identified by the three letter symbol ECY followed by a two-digit number. The letters shall designate glass-dielectric, fixed capacitors having established reliability rating, and the number shall identify the shape and dimensions of the particular capacitor.

1.2.1.2 Capacitance rating. - Three of the digits in the part number shall specify the capacitance rating in picofarads (pf). The first two of these digits shall be significant figures, and the last digit shall specify the number of zeros to follow. When fractional capacitance values are required, the letter R shall be used in place of the decimal point, and the digits that follow shall be significant figures.

1.2.1.3 Tolerance. - Capacitance tolerance shall be specified by a single letter in accordance with the following:

<u>Symbol</u>	<u>Tolerance</u>
C	± 0.25 pf
D	± 0.50 pf
F	$\pm 1\%$
G	$\pm 2\%$
J	$\pm 5\%$

1.2.1.4 Voltage. - The rated dc working voltage of the capacitor shall be specified by a single digit corresponding to the voltage in hundreds. (The digit 3 shall denote a rating of 300 volts; the digit 5 a rating of 500 volts.)

1.2.2 Temperature class. - Capacitors shall be suitable for operation at maximum rated direct-current (dc) working voltage throughout the environmental temperature range of minus 55 to plus 125 degrees Celsius (C).

1.2.3 Reliability rating. - The capacitor failure rate, established as specified herein, shall not exceed 1 percent per 1,000 hours of operation. This rating shall be based on 90-percent confidence. The failure rate, so established, shall apply to the family of capacitors subjected to failure rate inspection.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITORS

SECTION: MIL-SPEC ABSTRACT

MSFC-SPEC-400/1
July 20, 1964
SUPERSEDING
MSFC-SPEC-400/1
November 29, 1963

GEORGE C. MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPECIFICATION SHEET

CAPACITORS, FIXED, GLASS-DIELECTRIC, STYLE ECY10,
ESTABLISHED RELIABILITY

This specification sheet forms a part of the latest issue of George C. Marshall Space Flight Center (MSFC) Specification MSFC-SPEC-400.

1. SCOPE

1.1 Scope. - This specification covers the detail requirements for Style ECY10, fixed, glass-dielectric capacitors.

1.2 Classification.

1.2.1 Part number. - The part number shall be in accordance with table I.

2. APPLICABLE DOCUMENTS

2.1 The following document, of the issue in effect on the date of invitation for bids, forms a part of this specification to the extent specified herein.

SPECIFICATION

George C. Marshall Space Flight Center

MSFC-SPEC-400 Capacitors, Fixed, Glass-Dielectric,
Established Reliability, General
Specification for.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITORS

SECTION: MIL-SPEC ABSTRACT

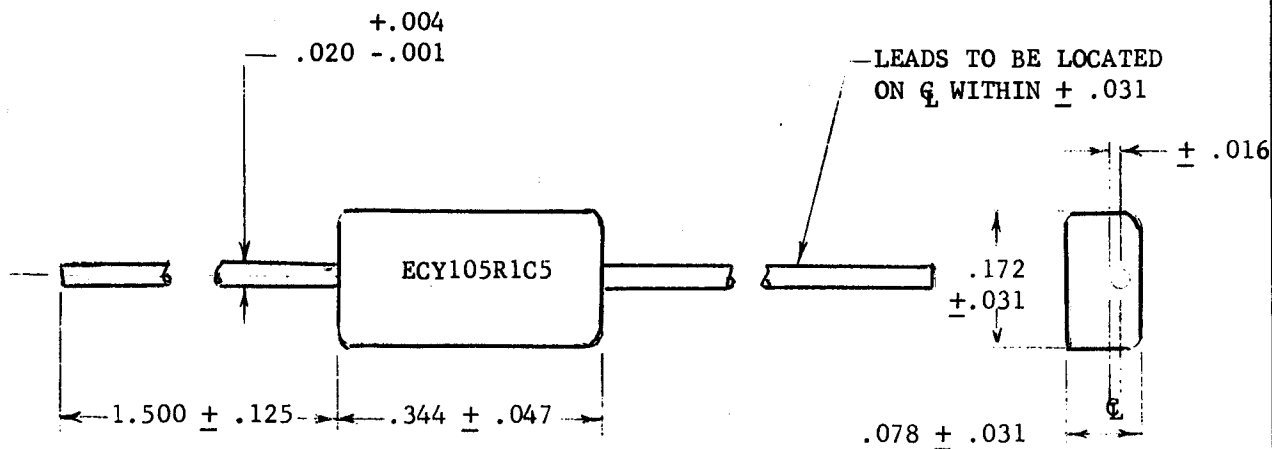
MSFC-SPEC-400/LA
July 20, 1964

(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.)

3. REQUIREMENTS

3.1 General. - Requirements for glass capacitors shall be in accordance with Specification MSFC-SPEC-400, and as specified herein.

3.2 Dimensions. - Dimensions shall be as shown in figure 1.



(All dimensions are in inches.)

Figure 1. Dimensions.

3.3 Identification. - Capacitors purchased to this specification shall be identified by a part number in accordance with table I.

4. QUALITY ASSURANCE PROVISIONS

4.1 Quality assurance provisions shall be in accordance with Specification MSFC-SPEC-400.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with Specification MSFC-SPEC-400.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITORS

SECTION: MIL-SPEC ABSTRACT

MSFC-SPEC-400/1
July 20, 1964

Table I. Style ECY10 capacitors

Part number	Capacitance	Working voltage	Capacitance tolerances available 1/
ECY	pf	vdc	±
ECY100R5C5	0.5	500	C
ECY101R0C5	1.0	500	C
ECY101R5C5	1.5	500	C
ECY102R2 5	2.2	500	CD
ECY102R7C5	2.7	500	C
ECY103R0 5	3.0	500	CD
ECY103R3C5	3.3	500	C
ECY103R6 5	3.6	500	CD
ECY103R9C5	3.9	500	C
ECY104R3 5	4.3	500	CD
ECY104R7C5	4.7	500	C
ECY105R1C5	5.1	500	C
ECY105R6 5	5.6	500	CJ
ECY106R2 5	6.2	500	CJ
ECY106R8 5	6.8	500	CJ
ECY107R5 5	7.5	500	CJ
ECY108R2 5	8.2	500	CJ
ECY109R1 5	9.1	500	CJ
ECY10100 5	10	500	CJ
ECY10110 5	11	500	CJ
ECY10120 5	12	500	CJ
ECY10130 5	13	500	GJ
ECY10150 5	15	500	GJ
ECY10160 5	16	500	GJ
ECY10180 5	18	500	GJ
ECY10200 5	20	500	GJ
ECY10220 5	22	500	GJ
ECY10240 5	24	500	GJ
ECY10270 5	27	500	FGJ
ECY10300 5	30	500	FGJ
ECY10330 5	33	500	FGJ
ECY10360 5	36	500	FGJ
ECY10390 5	39	500	FGJ
ECY10430 5	43	500	FGJ
ECY10470 5	47	500	FGJ
ECY10510 5	51	500	FGJ
ECY10560 5	56	500	FGJ
ECY10620 5	62	500	FGJ

1/ Applicable tolerance symbol shall appear in part number.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITORS

SECTION: MIL-SPEC ABSTRACT

MSFC-SPEC-400/1
July 20, 1964

Table I. Style ECY10 capacitors (continued)

Part number	Capacitance	Working voltage	Capacitance tolerances available 1/
ECY	pf	vdc	±
ECY10680 5	68	500	FGJ
ECY10750 5	75	500	FGJ
ECY10820 5	82	500	FGJ
ECY10910 5	91	500	FGJ
ECY10101 5	100	500	FGJ
ECY10111 5	110	500	FGJ
ECY10121 5	120	500	FGJ
ECY10131 5	130	500	FGJ
ECY10151 5	150	500	FGJ
ECY10161 3	160	300	FGJ
ECY10181 3	180	300	FGJ
ECY10201 3	200	300	FGJ
ECY10221 3	220	300	FGJ
ECY10241 3	240	300	FGJ

1/ Applicable tolerance symbol shall appear in part number.

6. NOTES

Not applicable

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

400393
MSFC-SPEC-400/2
July 20, 1963
SUPERSEDING
MSFC-SPEC-400/2
November 29, 1963

GEORGE C. MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPECIFICATION SHEET

CAPACITORS, FIXED, GLASS-DIELECTRIC, STYLE ECY15,
ESTABLISHED RELIABILITY

This specification sheet forms part of the latest issue of George C. Marshall Space Flight Center (MSFC) Specification MSFC-SPEC-400.

1. SCOPE

1.1 Scope. - This specification covers the detail requirements for Style ECY15, fixed, glass-dielectric capacitors.

1.2 Classification.

1.2.1 Part number. - The part number shall be in accordance with table 1.

2. APPLICABLE DOCUMENTS

2.1 The following document, of the issue in effect on the date of invitation for bids, forms a part of this specification to the extent specified herein.

SPECIFICATION

George C. Marshall Space Flight Center

MSFC-SPEC-400

Capacitors Fixed, Glass-Dielectric,
Established Reliability, General
Specification for.

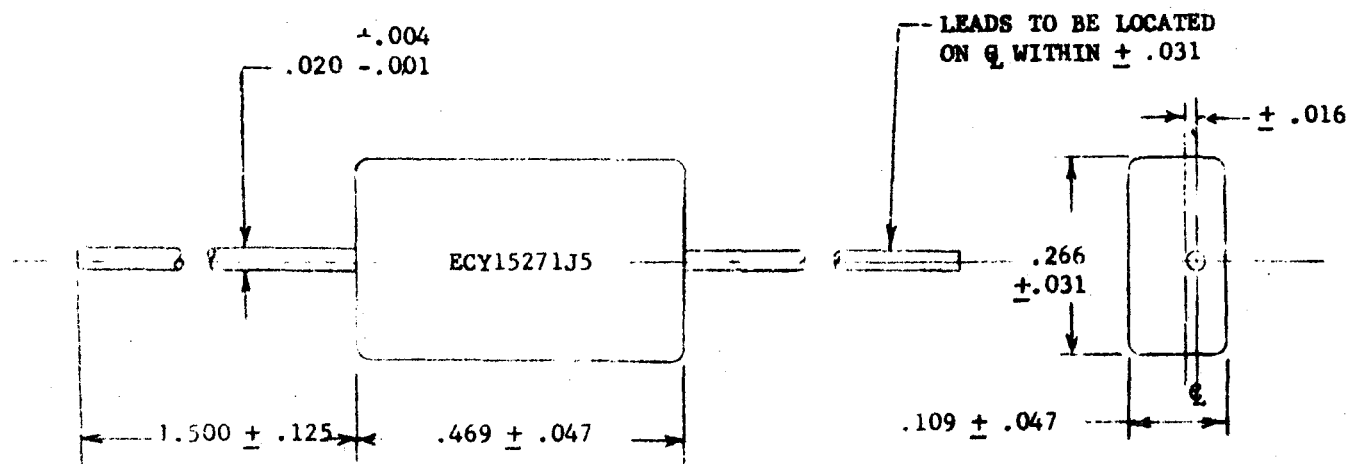
MSFC-SPEC 400/2A
July 20, 1964

(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.)

3. REQUIREMENTS

3.1 General. - Requirements for glass capacitors shall be in accordance with Specification MSFC-SPEC-400, and as specified herein.

3.2 Dimensions. - Dimensions shall be as shown in figure 1.



(All dimensions are in inches.)

Figure 1. Dimensions.

3.3 Identification. - Capacitors purchased to this specification shall be identified by a part number in accordance with table I.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Quality assurance provisions shall be in accordance with Specification MSFC-SPEC-400.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with Specification MSFC-SPEC-400.

MSFC-SPEC 400/2A
July 20, 1964

Table I. Style ECY15 capacitors

Part number	Capacitance	Working voltage	Capacitance tolerances available 1/
ECY	pf	vdc	+ -
ECY15161 5	160	500	FGJ
ECY15181 5	180	500	FGJ
ECY15201 5	200	500	FGJ
ECY15221 5	220	500	FGJ
ECY15241 5	240	500	FGJ
ECY15271 5	270	500	FGJ
ECY15301 5	300	500	FGJ
ECY15331 5	330	500	FGJ
ECY15361 5	360	500	FGJ
ECY15391 5	390	500	FGJ
ECY15431 5	430	500	FGJ
ECY15471 5	470	500	FGJ
ECY15511 5	510	500	FGJ
ECY15561 3	560	300	FGJ
ECY15621 3	620	300	FGJ
ECY15681 3	680	300	FGJ
ECY15751 3	750	300	FGJ
ECY15821 3	820	300	FGJ
ECY15911 3	910	300	FGJ
ECY15102 3	1000	300	FGJ
ECY15112 3	1100	300	FGJ
ECY15122 3	1200	300	FGJ

1/ Applicable tolerance symbol shall appear in part number.

6. NOTES

Not applicable

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

NASA - George C. Marshall
Space Flight Center

Preparing Activity:

George C. Marshall Space
Flight Center

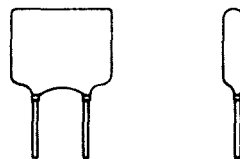
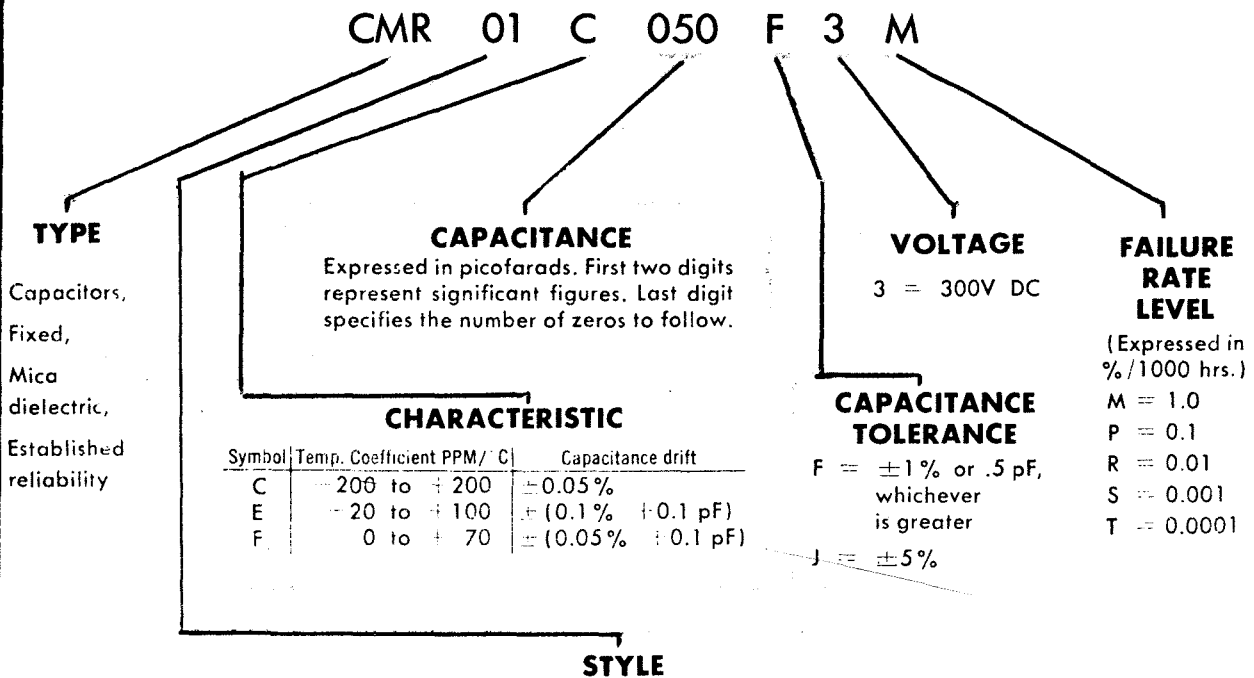
PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITOR, FIXED

SECTION: MIL SPEC ABSTRACT

TYPE CMR

(MILITARY SPECIFICATION MIL-C-39001)



dipped rectangular case

01 = 5 pF to 24 pF, .410"L. x .280"W. x .140"T.
27 pF to 62 pF, .420"L. x .280"W. x .140"T.
68 pF to 82 pF, .420"L. x .280"W. x .150"T.
91 pF to 100 pF, .430"L. x .280"W. x .150"T.
110 pF to 160 pF, .430"L. x .290"W. x .150"T.

02 = 180 pF to 680 pF, .700"L. x .440"W. x .130"T.
750 pF to 1200 pF, .700"L. x .450"W. x .140"T.
1300 pF to 1500 pF, .700"L. x .450"W. x .150"T.
1600 pF, .700"L. x .460"W. x .150"T.
1800 pF, .710"L. x .460"W. x .150"T.
2000 pF to 2200 pF, .710"L. x .460"W. x .160"T.
2400 pF, .710"L. x .460"W. x .190"T.
2700 pF, .710"L. x .470"W. x .200"T.
3000 pF, .720"L. x .470"W. x .210"T.
3300 pF, .720"L. x .480"W. x .220"T.
3600 pF, .720"L. x .470"W. x .230"T.
3900 pF, .720"L. x .490"W. x .240"T.
4300 pF, .720"L. x .490"W. x .250"T.
4700 pF, .730"L. x .490"W. x .260"T.
5100 pF, .730"L. x .500"W. x .270"T.

03 = 5600 pF, .720"L. x .790"W. x .220"T.
6200 pF, .720"L. x .800"W. x .220"T.
6800 pF, .720"L. x .800"W. x .230"T.
7500 pF, .730"L. x .800"W. x .240"T.
8200 pF, .730"L. x .800"W. x .250"T.
9100 pF, .730"L. x .800"W. x .260"T.
10000 pF, .730"L. x .800"W. x .270"T.
11000 pF, .740"L. x .810"W. x .280"T.
12000 pF, .740"L. x .810"W. x .290"T.
13000 pF, .740"L. x .810"W. x .300"T.
15000 pF, .740"L. x .820"W. x .330"T.
16000 pF, .740"L. x .820"W. x .340"T.
18000 pF, .750"L. x .820"W. x .360"T.
20000 pF, .750"L. x .830"W. x .380"T.

04 = 22000 pF, 1.350"L. x .800"W. x .240"T.
24000 pF, 1.360"L. x .800"W. x .250"T.
27000 pF, 1.360"L. x .800"W. x .260"T.
30000 pF, 1.370"L. x .810"W. x .280"T.
33000 pF, 1.370"L. x .810"W. x .290"T.
36000 pF, 1.380"L. x .820"W. x .310"T.
39000 pF, 1.380"L. x .820"W. x .330"T.
43000 pF, 1.390"L. x .830"W. x .350"T.
47000 pF, 1.400"L. x .830"W. x .380"T.
51000 pF, 1.410"L. x .850"W. x .400"T.

MIL-C-39003A
28 November 1966
SUPERSEDING
MIL-C-39003
1 August 1963
MIL-C-26655B
29 April 1964
MIL-C-38102B (USAF) (in part)
25 May 1964
(See 6.8)

MILITARY SPECIFICATION

CAPACITORS, FIXED, ELECTROLYTIC, TANTALUM, SOLID-ELECTROLYTE,

ESTABLISHED RELIABILITY,

GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope.- This specification covers the general requirements for established reliability, insulated, tantalum, solid-electrolyte, fixed capacitors, hermetically sealed in metal cases. These capacitors are primarily intended for bypass and other applications where the alternating-current (ac) component is small compared to the direct-current (dc) rated voltage. (See 6.1 and 6.4.) Capacitors covered by this specification have failure rate levels ranging from 2.0 (or 1.0) percent to 0.001 percent per 1,000 hours (see 1.2.1.5 and 3.1). These failure rate levels are established at a 60-percent confidence level on the basis of life tests and are referred to operation at full rated voltage at 85° C.

1.2 Classification.-

1.2.1 Type designation.- The type designation shall be in the following form, and as specified (see 3.1).

CSR13	B	565	K	L
├───┤	├──┤	├──┤	├──┤	├──┤
Style	DC rated and	Capacitance	Capacitance	Failure
(1.2.1.1)	surge voltages	(1.2.1.3)	tolerance	rate level
	(1.2.1.2)		(1.2.1.4)	(1.2.1.5)

1.2.1.1 Style.- The style is identified by the three-letter symbol "CSR" followed by a two-digit number; the letters identify established reliability, insulated, tantalum, solid-electrolyte, fixed capacitors, hermetically sealed in metal cases, and the number identifies the size of the capacitors.

FSC 5910

MIL-C-39003A

1.2.1.2 DC rated and surge voltages.- The dc rated and surge voltages are identified by a single letter in accordance with table I.

TABLE I - DC rated and surge voltages.

Symbol	DC rated voltage at 85°C	DC surge voltage at 85°C	DC rated voltage at 125°C	DC surge voltage at 125°C
	<u>Volts</u>	<u>Volts</u>	<u>Volts</u>	<u>Volts</u>
B - - -	6	8	4	5
C - - -	10	13	7	9
D - - -	15	20	10	12
E - - -	20	26	13	16
F - - -	35	46	23	28
G - - -	50	65	33	40
H - - -	75	98	50	64
J - - -	100	130	67	86

1.2.1.3 Capacitance.- The nominal capacitance value expressed in picofarads is identified by a three-digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow. Tabulations in microfarads (uf) are given, for information, in the specification sheets (see 3.1).

1.2.1.4 Capacitance tolerance.- The capacitance tolerance is identified by a single letter in accordance with table II.

TABLE II - Capacitance tolerance.

Symbol	Tolerance
	<u>Percent (±)</u>
K - - - - -	10
M - - - - -	20

1.2.1.5 Failure rate level.- The failure rate level is identified by a single letter as shown in table III.

TABLE III - Failure rate level (established at a 60-percent confidence level).

Symbol	Failure rate level
	<u>Percent/1,000 hr</u>
L - - - - -	2.0
M - - - - -	1.0
P - - - - -	0.1
R - - - - -	0.01
S - - - - -	0.001

MIL-C-39003/1B
26 March 1970
SUPERSEDING
MIL-C-39003/1A
28 November 1966

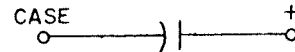
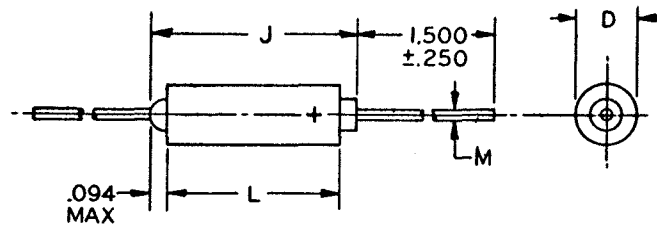
MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, ELECTROLYTIC, TANTALUM, SOLID-ELECTROLYTE,

ESTABLISHED RELIABILITY, STYLE CSR13

The complete requirements for procuring the capacitors described herein shall consist of this document and the latest issue of MIL-C-39003.

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



CIRCUIT DIAGRAM

Case size	Dimensions			
	L	D	M	J
	±.031	+.016 -.015	±.002	Max
A	.286	.135	.020	.422
B	.474	.185	.020	.610
C	.686	.289	.025	.822
D	.786	.351	.025	.922

INCHES	MM	INCHES	MM	INCHES	MM
.002	.05	.135	3.43	.474	12.04
.015	.38	.185	4.70	.610	15.49
.016	.41	.250	6.35	.686	17.42
.020	.51	.286	7.26	.786	19.96
.025	.64	.289	7.34	.822	20.88
.031	.79	.351	8.92	.922	23.42
.094	2.39	.422	10.72	1.500	38.10

NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. The case insulation shall extend .015 (.38 mm) minimum beyond each end. However, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.

(B) denotes change.

FSC 5910

REQUIREMENTS:

Design and construction:

Dimensions and configuration - See figure.

Case type - Tubular, insulated.

Material - Metal (alloy unspecified).

Type of seal - Hermetic.

Leads - Type N1 of MIL-STD-1276, tin-lead coated .0005 to .0015 inch.

DC rated voltage - See table I. Above 85° C voltage derating is required, see MIL-C-39003.

Capacitance (Cap.) (nom) - See table I.

Cap. tolerance - 10% (K) and 20% (M) as shown in table I.

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

Failure rate level - L, M, P, R, or S (2.0 percent to 0.001 percent per 1,000 hours).

DC leakage: See table I.

Dissipation factor: See table I.

Sleeving: In accordance with MIL-C-39003.

DC potential - 2,000 volts.

IR - 1,000 megohms, minimum.

Stability at low and high temperature: In accordance with MIL-C-39003.

Step 1 (+25° C): DCL - See table I.

 ΔC - Within tolerance specified.

DF - See table I.

Step 2 (-55° C): ΔC - Within ± 10 percent of step 1 value.

DF - See table I.

Step 3 (+25° C): DCL - See table I.

 ΔC - Within ± 2 percent of step 1 value.

DF - See table I.

Step 4 (+85° C): DCL - See table I.

 ΔC - Within ± 8 percent of step 1 value.

DF - See table I.

Step 5 (+25° C): DCL - See table I.

 ΔC - Within ± 2 percent of step 1 value.

DF - See table I.

Surge voltage: In accordance with MIL-C-39003.

DCL - See table I.

 ΔC - Within ± 2 percent of initial value.

DF - See table I.

Life: Method 108 of MIL-STD-202.

250 and 2,000 hours:

At 25° C: DCL - See table I.

 ΔC - Within ± 2 percent of initial measured value.

DF - See table I.

At 85° C: DCL - See table I.

At 125° C: DCL - See table I.

10,000 hours:

At 25° C: DCL - 200 percent of initial requirement.

 ΔC - Within ± 10 percent of initial measured value.

DF - See table I.

At 85° C: DCL - 200 percent of initial requirement.

At 125° C: DCL - 200 percent of initial requirement.

ⓑ Substitutability data: Type designations of this specification sheet unilaterally supersede previous dash numbers as shown in table II.

TABLE I. Style CSR13 characteristics.

Type designation ^{1/}	DC rated voltage	Capacitance	Capacitance tolerance symbol	DC leakage			Dissipation factor		Case size
				+25° C	+85° C	+125° C	-55° C +25° C	+85° C +125° C	
	volts	μf		μa	μa	μa	percent	percent	
CSR13B565K-	6	5.6	K	.5	6	7.5	4	4	A
B685--	6	6.8	K, M	.5	6	7.5	6	6	A
B476--	6	47.0	K, M	3.0	24	30.0	6	6	B
B566K-	6	56.0	K	3.0	24	30.0	6	6	B
B157--	6	150.0	K, M	9.0	90	113.0	8	8	C
B187K-	6	180.0	K	11.0	110	138.0	8	8	C
B277K-	6	270.0	K	13.0	130	163.0	8	8	D
B337--	6	330.0	K, M	15.0	150	188.0	8	8	D
C395K-	10	3.9	K	.6	6	7.5	4	4	A
C475--	10	4.7	K, M	.7	7	8.8	4	4	A
C276K-	10	27.0	K	4.0	40	50.0	6	6	B
C336--	10	33.0	K, M	5.0	50	63.0	6	6	B
C396K-	10	39.0	K	5.0	50	63.0	6	6	B
C826K-	10	82.0	K	8.0	80	100.0	6	6	C
C107--	10	100.0	K, M	10.0	100	125.0	8	8	C
C127K-	10	120.0	K	12.0	120	150.0	8	8	C
C187K-	10	180.0	K	18.0	180	226.0	8	8	D
C227--	10	220.0	K, M	20.0	200	250.0	8	8	D
D275K-	15	2.7	K	.6	6	7.5	4	4	A
D335--	15	3.3	K, M	.8	8	10.0	4	4	A
D186K-	15	18.0	K	3.5	35	44.0	6	6	B
D226--	15	22.0	K, M	4.0	40	50.0	6	6	B
D566K-	15	56.0	K	8.0	80	100.0	6	6	C
D686--	15	68.0	K, M	10.0	100	125.0	6	6	C
D127K-	15	120.0	K	18.0	180	226.0	8	8	D
D157--	15	150.0	K, M	20.0	200	250.0	8	8	D
E125K-	20	1.2	K	.6	6	7.5	4	4	A
E155--	20	1.5	K, M	.6	6	7.5	4	4	A
E185K-	20	1.8	K	.6	6	7.5	4	4	A
E225--	20	2.2	K, M	.8	8	10.0	4	4	A
E825K-	20	8.2	K	2.0	20	25.0	6	6	B
E106--	20	10.0	K, M	3.0	30	38.0	6	6	B
E126K-	20	12.0	K	3.5	35	44.0	6	6	B
E156--	20	15.0	K, M	4.0	40	50.0	6	6	B
E276K-	20	27.0	K	5.0	50	63.0	6	6	C
E336--	20	33.0	K, M	7.0	70	88.0	6	6	C
E396K-	20	39.0	K	8.0	80	100.0	6	6	C
E476--	20	47.0	K, M	9.0	90	113.0	6	6	C
E566K-	20	56.0	K	11.0	110	138.0	6	6	D
E686--	20	68.0	K, M	14.0	140	175.0	6	6	D
E826K-	20	82.0	K	16.0	160	200.0	6	6	D
E107--	20	100.0	K, M	20.0	200	250.0	8	8	D
F565K-	35	5.6	K	2.5	25	32.0	4	4	B
F685--	35	6.8	K, M	3.0	30	38.0	6	6	B
F226--	35	22.0	K, M	8.0	80	100.0	6	6	C
F276K-	35	27.0	K	9.0	90	113.0	6	6	D
F336--	35	33.0	K, M	11.0	110	138.0	6	6	D
F396K-	35	39.0	K	14.0	140	175.0	6	6	D
F476--	35	47.0	K, M	16.0	160	200.0	6	6	D

^{1/} See footnote at end of table.

TABLE I. Style CSR13 characteristics. - (Continued)

Type designation ^{1/}	DC rated voltage	Capacitance	Capacitance tolerance symbol	DC leakage			Dissipation factor		Case size
				+25° C	+85° C	+125° C	-55° C +25° C	+85° C +125° C	
	volts	μf		μa	μa	μa	percent	percent	
CSR13G472--	50	.0047	K, M	.5	5	6.3	2	4	A
G562K-	50	.0056	K	.5	5	6.3	2	4	A
G682--	50	.0068	K, M	.5	5	6.3	2	4	A
G822K-	50	.0082	K	.5	5	6.3	2	4	A
G103--	50	.01	K, M	.5	5	6.3	2	4	A
G123K-	50	.012	K	.5	5	6.3	2	4	A
G153--	50	.015	K, M	.5	5	6.3	2	4	A
G183K-	50	.018	K	.5	5	6.3	2	4	A
G223--	50	.022	K, M	.5	5	6.3	2	4	A
G273K-	50	.027	K	.5	5	6.3	2	4	A
G333--	50	.033	K, M	.5	5	6.3	2	4	A
G393K-	50	.039	K	.5	5	6.3	2	4	A
G473--	50	.047	K, M	.5	5	6.3	2	4	A
G563K-	50	.056	K	.5	5	6.3	2	4	A
G683--	50	.068	K, M	.5	5	6.3	2	4	A
G823K-	50	.082	K	.5	5	6.3	2	4	A
G104--	50	.1	K, M	.5	5	6.3	2	4	A
G124K-	50	.12	K	.5	5	6.3	2	4	A
G154--	50	.15	K, M	.5	5	6.3	2	4	A
G184K-	50	.18	K	.5	5	6.3	2	4	A
G224--	50	.22	K, M	.5	5	6.3	2	4	A
G274K-	50	.27	K	.5	5	6.3	2	4	A
G334--	50	.33	K, M	.5	5	6.3	2	4	A
G394K-	50	.39	K	.5	5	6.3	2	4	A
G474--	50	.47	K, M	.5	5	6.3	2	4	A
G564K-	50	.56	K	.5	5	6.3	2	4	A
G684--	50	.68	K, M	.5	5	6.3	2	4	A
G824K-	50	.82	K	.5	5	6.3	2	4	A
G105--	50	1.0	K, M	.8	8	10.0	2	4	A
G125K-	50	1.2	K	.9	9	11.0	4	4	B
G155--	50	1.5	K, M	1.2	12	15.0	4	4	B
G185K-	50	1.8	K	1.4	14	18.0	4	4	B
G225--	50	2.2	K, M	1.7	17	22.0	4	4	B
G275K-	50	2.7	K	2.0	20	25.0	4	4	B
G335--	50	3.3	K, M	2.5	25	32.0	4	4	B
G395K-	50	3.9	K	3.0	30	38.0	4	4	B
G475--	50	4.7	K, M	3.5	35	44.0	4	4	B
G565K-	50	5.6	K	4.5	45	56.0	4	4	C
G685--	50	6.8	K, M	4.5	45	56.0	6	6	C
G825K-	50	8.2	K	5.0	50	63.0	6	6	C
G106--	50	10.0	K, M	5.0	50	63.0	6	6	C
G126K-	50	12.0	K	6.0	60	75.0	6	6	C
G156--	50	15.0	K, M	8.0	80	100.0	6	6	C
G186K-	50	18.0	K	9.0	90	113.0	6	6	C
G226--	50	22.0	K, M	11.0	110	138.0	6	6	D
H104--	75	.1	K, M	.5	5.0	6.3	2	4	A
H124K-	75	.12	K	.5	5.0	6.3	2	4	A
H154--	75	.15	K, M	.5	5.0	6.3	2	4	A
H184K-	75	.18	K	.5	5.0	6.3	2	4	A
H224--	75	.22	K, M	.5	5.0	6.3	2	4	A

^{1/} See footnote at end of table.

TABLE I. Style CSR13 characteristics. - (Continued)

Type designation ^{1/}	DC rated voltage	Capacitance	Capacitance tolerance symbol	DC leakage			Dissipation factor		Case size
				+25° C	+85° C	+125° C	-55° C +25° C	+85° C +125° C	
	volts	μf		μa	μa	μa	percent	percent	
CSR13H274K-	75	.27	K	.5	5.0	6.3	2	4	A
H334--	75	.33	K, M	.5	5.0	6.3	2	4	A
H394K-	75	.39	K	.5	5.0	6.3	2	4	A
H474--	75	.47	K, M	.5	5.0	6.3	2	4	A
H564K-	75	.56	K	.5	5.0	6.3	2	4	A
H684--	75	.68	K, M	.5	5.0	6.3	2	4	A
H824K-	75	.82	K	.5	5.0	6.3	2	4	B
H105--	75	1.0	K, M	.5	5.0	6.3	2	4	B
H125K-	75	1.2	K	.5	5.0	6.3	4	4	B
H155--	75	1.5	K, M	1.0	10.0	13.0	4	4	B
H185K-	75	1.8	K	1.0	10.0	13.0	4	4	B
H225--	75	2.2	K, M	1.5	15.0	19.0	4	4	B
H275K-	75	2.7	K	1.5	15.0	19.0	4	4	B
H335--	75	3.3	K, M	2.0	20.0	25.0	4	4	B
H395K-	75	3.9	K	2.0	20.0	25.0	4	4	B
H475--	75	4.7	K, M	6.0	60.0	75.0	4	4	C
H565K-	75	5.6	K	6.0	60.0	75.0	4	4	C
H685--	75	6.8	K, M	10.0	100.0	125.0	6	6	C
H825K-	75	8.2	K	10.0	100.0	125.0	6	6	C
H106--	75	10.0	K, M	10.0	100.0	125.0	6	6	C
H126K-	75	12.0	K	10.0	100.0	125.0	6	6	D
H156--	75	15.0	K, M	14.0	140.0	175.0	6	6	D
J472--	100	.0047	K, M	.5	5.0	6.3	2	4	A
J562K-	100	.0056	K	.5	5.0	6.3	2	4	A
J682--	100	.0068	K, M	.5	5.0	6.3	2	4	A
J822K-	100	.0082	K	.5	5.0	6.3	2	4	A
J103--	100	.01	K, M	.5	5.0	6.3	2	4	A
J123K-	100	.012	K	.5	5.0	6.3	2	4	A
J153--	100	.015	K, M	.5	5.0	6.3	2	4	A
J183K-	100	.018	K	.5	5.0	6.3	2	4	A
J223--	100	.022	K, M	.5	5.0	6.3	2	4	A
J273K-	100	.027	K	.5	5.0	6.3	2	4	A
J333--	100	.033	K, M	.5	5.0	6.3	2	4	A
J393K-	100	.039	K	.5	5.0	6.3	2	4	A
J473--	100	.047	K, M	.5	5.0	6.3	2	4	A
J563K-	100	.056	K	.5	5.0	6.3	2	4	A
J683--	100	.068	K, M	.5	5.0	6.3	2	4	A
J823K-	100	.082	K	.5	5.0	6.3	2	4	A
J104--	100	.1	K, M	.5	5.0	6.3	2	4	A
J124K-	100	.12	K	.5	5.0	6.3	2	4	A
J154--	100	.15	K, M	.5	5.0	6.3	2	4	A
J184K-	100	.18	K	.5	5.0	6.3	2	4	A
J224--	100	.22	K, M	.5	5.0	6.3	2	4	A
J274K-	100	.27	K	.5	5.0	6.3	2	4	A
J334--	100	.33	K, M	.5	5.0	6.3	2	4	A
J394K-	100	.39	K	.5	5.0	6.3	2	4	A
J474--	100	.47	K, M	.5	5.0	6.3	2	4	A
J564K-	100	.56	K	.5	5.0	6.3	2	4	A
J684--	100	.68	K, M	.5	5.0	6.3	2	4	B
J824K-	100	.82	K	.5	5.0	6.3	2	4	B

^{1/} See footnote at end of table.

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TABLE I. Style CSR13 characteristics. - (Continued)

Type designation ^{1/}	DC rated voltage	Capacitance	Capacitance tolerance symbol	DC leakage			Dissipation factor		Case size
				+25° C	+85° C	+125° C	-55° C +25° C	+85° C +125° C	
	volts	μf		μa	μa	μa	percent	percent	
CSR13J105--	100	1.0	K, M	.5	5.0	6.3	2	4	B
J125K-	100	1.2	K	.5	5.0	6.3	4	4	B
J155--	100	1.5	K, M	1.0	10.0	13.0	4	4	B
J185K-	100	1.8	K	1.0	10.0	13.0	4	4	B
J225--	100	2.2	K, M	1.5	15.0	19.0	4	4	B
J275K-	100	2.7	K	1.5	15.0	19.0	4	4	B

^{1/} Complete type designation will include additional symbol(s) to indicate capacitance tolerance (when applicable) and failure rate level.

TABLE II. Cross reference of replaced parts.

Type designation ^{1/}	Superseded dash number					Type designation ^{1/}	Superseded dash number				
	Failure rate level (%/1,000 hrs)						Failure rate level (%/1,000 hrs)				
	L	M	P	R	S		L	M	P	R	S
	2.0	1.0	0.1	0.01	0.001		2.0	1.0	0.1	0.01	0.001
CSR13B565K-	2001	2241	2481	2721	2961	CSR13D226M-	2032	2272	2512	2752	2992
B685K-	2002	2242	2482	2722	2962	D566K-	2033	2273	2513	2753	2993
B685M-	2003	2243	2483	2723	2963	D686K-	2034	2274	2514	2754	2994
B476K-	2004	2244	2484	2724	2964	D686M-	2035	2275	2515	2755	2995
B476M-	2005	2245	2485	2725	2965	D127K-	2036	2276	2516	2756	2996
B566K-	2006	2246	2486	2726	2966	D157K-	2037	2277	2517	2757	2997
B157K-	2007	2247	2487	2727	2967	D157M-	2038	2278	2518	2758	2998
B157M-	2008	2248	2488	2728	2968	E125K-	2039	2279	2519	2759	2999
B187K-	2009	2249	2489	2729	2969	E155K-	2040	2280	2520	2760	3000
B277K-	2010	2250	2490	2730	2970	E155M-	2041	2281	2521	2761	3001
B337K-	2011	2251	2491	2731	2971	E185K-	2042	2282	2522	2762	3002
B337M-	2012	2252	2492	2732	2972	E225K-	2043	2283	2523	2763	3003
C395K-	2013	2253	2493	2733	2973	E225M-	2044	2284	2524	2764	3004
C475K-	2014	2254	2494	2734	2974	E825K-	2045	2285	2525	2765	3005
C475M-	2015	2255	2495	2735	2975	E106K-	2046	2286	2526	2766	3006
C276K-	2016	2256	2496	2736	2976	E106M-	2047	2287	2527	2767	3007
C336K-	2017	2257	2497	2737	2977	E126K-	2048	2288	2528	2768	3008
C336M-	2018	2258	2498	2738	2978	E156K-	2049	2289	2529	2769	3009
C396K-	2019	2259	2499	2739	2979	E156M-	2050	2290	2530	2770	3010
C826K-	2020	2260	2500	2740	2980	E276K-	2051	2291	2531	2771	3011
C107K-	2021	2261	2501	2741	2981	E336K-	2052	2292	2532	2772	3012
C107M-	2022	2262	2502	2742	2982	E336M-	2053	2293	2533	2773	3013
C127K-	2023	2263	2503	2743	2983	E396K-	2054	2294	2534	2774	3014
C187K-	2024	2264	2504	2744	2984	E476K-	2055	2295	2535	2775	3015
C227K-	2025	2265	2505	2745	2985	E476M-	2056	2296	2536	2776	3016
C227M-	2026	2266	2506	2746	2986	E566K-	2057	2297	2537	2777	3017
D275K-	2027	2267	2507	2747	2987	E686K-	2058	2298	2538	2778	3018
D335K-	2028	2268	2508	2748	2988	E686M-	2059	2299	2539	2779	3019
D335M-	2029	2269	2509	2749	2989	E826K-	2060	2300	2540	2780	3020
D186K-	2030	2270	2510	2750	2990	E107K-	2061	2301	2541	2781	3021
D226K-	2031	2271	2511	2751	2991	E107M-	2062	2302	2542	2782	3022

^{1/} See footnote at end of table.

TABLE II. Cross reference of replaced parts. - (Continued)

Type designation ^{1/}	Superseded dash number					Type designation ^{1/}	Superseded dash number				
	Failure rate level (%/1,000 hrs)						Failure rate level (%/1,000 hrs)				
	L	M	P	R	S		L	M	P	R	S
	2.0	1.0	0.1	0.01	0.001		2.0	1.0	0.1	0.01	0.001
CSR13F565K-	2063	2303	2543	2783	3023	CSR13G564K-	2112	2352	2592	2832	3072
F685K-	2064	2304	2544	2784	3024	G684K-	2113	2353	2593	2833	3073
F685M-	2065	2305	2545	2785	3025	G684M-	2114	2354	2594	2834	3074
F226K-	2066	2306	2546	2786	3026	G824K-	2115	2355	2595	2835	3075
F226M-	2067	2307	2547	2787	3027	G105K-	2116	2356	2596	2836	3076
F276K-	2068	2308	2548	2788	3028	G105M-	2117	2357	2597	2837	3077
F336K-	2069	2309	2549	2789	3029	G125K-	2118	2358	2598	2838	3078
F336M-	2070	2310	2550	2790	3030	G155K-	2119	2359	2599	2839	3079
F396K-	2071	2311	2551	2791	3031	G155M-	2120	2360	2600	2840	3080
F476K-	2072	2312	2552	2792	3032	G185K-	2121	2361	2601	2841	3081
F476M-	2073	2313	2553	2793	3033	G225K-	2122	2362	2602	2842	3082
G472K-	2074	2314	2554	2794	3034	G225M-	2123	2363	2603	2843	3083
G472M-	2075	2315	2555	2795	3035	G275K-	2124	2364	2604	2844	3084
G562K-	2076	2316	2556	2796	3036	G335K-	2125	2365	2605	2845	3085
G682K-	2077	2317	2557	2797	3037	G335M-	2126	2366	2606	2846	3086
G682M-	2078	2318	2558	2798	3038	G395K-	2127	2367	2607	2847	3087
G822K-	2079	2319	2559	2799	3039	G475K-	2128	2368	2608	2848	3088
G103K-	2080	2320	2560	2800	3040	G475M-	2129	2369	2609	2849	3089
G103M-	2081	2321	2561	2801	3041	G565K-	2130	2370	2610	2850	3090
G123K-	2082	2322	2562	2802	3042	G685K-	2131	2371	2611	2851	3091
G153K-	2083	2323	2563	2803	3043	G685M-	2132	2372	2612	2852	3092
G153M-	2084	2324	2564	2804	3044	G825K-	2133	2373	2613	2853	3093
G183K-	2085	2325	2565	2805	3045	G106K-	2134	2374	2614	2854	3094
G223K-	2086	2326	2566	2806	3046	G106M-	2135	2375	2615	2855	3095
G223M-	2087	2327	2567	2807	3047	G126K-	2136	2376	2616	2856	3096
G273K-	2088	2328	2568	2808	3048	G156K-	2137	2377	2617	2857	3097
G333K-	2089	2329	2569	2809	3049	G156M-	2138	2378	2618	2858	3098
G333M-	2090	2330	2570	2810	3050	G186K-	2139	2379	2619	2859	3099
G393K-	2091	2331	2571	2811	3051	G226K-	2140	2380	2620	2860	3100
G473K-	2092	2332	2572	2812	3052	G226M-	2141	2381	2621	2861	3101
G473M-	2093	2333	2573	2813	3053	H104K-	2142	2382	2622	2862	3102
G563K-	2094	2334	2574	2814	3054	H104M-	2143	2383	2623	2863	3103
G683K-	2095	2335	2575	2815	3055	H124K-	2144	2384	2624	2864	3104
G683M-	2096	2336	2576	2816	3056	H154K-	2145	2385	2625	2865	3105
G823K-	2097	2337	2577	2817	3057	H154M-	2146	2386	2626	2866	3106
G104K-	2098	2338	2578	2818	3058	H184K-	2147	2387	2627	2867	3107
G104M-	2099	2339	2579	2819	3059	H224K-	2148	2388	2628	2868	3108
G124K-	2100	2340	2580	2820	3060	H224M-	2149	2389	2629	2869	3109
G154K-	2101	2341	2581	2821	3061	H274K-	2150	2390	2630	2870	3110
G154M-	2102	2342	2582	2822	3062	H334K-	2151	2391	2631	2871	3111
G184K-	2103	2343	2583	2823	3063	H334M-	2152	2392	2632	2872	3112
G224K-	2104	2344	2584	2824	3064	H394K-	2153	2393	2633	2873	3113
G224M-	2105	2345	2585	2825	3065	H474K-	2154	2394	2634	2874	3114
G274K-	2106	2346	2586	2826	3066	H474M-	2155	2395	2635	2875	3115
G334K-	2107	2347	2587	2827	3067	H564K-	2156	2396	2636	2876	3116
G334M-	2108	2348	2588	2828	3068	H684K-	2157	2397	2637	2877	3117
G394K-	2109	2349	2589	2829	3069	H684M-	2158	2398	2638	2878	3118
G474K-	2110	2350	2590	2830	3070	H824K-	2159	2399	2639	2879	3119
G474M-	2111	2351	2591	2831	3071	H105K-	2160	2400	2640	2880	3120

^{1/} See footnote at end of table.

MIL-C-39003/1B

TABLE II. Cross reference of replaced parts. - (Continued)

Type designation ^{1/}	Superseded dash number					Type designation ^{1/}	Superseded dash number				
	Failure rate level (%/1,000 hrs)						Failure rate level (%/1,000 hrs)				
	L	M	P	R	S		L	M	P	R	S
	2.0	1.0	0.1	0.01	0.001		2.0	1.0	0.1	0.01	0.001
CSR13H105M-	2161	2401	2641	2881	3121	CSR13J333K-	2198	2438	2678	2918	3158
H125K-	2162	2402	2642	2882	3122	J333M-	2199	2439	2679	2919	3159
H155K-	2163	2403	2643	2883	3123	J393K-	2200	2440	2680	2920	3160
H155M-	2164	2404	2644	2884	3124	J473K-	2201	2441	2681	2921	3161
H185K-	2165	2405	2645	2885	3125	J473M-	2202	2442	2682	2922	3162
H225K-	2166	2406	2646	2886	3126	J563K-	2203	2443	2683	2923	3163
H225M-	2167	2407	2647	2887	3127	J683K-	2204	2444	2684	2924	3164
H275K-	2168	2408	2648	2888	3128	J683M-	2205	2445	2685	2925	3165
H335K-	2169	2409	2649	2889	3129	J823K-	2206	2446	2686	2926	3166
H335M-	2170	2410	2650	2890	3130	J104K-	2207	2447	2687	2927	3167
H395K-	2171	2411	2651	2891	3131	J104M-	2208	2448	2688	2928	3168
H475K-	2172	2412	2652	2892	3132	J124K-	2209	2449	2689	2929	3169
H475M-	2173	2413	2653	2893	3133	J154K-	2210	2450	2690	2930	3170
H565K-	2174	2414	2654	2894	3134	J154M-	2211	2451	2691	2931	3171
H685K-	2175	2415	2655	2895	3135	J184K-	2212	2452	2692	2932	3172
H685M-	2176	2416	2656	2896	3136	J224K-	2213	2453	2693	2933	3173
H825K-	2177	2417	2657	2897	3137	J224M-	2214	2454	2694	2934	3174
H106K-	2178	2418	2658	2898	3138	J274K-	2215	2455	2695	2935	3175
H106M-	2179	2419	2659	2899	3139	J334K-	2216	2456	2696	2936	3176
H126K-	2180	2420	2660	2900	3140	J334M-	2217	2457	2697	2937	3177
H156K-	2181	2421	2661	2901	3141	J394K-	2218	2458	2698	2938	3178
H156M-	2182	2422	2662	2902	3142	J474K-	2219	2459	2699	2939	3179
J472K-	2183	2423	2663	2903	3143	J474M-	2220	2460	2700	2940	3180
J472M-	2184	2424	2664	2904	3144	J564K-	2221	2461	2701	2941	3181
J562K-	2185	2425	2665	2905	3145	J684K-	2222	2462	2702	2942	3182
J682K-	2186	2426	2666	2906	3146	J684M-	2223	2463	2703	2943	3183
J682M-	2187	2427	2667	2907	3147	J824K-	2224	2464	2704	2944	3184
J822K-	2188	2428	2668	2908	3148	J105K-	2225	2465	2705	2945	3185
J103K-	2189	2429	2669	2909	3149	J105M-	2226	2466	2706	2946	3186
J103M-	2190	2430	2670	2910	3150	J125K-	2227	2467	2707	2947	3187
J123K-	2191	2431	2671	2911	3151	J155K-	2228	2468	2708	2948	3188
J153K-	2192	2432	2672	2912	3152	J155M-	2229	2469	2709	2949	3189
J153M-	2193	2433	2673	2913	3153	J185K-	2230	2470	2710	2950	3190
J183K-	2194	2434	2674	2914	3154	J225K-	2231	2471	2711	2951	3191
J223K-	2195	2435	2675	2915	3155	J225M-	2232	2472	2712	2952	3192
J223M-	2196	2436	2676	2916	3156	J275K-	2233	2473	2713	2953	3193
J273K-	2197	2437	2677	2917	3157						

^{1/} Complete type designation will include an additional symbol for appropriate failure rate level.

MIL-C-39006A
6 December 1967
SUPERSEDING
MIL-C-39006
10 October 1963, and
MIL-C-38102B(USAF)(in part)
25 May 1964
(See 6.3)

MILITARY SPECIFICATION

CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM, ESTABLISHED RELIABILITY, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for established reliability, tantalum, electrolytic (nonsolid electrolyte), fixed capacitors (polarized and nonpolarized), hermetically and nonhermetically sealed (see 1.2.1.6) in metal cases; all tubular types are insulated. These capacitors are primarily intended for use in filter, by-pass, and energy-storage applications requiring large capacitance values but where close tolerances are not an important factor and where the alternating current (ac) component of voltage is small compared to the direct current (dc) rated voltage. Capacitors covered by this specification have failure rate levels ranging from 2.0 (or 1.0) percent to 0.001 percent per 1,000 hours (see 1.2.1.7). These failure rate levels are established at a 60-percent confidence level and maintained at a 10-percent producer's risk, and are based on life tests performed with rated voltage applied at 85°C. The degradation limits change with duration of life test. The failure rate levels are based on catastrophic failures and failures occurring outside the degradation limits.

1.2 Classification.

1.2.1 Type designation. The type designation shall be in the following form, and as specified (see 3.1 and 6.6):

CLR25	B	D	150	U	E	L
Style (1.2.1.1)	Character- istic (1.2.1.2)	Rated and surge voltages (1.2.1.3)	Capacitance (1.2.1.4)	Capacitance tolerance (1.2.1.5)	Type of seal (1.2.1.6)	Failure rate level (1.2.1.7)

1.2.1.1 Style. The style is identified by the three-letter symbol "CLR" followed by a two-digit number; the letters identify established reliability, tantalum, electrolytic (nonsolid electrolyte), fixed capacitors, and the number identifies a design feature of the capacitor.

1.2.1.2 Characteristic. The characteristic is identified by a single letter as shown in table I.

TABLE I. Characteristic.

Symbol	Rated temperature (range)
B - - - - -	°C -55 to +85 ^{1/}

^{1/} When properly derated (see 3.1), these capacitors will operate up to +125° C.

MIL-C-39006A

1.2.1.3 Rated and surge voltages. The rated and surge voltages are identified by a single letter as shown in table II.

TABLE II. Rated and surge voltages.

Symbol	Rated voltage		Surge voltage (85° C)
	Rated (85° C)	Derated (125° C)	
	Volts, dc	Volts, dc	Volts, dc
A - - - - -	6	4	6.9
B - - - - -	8	5	9.2
C - - - - -	10	7	11.5
D - - - - -	15	10	17.2
E - - - - -	25	15	28.8
F - - - - -	30	20	34.5
G - - - - -	35	25	40.2
H - - - - -	50	30	57.5
J - - - - -	60	40	69.0
K - - - - -	75	50	86.2
M - - - - -	100	65	115
P - - - - -	125	85	144
Q - - - - -	150	100	172
R - - - - -	200	150	230
S - - - - -	300	200	345
U - - - - -	375	250	431
V - - - - -	450	300	518

1.2.1.4 Capacitance. The nominal capacitance value, expressed in microfarads (μf), is identified by a three-digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow. When the nominal capacitance is less than 10 and does not involve fractional values, the first digit shall be a zero. When fractional values of a μf are required, the letter "R" shall be used to indicate the decimal point and shall be placed where appropriate in the three-digit number. For example: 1R5 represents 1.5 μf ; 0R1 represents 0.1 μf ; and R15 represents 0.15 μf .

1.2.1.5 Capacitance tolerance. The capacitance tolerance is identified by a single letter as shown in table III.

TABLE III. Capacitance tolerance.

Symbol	Capacitance tolerance
	Percent
K - - - - -	± 10
M - - - - -	± 20
S - - - - -	+30, -15
T - - - - -	+50, -15
U - - - - -	+75, -15

MI1-C-39006A

1.2.1.6 Type of seal. The type of seal is identified by a single letter as shown in table IV.

TABLE IV. Type of seal.

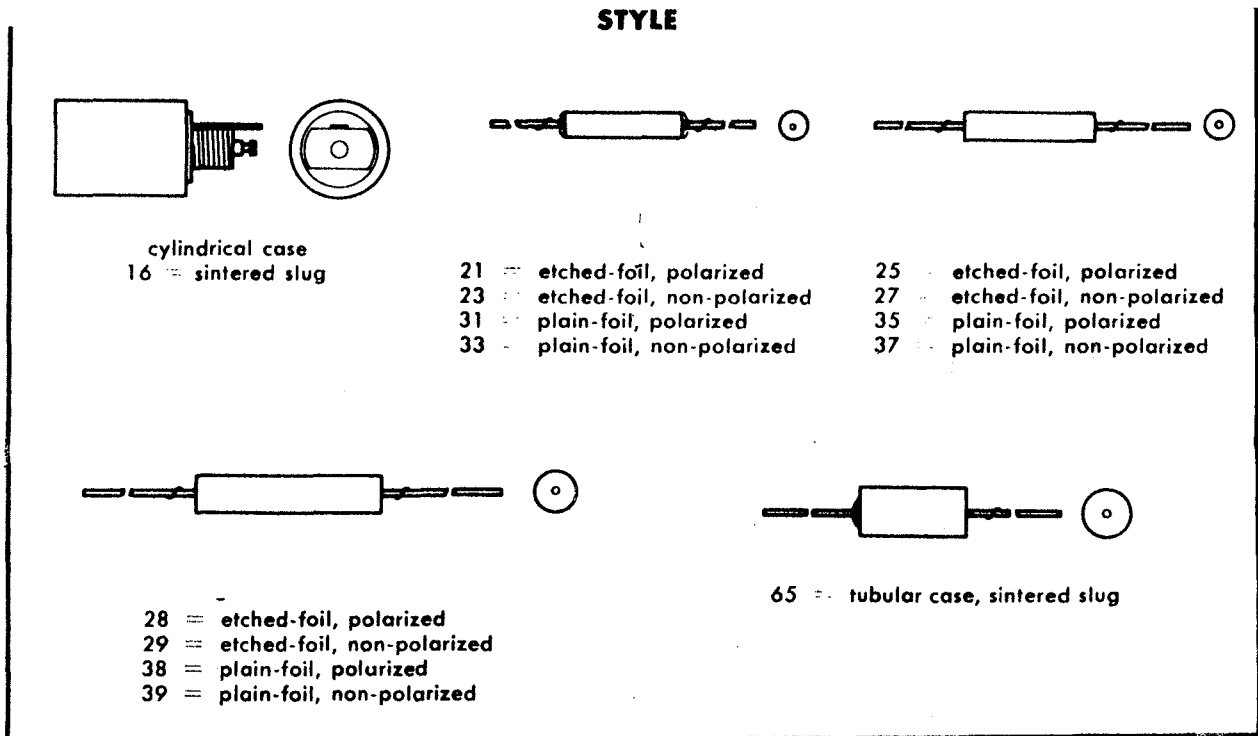
Symbol	Type of seal
G - - - - -	Hermetic (glass-to-metal)
E - - - - -	Nonhermetic (elastomer)

1.2.1.7 Failure rate level. The failure rate level (based on life test performed at 85° C) is identified by a single letter as shown in table V.

TABLE V. Failure rate level (established at a 60-percent confidence level).

Symbol	Failure rate level
	Percent/1, 000 hr
L - - - - -	2.0
M - - - - -	1.0
P - - - - -	0.1
R - - - - -	0.01
S - - - - -	0.001

STYLE

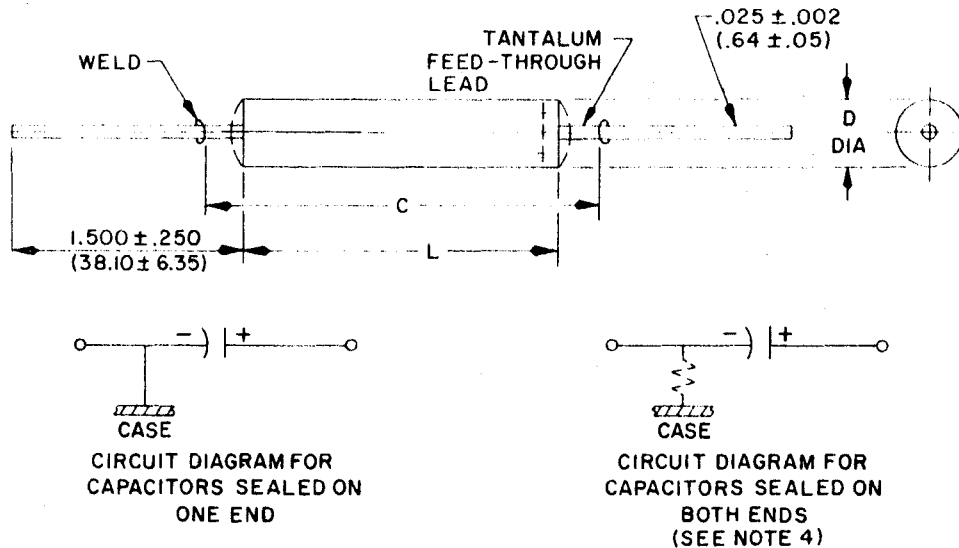


MIL-C-39006/1A
6 December 1967
SUPERSEDING
MIL-C-39006/1
10 October 1963
MIL-C-39006/5
10 October 1963
MIL-C-39006/11
10 October 1963, and
MIL-C-38102/7B (USAF)
25 May 1964

MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM,
(POLARIZED, ETCHED FOIL), ESTABLISHED RELIABILITY,
STYLE CLR25

The complete requirements for procuring the capacitors described herein shall consist of this document and the issue in effect of Specification MIL-C-39006.



Case size	Dimensions			
	Basic case		Insulated case 1/	Weld to weld
	L $\pm$.062 (1.57)	D $\pm$.016 (.41)	D max	C max
E1	.688 (17.48)	.188 (4.78)	.219 (5.56)	1.188 (30.18)
E2	.906 (23.01)	.281 (7.14)	.312 (7.92)	1.406 (35.71)
G2	.969 (24.61)	.281 (7.14)	.312 (7.92)	1.469 (37.31)
E3 or G3	1.438 (36.53)	.375 (9.53)	.406 (10.31)	1.938 (49.23)
E4 or G4	2.125 (53.98)	.375 (9.53)	.406 (10.31)	2.625 (66.68)
E5 or G5	2.750 (69.85)	.375 (9.53)	.406 (10.31)	3.250 (82.55)

1/ The case insulation shall extend .015 inch (.38 mm) minimum, ~~.062 inch (1.57 mm)~~ maximum, beyond each end of the capacitor body; however, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.

NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. There is an indeterminate resistance between the metal case and the negative terminal.

FIGURE 1. Style CLR25 capacitors.

FSC 5910

TABLE I. Capacitor characteristics and dash numbers (hermetically-sealed).

Type designation ^{1/}	Cap.	Cap. tolerance	Voltage			Impedance (max)	DC leakage (max)		Case size	Part No. M39006-01- Failure rate level (%/1,000 hr)				
			Rated (85°C)	Derated (125°C)	Surge (85°C)		25°C	125°C		L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)
			volts	volts	volts		μa	μa						
CLR25BD600UG	60	+75, -15	15	10	17.2	55	2	13	G2	1001	1027	1053	1079	1105
CLR25BD201UG	200	+75, -15	15	10	17.2	17	3	40	G3	1002	1028	1054	1080	1106
CLR25BD401UG	400	+75, -15	15	10	17.2	9	6	80	G4	1003	1029	1055	1081	1107
CLR25BD581UG	580	+75, -15	15	10	17.2	6	9	100	G5	1004	1030	1056	1082	1108
CLR25BE400UG	40	+75, -15	25	15	28.8	83	2	13	G2	1005	1031	1057	1083	1109
CLR25BE121UG	120	+75, -15	25	15	28.8	27	3	40	G3	1006	1032	1058	1084	1110
CLR25BE251UG	250	+75, -15	25	15	28.8	13	6	80	G4	1007	1033	1059	1085	1111
CLR25BE351UG	350	+75, -15	25	15	28.8	10	10	100	G5	1008	1034	1060	1086	1112
CLR25BH180TG	18	+50, -15	50	30	57.5	180	2	13	G2	1009	1035	1061	1087	1113
CLR25BH600TG	60	+50, -15	50	30	57.5	55	3	40	G3	1010	1036	1062	1088	1114
CLR25BH750TG	75	+50, -15	50	30	57.5	52	4	70	G5	1011	1037	1063	1089	1115
CLR25BH101TG	100	+50, -15	50	30	57.5	33	4	75	G4	1012	1038	1064	1090	1116
CLR25BH151TG	150	+50, -15	50	30	57.5	22	5	100	G5	1013	1039	1065	1091	1117
CLR25BK120TG	12	+50, -15	75	50	86.2	270	2	13	G2	1015	1041	1067	1093	1119
CLR25BK300TG	30	+50, -15	75	50	86.2	110	3	34	G3	1016	1042	1068	1094	1120
CLR25BK700TG	70	+50, -15	75	50	86.2	47	6	80	G4	1017	1043	1069	1095	1121
CLR25BK101TG	100	+50, -15	75	50	86.2	33	10	100	G5	1018	1044	1070	1096	1122
CLR25BM080TG	8	+50, -15	100	65	115	410	2	12	G2	1019	1045	1071	1097	1123
CLR25BM250TG	25	+50, -15	100	65	115	130	2.5	37	G3	1020	1046	1072	1098	1124
CLR25BM500TG	50	+50, -15	100	65	115	66	5	75	G4	1021	1047	1073	1099	1125
CLR25BM700TG	70	+50, -15	100	65	115	47	7	100	G5	1022	1048	1074	1100	1126
CLR25BQ040SG	4	+30, -15	150	100	172	750	2	13	G2	1023	1049	1075	1101	1127
CLR25BQ130SG	13	+30, -15	150	100	172	250	3	30	G3	1024	1050	1076	1102	1128
CLR25BQ250SG	25	+30, -15	150	100	172	130	5	80	G4	1025	1051	1077	1103	1129
CLR25BQ360SG	36	+30, -15	150	100	172	94	8	100	G5	1026	1052	1078	1104	1130

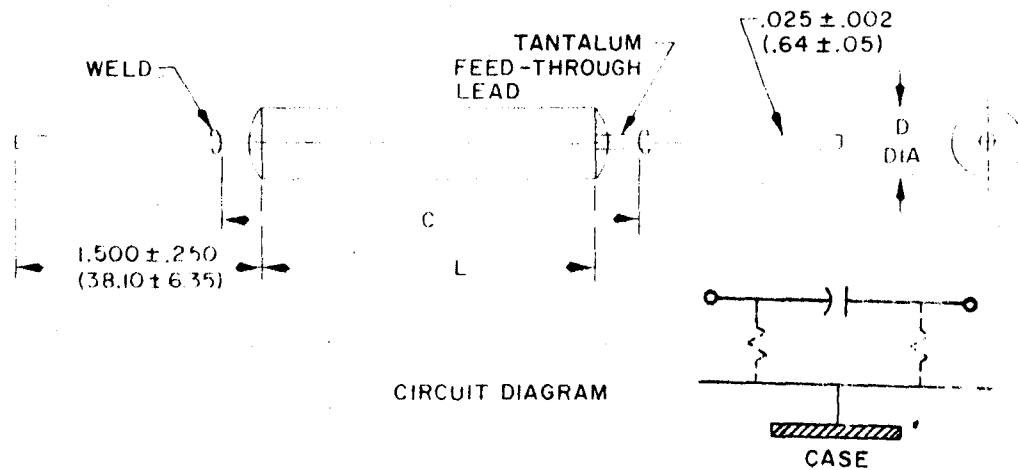
^{1/}Complete type designation will include an additional letter symbol to indicate failure rate level.

MIL-C-39006/2A
6 December 1967
SUPERSEDING
MIL-C-39006/2
10 October 1963,
MIL-C-39006/6
10 October 1963, and
MIL-C-39006/12
10 October 1963

MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM,
(NONPOLARIZED, ETCHED FOIL), ESTABLISHED RELIABILITY,
STYLE CLR27

The complete requirements for procuring the capacitors described herein shall consist of this document and the issue in effect of Specification MIL-C-39006.



Case size	Dimensions			
	Basic case		Insulated case 1/	Weld to weld
	$L \pm .062$ (1.57)	$D \pm .016$ (.41)	D max	C max
E1	.688 (17.48)	.188 (4.78)	.219 (5.56)	1.188 (30.18)
E2	.906 (23.01)	.281 (7.14)	.312 (7.92)	1.406 (35.71)
G2	.969 (24.61)	.281 (7.14)	.312 (7.92)	1.469 (37.31)
E3 or G3	1.438 (36.53)	.375 (9.53)	.406 (10.31)	1.938 (49.23)
E4 or G4	2.125 (53.98)	.375 (9.53)	.406 (10.31)	2.625 (66.68)
E5 or G5	2.750 (69.85)	.375 (9.53)	.406 (10.31)	3.250 (82.55)

1/ The case insulation shall extend .015 inch (.38 mm) minimum, .062 inch (1.57 mm) maximum, beyond each end of the capacitor body; however, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.

NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1. Style CLR27 capacitors.

FSC 5910

TABLE 1. Capacitor characteristics and dash numbers (hermetically-sealed)

Type designation ^{1/}	Cap.	Cap. tolerance	Voltage			Impedance (max)	DC leakage (max)		Case size	Part No. M39006/02- .				
			Rated (55°C)	Derated (125°C)	Surge (85°C)		25°C	125°C 85°C		Failure rate level (%/1,000 hr)				
										L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)
	μf	percent	volts	volts	volts	ohms	μa	μa						
CLR27BD400UG	40	+75,-15	15	10	17.2	85	2	10	G2	1001	1025	1049	1073	1097
CLR27BD121UG	120	-75,-15	15	10	17.2	27	3	40	G3	1002	1026	1050	1074	1098
CLR27BD251UG	250	+75,-15	15	10	17.2	14	6	80	G4	1003	1027	1051	1075	1099
CLR27BD351UG	350	-75,-15	15	10	17.2	10	9	100	G5	1004	1028	1052	1076	1100
CLR27BE200UG	20	-75,-15	25	15	28.8	170	2	13	G2	1005	1029	1053	1077	1101
CLR27BE700UG	70	-75,-15	25	15	28.8	49	3	40	G3	1006	1030	1054	1078	1102
CLR27BE141UG	140	+75,-15	25	15	28.8	24	6	80	G4	1007	1031	1055	1079	1103
CLR27BE201UG	200	-75,-15	25	15	28.8	17	10	100	G5	1008	1032	1056	1080	1104
CLR27BH100TG	10	-50,-15	50	30	57.5	339	2	13	G2	1009	1033	1057	1081	1105
CLR27BH300TG	30	+50,-15	50	30	57.5	113	3	40	G3	1010	1034	1058	1082	1106
CLR27BH600TG	60	-50,-15	50	30	57.5	57	4	75	G4	1011	1035	1059	1083	1107
CLR27BH800TG	80	+50,-15	50	30	57.5	41	5	100	G5	1012	1036	1060	1084	1108
CLR27BK060TG	6	-50,-15	75	50	86.2	565	2	13	G2	1013	1037	1061	1085	1109
CLR27BK150TG	15	-50,-15	75	50	86.2	210	3	34	G3	1014	1038	1062	1086	1110
CLR27BK350TG	35	-50,-15	75	50	86.2	97	5	80	G4	1015	1039	1063	1087	1111
CLR27BK500TG	50	-50,-15	75	50	86.2	68	10	100	G5	1016	1040	1064	1088	1112
CLR27BM040TG	4	-50,-15	100	65	115	845	2	13	G2	1017	1041	1065	1089	1113
CLR27BM120TG	12	-50,-15	100	65	115	283	3	37	G3	1018	1042	1066	1090	1114
CLR27BM250TG	25	-50,-15	100	65	115	135	5	75	G4	1019	1043	1067	1091	1115
CLR27BM350TG	35	+50,-15	100	65	115	97	7	100	G5	1020	1044	1068	1092	1116
CLR27BQ020SG	2	-30,-15	150	100	172	1690	2	13	G2	1021	1045	1069	1093	1117
CLR27BQ060SG	6	-30,-15	150	100	172	565	3	30	G3	1022	1046	1070	1094	1118
CLR27BQ120SG	12	-30,-15	150	100	172	283	5	80	G4	1023	1047	1071	1095	1119
CLR27BQ180SG	18	-30,-15	150	100	172	182	8	100	G5	1024	1048	1072	1096	1120

^{1/} Complete type designation will include an additional letter symbol to indicate failure rate level.

MIL-C-39006/2A

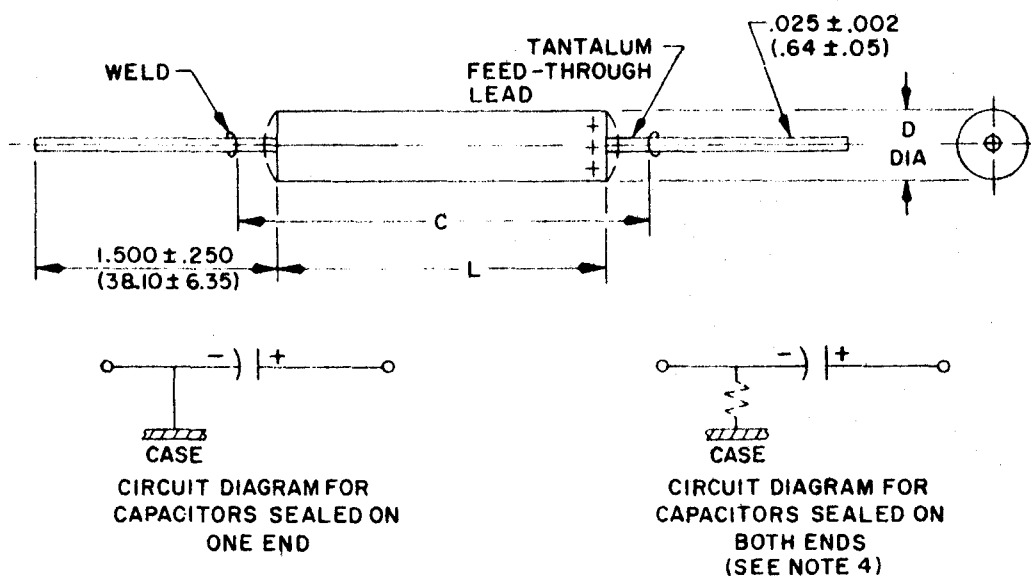
Attachment II
ATM 241 Rev D

MIL-C-39006/3A
6 December 1967
SUPERSEDING
MIL-C-39006/3
10 October 1963,
MIL-C-39006/7
10 October 1963,
MIL-C-39006/13
10 October 1963, and
MIL-C-38102/5B (USAF)
25 May 1964

MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM,
(POLARIZED, PLAIN FOIL), ESTABLISHED RELIABILITY,
STYLE CLR35

The complete requirements for procuring the capacitors described herein shall consist of this document and the issue in effect of Specification MIL-C-39006.



Case size	Dimensions			
	Basic case		Insulated case 1/	Weld to weld
	L + .062 (1.57)	D + .016 (.41)	D max	C max
E1	.688 (17.48)	.188 (4.78)	.219 (5.56)	1.188 (30.18)
E2	.906 (23.01)	.281 (7.14)	.312 (7.92)	1.406 (35.71)
G2	.969 (24.61)	.281 (7.14)	.312 (7.92)	1.469 (37.31)
E3 or G3	1.438 (36.53)	.375 (9.53)	.406 (10.31)	1.938 (49.23)
E4 or G4	2.125 (53.98)	.375 (9.53)	.406 (10.31)	2.625 (66.68)
E5 or G5	2.750 (69.85)	.375 (9.53)	.406 (10.31)	3.250 (82.55)

1/ The case insulation shall extend .015 inch (.38 mm) minimum, .062 inch (1.57 mm) maximum, beyond each end of the capacitor body; however, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.

NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. There is an indeterminate resistance between the metal case and the negative terminal.

FIGURE 1. Style CLR35 capacitors.

FSC 5910

TABLE I. Capacitor characteristics and dash numbers (hermetically-sealed).

Type designation ¹	Cap.	Cap. tolerance	Voltage			Impedance (max)	DC leakage (max)		Case size	Part No. M39006 03- Failure rates (per 1000 hr)				
			Rated (85°C)	Derated (125°C)	Surge (85°C)		25°C	125°C		L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)
			volts	volts	volts		ohms	85°C						
	μf	percent					μa	μa						
CLR35BD180MG	18	=20	15	10	17.2	125	2	4	G2	1001	1043	1085	1127	1169
CLR35BD550MG	55	=20	15	10	17.2	41	2	10	G3	1002	1044	1086	1128	1170
CLR35BD111MG	110	=20	15	10	17.2	20	4	20	G4	1003	1045	1087	1129	1171
CLR35BD161MG	160	=20	15	10	17.2	14	5	30	G5	1004	1046	1088	1130	1172
CLR35BE120MG	12	=20	25	15	28.8	186	2	4	G2	1005	1047	1089	1131	1173
CLR35BE350MG	35	=20	25	15	28.8	64	2	10	G3	1006	1048	1090	1132	1174
CLR35BE700MG	70	=20	25	15	28.8	32	4	20	G4	1007	1049	1091	1133	1175
CLR35BE101MG	100	=20	25	15	28.8	23	6	30	G5	1008	1050	1092	1134	1176
CLR35BF010MG	10	=20	30	20	34.5	223	5	15	G2	1009	1051	1093	1135	1177
CLR35BG068MG	68	=20	35	25	40.2	40	5	25	G5	1010	1052	1094	1136	1178
CLR35BH060MG	6	=20	50	30	57.5	340	2	6	G2	1011	1053	1095	1137	1179
CLR35BH200MG	20	=20	50	30	57.5	112	2	13	G3	1012	1054	1096	1138	1180
CLR35BH400MG	40	=20	50	30	57.5	56	4	26	G4	1013	1055	1097	1139	1181
CLR35BH550MG	55	=20	50	30	57.5	41	6	38	G5	1014	1056	1098	1140	1182
CLR35BK040MG	4	=20	75	50	86.2	558	2	6	G2	1015	1057	1099	1141	1183
CLR35BK140MG	14	=20	75	50	86.2	159	2	13	G3	1016	1058	1100	1142	1184
CLR35BK280MG	28	=20	75	50	86.2	80	4	26	G4	1017	1059	1101	1143	1185
CLR35BK400MG	40	=20	75	50	86.2	56	6	38	G5	1018	1060	1102	1144	1186
CLR35BM030MG	3	=20	100	65	115	743	2	6	G2	1019	1061	1103	1145	1187
CLR35BM100MG	10	=20	100	65	115	223	2	13	G3	1020	1062	1104	1146	1188
CLR35BM200MG	20	=20	100	65	115	112	3	25	G4	1021	1063	1105	1147	1189
CLR35BM300MG	30	=20	100	65	115	74	6	38	G5	1022	1064	1106	1148	1190
CLR35BQ020MG	2	=20	150	100	172	1115	2	6	G2	1023	1065	1107	1149	1191
CLR35BQ070MG	7	=20	150	100	172	319	3	13	G3	1024	1066	1108	1150	1192
CLR35BQ140MG	14	=20	150	100	172	159	4	26	G4	1025	1067	1109	1151	1193
CLR35BQ200MG	20	=20	150	100	172	112	6	38	G5	1026	1068	1110	1152	1194
CLR35BR1R5MG	1.5	=20	200	150	230	1800	2	20	G2	1027	1069	1111	1153	1195
CLR35BR050MG	5	=20	200	150	230	450	3	70	G3	1028	1070	1112	1154	1196
CLR35BR100MG	10	=20	200	150	230	250	6	100	G4	1029	1071	1113	1155	1197
CLR35BR150MG	15	=20	200	150	230	150	10	200	G5	1030	1072	1114	1156	1198
CLR35BS010MG	1	=20	300	200	345	2250	10	50	G2	1031	1073	1115	1157	1199
CLR35BS3R3MG	3.3	=20	300	200	345	750	20	100	G3	1032	1074	1116	1158	1200
CLR35BS6R8MG	6.8	=20	300	200	345	322	35	175	G4	1033	1075	1117	1159	1201
CLR35BS100MG	10	=20	300	200	345	225	50	250	G5	1034	1076	1118	1160	1202
CLR35BUR82MG	0.82	=20	375	250	431	2810	10	100	G2	1035	1077	1119	1161	1203
CLR35BU2R7MG	2.7	=20	375	250	431	900	20	225	G3	1036	1078	1120	1162	1204
CLR35BU5R6MG	5.6	=20	375	250	431	450	35	250	G4	1037	1079	1121	1163	1205
CLR35BU8R2MG	8.2	=20	375	250	431	281	50	325	G5	1038	1080	1122	1164	1206
CLR35BVR56MG	0.56	=20	450	300	518	5350	10	150	G2	1039	1081	1123	1165	1207
CLR35BV2R2MG	2.2	=20	450	300	518	1600	20	400	G3	1040	1082	1124	1166	1208
CLR35BV3R9MG	3.9	=20	450	300	518	800	35	800	G4	1041	1083	1125	1167	1209
CLR35BV6R8MG	6.8	=20	450	300	518	535	50	1000	G5	1042	1084	1126	1168	1210

¹ Complete type designation will include an additional letter symbol to indicate failure rate level.

MIL-C-39006/3A

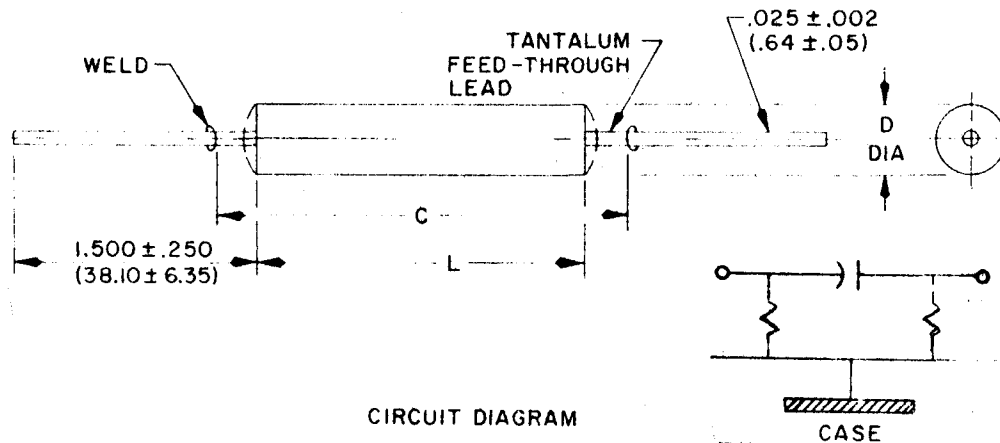
Attachment II
ATM 241 Rev D

MIL-C-39006/4A
6 December 1967
SUPERSEDING
MIL-C-39006/4
10 October 1963,
MIL-C-39006/8
10 October 1963,
MIL-C-39006/14
10 October 1963, and
MIL-C-38102/6B (USAF)
25 May 1964

MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM
(NONPOLARIZED, PLAIN FOIL), ESTABLISHED RELIABILITY,
STYLE CLR37

The complete requirements for procuring the capacitors described herein shall
consist of this document and the issue in effect of Specification MIL-C-39006.



Case size	Dimensions			
	Basic case		Insulated case 1/	Weld to weld
	L ± .062 (1.57)	D ± .016 (.41)	D max	C max
E1	.688 (17.48)	.188 (4.78)	.219 (5.56)	1.188 (30.18)
E2	.906 (23.01)	.281 (7.14)	.312 (7.92)	1.406 (35.71)
G2	.969 (24.61)	.281 (7.14)	.312 (7.92)	1.469 (37.31)
E3 or G3	1.438 (36.53)	.375 (9.53)	.406 (10.31)	1.938 (49.23)
E4 or G4	2.125 (53.98)	.375 (9.53)	.406 (10.31)	2.625 (66.68)
E5 or G5	2.750 (69.85)	.375 (9.53)	.406 (10.31)	3.250 (82.55)

1/ The case insulation shall extend .015 inch (.38 mm) minimum, .062 inch (1.57 mm) maximum, beyond each end of the capacitor body; however, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.

NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1. Style CLR37 capacitors.

FSC 5910

TABLE I. Capacitor characteristics and dash numbers (hermetically-sealed).

Type designation ^{1/}	Cap.	Cap. tolerance	Voltage			Impedance (max)	DC leakage (max)		Case size	Part No. M39006/04- Failure rate level (%/1,000 hr)				
			Rated (85°C)	Derated (125°C)	Surge (85°C)		25°C	125°C 85°C		Failure rate level (%/1,000 hr)				
			volts	volts	volts		ohms	μa	μa					
	μf	percent								L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)
CLR37BD100MG	10	±20	15	10	17.2	220	2	4	G2	1001	1038	1075	1112	1149
CLR37BD350MG	35	±20	15	10	17.2	67	2	10	G3	1002	1039	1076	1113	1150
CLR37BD700MG	70	±20	15	10	17.2	32	4	20	G4	1003	1040	1077	1114	1151
CLR37BD101MG	100	±20	15	10	17.2	22	5	30	G5	1004	1041	1078	1115	1152
CLR37BE060MG	6	±20	25	15	28.8	372	2	6	G2	1005	1042	1079	1116	1153
CLR37BE200MG	20	±20	25	15	28.8	100	2	10	G3	1006	1043	1080	1117	1154
CLR37BE400MG	40	±20	25	15	28.8	56	4	20	G4	1007	1044	1081	1118	1155
CLR37BE600MG	60	±20	25	15	28.8	39	5	30	G5	1008	1045	1082	1119	1156
CLR37BH030MG	3	±20	50	30	57.5	670	2	6	G2	1009	1046	1083	1120	1157
CLR37BH100MG	10	±20	50	30	57.5	220	2	12	G3	1010	1047	1084	1121	1158
CLR37BH200MG	20	±20	50	30	57.5	100	4	24	G4	1011	1048	1085	1122	1159
CLR37BH300MG	30	±20	50	30	57.5	67	6	36	G5	1012	1049	1086	1123	1160
CLR37BK020MG	2	±20	75	50	86.2	1000	2	6	G2	1013	1050	1087	1124	1161
CLR37BK070MG	7	±20	75	50	86.2	320	2	13	G3	1014	1051	1088	1125	1162
CLR37BK140MG	14	±20	75	50	86.2	150	4	24	G4	1015	1052	1089	1126	1163
CLR37BK200MG	20	±20	75	50	86.2	100	6	36	G5	1016	1053	1090	1127	1164
CLR37BM1R5MG	1.5	±20	100	65	115	1487	2	6	G2	1017	1054	1091	1128	1165
CLR37BM050MG	5	±20	100	65	115	446	2	13	G3	1018	1055	1092	1129	1166
CLR37BM100MG	10	±20	100	65	115	220	4	24	G4	1019	1056	1093	1130	1167
CLR37BM150MG	15	±20	100	65	115	150	6	36	G5	1020	1057	1094	1131	1168
CLR37BQ010MG	1	±20	150	100	172	2200	2	6	G2	1021	1058	1095	1132	1169
CLR37BQ1R2MG	1.2	±20	150	100	172	2000	3	12	G2	1022	1059	1096	1133	1170
CLR37BQ3R5MG	3.5	±20	150	100	172	638	3	13	G3	1023	1060	1097	1134	1171
CLR37BQ070MG	7	±20	150	100	172	320	4	24	G4	1024	1061	1098	1135	1172
CLR37BQ100MG	10	±20	150	100	172	220	6	36	G5	1025	1062	1099	1136	1173
CLR37BRR75MG	0.75	±20	225	150	258	2700	10	50	G2	1026	1063	1100	1137	1174
CLR37BR2R5MG	2.5	±20	225	150	258	820	20	100	G3	1027	1064	1101	1138	1175
CLR37BR050MG	5	±20	225	150	258	450	35	150	G4	1028	1065	1102	1139	1176
CLR37BR7R5MG	7.5	±20	225	150	258	270	50	250	G5	1029	1066	1103	1140	1177
CLR37BSR47MG	0.47	±20	300	200	345	4500	10	100	G2	1030	1067	1104	1141	1178
CLR37BS1R5MG	1.5	±20	300	200	345	1500	20	225	G3	1031	1068	1105	1142	1179
CLR37BS3R3MG	3.3	±20	300	200	345	643	35	250	G4	1032	1069	1106	1143	1180
CLR37BS4R7MG	4.7	±20	300	200	345	450	50	325	G5	1033	1070	1107	1144	1181
CLR37BUR39MG	0.39	±20	375	250	431	5620	10	150	G2	1034	1071	1108	1145	1182
CLR37BU1R2MG	1.2	±20	375	250	431	1880	20	400	G3	1035	1072	1109	1146	1183
CLR37BU2R2MG	2.2	±20	375	250	431	900	35	800	G4	1036	1073	1110	1147	1184
CLR37BU3R9MG	3.9	±20	375	250	431	562	50	1000	G5	1037	1074	1111	1148	1185

^{1/} Complete type designation will include an additional letter symbol to indicate failure rate level.

MIL-C-39006/4A

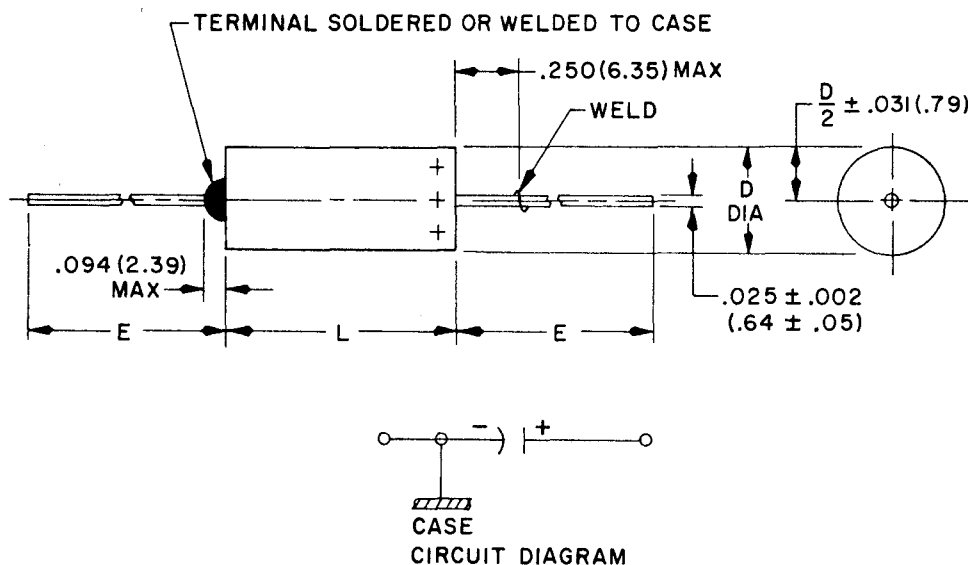
Attachment II
ATM 241 Rev D

MIL-C-39006/9A
6 December 1967
SUPERSEDING
MIL-C-39006/9
10 October 1963

MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM,
(POLARIZED, SINTERED SLUG), ESTABLISHED RELIABILITY,
STYLE CLR65

The complete requirements for procuring the capacitors described herein shall consist of this document and the issue in effect of Specification MIL-C-39006.



Case size	Dimensions			
	Basic case		Insulated case 1/	
	$L + .031 (.79)$ $-.016 (.41)$	$D \pm .016 (.41)$	D max	$E \pm .250 (6.35)$
ET1 or GT1	.453 (11.51)	.188 (4.78)	.219 (5.56)	1.500 (38.10)
ET2 or GT2	.641 (16.28)	.281 (7.14)	.313 (7.95)	2.250 (57.15)
ET3 or GT3	.766 (19.46)	.375 (9.53)	.406 (10.31)	2.250 (57.15)

1/ The case insulation shall extend .015 inch (.38 mm) minimum, .031 inch (.79 mm) maximum, beyond each end of the capacitor body; however, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.

NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1. Style CLR65 capacitors.

FSC 5910

TABLE I. Capacitor characteristics and dash numbers (hermetically-sealed).

Type designation 1/	Cap.	Cap. tol.	Voltage			Power factor	Imp. (max)	DC leakage (max)		Capacitance change at			Case size	2/Part No. M39006/09- Failure rate level (%/1,000 hr)				
			Rated (85°C)	Derated (125°C)	Surge (85°C)			+25°C	+125°C	-55°C	+85°C	+125°C		L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)
			volts	volts	volts			percent	percent	percent	percent	percent		percent	percent	percent	percent	percent
CLR65BA300MG	30	±20	6	4	6.9	9.1	100	1	2	-40	+10.5	+12	GT1 1001	1125	1209	1373	1497	
CLR65BA300KG	30	±10	6	4	6.9	9.1	100	1	2	-40	+10.5	+12	GT1 1002	1126	1250	1374	1498	
CLR65BA680MG	*68	±20	6	4	6.9	20.0	60	1	2	-40	+14	+16	GT1 1003	1127	1251	1375	1499	
CLR65BA680KG	*68	±10	6	4	6.9	20.0	60	1	2	-40	+14	+16	GT1 1004	1128	1252	1376	1500	
CLR65BA141MG	140	±20	6	4	6.9	20.8	40	1	3	-40	+14	+16	GT2 1005	1129	1253	1377	1501	
CLR65BA141KG	140	±10	6	4	6.9	20.8	40	1	3	-40	+14	+16	GT2 1006	1130	1254	1378	1502	
CLR65BA271MG	*270	±20	6	4	6.9	63.3	25	1	6.5	-44	+17.5	+20	GT2 1007	1131	1255	1379	1503	
CLR65BA271KG	*270	±10	6	4	6.9	63.3	25	1	6.5	-44	+17.5	+20	GT2 1008	1132	1256	1380	1504	
CLR65BA331MG	330	±20	6	4	6.9	44.4	20	2	7.9	-44	+14	+16	GT3 1009	1133	1257	1381	1505	
CLR65BA331KG	330	±10	6	4	6.9	44.4	20	2	7.9	-44	+14	+16	GT3 1010	1134	1258	1382	1506	
CLR65BA561MG	*560	±20	6	4	6.9	78.8	25	2	13	-64	+17.5	+20	GT3 1011	1135	1259	1383	1507	
CLR65BA561KG	*560	±10	6	4	6.9	78.8	25	2	13	-64	+17.5	+20	GT3 1012	1136	1260	1384	1508	
CLR65BB250MG	25	±20	7	5	9.2	7.6	100	1	2	-40	+10.5	+12	GT1 1013	1137	1261	1385	1509	
CLR65BB250KG	25	±10	7	5	9.2	7.6	100	1	2	-40	+10.5	+12	GT1 1014	1138	1262	1386	1510	
CLR65BB560MG	*56	±20	7	5	9.2	16.8	59	1	2	-40	+14	+16	GT1 1015	1139	1263	1387	1511	
CLR65BB560KG	*56	±10	7	5	9.2	16.8	59	1	2	-40	+14	+16	GT1 1016	1140	1264	1388	1512	
CLR65BB221MG	*220	±20	7	5	9.2	55.3	30	1	7	-44	+17.5	+20	GT2 1017	1141	1265	1389	1513	
CLR65BB221KG	*220	±10	7	5	9.2	55.3	30	1	7	-44	+17.5	+20	GT2 1018	1142	1266	1390	1514	
CLR65BB431MG	*430	±20	7	5	9.2	67.5	25	2	13.8	-64	+17.5	+20	GT3 1019	1143	1267	1391	1515	
CLR65BB431KG	*430	±10	7	5	9.2	67.5	25	2	13.8	-64	+17.5	+20	GT3 1020	1144	1268	1392	1516	
CLR65BC200MG	20	±20	10	7	11.5	6.1	175	1	2	-32	+10.5	+12	GT1 1021	1145	1269	1393	1517	
CLR65BC200KG	20	±10	10	7	11.5	6.1	175	1	2	-32	+10.5	+12	GT1 1022	1146	1270	1394	1518	
CLR65BC470MG	*47	±20	10	7	11.5	17.8	100	1	2	-36	+14	+16	GT1 1023	1147	1271	1395	1519	
CLR65BC470KG	*47	±10	10	7	11.5	17.8	100	1	2	-36	+14	+16	GT1 1024	1148	1272	1396	1520	
CLR65BC101MG	100	±20	10	7	11.5	15.0	60	1	4	-36	+14	+16	GT2 1025	1149	1273	1397	1521	
CLR65BC101KG	100	±10	10	7	11.5	15.0	60	1	4	-36	+14	+16	GT2 1026	1150	1274	1398	1522	
CLR65BC181MG	*180	±20	10	7	11.5	47.8	40	1	7	-36	+14	+16	GT2 1027	1151	1275	1399	1523	
CLR65BC181KG	*180	±10	10	7	11.5	47.8	40	1	7	-36	+14	+16	GT2 1028	1152	1276	1400	1524	
CLR65BC251MG	250	±20	10	7	11.5	35.4	30	2	10	-40	+14	+16	GT3 1029	1153	1277	1401	1525	
CLR65BC251KG	250	±10	10	7	11.5	35.4	30	2	10	-40	+14	+16	GT3 1030	1154	1278	1402	1526	
CLR65BC391MG	*390	±20	10	7	11.5	65.9	25	2	15.6	-64	+17.5	+20	GT3 1031	1155	1279	1403	1527	
CLR65BC391KG	*390	±10	10	7	11.5	65.9	25	2	15.6	-64	+17.5	+20	GT3 1032	1156	1280	1404	1528	
CLR65BD150MG	15	±20	15	10	17.2	5.7	155	1	2	-24	+10.5	+12	GT1 1033	1157	1281	1405	1529	
CLR65BD150KG	15	±10	15	10	17.2	5.7	155	1	2	-24	+10.5	+12	GT1 1034	1158	1282	1406	1530	
CLR65BD330MG	*33	±20	15	10	17.2	12.4	90	1	2	-28	+14	+16	GT1 1035	1159	1283	1407	1531	
CLR65BD330KG	*33	±10	15	10	17.2	12.4	90	1	2	-28	+14	+16	GT1 1036	1160	1284	1408	1532	
CLR65BD700MG	70	±20	15	10	17.2	13.0	75	1	4	-28	+14	+16	GT2 1037	1161	1285	1409	1533	
CLR65BD700KG	70	±10	15	10	17.2	13.0	75	1	4	-28	+14	+16	GT2 1038	1162	1286	1410	1534	

See footnotes at end of table.

MIL-C-39006/3A

Attachment II
ATM 241 Rev D

TABLE I. Capacitor characteristics and dash numbers (hermetically-sealed) (cont.).

Type designation ^{1/}	Cap.	Cap. tol.	Voltage			Power factor	Imp. (max)	DC leakage (max)		Capacitance change at			Case size	2/Part No. M39006/09- Failure rate level (%/1,000 hr)				
			Rated (85°C)	Derated (125°C)	Surge (85°C)			+25°C	+125°C +85°C	-55°C	+85°C	+125°C		L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)
	μf	percent	volts	volts	volts	percent	ohms	μa	μa	percent	percent	percent						
CLR65BD121MG	*120	±20	15	10	17.2	34.5	50	1	7	-28	+17.5	+20	GT2	1039	1163	1287	1411	1535
CLR65BD121KG	*120	±10	15	10	17.2	34.5	50	1	7	-28	+17.5	+20	GT2	1040	1164	1288	1412	1536
CLR65BD171MG	170	±20	15	10	17.2	24.6	35	2	10	-32	+14	+16	GT3	1041	1165	1289	1413	1537
CLR65BD171KG	170	±10	15	10	17.2	24.6	35	2	10	-32	+14	+16	GT3	1042	1166	1290	1414	1538
CLR65BD271MG	*270	±20	15	10	17.2	52.0	30	2	16	-56	+17.5	+20	GT3	1043	1167	1291	1415	1539
CLR65BD271KG	*270	±10	15	10	17.2	52.0	30	2	16	-56	+17.5	+20	GT3	1044	1168	1292	1416	1540
CLR65BE100MG	10	±20	25	15	28.8	4.6	220	1	2	-16	+8	+9	GT1	1045	1169	1293	1417	1541
CLR65BE100KG	10	±10	25	15	28.8	4.6	220	1	2	-16	+8	+9	GT1	1046	1170	1294	1418	1542
CLR65BE220MG	*22	±20	25	15	28.8	8.3	140	1	2	-20	+10.5	+12	GT1	1047	1171	1295	1419	1543
CLR65BE220KG	*22	±10	25	15	28.8	8.3	140	1	2	-20	+10.5	+12	GT1	1048	1172	1296	1420	1544
CLR65BE101MG	*100	±20	25	15	28.8	30.0	50	1	10	-28	+13	+15	GT2	1049	1173	1297	1421	1545
CLR65BE101KG	*100	±10	25	15	28.8	30.0	50	1	10	-28	+13	+15	GT2	1050	1174	1298	1422	1546
CLR65BE181MG	*180	±20	25	15	28.8	47.7	32	2	18	-48	+13	+15	GT3	1051	1175	1299	1423	1547
CLR65BE181KG	*180	±10	25	15	28.8	47.7	32	2	18	-48	+13	+15	GT3	1052	1176	1300	1424	1548
CLR65BF080MG	8	±20	30	20	34.5	4.5	275	1	2	-16	+8	+12	GT1	1053	1177	1301	1425	1549
CLR65BF080KG	8	±10	30	20	34.5	4.5	275	1	2	-16	+8	+12	GT1	1054	1178	1302	1426	1550
CLR65BF150MG	*15	±20	30	20	34.5	9.1	175	1	2	-20	+10.5	+12	GT1	1055	1179	1303	1427	1551
CLR65BF150KG	*15	±10	30	20	34.5	9.1	175	1	2	-20	+10.5	+12	GT1	1056	1180	1304	1428	1552
CLR65BF400MG	40	±20	30	20	34.5	12.1	65	1	4.8	-24	+10.5	+12	GT2	1057	1181	1305	1429	1553
CLR65BF400KG	40	±10	30	20	34.5	12.1	65	1	4.8	-24	+10.5	+12	GT2	1058	1182	1306	1430	1554
CLR65BF680MG	*68	±20	30	20	34.5	29.6	60	1	8	-24	+13	+15	GT2	1059	1183	1307	1431	1555
CLR65BF680KG	*68	±10	30	20	34.5	29.6	60	1	8	-24	+13	+15	GT2	1060	1184	1308	1432	1556
CLR65BF101MG	100	±20	30	20	34.5	18.6	40	2	12	-28	+10.5	+12	GT3	1061	1185	1309	1433	1557
CLR65BF101KG	100	±10	30	20	34.5	18.6	40	2	12	-28	+10.5	+12	GT3	1062	1186	1310	1434	1558
CLR65BF151MG	*150	±20	30	20	34.5	41.5	35	2	18	-48	+13	+15	GT3	1063	1187	1311	1435	1559
CLR65BF151KG	*150	±10	30	20	34.5	41.5	35	2	18	-48	+13	+15	GT3	1064	1188	1312	1436	1560
CLR65BH050MG	5	±20	50	30	57.5	3.4	400	1	2	-16	+5	+6	GT1	1065	1189	1313	1437	1561
CLR65BH050KG	5	±10	50	30	57.5	3.4	400	1	2	-16	+5	+6	GT1	1066	1190	1314	1438	1562
CLR65BH100MG	*10	±20	50	30	57.5	6.0	250	1	2	-24	+8	+9	GT1	1067	1191	1315	1439	1563
CLR65BH100KG	*10	±10	50	30	57.5	6.0	250	1	2	-24	+8	+9	GT1	1068	1192	1316	1440	1564
CLR65BH250MG	25	±20	50	30	57.5	11.1	95	1	5	-20	+10.5	+12	GT2	1069	1193	1317	1441	1565
CLR65BH250KG	25	±10	50	30	57.5	11.1	95	1	5	-20	+10.5	+12	GT2	1070	1194	1318	1442	1566
CLR65BH470MG	*47	±20	50	30	57.5	20.9	70	1	9	-28	+13	+15	GT2	1071	1195	1319	1443	1567
CLR65BH470KG	*47	±10	50	30	57.5	20.9	70	1	9	-28	+13	+15	GT2	1072	1196	1320	1444	1568
CLR65BH600MG	60	±20	50	30	57.5	13.5	45	2	12	-16	+10.5	+12	GT3	1073	1197	1321	1445	1569
CLR65BH600KG	60	±10	50	30	57.5	13.5	45	2	12	-16	+10.5	+12	GT3	1074	1198	1322	1446	1570

See footnotes at end of table

Attachment II
ATM 241 Rev D

MIL-C-39006/9A

TABLE I. Capacitor characteristics and dash numbers (hermetically-sealed) (cont).

Type designation 1/	Cap.	Cap. tol.	Voltage			Power factor	Imp. (max)	DC leakage (max)		Capacitance change at			Case size	2/Part No. M39006/09- Failure rate level (%/1,000 hr)					
			Rated (85°C)	Derated (125°C)	Surge (85°C)			+25°C	+125°C +85°C	-55°C	+85°C	+125°C		L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	
	μf	percent	volts	volts	volts	percent	ohms	μa	μa	percent	percent	percent							
CLR65BH820MG	*82	±20	50	30	57.5	24.2	45	2	16	-32	+13	+15	GT3	1075	1199	1323	1447	1571	
CLR65BH820KG	*82	±10	50	30	57.5	24.2	45	2	16	-32	+13	+15	GT3	1076	1200	1324	1448	1572	
CLR65BJ040MG	4	±20	60	40	69.0	3.0	550	1	2	-16	+5	+6	GT1	1077	1201	1325	1449	1573	
CLR65BJ040KG	4	±10	60	40	69.0	3.0	550	1	2	-16	+5	+6	GT1	1078	1202	1326	1450	1574	
CLR65BJ8R2MG	*8.2	±20	60	40	69.0	5.0	275	1	2	-24	+8	+9	GT1	1079	1203	1327	1451	1575	
CLR65BJ8R2KG	*8.2	±10	60	40	69.0	5.0	275	1	2	-24	+8	+9	GT1	1080	1204	1328	1452	1576	
CLR65BJ200MG	20	±20	60	40	69.0	7.6	105	1	4.8	-16	+10.5	+12	GT2	1081	1205	1329	1453	1577	
CLR65BJ200KG	20	±10	60	40	69.0	7.6	105	1	4.8	-16	+10.5	+12	GT2	1082	1206	1330	1454	1578	
CLR65BJ390MG	*39	±20	60	40	69.0	20.3	90	1	9	-28	+10.5	+12	GT2	1083	1207	1331	1455	1579	
CLR65BJ390KG	*39	±10	60	40	69.0	20.3	90	1	9	-28	+10.5	+12	GT2	1084	1208	1332	1456	1580	
CLR65BJ500MG	50	±20	60	40	69.0	15.1	50	2	12	-16	+10.5	+12	GT3	1085	1209	1333	1457	1581	
CLR65BJ500KG	50	±10	60	40	69.0	15.1	50	2	12	-16	+10.5	+12	GT3	1086	1210	1334	1458	1582	
CLR65BJ680MG	*68	±20	60	40	69.0	29.3	50	2	16	-32	+10.5	+12	GT3	1087	1211	1335	1459	1583	
CLR65BJ680KG	*68	±10	60	40	69.0	29.3	50	2	16	-32	+10.5	+12	GT3	1088	1212	1336	1460	1584	
CLR65BK3R5MG	3.5	±20	75	50	86.2	2.5	650	1	2	-16	+5	+6	GT1	1089	1213	1337	1461	1585	
CLR65BK3R5KG	3.5	±10	75	50	86.2	2.5	650	1	2	-16	+5	+6	GT1	1090	1214	1338	1462	1586	
CLR65BK6R8MG	*6.8	±20	75	50	86.2	4.1	300	1	2	-20	+8	+9	GT1	1091	1215	1339	1463	1587	
CLR65BK6R8KG	*6.8	±10	75	50	86.2	4.1	300	1	2	-20	+8	+9	GT1	1092	1216	1340	1464	1588	
CLR65BK150MG	15	±20	75	50	86.2	7.5	150	1	4.5	-16	+8	+9	GT2	1093	1217	1341	1465	1589	
CLR65BK150KG	15	±10	75	50	86.2	7.5	150	1	4.5	-16	+8	+9	GT2	1094	1218	1342	1466	1590	
CLR65BK330MG	*33	±20	75	50	86.2	17.2	90	1	9.9	-24	+10.5	+15	GT2	1095	1219	1343	1467	1591	
CLR65BK330KG	*33	±10	75	50	86.2	17.2	90	1	9.9	-24	+10.5	+15	GT2	1096	1220	1344	1468	1592	
CLR65BK400MG	40	±20	75	50	86.2	15.0	60	2	12	-16	+10.5	+12	GT3	1097	1221	1345	1469	1593	
CLR65BK400KG	40	±10	75	50	86.2	15.0	60	2	12	-16	+10.5	+12	GT3	1098	1222	1346	1470	1594	
CLR65BK560MG	*56	±20	75	50	86.2	24.9	60	2	16.8	-28	+10.5	+15	GT3	1099	1223	1347	1471	1595	
CLR65BK560KG	*56	±10	75	50	86.2	24.9	60	2	16.8	-28	+10.5	+15	GT3	1100	1224	1348	1472	1596	
CLR65BM2R5MG	2.5	±20	100	65	115	1.9	950	1	2	-16	+7	+8	GT1	1101	1225	1349	1473	1597	
CLR65BM2R5KG	2.5	±10	100	65	115	1.9	950	1	2	-16	+7	+8	GT1	1102	1226	1350	1474	1598	
CLR65BM4R7MG	*4.7	±20	100	65	115	3.6	500	1	2	-16	+7	+8	GT1	1103	1227	1351	1475	1599	
CLR65BM4R7KG	*4.7	±10	100	65	115	3.6	500	1	2	-16	+7	+8	GT1	1104	1228	1352	1476	1600	
CLR65BM110MG	11	±20	100	65	115	5.0	200	1	4.4	-16	+7	+8	GT2	1105	1229	1353	1477	1601	
CLR65BM110KG	11	±10	100	65	115	5.0	200	1	4.4	-16	+7	+8	GT2	1106	1230	1354	1478	1602	
CLR65BM220MG	*22	±20	100	65	115	11.7	100	1	8.8	-16	+7	+8	GT2	1107	1231	1355	1479	1603	
CLR65BM220KG	*22	±10	100	65	115	11.7	100	1	8.8	-16	+7	+8	GT2	1108	1232	1356	1480	1604	
CLR65BM300MG	30	±20	100	65	115	9.1	80	2	12	-16	+7	+8	GT3	1109	1233	1357	1481	1605	
CLR65BM300KG	30	±10	100	65	115	9.1	80	2	12	-16	+7	+8	GT3	1110	1234	1358	1482	1606	

See footnotes at end of table.

MIL-C-39006/9A

Attachment II
ATM 241 Rev D

TABLE I. Capacitor characteristics and dash numbers (hermetically-sealed) (cont).

Type designation ^{1/}	Cap.	Cap. tol.	Voltage			Power factor	Imp. (max)	DC leakage (max)		Capacitance change at			Case size	2/Part No. M39006/09- Failure rate level (%/1, 000 hr)				
			Rated (85° C)	Derated (125° C)	Surge (85° C)			+ 25° C	+ 125° C + 85° C	-55° C	+ 85° C	+ 125° C		L(2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)
			volts	volts	volts			percent	percent	percent	percent	percent						
CLR65BM430MG	*43	± 20	100	65	115	19.3	70	2	17.2	-20	+ 7	+ 8	GT3	1111	1235	1359	1483	1607
CLR65BM430KG	*43	± 10	100	65	115	19.3	70	2	17.2	-20	+ 7	+ 8	GT3	1112	1236	1360	1484	1608
CLR65BP1R7MG	1.7	± 20	125	85	144	1.9	1250	1	2	-16	+ 7	+ 8	GT1	1113	1237	1361	1485	1609
CLR65BP1R7KG	1.7	± 10	125	85	144	1.9	1250	1	2	-16	+ 7	+ 8	GT1	1114	1238	1362	1486	1610
CLR65BP3R6MG	*3.6	± 20	125	85	144	4.1	600	1	2	-16	+ 7	+ 8	GT1	1115	1239	1363	1487	1611
CLR65BP3R6KG	*3.6	± 10	125	85	144	4.1	600	1	2	-16	+ 7	+ 8	GT1	1116	1240	1364	1488	1612
CLR65BP090MG	9	± 20	125	85	144	10.2	240	1	4.5	-16	+ 7	+ 8	GT2	1117	1241	1365	1489	1613
CLR65BP090KG	9	± 10	125	85	144	10.2	240	1	4.5	-16	+ 7	+ 8	GT2	1118	1242	1366	1490	1614
CLR65BP140MG	*14	± 20	125	85	144	12.6	167	1	7	-16	+ 7	+ 8	GT2	1119	1243	1367	1491	1615
CLR65BP140KG	*14	± 10	125	85	144	12.6	167	1	7	-16	+ 7	+ 8	GT2	1120	1244	1368	1492	1616
CLR65BP180MG	18	± 20	125	85	144	14.8	129	2	9	-16	+ 7	+ 8	GT3	1121	1245	1369	1493	1617
CLR65BP180KG	18	± 10	125	85	144	14.8	129	2	9	-16	+ 7	+ 8	GT3	1122	1246	1370	1494	1618
CLR65BP250MG	*25	± 20	125	85	144	18.7	93	2	12.5	-16	+ 7	+ 8	GT3	1123	1247	1371	1495	1619
CLR65BP250KG	*25	± 10	125	85	144	18.7	93	2	12.5	-16	+ 7	+ 8	GT3	1124	1248	1372	1496	1620

* Indicates high-capacitance series. Using different-sized tantalum powders during slug manufacture results in different electrical capacity for slugs of the same physical size. Finer grades are used in the high-capacitance series.

^{1/} Complete type designation will include an additional letter symbol to indicate failure rate level.

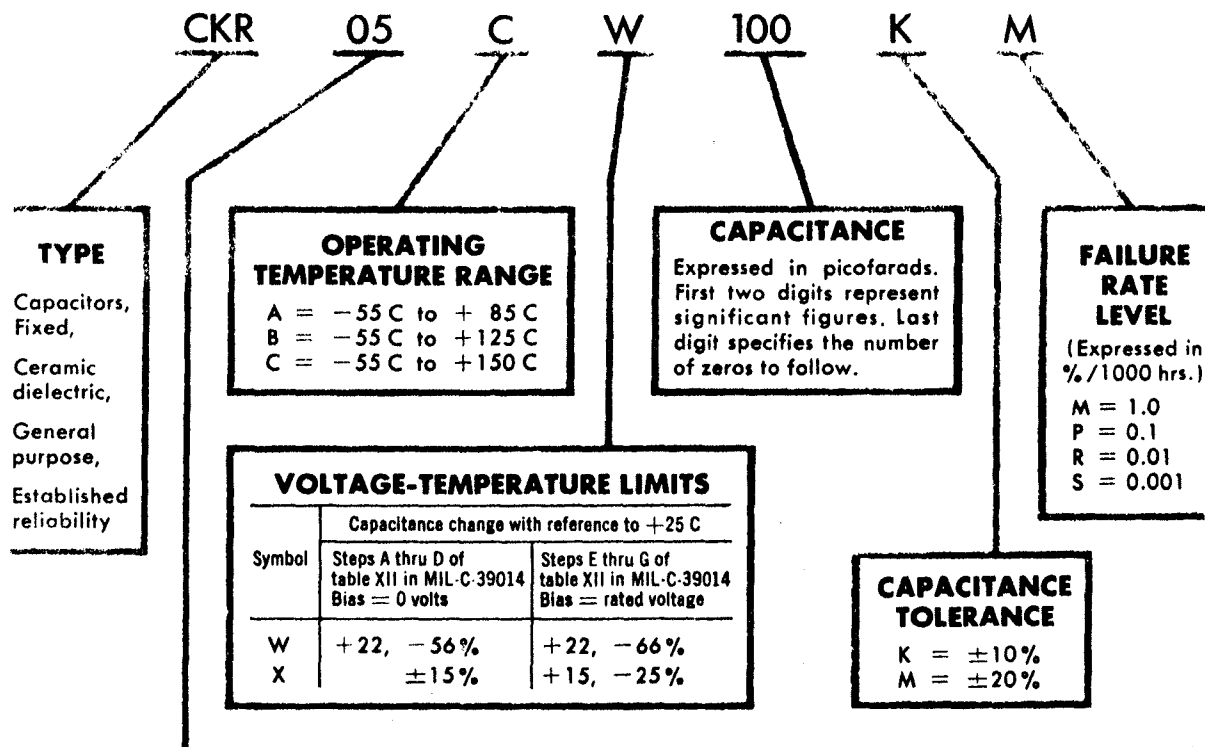
^{2/} Part number for GT1 case size shall be abbreviated (see "marking" requirement).

TITLE: CAPACITOR, FIXED

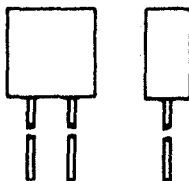
SECTION: MIL SPEC ABSTRACT

TYPE CKR

(MILITARY SPECIFICATION MIL-C-39014)

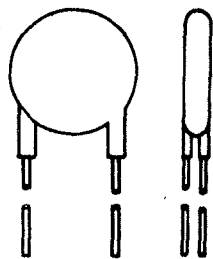


STYLE



rectangular case

05 = 10 pF to 1000 pF, .190"H. x .190"W. x .090"T.
06 = 1200 pF to 100000 pF, .290"H. x .290"W. x .090"T.
07 = 27 pF to 1000 pF, .080"H. x .080"W. x .050"T.
08 = 1500 pF to 3300 pF, .130"H. x .130"W. x .050"T.
09 = 4700 pF to 10000 pF, .230"H. x .230"W. x .050"T.
10 = 15000 pF, .330"H. x .330"W. x .050"T.



disc case

64 = 510 pF to 3900 pF, .730"D. x .167"T.



tubular case

12 = 10 pF to 10000 pF, .090"D. x .250"L.
13 = 15000 pF to 100000 pF, .190"D. x .490"L.



tubular case feed-through style

72 = 100 pF to 1000 pF, .250"D. x .875"L.

MIL-C-39014/1A
1 February 1968
SUPERSEDING
MIL-C-39014/1
17 February 1964

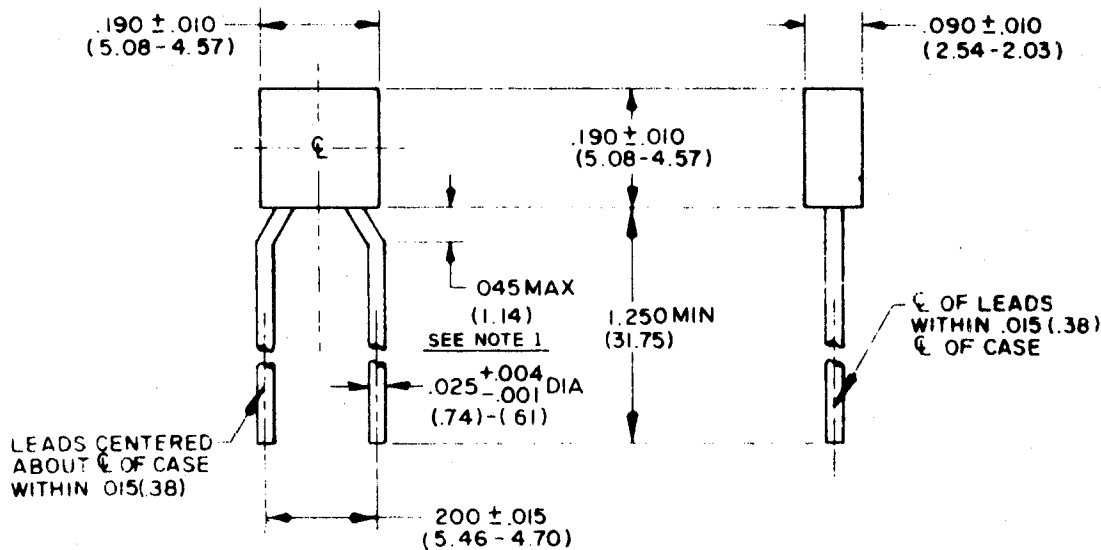
MILITARY SPECIFICATION SHEET
CAPACITORS, FIXED, CERAMIC DIELECTRIC

(GENERAL PURPOSE)

ESTABLISHED RELIABILITY,

STYLE CKR05

The complete requirements for procuring the capacitors described herein shall consist of this document and the latest issue in effect of Specification MIL-C-39014.



NOTES:

1. For flush mounting, a 5/64 (1.98) printed-circuit-hole diameter is required to clear shoulder.
2. Dimensions are in inches.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Millimeters are in parentheses.

REQUIREMENTS:

Dimensions and configuration: See above figure and table I.

Case type: Molded or preformed.

Capacitance value: See table I.

Capacitance tolerance: See table I.

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

FSC 5910

Ⓐ For changes see pages 2 and 3.

MIL-C-39014/1A

TABLE I.

Type designation ^{1/}	DC rated voltage	Operating temperature range and voltage-temperature limits	Capacitance	Capacitance tolerance ^{2/}	Dash number Failure rate level (%/1,000 hours)			
					(M)1.0	(P)0.1	(R)0.01	(S)0.001
	volts	(A)	pf		(A)	(A)	(A)	(A)
CKR05BX100K-	200	BX	10	K	0201	0241	0281	0321
CKR05BX100M-	200	BX	10	M	0202	0242	0282	0322
CKR05BX120K-	200	BX	12	K	0203	0243	0283	0323
CKR05BX150K-	200	BX	15	K	0204	0244	0284	0324
CKR05BX150M-	200	BX	15	M	0205	0245	0285	0325
CKR05BX180K-	200	BX	18	K	0206	0246	0286	0326
CKR05BX220K-	200	BX	22	K	0207	0247	0287	0327
CKR05BX220M-	200	BX	22	M	0208	0248	0288	0328
CKR05BX270K-	200	BX	27	K	0209	0249	0289	0329
CKR05BX330K-	200	BX	33	K	0210	0250	0290	0330
CKR05BX330M-	200	BX	33	M	0211	0251	0291	0331
CKR05BX390K-	200	BX	39	K	0212	0252	0292	0332
CKR05BX470K-	200	BX	47	K	0213	0253	0293	0333
CKR05BX470M-	200	BX	47	M	0214	0254	0294	0334
CKR05BX560K-	200	BX	56	K	0215	0255	0295	0335
CKR05BX680K-	200	BX	68	K	0216	0256	0296	0336
CKR05BX680M-	200	BX	68	M	0217	0257	0297	0337
CKR05BX820K-	200	BX	82	K	0218	0258	0298	0338
CKR05BX101K-	200	BX	100	K	0219	0259	0299	0339
CKR05BX101M-	200	BX	100	M	0220	0260	0300	0340
CKR05BX121K-	200	BX	120	K	0221	0261	0301	0341
CKR05BX151K-	200	BX	150	K	0222	0262	0302	0342
CKR05BX151M-	200	BX	150	M	0223	0263	0303	0343
CKR05BX181K-	200	BX	180	K	0224	0264	0304	0344
CKR05BX221K-	200	BX	220	K	0225	0265	0305	0345
CKR05BX221M-	200	BX	220	M	0226	0266	0306	0346
CKR05BX271K-	200	BX	270	K	0227	0267	0307	0347
CKR05BX331K-	200	BX	330	K	0228	0268	0308	0348
CKR05BX331M-	200	BX	330	M	0229	0269	0309	0349
CKR05BX391K-	200	BX	390	K	0230	0270	0310	0350
CKR05BX471K-	200	BX	470	K	0231	0271	0311	0351
CKR05BX471M-	200	BX	470	M	0232	0272	0312	0352
CKR05BX561K-	200	BX	560	K	0233	0273	0313	0353
CKR05BX681K-	200	BX	680	K	0234	0274	0314	0354
CKR05BX681M-	200	BX	680	M	0235	0275	0315	0355
CKR05BX821K-	200	BX	820	K	0236	0276	0316	0356
CKR05BX102K-	200	BX	1,000	K	0237	0277	0317	0357
CKR05BX102M-	200	BX	1,000	M	0238	0278	0318	0358

^{1/}Complete type designation will include an additional symbol to indicate failure rate level.
^{2/}Capacitance tolerance in percent: K, ± 10 ; M, ± 20 .

(A) For changes see pages 2 and 3

MIL-C-39014/1A

- Voltage conditioning: 200 percent of rated voltage at 125°C for 100 hours.
- Capacitance: Method 305 of Standard MIL-STD-202.
Test frequency: 1 kHz $\pm$ 100 Hz at 2 $\pm$ 0.25 volts rms applied.
- Dissipation factor: Not more than 2.5 percent.
- Dielectric withstanding voltage:
Dielectric: Method 301 of MIL-STD-202, 500 volts dc.
Body insulation: Shall be able to withstand 1,300 volts between leads and case.
- Barometric pressure: Method 105 of MIL-STD-202, condition D (100,000 ft), 200 volts.
- Insulation resistance: Method 302 of MIL-STD-202 (measured with 200 volts dc applied): Shall be not less than 100,000 megohms at 25°C and 10,000 megohms at 125°C.
- Solderability: Method 208 of MIL-STD-202.
- Voltage-temperature limits: In accordance with MIL-C-39014.
- Vibration, high frequency: Method 204 of MIL-STD-202, condition D.
- ① Temperature cycling and immersion: Method 102 of MIL-STD-202, condition B.
Method 104, condition B.
IR not less than 50,000 megohms.
- Shock, medium impact: Method 205 of MIL-STD-202, condition C.
- ① Terminal strength: Method 211 of MIL-STD-202, conditions A and C.
- ① Moisture resistance: Method 106 of MIL-STD-202, 20 cycles.
IR not less than 10,000 megohms.
 Δ C - Less than $\pm$ 10 percent from initial measured value.
- ① Fungus: Method 508 of MIL-STD-810.
- ① Resistance to soldering heat: Method 210 of MIL-STD-202.
IR not less than 100,000 megohms at 25°C.
 Δ C - Less than 5 percent from initial measured value.
Dissipation factor: Not more than 2.5 percent.
- ① Resistance to solvents: In accordance with MIL-C-39014.
- ① Life: Method 108 of MIL-STD-202.
Rated conditions, 100 percent of dc rated voltage at 125°C.
0 through 32,000 hours:
IR - Not less than 10,000 megohms at 25°C and 500 megohms at 125°C.
 Δ C - Less than $\pm$ 20 percent from initial measured value.
Dissipation factor - Not more than 2.5 percent.
Accelerated conditions, 200 percent of dc rated voltage at 125°C.
0 and 250 hours:
IR - Not less than 50,000 megohms at 25°C and 5,000 megohms at 125°C.
 Δ C - Less than $\pm$ 20 percent from initial measured value.
Dissipation factor - Not more than 2.5 percent.
1,000; 2,000; 4,000 hours:
IR - Not less than 10,000 megohms at 25°C and 5,000 megohms at 125°C.
 Δ C - Less than $\pm$ 20 percent from initial measured value.
Dissipation factor - Not more than 2.5 percent.
- Marking: In accordance with MIL-C-39014.

① For changes see pages 2 and 3.

MIL-C-39014/1A

Part number: Consists of the basic
number of this specification sheet
and a dash number taken from table I.

Example:

↙ M39014/01-0201 ↘
↓ ↓
Basic Dash number
document from
number table I.

Custodians:

Army - EL
Navy - EC
Air Force - 11

Preparing activity:

Army - EL

(Project 5910-0811)

Review activities:

Army - MI, MU
Navy - EC
Air Force - 11, 17, 85

Code "C"

User activities:

Army - ME, AT, AV
Navy - MC
Air Force - 19

④ For changes see pages 2 and 3.

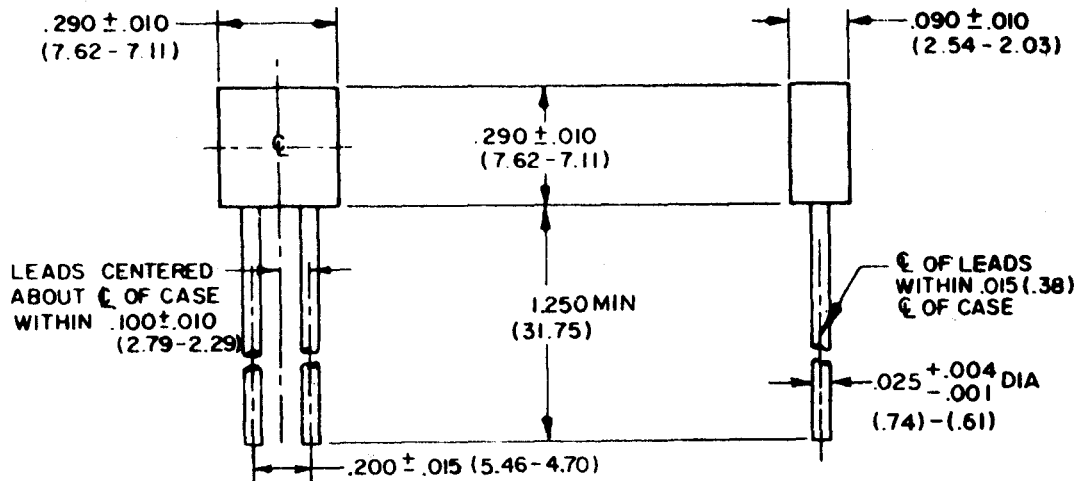
MIL-C-39014/2C
30 September 1968
SUPERSEDING
MIL-C-39014/2B
1 February 1968

MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, CERAMIC DIELECTRIC
(GENERAL PURPOSE)
ESTABLISHED RELIABILITY,
STYLE CKR06

The complete requirements for procuring the capacitors described herein shall consist of this document and the latest issue of Specification MIL-C-39014.

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



NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. Millimeters are in parentheses.

REQUIREMENTS:

Dimensions and configuration: See above figure and table I. Capacitance tolerance: See table I.

Case type: Molded or preformed. Operating temperature range: -55°C to $+125^{\circ}\text{C}$.

Capacitance value: See table I.

© For changes, see pages 2 and 3.

FSC 5910

MIL-C-39014/2C

TABLE I.

Type designation ^{1/}	DC rated voltage	Operating temperature range and voltage-temperature limits	Capacitance	Capacitance tolerance 2/	Dash number Failure rate level (%/1,000 hours)			
					(M)1.0	(P)0.1	(R)0.01	(S)0.001
	<u>volts</u>		<u>pf</u>					
CKR06BX122K-	200	BX	1,200	K	0201	0241	0281	0321
CKR06BX152K-	200	BX	1,500	K	0202	0242	0282	0322
CKR06BX152M-	200	BX	1,500	M	0203	0243	0283	0323
CKR06BX182K-	200	BX	1,800	K	0204	0244	0284	0324
CKR06BX202K-	200	BX	2,000	K	0205	0245	0285	0325
CKR06BX222K-	200	BX	2,200	K	0206	0246	0286	0326
CKR06BX222M-	200	BX	2,200	M	0207	0247	0287	0327
CKR06BX272K-	200	BX	2,700	K	0208	0248	0288	0328
CKR06BX332K-	200	BX	3,300	K	0209	0249	0289	0329
CKR06BX332M-	200	BX	3,300	M	0210	0250	0290	0330
CKR06BX392K-	200	BX	3,900	K	0211	0251	0291	0331
CKR06BX472K-	200	BX	4,700	K	0212	0252	0292	0332
CKR06BX472M-	200	BX	4,700	M	0213	0253	0293	0333
CKR06BX562K-	200	BX	5,600	K	0214	0254	0294	0334
CKR06BX682K-	200	BX	6,800	K	0215	0255	0295	0335
CKR06BX682M-	200	BX	6,800	M	0216	0256	0296	0336
CKR06BX822K-	200	BX	8,200	K	0217	0257	0297	0337
CKR06BX103K-	200	BX	10,000	K	0218	0258	0298	0338
CKR06BX103M-	200	BX	10,000	M	0219	0259	0299	0339
CKR06BX153K-	100	BX	15,000	K	0220	0260	0300	0340
CKR06BX183K-	100	BX	18,000	K	0221	0261	0301	0341
CKR06BX223K-	100	BX	22,000	K	0222	0262	0302	0342
CKR06BX333K-	100	BX	33,000	K	0223	0263	0303	0343
CKR06BX393K-	100	BX	39,000	K	0224	0264	0304	0344
CKR06BX473K-	100	BX	47,000	K	0225	0265	0305	0345
CKR06BX563K-	100	BX	56,000	K	0226	0266	0306	0346
CKR06BX683K-	100	BX	68,000	K	0227	0267	0307	0347
CKR06BX723K-	100	BX	72,000	K	0228	0268	0308	0348
CKR06BX823K-	100	BX	82,000	K	0229	0269	0309	0349
CKR06BX104K-	100	BX	100,000	K	0230	0270	0310	0350

^{1/}Complete type designation will include an additional symbol to indicate failure rate level.
^{2/}Capacitance tolerance in percent: K, ± 10 ; M, ± 20 .

For changes, see pages 2 and 3.

MIL-C-39014/2C

Voltage conditioning: 200 percent of rated voltage at 125°C for 100 hours.

Capacitance: Method 305 of Standard MIL-STD-202.

Test frequency: 1 kHz $\pm$ 100 Hz at 2 $\pm$ 0.25 volts rms applied.

Dissipation factor: Not more than 2.5 percent.

Dielectric withstanding voltage:

(C) Dielectric: Method 301 of MIL-STD-202, 250 percent of rated voltage applied.

Body insulation: Shall be able to withstand 1,300 volts between leads and case.

Barometric pressure: Method 105 of MIL-STD-202, condition D (100,000 ft), with rated voltage applied.

(C) Insulation resistance: Method 302 of MIL-STD-202 (measured with rated voltage applied); Shall be not less than the value shown on figure 1 of MIL-C-39014.

Solderability: Method 208 of MIL-STD-202.

Voltage-temperature limits: In accordance with MIL-C-39014.

Vibration, high frequency: Method 204 of MIL-STD-202, condition D.

Temperature cycling and immersion: Method 102 of MIL-STD-202, condition D.
Method 104, condition B. IR not less than 50 percent of the value shown on figure 1 of MIL-C-39014.

Shock, medium impact: Method 205 of MIL-STD-202, condition C.

Terminal strength: Method 211 of MIL-STD-202, conditions A and C.

Moisture resistance: Method 106 of MIL-STD-202, 20 cycles.
IR not less than 10 percent of the 25°C value shown on figure 1 of MIL-C-39014.
 ΔC - Not less than ± 10 percent from initial measured value.

Fungus: Method 508 of MIL-STD-810.

(C) Resistance to soldering heat: Method 210 of MIL-STD-202.
IR not less than the initial value at 25°C.
 ΔC - Less than 5 percent from initial measured value.
Dissipation factor: Not more than 2.5 percent.

Resistance to solvents: In accordance with MIL-C-39014.

Life: Method 108 of MIL-STD-202.
Rated conditions, 100 percent of dc rated voltage at 125°C.
0 through 32,000 hours:
IR - At 25°C, not less than 10 percent of the 25°C value shown on figure 1 of MIL-C-39014.
IR at 125°C, not less than 5 percent of the 125°C value shown on figure 1 of MIL-C-39014.
 ΔC - Less than ± 20 percent from initial measured value.
Dissipation factor - Not more than 2.5 percent.
Accelerated conditions, 200 percent of dc rated voltage at 125°C.
0,250 hours:
IR - not less than 50 percent of the initial requirement at 25°C and 125°C.
 ΔC - Less than ± 20 percent from initial measured value.
Dissipation factor - Not more than 2.5 percent.
1,000; 2,000; 4,000 hours:
IR - At 25°C, not less than 10 percent of the 25°C value shown on figure 1 of MIL-C-39014;
IR - At 125°C, not less than 5 percent of the 125°C value shown on figure 1 of MIL-C-39014.
 ΔC - Less than ± 20 percent from initial measured value.
Dissipation factor - Not more than 2.5 percent.

Marking: In accordance with MIL-C-39014.

For changes see pages 2 and 3.

MIL-C-39014/2C

Part number: Consists of the basic number of this specification sheet and a dash number taken from table I.

Example:

M39014/02-0201

Basic document number	Dash number from table I.
-----------------------------	---------------------------------

Custodians:

Army - EL
Navy - EC
Air Force - 11

Preparing activity:

Army - EL

(Project 5910-0965)

Review activities:

Army - MI, MU
Navy - EC
Air Force - 11, 17, 85

User activities:

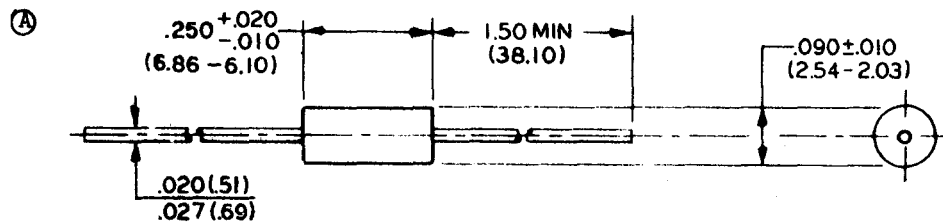
Army - ME, AT, AV
Navy - MC
Air Force - 19

For changes see pages 2 and 3.

MIL-C-39014/5A
1 February 1968
SUPERSEDING
MIL-C-39014/5
17 February 1964

MILITARY SPECIFICATION SHEET
CAPACITORS, FIXED, CERAMIC DIELECTRIC
(GENERAL PURPOSE),
ESTABLISHED RELIABILITY,
STYLE CKR12

The complete requirements for procuring the capacitors described herein shall consist of this document and the latest issue in effect of Specification MIL-C-39014.



NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. Millimeters are in parentheses.

FIGURE 1.

REQUIREMENTS:

Dimensions and configuration: See figure 1 and table I.

Case type: Tubular.

Capacitance value: See table I.

Capacitance tolerance: See table I.

Operating temperature range:
-55°C to +125°C, see figure 2.

Voltage conditioning: 200 percent of rated voltage at 125°C for 100 hours.

Capacitance: Method 305 of MIL-STD-202.

Test frequency and applied voltage: In accordance with MIL-C-39014.

Dissipation factor:
Not more than 2.5 percent.

Dielectric withstanding voltage:
Dielectric: Method 301 of MIL-STD-202, 250 volts dc.

Barometric pressure: Method 105 of MIL-STD-202, condition D (100,000 ft.), 100 volts.

Insulation resistance: Method 302 of MIL-STD-202 (measured with 100 volts dc applied):
Shall be not less than 100,000 megohms at 25°C and 10,000 megohms at 85°C and 125°C.

(A) For changes see pages 1, 3, and 4

FSC 5910

MIL-C-39014/5A

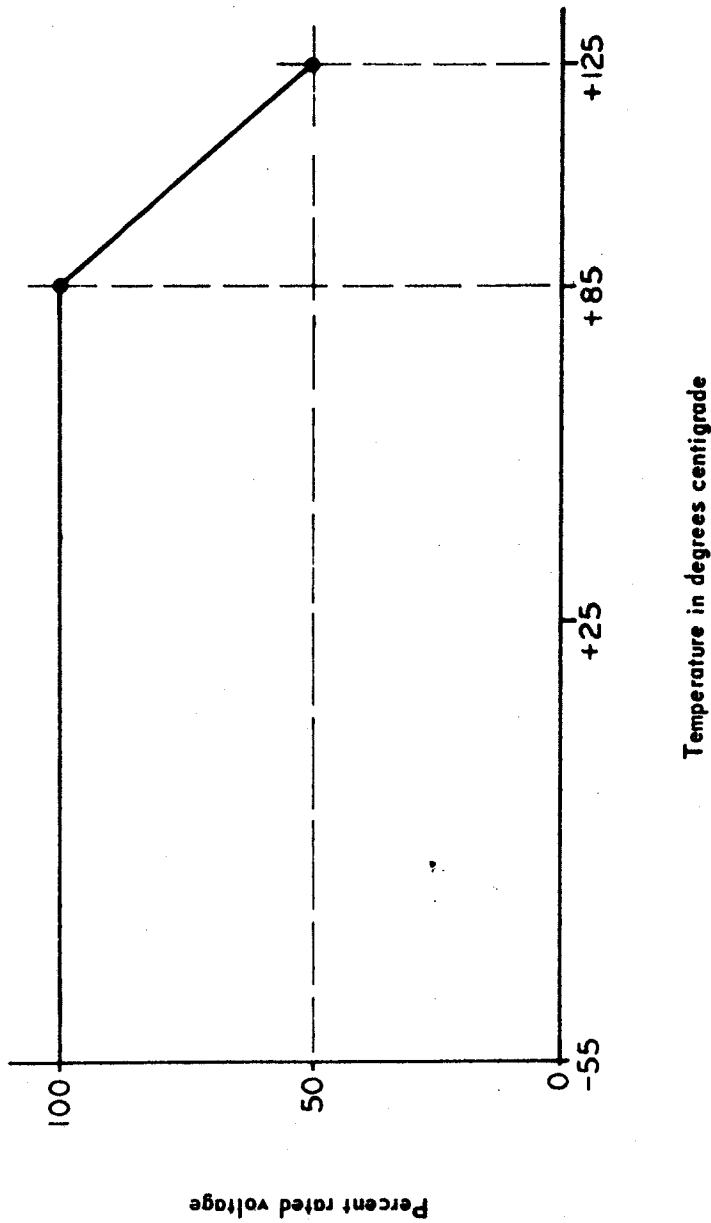


FIGURE 2. Voltage derating with temperature.

Ⓐ For changes see pages 1, 3, and 4.

MIL-C-39014/5A

TABLE 1.

Type designation ^{1/}	DC rated voltage ^{2/}	Operating temperature range and voltage-temperature limits	Capacitance	Capacitance tolerance ^{3/}	Dash number Failure rate level (%/1,000 hours) ^{4/}			
					(M)1.0	(P)0.1	(R)0.01	(S)0.001
	volts		pf		(A)	(A)	(A)	(A)
CKR12BX100K-	100	BX	10	K	0201	0251	0301	0351
CKR12BX100M-	100	BX	10	M	0202	0252	0302	0352
CKR12BX220K-	100	BX	22	K	0203	0253	0303	0353
CKR12BX220M-	100	BX	22	M	0204	0254	0304	0354
CKR12BX330K-	100	BX	33	K	0205	0255	0305	0355
CKR12BX330M-	100	BX	33	M	0206	0256	0306	0356
CKR12BX470K-	100	BX	47	K	0207	0257	0307	0357
CKR12BX470M-	100	BX	47	M	0208	0258	0308	0358
CKR12BX560K-	100	BX	56	K	0209	0259	0309	0359
CKR12BX680K-	100	BX	68	K	0210	0260	0310	0360
CKR12BX680M-	100	BX	68	M	0211	0261	0311	0361
CKR12BX820K-	100	BX	82	K	0212	0262	0312	0362
CKR12BX820M-	100	BX	82	M	0213	0263	0313	0363
CKR12BX101K-	100	BX	100	K	0214	0264	0314	0364
CKR12BX101M-	100	BX	100	M	0215	0265	0315	0365
CKR12BX151K-	100	BX	150	K	0216	0266	0316	0366
CKR12BX151M-	100	BX	150	M	0217	0267	0317	0367
CKR12BX181K-	100	BX	180	K	0218	0268	0318	0368
CKR12BX221K-	100	BX	220	K	0219	0269	0319	0369
CKR12BX221M-	100	BX	220	M	0220	0270	0320	0370
CKR12BX331K-	100	BX	330	K	0221	0271	0321	0371
CKR12BX331M-	100	BX	330	M	0222	0272	0322	0372
CKR12BX391K-	100	BX	390	K	0223	0273	0323	0373
CKR12BX471K-	100	BX	470	K	0224	0274	0324	0374
CKR12BX471M-	100	BX	470	M	0225	0275	0325	0375
CKR12BX561K-	100	BX	560	K	0226	0276	0326	0376
CKR12BX681K-	100	BX	680	K	0227	0277	0327	0377
CKR12BX681M-	100	BX	680	M	0228	0278	0328	0378
CKR12BX721K-	100	BX	720	K	0229	0279	0329	0379
CKR12BX821K-	100	BX	820	K	0230	0280	0330	0380
CKR12BX821M-	100	BX	820	M	0231	0281	0331	0381
CKR12BX102K-	100	BX	1,000	K	0232	0282	0332	0382
CKR12BX102M-	100	BX	1,000	M	0233	0283	0333	0383
CKR12BX122K-	100	BX	1,200	K	0234	0284	0334	0384
CKR12BX152K-	100	BX	1,500	K	0235	0285	0335	0385
CKR12BX152M-	100	BX	1,500	M	0236	0286	0336	0386
CKR12BX182K-	100	BX	1,800	K	0237	0287	0337	0387
CKR12BX222K-	100	BX	2,200	K	0238	0288	0338	0388
CKR12BX222M-	100	BX	2,200	M	0239	0289	0339	0389
CKR12BX332K-	100	BX	3,300	K	0240	0290	0340	0390
CKR12BX332M-	100	BX	3,300	M	0241	0291	0341	0391
CKR12BX472K-	100	BX	4,700	K	0242	0292	0342	0392
CKR12BX472M-	100	BX	4,700	M	0243	0293	0343	0393
CKR12BX682K-	100	BX	6,800	K	0244	0294	0344	0394
CKR12BX682M-	100	BX	6,800	M	0245	0295	0345	0395
CKR12BX103K-	100	BX	10,000	K	0246	0296	0346	0396
CKR12BX103M-	100	BX	10,000	M	0247	0297	0347	0397

^{1/}Complete type designation will include an additional symbol to indicate failure rate level.

^{2/}For operation at 125°C the dc rated voltage shall be derated by 50 percent.

^{3/}Capacitance tolerance in percent: K, ±10; M, ±20.

^{4/}Dash numbers -0201 thru -0237 of this specification shall unilaterally supersede and be acceptable substitutes for MIL-C-38102/12 style 12EC units of equivalent capacitance, capacitance tolerance, and failure rate level.

(A) For changes see pages 1, 3, and 4.

MIL-C-39014/5A

Solderability: Method 208 of
MIL-STD-202.

Voltage-temperature limits:
In accordance with MIL-C-39014.

Vibration, high frequency: Method
204 of MIL-STD-202, condition D.

- (A) Temperature cycling and immersion:
Method 102 of MIL-STD-202,
condition D.
Method 104, condition B.
IR not less than 50,000 megohms.

Shock, medium impact: Method 205 of
MIL-STD-202, condition C.

- (A) Terminal strength: Method 211 of
MIL-STD-202, conditions A and D.

- (A) Moisture resistance: Method 106 of
MIL-STD-202, 20 cycles.
IR not less than 10,000 megohms.
Capacitance change: Not less
than ± 10 percent from initial
measured value.

- (A) Fungus: Method 508 of MIL-STD-810.

- (A) Resistance to soldering heat:
Method 210 of MIL-STD-202.
IR not less than 100,000 megohms
at 25°C.
 ΔC - Less than 5 percent from
initial measured value.
Dissipation factor: Not more
than 0.5 percent.

Resistance to solvents: In accord-
ance with MIL-C-39014.

- (A) Life: Method 108 of MIL-STD-202.
Rated conditions, 100 percent of
dc rated voltage at 125°C:
0 through 16,000 hours:
IR - Not less than 50,000
megohms at 25°C and 125°C.
 ΔC - Less than ± 10 percent
from initial measured value.
Dissipation factor - Not more
than 2.5 percent.

- (A) For changes see pages 1, 3, and 4.

16,000 - 32,000 hours:

IR - Not less than 10,000 meg-
ohms at 25°C and 500 megohms
at 125°C.

ΔC - Less than ± 20 percent from
initial measured value.

Dissipation factor - Not more
than 2.5 percent.

Accelerated conditions, 200 percent
of dc rated voltage at 85°C or
125°C.

0 through 2,000 hours:

IR - Not less than 50,000 meg-
ohms at 25°C and 10,000 meg-
ohms at 85°C or 125°C.

ΔC - Less than ± 10 percent
from initial measured value.

Dissipation factor - Not more
than 2.5 percent.

2,000 - 4,000 hours:

IR - Not less than 10,000 meg-
ohms at 25°C and 500 megohms
at 125°C.

ΔC - Less than ± 20 percent
from initial measured value.

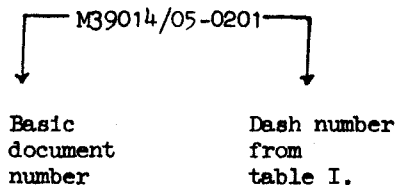
Dissipation factor - Not more
than 2.5 percent.

Marking: In accordance with
MIL-C-39014.

Part number:

Consists of the basic number of
this specification sheet and a dash
number taken from table I.

Example:



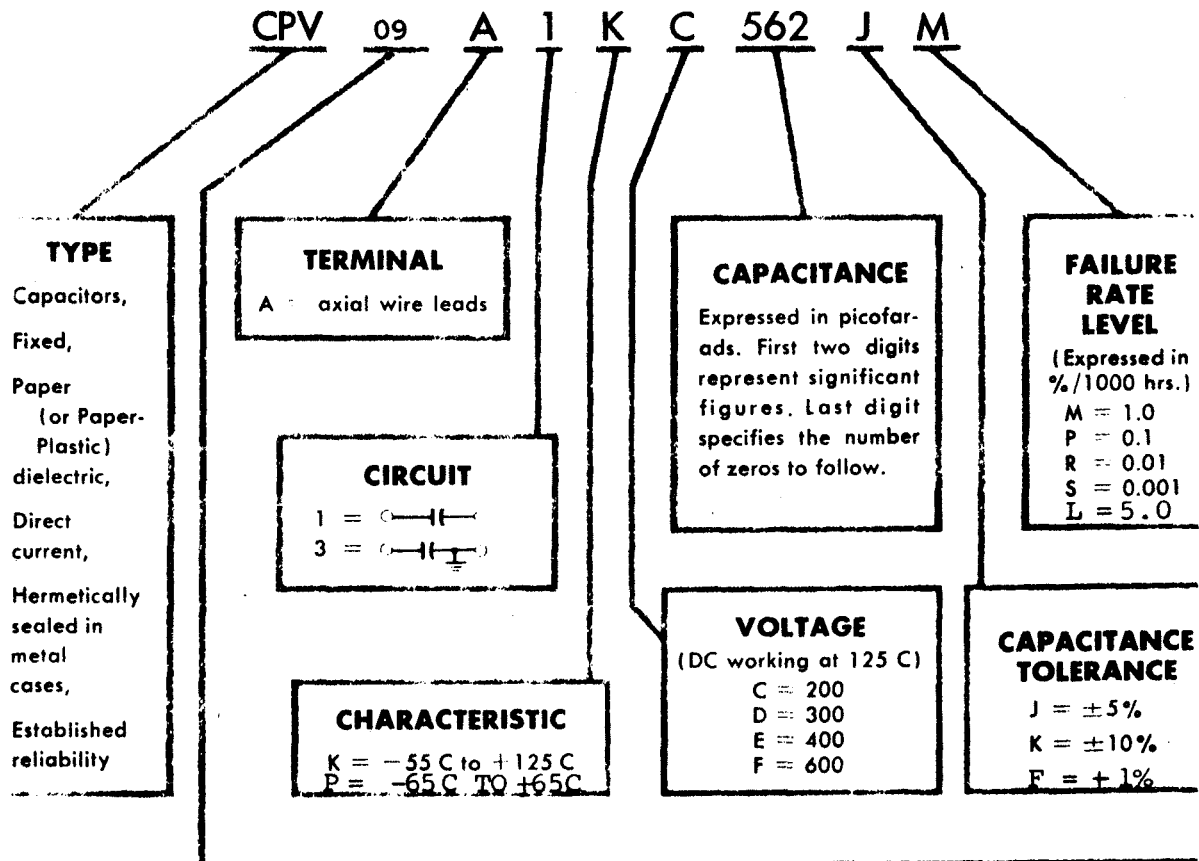
PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: CAPACITOR, FIXED

SECTION: MIL SPEC ABSTRACT

TYPE CPV

(MILITARY SPECIFICATION MIL-C-14157D)



STYLE



round tubular case

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: RESISTORS

SECTION: GENERAL CHARACTERISTICS

To select properly the resistors to be used, the user must know as much as possible about the types from which he can choose. He should know their advantages and disadvantages, their behavior under various environmental conditions, their construction, their effect on circuits and the effects of circuits on them. He should know what makes resistors fail. He must have an intimate working knowledge of the military specifications that govern the procurement of resistors for his equipment and should have a clear picture of what these specifications will not do, as well as what they will do.

RESISTOR TYPES:

They are either composition types, high-stability film types, or wirewound types. As the name indicates, the composition resistor is made of a mixture of resistive material and a binder which are molded into the proper shape and resistance value. The film type is composed of a resistive film deposited on, or inside of, an insulating cylinder or filament. The wirewound type is made up of resistance wire, wound on an insulated form.

These basic types differ from each other in size, cost, resistance and power rating, and general characteristics. Some are better than others for particular purposes; no one type has all the best characteristics. The choice among them, therefore, depends on the requirements, both initial and long-term; the environment in which they must exist; and numerous other factors which the designer must understand.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: RESISTORS

SECTION: APPLICATION

Fixed Composition

Small; inexpensive; good reliability when properly used; poor stability; poor noise characteristic; appreciable voltage and temperature coefficients; good high-frequency characteristics but not controlled by specification.

Fixed Film

High stability; low voltage and temperature coefficients; expensive compared to composition-type resistors; more fragile and subject to mechanical damage than composition types; useful where accurate wirewound types cannot be used. Vhf types, in addition to the above advantages and disadvantages, have low capacitive and inductive reactance.

Wirewound, Power

High stability; medium temperature coefficient; high reliability; negligible voltage coefficient; poor high-frequency characteristics; capable of dissipating considerable heat; negligible noise.

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: RESISTORS

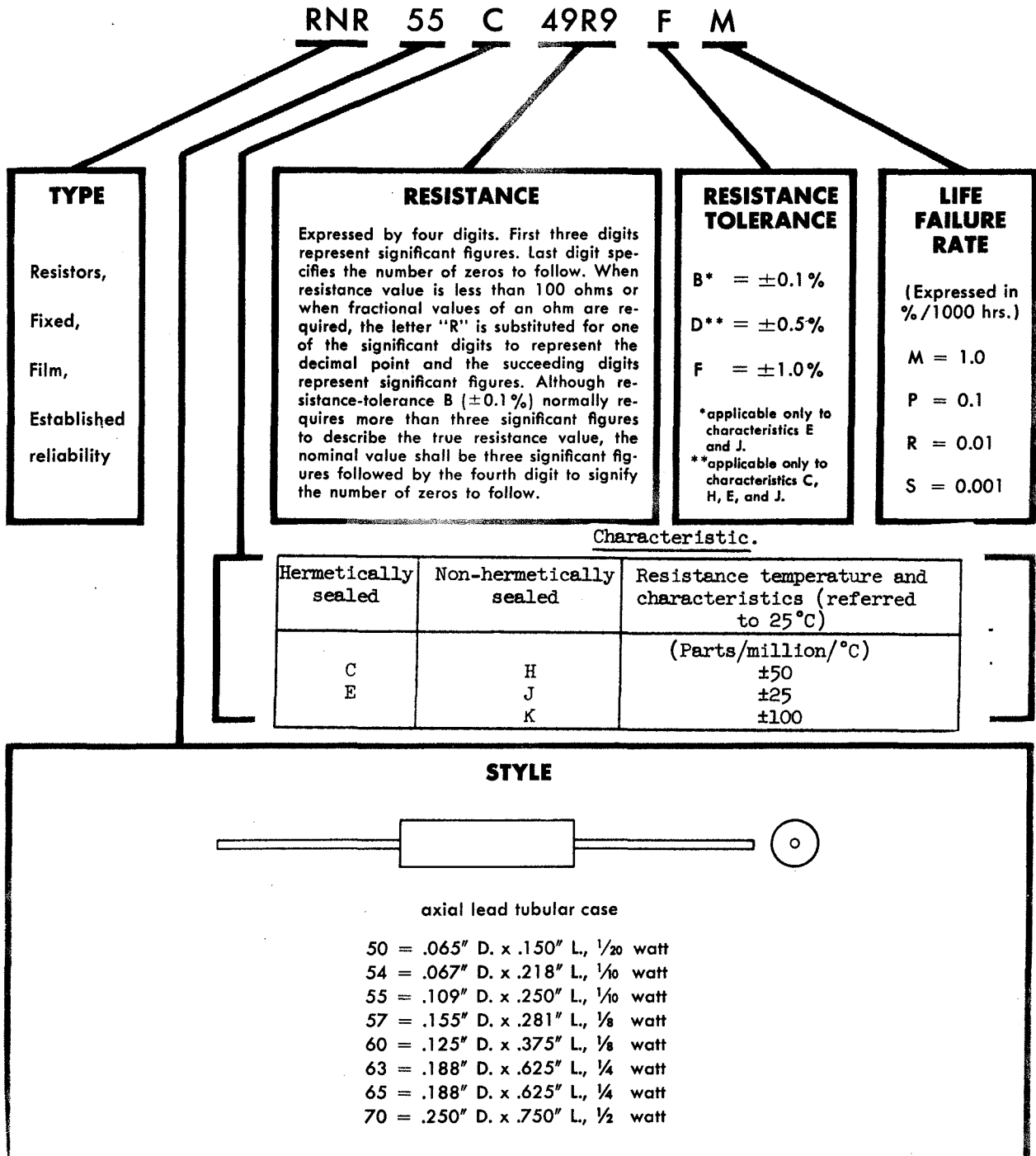
SECTION: APPLICATION CHECKLIST

1. Select a resistor for each circuit application from the lists of standard values, or in the applicable military specification.
2. Be sure that the circuit being designed will work with any resistor whose resistance value is within the limits set by tolerance plus voltage coefficient plus temperature coefficient plus drift with time.
3. Failure to take these precautions will mean that in equipments produced in quantity for the armed services there will be some circuits that will not work under extreme conditions.

Rating. The minimum required power rating of a resistor is another factor that is initially set by the circuit usage, but is markedly affected by the other conditions of use. As mentioned above, the power rating is based on the hot-spot temperature that the resistor will stand, while still meeting its other requirements of resistance variation, accuracy, and life.

TYPE RNR

(MILITARY SPECIFICATION MIL-R-55182B)



MIL-R-55182C
18 November 1966
SUPERSEDING
MIL-R-55182B
8 September 1964
MIL-R-38101A
15 October 1963
(See Section Six)

MILITARY SPECIFICATION

RESISTORS, FIXED, FILM,

ESTABLISHED RELIABILITY

GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for hermetically sealed (see 3.11), and non-hermetically sealed (see 3.11.1), film, fixed resistors that possess a high degree of stability with respect to time under severe environmental conditions, with an established reliability. Resistors covered by this specification will have life failure rates ranging from 1 percent to 0.001 percent per 1,000 hours (see 1.2.1.5). These failure rates are established at 60-percent confidence on the basis of life tests. The failure rate, identified by the appropriate symbol, is referred to operation at full rated voltage and rated temperature, with a permissible change in resistance of ± 2 percent as the criteria for failure. Table I of supplement 1 provides a summary of performance characteristics for these resistors.

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):

RNR55	C	49R9	F	M
└─┘	└─┘	└─┘	└─┘	└─┘
Style and terminal type (1.2.1.1)	Characteristic (1.2.1.2)	Resistance (1.2.1.3)	Resistance tolerance (1.2.1.4)	Life failure rate (1.2.1.5)

1.2.1.1 Style and terminal type. The style and terminal type is identified by a three letter symbol as indicated in table I and a two-digit number. The letters identify established reliability, film, fixed, resistors, of a specified terminal type and the number identifies the size of the resistor.

FSC 5905

MIL-R-55182C

TABLE I. Terminal type.

Symbol	Terminal
RNR	Solderable
RNC	Solderable/weldable (type C of MIL-STD-1276)
RND	Weldable (type D of MIL-STD-1276) $\frac{1}{/}$
RNN	Weldable (type N-2 of MIL-STD-1276) $\frac{1}{/}$

$\frac{1}{/}$ Not applicable to characteristics H, J and K.

1.2.1.2 Characteristic. The characteristic is identified by a single letter in accordance with table II.

TABLE II. Characteristic.

Hermetically sealed	Non-hermetically sealed	Resistance temperature characteristics (referred to 25°C)
		(Parts/million/°C)
C	H	±50
E	J	±25
	K	±100

1.2.1.3 Resistance. The nominal resistance expressed in ohms is identified by four digits; the first three digits represent significant figures and the last digit specifies the number of zeros to follow. When the value of resistance is less than 100 ohms, or when fractional values of an ohm are required, the letter "R" shall be substituted for one of the significant digits to represent the decimal point. When the letter "R" is used, succeeding digits of the group represent significant figures. The resistance-value designations are shown in table III. Minimum and maximum resistance values shall be as specified (see 3.1). The standard values for every decade shall follow the sequence demonstrated for the "10 to 100" decade in table IV. Although resistance-tolerance B (see 1.2.1.4) normally requires more than three significant figures to adequately describe the true resistance value, for the purpose of this specification, the nominal value shall be three significant figures followed by the fourth digit to signify the number of zeros to follow.

TABLE III. Designation of resistance values.

Designation	Resistance
	Ohms
10R0 to 97R6 incl - - - - -	10.0 to 97.6 incl
1000 to 9760 incl - - - - -	100 to 976 incl
1001 to 9761 incl - - - - -	1,000 to 9,760 incl
1002 to 9762 incl - - - - -	10,000 to 97,600 incl
1003 to 9763 incl - - - - -	0.1 megohm to 0.976 megohm, incl
1004 to 9764 incl - - - - -	1.0 megohm to 9.76 megohms, incl

MIL-R-55182C

TABLE IV. Standard resistance values for the 10 to 100 decade.

Resistance tolerance																	
B ^{1/} (0.1)	D (0.5)	F (1.0)	B ^{1/} (0.1)	D (0.5)	F (1.0)	B ^{1/} (0.1)	D (0.5)	F (1.0)	B ^{1/} (0.1)	D (0.5)	F (1.0)	B ^{1/} (0.1)	D (0.5)	F (1.0)	B ^{1/} (0.1)	D (0.5)	F (1.0)
10.0	10.0	14.7	14.7	21.5	21.5	31.6	31.6	46.4	46.4	68.1	68.1						
10.1	---	14.9	---	21.8	---	32.0	---	47.0	---	69.0	---						
10.2	10.2	15.0	15.0	22.1	22.1	32.4	32.4	47.5	47.5	69.8	69.8						
10.4	---	15.2	---	22.3	---	32.8	---	48.1	---	70.6	---						
10.5	10.5	15.4	15.4	22.6	22.6	33.2	33.2	48.7	48.7	71.5	71.5						
10.6	---	15.6	---	22.9	---	33.6	---	49.3	---	72.3	---						
10.7	10.7	15.8	15.8	23.2	23.2	34.0	34.0	49.9	49.9	73.2	73.2						
10.9	---	16.0	---	23.4	---	34.4	---	50.5	---	74.1	---						
11.0	11.0	16.2	16.2	23.7	23.7	34.8	34.8	51.1	51.1	75.0	75.0						
11.1	---	16.4	---	24.0	---	35.2	---	51.7	---	75.9	---						
11.3	11.3	16.5	16.5	24.3	24.3	35.7	35.7	52.3	52.3	76.8	76.8						
11.4	---	16.7	---	24.6	---	36.1	---	53.0	---	77.7	---						
11.5	11.5	16.9	16.9	24.9	24.9	36.5	36.5	53.6	53.6	78.7	78.7						
11.7	---	17.2	---	25.2	---	37.0	---	54.2	---	79.6	---						
11.8	11.8	17.4	17.4	25.5	25.5	37.4	37.4	54.9	54.9	80.6	80.6						
12.0	---	17.6	---	25.8	---	37.9	---	55.6	---	81.6	---						
12.1	12.1	17.8	17.8	26.1	26.1	38.3	38.3	56.2	56.2	82.5	82.5						
12.3	---	18.0	---	26.4	---	38.8	---	56.9	---	83.5	---						
12.4	12.4	18.2	18.2	26.7	26.7	39.2	39.2	57.6	57.6	84.5	84.5						
12.6	---	18.4	---	27.1	---	39.7	---	58.3	---	85.6	---						
12.7	12.7	18.7	18.7	27.4	27.4	40.2	40.2	59.0	59.0	86.6	86.6						
12.9	---	18.9	---	27.7	---	40.7	---	59.7	---	87.6	---						
13.0	13.0	19.1	19.1	28.0	28.0	41.2	41.2	60.4	60.4	88.7	88.7						
13.2	---	19.3	---	28.4	---	41.7	---	61.2	---	89.8	---						
13.3	13.3	19.6	19.6	28.7	28.7	42.2	42.2	61.9	61.9	90.9	90.9						
13.5	---	19.8	---	29.1	---	42.7	---	62.6	---	92.0	---						
13.7	13.7	20.0	20.0	29.4	29.4	43.2	43.2	63.4	63.4	93.1	93.1						
13.8	---	20.3	---	29.8	---	43.7	---	64.2	---	94.2	---						
14.0	14.0	20.5	20.5	30.1	30.1	44.2	44.2	64.9	64.9	95.3	95.3						
14.2	---	20.8	---	30.5	---	44.8	---	65.7	---	96.5	---						
14.3	14.3	21.0	21.0	30.9	30.9	45.3	45.3	66.5	66.5	97.6	97.6						
14.5	---	21.3	---	31.2	---	45.9	---	67.3	---	98.8	---						

^{1/} The resistance values for tolerance B may be of any value, but it is preferred that the values be chosen from the tolerance D values in this table.

MIL-R-55182C

1.2.1.4 Resistance to tolerance. The resistance tolerance is identified by a single letter in accordance with table V.

TABLE V. Resistance tolerance.

Symbol	Resistance tolerance
^{1/} B - - - -	<u>Percent (±)</u> 0.1
D - - - -	0.5
F - - - -	1.0

^{1/} Applicable only to characteristics E and J.

1.2.1.5 Life failure-rate designation. The life failure-rate designation as shown in table VI is signified by a single letter (M, P, R, or S), which identifies the life failure-rate level for which the resistor is qualified (see 4.5 and 6.2).

TABLE VI. Life failure rate level (established at 60-percent confidence).

Failure-rate-level designation	Failure rate, percent/1,000 hours
M - - - - -	1.0
P - - - - -	0.1
R - - - - -	0.01
S - - - - -	0.001

Attachment II
ATM 241 Rev D

MIL-R-55182/1E
21 November 1968
SUPERSEDING
MIL-R-55182/1D
11 July 1967
MIL-R-55182/8(USAF)
9 July 1965
MIL-R-10509/007C(USAF)
14 January 1966
(See Section Six)

MILITARY SPECIFICATION

RESISTORS, FIXED, FILM,
ESTABLISHED RELIABILITY
STYLE RNR55 ^{1/}

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

1. SCOPE

1.1 This specification covers the detail requirements for style RNR55, ^{1/} established reliability, film, fixed resistors.

2. APPLICABLE DOCUMENTS

2.1 The following document, of the issue in effect on date of invitation for bids or request for proposal, forms a part of this specification to the extent specified herein:

SPECIFICATION

MILITARY

MIL-R-55182 - Resistors, Fixed, Film, Established Reliability,
General Specification for.

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

3. REQUIREMENTS

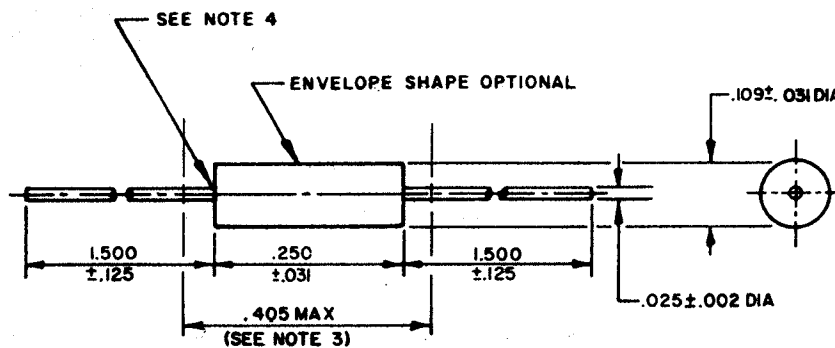
3.1 Requirements. Requirements shall be in accordance with MIL-R-55182, and as specified herein.

3.2 Design and construction. Resistors shall be of the design, construction, and physical dimensions specified on figure 1.

3.2.1 Characteristic. Style RNR55 is available in characteristics C, E, H, J and K.

^{1/} Third letter is variable, dependent upon lead material or capability.

MIL-R-55182/1E



INCHES	MM
.002	.05
.025	.64
.031	.79
.109	2.77
.125	3.18
.250	6.35
.405	10.29
1.500	38.10

NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. Maximum length is "clean lead" to "clean lead".
4. The end of the body shall be that point at which the body diameter equals the nearest drill size larger than 250 percent of the nominal lead diameter.

FIGURE 1. Style RNR55 resistors, ^{1/}

^{1/} See footnote 1, page 1.

3.2.2 Terminal. Terminal type availability in, and applicability to, characteristics shall be as follows:

<u>Terminal designator</u>	<u>Applicable characteristic</u>
RNR	C, E, H, J, K
RNC	C, E, H, J, K
RND	C, E
RNN	C, E

3.3 Power rating. The power rating shall be 1/10 watt.

3.4 Voltage rating. The continuous working voltage shall not exceed 200 volts.

3.5 Resistance. Minimum and maximum resistance values shall be as follows:

Minimum resistance:

Characteristic:

K - - - - -	10.0 ohms.
C, E, H, J - - - - -	49.9 ohms.

Maximum resistance:

Characteristic:

K - - - - -	0.301 megohm.
C, E, H, J - - - - -	0.200 megohm.

* 3.6 Voltage coefficient (applicable to resistors of 1,000 ohms and above). The voltage coefficient shall not exceed ± 0.005 percent per volt.

3.7 Marking. Due to size limitations this style resistor shall be marked with the following minimum information:

733K	-	Date code, characteristic.
49R9	-	Coded resistance value.
FMDJ	-	Tolerance, failure rate, lead material, JAN marking.

The complete marking is required on the unit package. Where manufacturers are able to provide more information, the following is preferred in the sequence presented: Style, manufacturer's trademark, production lot code, and source code.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection shall be in accordance with MIL-R-55182.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with MIL-R-55182.

6. NOTES

6.1 The notes specified in MIL-R-55182 are applicable to this specification.

* 6.2 Supersession data. This specification supersedes MIL-R-10509/007C(USAF), and MIL-R-55182/8(USAF) in the following manner.

<u>Characteristic in MIL-R-55182/1</u> <u>in FR level "M"</u>	<u>Supersedes characteristic in</u> <u>MIL-R-10509/007</u>	<u>Supersedes characteristic</u> <u>in MIL-R-55182/8(USAF)</u>
K - - - - -	D - - - - -	---
C or E - - - - -	G (up to .100 megohm) incl. -	---
H - - - - -	C - - - - -	H
J - - - - -	E - - - - -	J

MIL-R-55182/1E

* 6.3 MIL-R-10509 substitution data. Resistors of this specification, regardless of their failure rate designation, are substitutes for resistors of the same resistance value and tolerance specified in the inactivated specification MIL-R-10509/7. Substitute characteristics and terminal types are indicated in table I.

TABLE I. Characteristic and terminal substitution.

MIL-R-10509 Style RN55	MIL-R-55182/1 Substitute characteristic	MIL-R-55182/1 Substitute terminal
<u>Inactive characteristic</u>		
C	H	RNC, RNR
E	J	RNC, RNR

* 6.4 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue 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 and relationship to the last previous issue.

Custodians:
Army - EL
Navy - EC
Air Force - 11

Preparing activity:
Army - EL
(Project 5905-0518-1)

Review activities:
Army - EL, MU, MI
Navy - EC, AS, OS
Air Force - 11, 17, 85
DSA - ES

User activities:
Army - AT, ME, AV
Navy - MC, CG
Air Force - 19

MIL-R-55182/2F
11 July 1967
SUPERSEDING
MIL-R-55182/2E
18 November 1966
MIL-R-38101/1B(USAF)
15 April 1964

MILITARY SPECIFICATION

RESISTORS, FIXED, FILM,

ESTABLISHED RELIABILITY

STYLE RNR57 ^{1/}

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

1. SCOPE

- * 1.1 This specification covers the detail requirements for style RNR57, ^{1/} established reliability, film, fixed resistors.

2. APPLICABLE DOCUMENTS

2.1 The following document, of the issue in effect on date of invitation for bids or request for proposal, forms a part of this specification to the extent specified herein:

SPECIFICATION

MILITARY

MIL-R-55182 - Resistors, Fixed, Film, Established Reliability,
General Specification for.

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

3. REQUIREMENTS

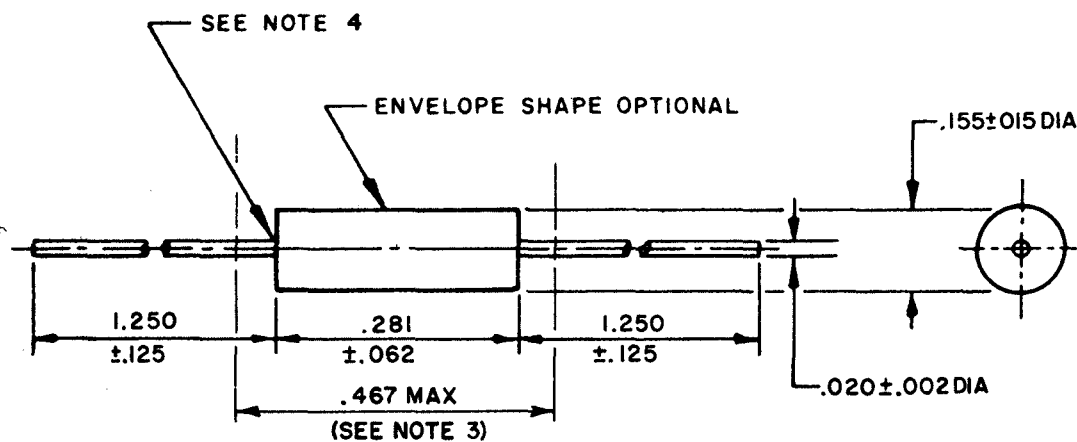
3.1 Requirements. Requirements shall be in accordance with MIL-R-55182, and as specified herein.

3.2 Design and construction. Resistors shall be of the design, construction, and physical dimensions specified in figure 1.

- * 3.2.1 Characteristic. Style RNR57 is available in characteristics C and E only.

^{1/}Third letter is variable, dependent upon lead material or capability.

MIL-R-55182/2F



INCHES	MM
.002	.05
.015	.38
.020	.51
.062	1.57
.125	3.18
.155	3.94
.281	7.14
.467	11.86
1.250	31.75

NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. Maximum length is 'clean lead' to 'clean lead'.
4. The end of the body shall be that point at which the body diameter equals the nearest drill size larger than 250 percent of the nominal lead diameter.

FIGURE 1. Style RNR57 resistors. ^{1/}

^{1/}See footnote 1, page 1.

MIL-R-55182/2F

- * 3.2.2 Terminal. Terminal type availability in, and applicability to, characteristics shall be as follows:

<u>Terminal designator</u>	<u>Applicable characteristic</u>
RNR	C,E
RND	C,E
RNN	C,E

3.3 Power rating. The power rating shall be 1/8 watt.

3.4 Voltage rating. The continuous working voltage shall not exceed 250 volts.

3.5 Resistance. Minimum and maximum resistance values shall be as follows:

Minimum resistance:

Characteristic:

C, E - - - - - 10.0 ohms.

Maximum resistance:

Characteristic:

C, E - - - - - 0.200 megohm.

3.6 Resistance tolerance. This style is available only in tolerance F (1.0 percent).

3.7 Voltage coefficient. The voltage coefficient shall not exceed ± 0.005 percent per volt.

3.8 Marking. Due to size limitations this style resistor shall be marked with the following minimum information:

733C -- Date code, characteristic.

10R0 - Coded resistance value

FMDJ - Tolerance, failure rate, lead material, JAN marking.

The complete marking is required on the unit package. Where manufacturers are able to provide more information the following is preferred in the sequence presented: style, manufacturers trademark, production lot code, source code.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection shall be in accordance with MIL-R-55182.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with MIL-R-55182.

6. NOTES

6.1 The notes specified in MIL-R-55182 are applicable to this specification.

Attachment II
ATM 241 Rev D

MIL-R-55182/2F

6.2 Supersession data. This specification supersedes MIL-R-38101/1B(USAF), dated 15 April 1964, "Resistors, Fixed, Film, 1/8 watt +1.0 percent tolerance, Established Reliability."

6.3 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue 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 and relationship to the last previous issue.

Custodians:

Army - EL
Navy - SH
Air Force - 11

Preparing activity:

Army - EL

(Project 5905-0594-3)

Review activities:

Army - MJ, EL
Navy - SH, AS, OS
Air Force - 11, 17, 85

Code "C"

User activities:

Army - AT, ME, AV
Navy - MC, CG
Air Force - 14, 19

*U.S. GOVERNMENT PRINTING OFFICE: 1967-301-510-/955

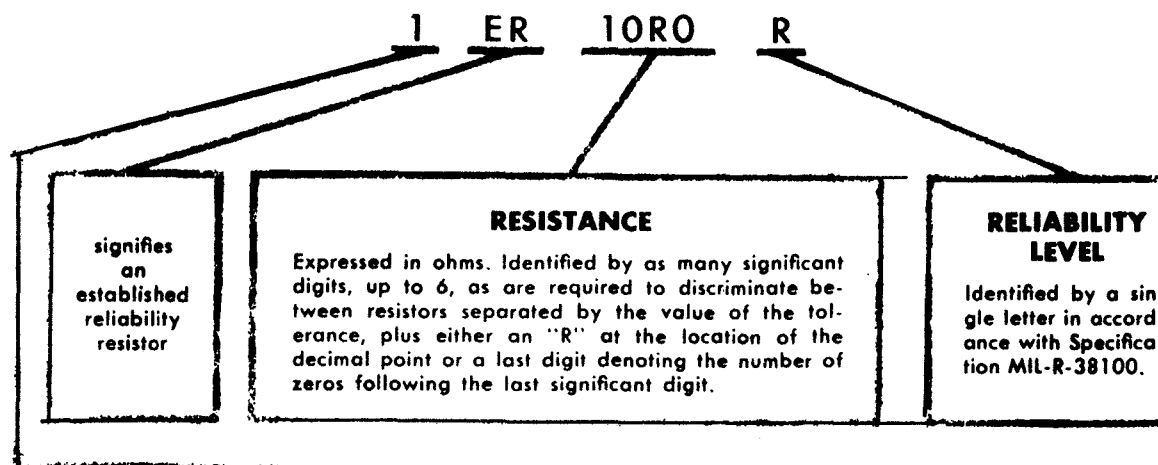
PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: RESISTORS

SECTION: MIL SPEC ABSTRACT

TYPE ER

(MILITARY SPECIFICATION MIL-R-38101A—USAF)



STYLE



tubular case

Signifies the resistor type as well as the number assigned to the specification sheet that describes the particular resistor.

- 1 = resistor, fixed, film, 1/8 watt, $\pm 1.0\%$ tolerance
- 2 = resistor, fixed, power, wirewound, miniature, 2 watt, $\pm 1.0\%$ tolerance
- 3 = resistor, fixed, precision, wirewound, 1 watt, $\pm 0.02\%$ tolerance
- 4 = resistor, fixed, precision, wirewound, 1/8 watt, $\pm 1.0\%$ tolerance
- 5 = resistor, fixed, precision, wirewound, 1/8 watt, $\pm 1.0\%$ tolerance
- 6 = resistor, fixed, precision, wirewound, 1 watt, $\pm 1.0\%$ tolerance
- 7 = resistor, fixed, precision, wirewound, 1/8 watt, $\pm 0.1\%$ tolerance
- 8 = resistor, fixed, precision, wirewound, 1/8 watt, $\pm 0.1\%$ tolerance
- 9 = resistor, fixed, precision, wirewound, 1/8 watt, $\pm 0.1\%$ tolerance
- 10 = resistor, fixed, precision, wirewound, 1 watt, $\pm 0.1\%$ tolerance
- 11 = resistor, fixed, precision, wirewound, 1/8 watt, $\pm 0.02\%$ tolerance
- 12 = resistor, fixed, precision, wirewound, sub-miniature, 1/8 watt, $\pm 0.01\%$ tolerance
- 13 = resistor, fixed, power, wirewound, sub-miniature, 1.0 watt, $\pm 1.0\%$ tolerance
- 14 = resistor, fixed, power, wirewound, sub-miniature, 2.25 watt, $\pm 1.0\%$ tolerance
- 15 = resistor, fixed, power, wirewound, sub-miniature, 4.0 watt, $\pm 1.0\%$ tolerance
- 16 = resistor, fixed, power, wirewound, miniature, 5.0 watt, $\pm 1.0\%$ tolerance
- 17 = resistor, fixed, power, wirewound, sub-miniature, 7.0 watt, $\pm 1.0\%$ tolerance
- 18 = resistor, fixed, power, wirewound, miniature, 10 watt, $\pm 1.0\%$ tolerance
- 19 = resistor, fixed, metal film, sub-miniature, 0.1 watt, $\pm 1.0\%$ tolerance
- 20 = resistor, fixed, metal film, sub-miniature, 0.05 watt, $\pm 1.0\%$ tolerance
- 21 = resistor, fixed, film, 1/8 watt, $\pm 2.0\%$ tolerance Min 51 ohm Max 150K ohm
- 22 = resistor, fixed, film, 1/8 watt, $\pm 2.0\%$ tolerance
- 23 = resistor, fixed, film, 1 watt, $\pm 2.0\%$ tolerance

* Equivale + to: MIL-R-31097 style RLR07, 20, 33 except for lead diameter and corning style A-51, A-52, A-53.

MIL-R-39017A
16 August 1966
SUPERSEDING
MIL-R-39017
22 September 1964
MIL-R-38101A(USAF)
15 October 1963
MIL-R-22684(USAF)
1 June 1965
(See Section Six Herein)

MILITARY SPECIFICATION
RESISTORS, FIXED, FILM, (INSULATED)

ESTABLISHED RELIABILITY

GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for insulated, film, fixed resistors of 2- and 5-percent resistance tolerance. These resistors are capable of full-load operation at an ambient temperature of 70° C and have a resistance-temperature characteristic of ± 200 parts per million per degree C (ppm/°C). The resistors will have life failure rate levels ranging from 1.0 to 0.001 percent per 1,000 hours (see 1.2.1.4). These failure rate levels are established at a 60-percent confidence level on the basis of life tests. The failure rate level, identified by the appropriate symbol, is referred to operation at full rated wattage at 70° C, with a permissible change in resistance of ± 4 percent in 10,000 hours as the criteria for failure. Table I of supplement 1 provides a summary of performance characteristics for these resistors.

1.2 Classification.

1.2.1 Type designation. The type designation shall be in the following form, and as specified (see 3.1):

RLR20	C	103	G	M
┆	┆	┆	┆	┆
Style	Terminal	Resistance	Resistance	Life failure
(1.2.1.1)	(1.2.1.2)	(1.2.1.5)	tolerance	rate
			(1.2.1.3)	(1.2.1.4)

1.2.1.1 Style. The style is identified by the three-letter symbol "RLR" followed by a two-digit number; the letters identify established reliability, insulated, film, fixed resistors, and the number identifies the size and power rating of the resistors.

FSC 5905

1.2.1.2 Terminals. The terminals are identified by a single letter in accordance with table I.

TABLE I. Terminal.

Symbol	Terminal
C - - - - -	Solderable/weldable

1.2.1.3 Resistance tolerance. The resistance tolerance is identified by a single letter in accordance with table II.

TABLE II. Resistance tolerance.

Symbol	Resistance tolerance
	<u>Percent ($\pm$)</u>
G - - - - -	2
J - - - - -	5

1.2.1.4 Life failure-rate-level designation. The life failure-rate-level designation as shown in table III is signified by a single letter ("M", "P", "R", or "S"), which identifies the life failure-rate level for which the resistor is qualified (see 4.4).

TABLE III. Life failure-rate level (established at 60-percent confidence).

Failure-rate-level designation	Failure rate level (%/1,000 hr)
M - - - - -	1.0
P - - - - -	0.1
R - - - - -	0.01
S - - - - -	0.001

1.2.1.5 Resistance. The nominal resistance value expressed in ohms is identified by a three-digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow.

Examples: 100 = 10 ohms
101 = 100 ohms
102 = 1,000 ohms

Minimum and maximum resistance values shall be as specified (see 3.1). The standard values for every decade shall follow the sequence demonstrated for the "10 to 100" decade in accordance with MS90178.

MIL-R-39017A

6.8 Supersession data. The styles of this specification supersede other styles in accordance with table XI.

TABLE XI. Styles.

STYLES IN MIL-R-39017A	SUPERSEDES STYLES IN MIL-R-39017	SUPERSEDES STYLES IN MIL-R-38101	SUPERSEDES STYLES IN 22684 (USAF)
RLR07 } RLR20 } RLR32 } RLR42 }	39017/1 (RLR07) 39017/2 (RLR20) 39017/3 (RLR32) -----	38101/21 38101/22 38101/23 ----	(RL07--TX)22684/5(USAF) (RL20--TX)22684/6(USAF) (RL32--TX)22684/7(USAF) (RL42--TX)22684/8(USAF)

^{1/} Failure rate level "M" is the equivalent level for supersession of the referenced 22684 (USAF) style.

6.9 Terminal supersession. Terminal type "C" of MIL-R-39017A supersedes terminal types "S" and "D" of MIL-R-39017. Type "C" also supersedes the weldable lead specified in 22684/5 (USAF) thru 22684/8 (USAF).

6.10 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.

MIL-R-39017A
SUPPLEMENT 1B

TABLE I. Performance requirements.

Style	RLR05	RLR07	RLR20	RLR32	RLR42
Maximum resistance-temperature characteristic in parts/million/°C-ppm (ref to 25° C) (see 3.11) - - - - -	± 200	± 200	± 200	± 200	± 200
Maximum ambient temperature at rated wattage (see figure 1) -	70° C	70° C	70° C	70° C	70° C
Maximum ambient temperature at zero wattage derating (see figure 1) - - - - -	150° C	150° C	150° C	150° C	150° C
Power rating and maximum dc or rms voltage- - - - -	1/8 watt 200V	1/4 watt 250V	1/2 watt 350V	1 watt 500V	2 watts 500V
Resistance tolerance (in percent) - - - - -	2, 5	2, 5	2, 5	2, 5	2, 5
Minimum resistance value - - - -	4.7 ohms	10 ohms	4.3 ohms	10 ohms	10 ohms
Maximum resistance value - - - -	.15 Megohm	.16 Megohm	1.0 Megohm	1.0 Megohm	1.5 Megohm
Maximum ± percent change in resistance after 1/ Power conditioning (see 3.8) - - -	.5	.5	.5	.5	.5
Temperature cycling (see 3.10) -	.25	.25	.25	.25	.25
Low temperature operation (see 3.12) - - - - -	.25	.25	.25	.25	.25
Short-time overload (see 3.13)- -	.5	.5	.5	.5	.5
Terminal strength (see 3.14)- - -	.25	.25	.25	.25	.25
Dielectric withstanding voltage (see 3.17) - - - - -	.25	.25	.25	.25	.25
Resistance to soldering heat (see 3.19) - - - - -	.25	.25	.25	.25	.25
Moisture resistance (see 3.20)- -	1.0	1.0	1.0	1.0	1.0
Shock, medium impact (see 3.21) - - - - -	} .5	} .5	} .5	} .5	} .5
Vibration, high frequency (see 3.22) - - - - -					
Life (see 3.23) - - - - -	See 3.21				
High temperature exposure (see 3.24) - - - - -	2	2	2	2	2
Insulation resistance (dry) (see 3.18) - - - - -	1,000 Megohms	1,000 Megohms	1,000 Megohms	1,000 Megohms	1,000 Megohms
Insulation resistance (wet) (see 3.20) - - - - -	100 Megohms	100 Megohms	100 Megohms	100 Megohms	100 Megohms

1/ Where total resistance change is 1 percent or less, it shall be considered as ± (_ percent + 0.05 ohm).

MIL-R-39017/5
24 March 1969

MILITARY SPECIFICATION
RESISTORS, FIXED, FILM, (INSULATED),
ESTABLISHED RELIABILITY
STYLE RLR05

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

1. SCOPE

1.1 This specification covers the detail requirements for style RLR05, established reliability, insulated, film, fixed resistors.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-R-39017 - Resistors, Fixed, Film, (Insulated), Established Reliability,
General Specification for.

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

3. REQUIREMENTS

3.1 Requirements. Requirements shall be in accordance with MIL-R-39017, and as specified herein.

3.2 Design and construction. Resistors shall be of the design, construction, and physical dimensions specified on figure 1.

3.3 Power rating. The power rating shall be 1/8 watt.

3.4 Voltage rating. The continuous working voltage shall not exceed 200 volts.

3.5 Resistance. Minimum and maximum resistance values shall be as follows:

Minimum resistance - 4.7 ohms.
Maximum resistance - 0.15 megohm.

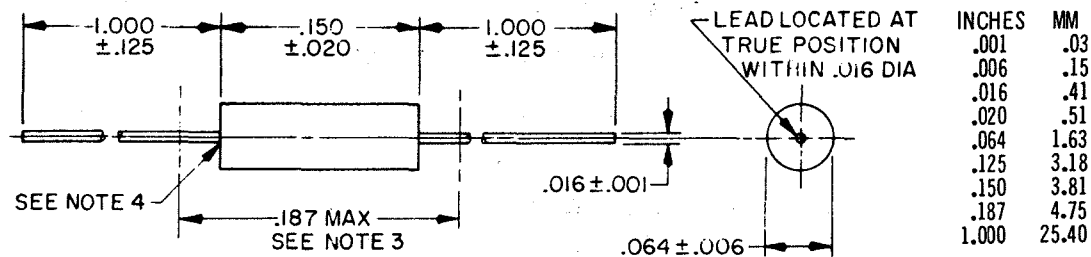
3.6 Maximum weight. The maximum weight shall not exceed .3 gram.

3.7 Marking. Due to size limitations this style resistor shall be marked with the following minimum information:

693A - Year and week manufactured, lot code (letters "O" and "I" excluded).
103G - Resistance value, tolerance.
MJ - Failure rate designator and JAN marking.

Full marking is required on the unit package.

MIL-R-39017/5



NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. Maximum length is 'clean lead' to 'clean lead'.
4. The end of the body shall be that point at which the body diameter equals the nearest drill size larger than 150 percent of the nominal lead diameter.

FIGURE 1. Style RLR05 resistor.

4. QUALITY ASSURANCE PROVISIONS

- 4.1 Sampling and inspection shall be in accordance with MIL-R-39017.
- 4.2 Power conditioning. The maximum voltage applied shall not exceed 250 volts, ac or dc.
- 4.3 Dielectric withstanding voltage. The test voltages applicable to style RLR05 are as follows:

Atmospheric pressure - 300 volts rms.
Barometric pressure - 200 volts rms.

5. PREPARATION FOR DELIVERY

- 5.1 Preparation for delivery shall be in accordance with MIL-R-39017.

6. NOTES

- 6.1 The notes specified in MIL-R-39017 are applicable to this specification.

Custodians:

Army - EL
Navy - EC
Air Force - 11

Preparing activity:

Army - EL

(Project 5905-0681-1)

Review activities:

Army - EL, MU, MI
Navy - EC, AS, OS
Air Force - 11, 17, 85
DSA - ES

User activities:

Army - ME, AT, AV
Navy - MC, CG
Air Force - 19

MIL-R-39017/1D
22 November 1968
SUPERSEDING
MIL-R-39017/1C
4 December 1967
22684/5(USAF)
1 June 1965
MIL-R-38101/21A(USAF)
15 April 1964

MILITARY SPECIFICATION

RESISTORS, FIXED, FILM, (INSULATED),

ESTABLISHED RELIABILITY

STYLE RLR07

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

1. SCOPE

1.1 This specification covers the detail requirements for style RLR07, established reliability, insulated, film, fixed resistors.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-R-39017 - Resistors, Fixed, Film, (Insulated)
Established Reliability, General
Specification for.

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

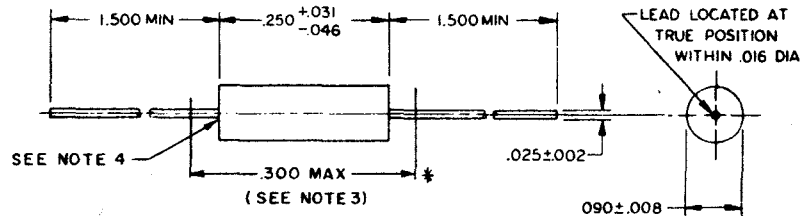
3. REQUIREMENTS

3.1 Requirements. Requirements shall be in accordance with MIL-R-39017, and as specified herein.

3.2 Design and construction. Resistors shall be of the design, construction, and physical dimensions specified on figure.

3.3 Power rating. The power rating shall be 1/4 watt.

3.4 Voltage rating. The continuous working voltage shall not exceed 250 volts.



NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. Maximum length is 'clean lead' to 'clean lead'.
4. The end of the body shall be that point at which the body diameter equals the nearest drill size larger than 150 percent of the nominal lead diameter.

Style RLR07 resistor.

INCHES	MM
.002	.05
.008	.20
.016	.41
.025	.64
.031	.79
.046	1.17
.090	2.29
.250	6.35
.300	7.62
1.500	38.10

3.5 Resistance. Minimum and maximum resistance values shall be as follows:

Minimum resistance - 10 ohms.
Maximum resistance - .16 megohm.

3.6 Maximum weight. The maximum weight shall not exceed .5 gram.3.7 Marking. Due to size limitations this style resistor shall be marked with the following minimum information:

- 683AJ - Year and week manufactured, lot code (letters "O" and "I" excluded), JAN marking.
RLR7C - Partial style ("O" deleted for partial marking), terminal.
103G - Resistance value, tolerance.
M - - - - Failure rate designator and manufacturer's identification trademark or name.

Full marking is required on the unit package.

4. QUALITY ASSURANCE PROVISIONS

- 4.1 Sampling and inspection shall be in accordance with MIL-R-39017.
- 4.2 Power conditioning. The maximum voltage applied shall not exceed 250 volts, ac or dc.
- 4.3 Dielectric withstanding voltage. The test voltages applicable to style RLR07 are as follows:

Atmospheric pressure - 500 volts rms.
Barometric pressure - 250 volts rms.

5. PREPARATION FOR DELIVERY

- 5.1 Preparation for delivery shall be in accordance with MIL-R-39017.

MIL-R-39017/3B
24 March 1969
SUPERSEDING
MIL-R-39017/3A
16 August 1966
22684/7(USAF)
1 June 1965
MIL-R-38101/23A(USAF)
15 April 1964

MILITARY SPECIFICATION
RESISTORS, FIXED, FILM, (INSULATED),
ESTABLISHED RELIABILITY
STYLE RLR32

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

1. SCOPE

1.1 This specification covers the detail requirements for style RLR32, established reliability, insulated, film fixed resistors.

2. APPLICABLE DOCUMENTS

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

SPECIFICATION

MILITARY

MIL-R-39017 - Resistors, Fixed, Film, (Insulated), Established Reliability,
General Specification for.

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

3. REQUIREMENTS

3.1 Requirements. Requirements shall be in accordance with MIL-R-39017, and as specified herein.

3.2 Design and construction. Resistors shall be of the design, construction, and physical dimensions specified on figure 1.

3.3 Power rating. The power rating shall be 1 watt.

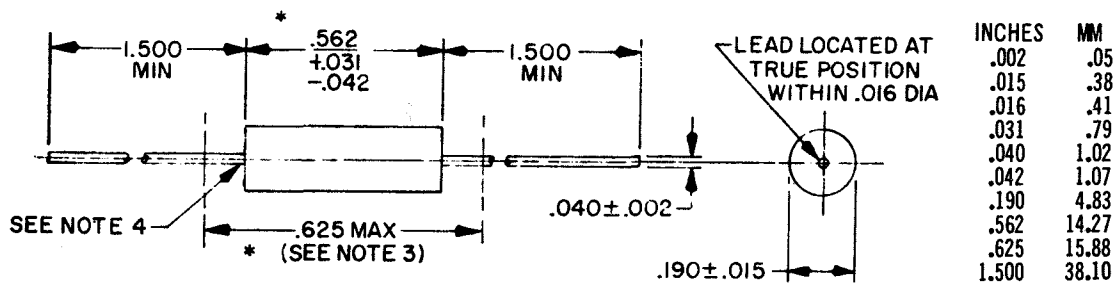
3.4 Voltage rating. The continuous working voltage shall not exceed 500 volts.

3.5 Resistance. Minimum and maximum resistance values shall be as follows:

Minimum resistance - 10.0 ohms.
Maximum resistance - 1.0 megohm.

3.6 Maximum weight. The maximum weight shall not exceed 1.50 grams.

MIL-R-39017/3B



NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
3. Maximum length is 'clean lead' to 'clean lead'.
4. The end of the body shall be that point at which the body diameter equals the nearest drill size larger than 250 percent of the nominal lead diameter.

FIGURE 1. Style RLR32 resistor.

4. QUALITY ASSURANCE PROVISIONS

- 4.1 Sampling and inspection shall be in accordance with MIL-R-39017.
- 4.2 Power conditioning. The maximum voltage applied shall not exceed 500 volts, ac or dc.
- 4.3 Dielectric withstanding voltage. The test voltages applicable to style RLR32 are as follows:

Atmospheric pressure - 1,000 volts rms.
Barometric pressure - 350 volts rms.

5. PREPARATION FOR DELIVERY

- 5.1 Preparation for delivery shall be in accordance with MIL-R-39017.

6. NOTES

- 6.1 The notes specified in MIL-R-39017 are applicable to this specification.
- 6.2 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue 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 and relationship to the last previous issue.

TITLE: RESISTORS

SECTION: MIL-SPEC ABSTRACT

TYPE RWR

(MILITARY SPECIFICATION MIL-R-39007A)

RWR 71 S 49R9 F M

TYPE

Resistors,
Fixed,
Wirewound,
Power
type,
Established
reliability

TERMINAL

S = solderable
W = weldable

RESISTANCE TOLERANCE

F = $\pm 1.0\%$

LIFE FAILURE RATE

(Expressed in
%/1000 hrs.)

M = 1.0
P = 0.1
R = 0.01
S = 0.001

RESISTANCE

Expressed in ohms and identified by four digits. First three digits represent significant figures. Last digit specifies the number of zeros to follow. When resistance value is less than 100 ohms, or when fractional values of an ohm are required, the letter "R" is substituted for one of the significant digits, represents the decimal point, and the succeeding digits represent significant figures.

STYLE



axial lead tubular case

71 = .187" D. x .812" L., 2.0 watts at 25 C
74 = .312" D. x .875" L., 5.0 watts at 25 C
78 = .375" D. x 1.780" L., 10.0 watts at 25 C
80 = .094" D. x .406" L., 2.0 watts at 25 C
81 = .085" D. x .250" L., 1.0 watt at 25 C
84 = .312" D. x .875" L., 7.0 watts at 25 C
89 = .187" D. x .560" L., 3.0 watts at 25 C

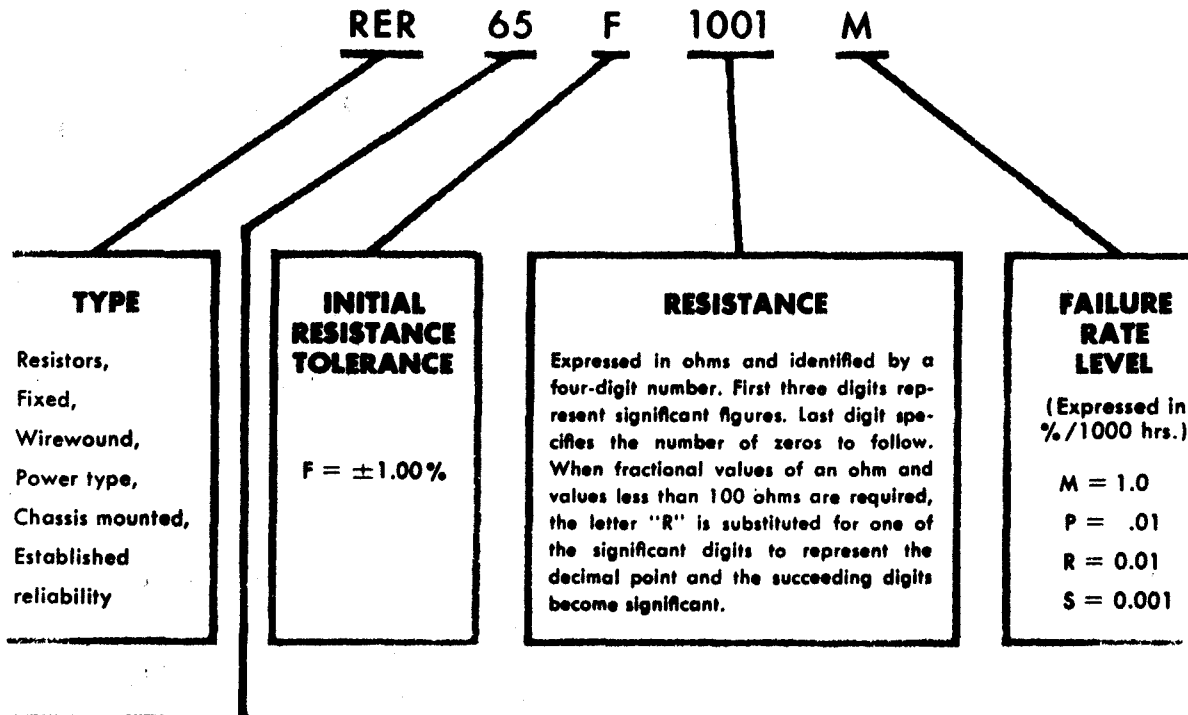
PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: RESISTORS

SECTION: MIL SPEC ABSTRACT

TYPE RER

(MILITARY SPECIFICATION MIL-R-39009)



STYLE



tubular case, lug terminals

65 = .438" D. x .750" L., 10 watts

70 = .531" D. x 1.062" L., 15 watts

75 = .594" D. x 1.938" L., 30 watts

RESISTANCE RANGE

MIN	MAX
0.1	5.62K
0.1	12.1 K
0.1	39.2 K

DIELECTRIC WITHSTANDING VOLTAGE

1000 VDC
1000 VDC
2000 VDC

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: RESISTORS

SECTION: MIL SPEC ABSTRACT

TYPE RCR

(MILITARY SPECIFICATION MIL-R-39008)

RCR 07 G 153 J M

TYPE

Resistors,
Fixed,
Composition
(Insulated),
Established
reliability

RESISTANCE

Expressed in ohms and identified by three-digit number. First two digits represent significant figures. Last digit specifies the number of zeros to follow.

MIN - 10 OHMS
MAX - 1 MEG OHM

RESISTANCE TOLERANCE

J = $\pm 5\%$

LIFE FAILURE RATE

Life failure-rate level at 50% rated wattage. Expressed in %/1,000 hrs.

M = 1.0 R = 0.01
P = 0.1 S = 0.001

CHARACTERISTIC

Symbol	Max. ambient operating temp. (100% rated wattage)	Resistance—temperature characteristic		
		Nominal resistance (ohms)	Max. allowable change in resistance from resistance at ambient temp. of 25C	
			At -55C	At +105C
G	70C	1,000 and under	$\pm 6.5\%$	$\pm 5\%$
		1,100 to 10,000	$\pm 10\%$	$\pm 6\%$
		11,000 to 0.1M Ω	$\pm 13\%$	$\pm 7.5\%$
		0.11M Ω to 1.0M Ω	$\pm 15\%$	$\pm 10\%$

STYLE



axial lead tubular case

**MAXIMUM
WORKING VOLT DC**
200V
350V
500V

07 = .090" D. x .250" L., ¼ watt at 70C
20 = .138" D. x .375" L., ½ watt at 70C
32 = .225" D. x .562" L., 1 watt at 70C

MIL-R-39008A
11 May 1967
SUPERSEDING
MIL-R-39008
30 October 1963
MIL-R-11F
17 April 1967
(See section six)

MILITARY SPECIFICATION

RESISTORS, FIXED, COMPOSITION (INSULATED),

ESTABLISHED RELIABILITY

GENERAL SPECIFICATION FOR

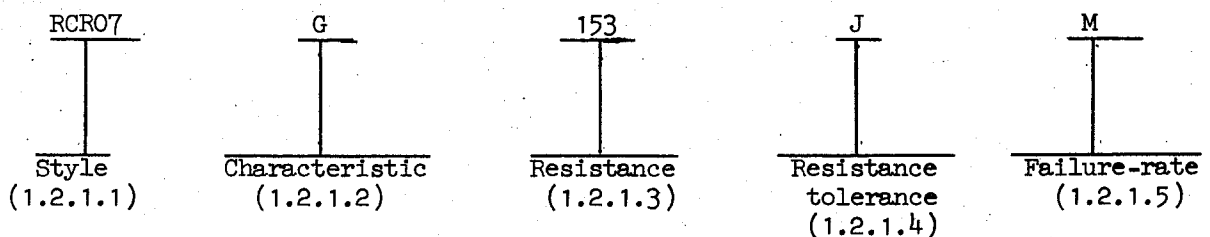
This specification is mandatory for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for established reliability, insulated, fixed resistors having a composition resistance element consisting of a mixture of carbon, insulating material, and suitable binders, either molded together or applied as a thin layer of conducting material on an insulated form. Resistors covered by this specification shall have failure rates ranging from 1.0 percent to 0.001 percent per 1,000 hours (see 1.2.1.5) at 50 percent full-load operation at an ambient temperature of 70°C (see table I). These failure rates are established at 60 percent confidence level on the basis of life tests. The failure-rate, identified by the appropriate symbol, is referred to operation at rated temperature and at a voltage equivalent to 50 percent of rated wattage (with a permissible resistance change of ± 15 percent).

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):



1.2.1.1 Style. The style is identified by the three-letter symbol "RCR" followed by a two-digit number; the letters identify established reliability, insulated, composition, fixed resistors, and the number identifies the size and power rating of the resistors.

MIL-R-39008A

1.2.1.2 Characteristic. The characteristic is identified by a single letter in accordance with table I.

"TABLE I. Characteristic.

Symbol	Maximum ambient operating temperature (100 percent rated wattage and 50 percent rated wattage for failure-rate determination)	Resistance-temperature characteristic		
		Nominal resistance	Maximum allowable change in resistance from resistance at ambient temperature of 25° C	
			At -55° C (ambient)	At +105° C (ambient)
G - -	°C 70	Ohms	Percent (±)	Percent (±)
		1, 000 and under - - -	6.5	5
		1, 100 to 10, 000 incl-	10	6
		11, 000 to 0.1 megohm incl	13	7.5
		Megohms		
		0.11 to 1.0 incl - - -	15	10
		1.1 to 10 incl - - - -	20	15
		11.0 and over - - - -	25	15

1.2.1.3 Resistance. The nominal resistance value expressed in ohms is identified by a three-digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow. When resistance values less than 10 ohms are required, the letter "R" is substituted for one of the significant digits to represent the decimal point. When the letter "R" is used, succeeding digits of the group represent significant figures as shown in the following example:

$$2R7 = 2.7 \text{ ohms.}$$

Minimum and maximum resistance values shall be as specified (see 3.1). The standard values for every decade shall follow the sequence demonstrated for the "10 to 100" decade in accordance with MS90178 - Standard 24 - Value Series Decade for Electronic Components of 5-, 10-, and 20-Percent Tolerances.

1.2.1.4 Resistance tolerance. The resistance tolerance is identified by a single letter in accordance with table II.

TABLE II. Resistance tolerance.

Symbol	Resistance tolerance
	Percent (+)
J - - - - -	5
K - - - - -	10

1.2.1.5 Failure-rate designation. The failure-rate designation as shown in table III is signified by a single letter (M, P, R, or S), which identifies the failure-rate level for which the resistor is qualified (see 4.5).

TABLE III. Failure-rate level (at 50-percent rated wattage).

Failure-rate level designation	Failure rate percent/1,000 hours
M - - - - -	1.0
P - - - - -	0.1
R - - - - -	0.01
S - - - - -	0.001

MIL-R-39008/4C
18 December 1969
SUPERSEDING
MIL-R-39008/4B
11 August 1969

MILITARY SPECIFICATION

RESISTOR, FIXED, COMPOSITION (INSULATED),

ESTABLISHED RELIABILITY

STYLE RCR05

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

1. SCOPE

1.1 This specification covers the detail requirements for style RCR05 resistor.

2. APPLICABLE DOCUMENTS

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

SPECIFICATION

MILITARY

MIL-R-39008 - Resistors, Fixed, Composition (Insulated), Established Reliability,
General Specification For.

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

3. REQUIREMENTS

3.1 Requirements. Requirements shall be in accordance with MIL-R-39008, and as specified herein.

3.2 Design and construction. The resistor shall be of the design, construction, and physical dimensions specified on figure 1.

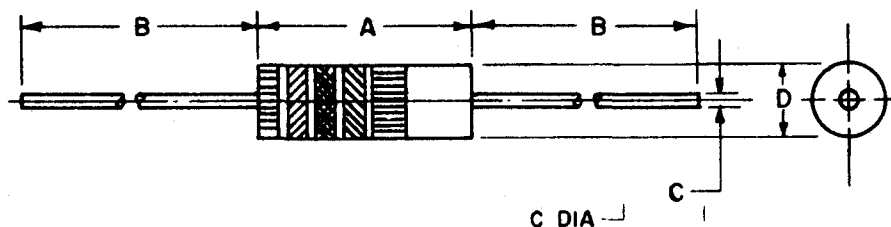
3.3 Power rating. The power rating shall be 1/8 watt, based on full load operation at an ambient temperature of 70° C. Resistors operated at ambient temperatures in excess of 70° C shall be derated in accordance with figure 2. The rated direct current (dc) or root mean square (rms) continuous working voltage shall not exceed 150 volts.

* 3.4 Resistance. Minimum resistance value shall be 2.7 ohms; maximum resistance value shall be 22 megohms.

3.5 Moisture resistance. The change in resistance shall not exceed an average of 12 percent for each group of 10 resistors tested, nor a maximum of 15 percent for any individual resistor up to and including 1 megohm. For values over 1 megohm, the change in resistance shall not exceed a maximum of 15 percent for any individual resistor.

Attachment II
ATM 241 Rev D

MIL-R-39008/4C



A±.015	B±.125	C±.003	D±.004
.145	1.000	.015	.062

INCHES	MM
.002	.05
.003	.08
.004	.10
.015	.38
.062	1.57
.125	3.18
.145	3.68
1.000	25.40

NOTES:

1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1. Style RCR05 resistor.

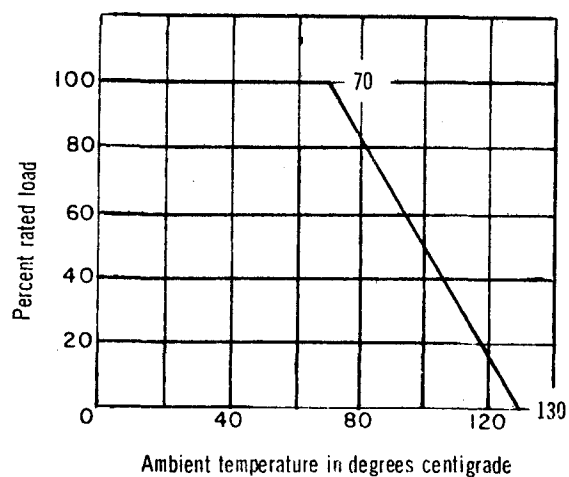


FIGURE 2. Derating curve for high ambient temperatures.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-R-39008, and as specified herein.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with MIL-R-39008.

6. NOTES

6.1 The notes specified in MIL-R-39008 are applicable to this specification.

6.2 Weight. The maximum weight of this style shall be .080 gram.

6.3 Power rating. It is essential that no more than 50 percent of the rated wattage be applied if the established failure rate level is to be maintained.

6.4 MIL-R-11 substitution data. Resistors of this specification, regardless of their failure rate designation, are substitutes for resistors of the same resistance value and tolerance specified in the inactivated specification MIL-R-11/11.

* NOTE: The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This has been 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 and relationship to the last previous issue.

Custodians:

Army - EL
Navy - EC
Air Force - 11

Review activities:

Army - EL, MU, MI
Navy - EC, AS, OS
Air Force - 11, 17, 85
DSA - ES

User activities:

Army - ME, AT, AV
Navy - MC
Air Force - 19

Preparing activity:

Army - EL

Agent:

DSA - ES

(Project 5905-0707)

Attachment II
ATM 241 Rev D

MIL-R-39008/1B
12 February 1968
SUPERSEDING
MIL-R-39008/1A
11 May 1967

MILITARY SPECIFICATION

RESISTOR, FIXED, COMPOSITION (INSULATED),

ESTABLISHED RELIABILITY

STYLE RCRO7

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

1. SCOPE

1.1 This specification covers the detail requirements for style RCRO7 resistor.

2. APPLICABLE DOCUMENTS

2.1 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

MILITARY

MIL-R-39008 - Resistors, Fixed, Composition (Insulated),
Established Reliability, General Specification
for.

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

3. REQUIREMENTS

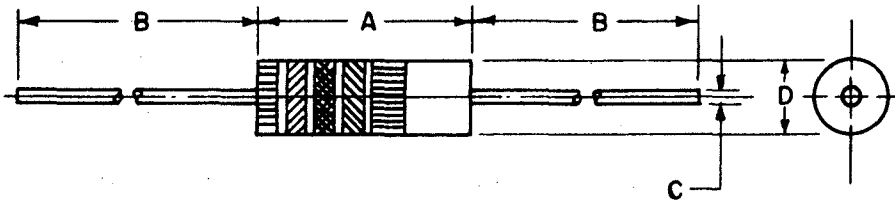
3.1 Requirements. Requirements shall be in accordance with MIL-R-39008, and as specified herein.

3.2 Design and construction. The resistor shall be of the design, construction, and physical dimensions specified on figure 1.

3.3 Power rating. The power rating shall be 1/4 watt, based on full load operation (100 percent rated wattage) at an ambient temperature of 70°C. Resistors operated at ambient temperatures in excess of 70°C shall be derated in accordance with figure 2. The rated dc or rms continuous working voltage shall not exceed 250 volts.

Attachment II
ATM 241 Rev D

MIL-R-39008/1B



Ltr	Dimensions
A	.250 (6.35) $\pm$.031 (.79)
B	1.500 (38.10) $\pm$.125 (3.18)
C	.025 (.64) $\pm$.002 (.05)
D	.090 (2.29) $\pm$.008 (.20)

NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1. Style RCR07 resistor.

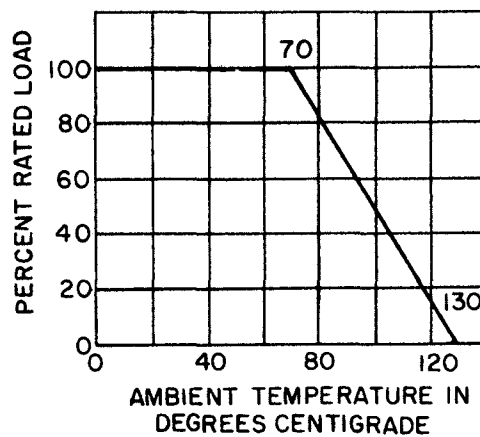


FIGURE 2. Derating curve for high ambient temperatures.

Attachment II
ATM 241 Rev D

MIL-R-39008/1B

3.4 Resistance. The minimum resistance value shall be 2.7 ohms; maximum value shall be 22 megohms.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-R-39008 and as specified herein.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with MIL-R-39008.

6. NOTES

6.1 The notes specified in MIL-R-39008 are applicable to this specification.

6.2 Weight. The maximum weight of this style shall be 0.300 gram.

6.3 Power rating. It is essential that no more than 50-percent of the rated wattage be applied if the established failure-rate level is to be maintained.

* 6.4 MIL-R-11 substitution data. Resistors of this specification, regardless of their failure rate designation, are substitutes for resistors of the same resistance value and tolerance specified in the inactivated specification MIL-R-11/8.

* 6.5 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue 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 and relationship to the last previous issue.

Custodians:

Army - EL
Navy - EC
Air Force - 11

Preparing activity:

Army - EL

(Project 5905-0648-2)

Review activities:

Army - EL, MJ, MI
Navy - EC, AS, OS
Air Force - 11, 17, 85
DSA - ES

Code "C"

User activities;

Army - ME, AT, AV
Navy - MC
Air Force - 19

MIL-R-39008/2B
12 February 1968
SUPERSEDING
MIL-R-39008/2A
11 May 1967

MILITARY SPECIFICATION

RESISTOR, FIXED, COMPOSITION (INSULATED),

ESTABLISHED RELIABILITY

STYLE RCR20

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

1. SCOPE

1.1 This specification covers the detail requirements for style RCR20 resistor.

2. APPLICABLE DOCUMENTS

2.1 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

MILITARY

MIL-R-39008 - Resistors, Fixed, Composition (Insulated),
Established Reliability, General Specification
for.

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

3. REQUIREMENTS

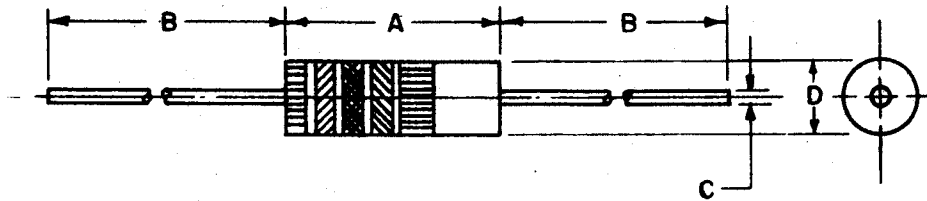
3.1 Requirements. Requirements shall be in accordance with MIL-R-39008, and as specified herein.

3.2 Design and construction. The resistor shall be of the design, construction, and physical dimensions specified on figure 1.

3.3 Power rating. The power rating shall be 1/2 watt, based on full load operation (100 percent rated wattage) at an ambient temperature of 70°C. Resistors operated at ambient temperatures in excess of 70°C shall be derated in accordance with figure 2. The rated dc or rms continuous working voltage shall not exceed 350 volts.

3.4 Resistance. Minimum resistance value shall be 2.7 ohms; maximum value shall be 22 megohms.

MIL-R-39008/2B



Ltr	Dimensions
A	.375 (9.53) $\begin{smallmatrix} +.041 (1.04) \\ -.031 (.79) \end{smallmatrix}$
B	1.500 (38.10) $\pm .125 (3.18)$
C	.031 (.79) $\pm .005 (.13)$
D	.138 (3.51) $\pm .023 (.58)$

NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1 Style RCR20 resistor.

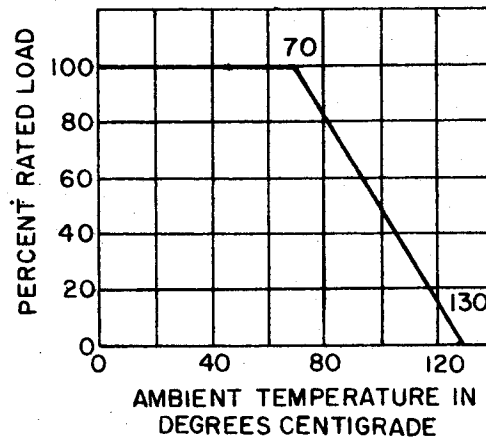


FIGURE 2. Derating curve for high ambient temperatures.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-R-39008 and as specified herein.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with MIL-R-39008.

6. NOTES

6.1 The notes specified in MIL-R-39008 are applicable to this specification.

6.2 Weight. The maximum weight of this style shall be 0.662 gram.

6.3 Power rating. It is essential that no more than 50-percent of the rated wattage be applied if the established failure-rate level is to be maintained.

* 6.4 MIL-R-11 substitution data. Resistors of this specification, regardless of their failure rate designation, are substitutes for resistors of the same resistance value and tolerance specified in the inactivated specification MIL-R-11/3.

* 6.5 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue 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 and relationship to the last previous issue.

Custodians:

Army - EL
Navy - EC
Air Force - 11

Preparing activity:

Army - EL

(Project 5905-0648-3)

Review activities:

Army - EL, MU, MI
Navy - EC, AS, OS
Air Force - 11, 17, 85
DSA - ES

Code "C"

User activities:

Army - ME, AT, AV
Navy - MC
Air Force - 19

PARTS APPLICATION AND RELIABILITY BULLETIN

TITLE: RESISTORS

SECTION: MIL-SPEC ABSTRACTS

TYPE RBR

(MILITARY SPECIFICATION MIL-R-39005)

RBR 52 S 12601 D M

TYPE

Resistors,
Fixed,
Wirewound,
(Accurate),
Established
reliability

TERMINAL

S = solderable
W = weldable

RESISTANCE TOLERANCE

Symbol	Initial Resistance Tol. (at $25 \pm 2^\circ \text{C}$)	Minimum Resistance Value
A	$\pm 0.05\%$	10 ohms
B	$\pm 0.10\%$	10 ohms
F	$\pm 1.00\%$	0.1 ohms
G	$\pm 0.02\%$	10 ohms
T	$\pm 0.01\%$	10 ohms

LIFE FAILURE RATE

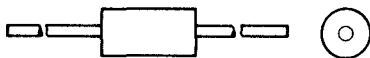
(Expressed in
%/1000 hrs.)

M = 1.0
P = 0.1
R = 0.01
S = 0.001

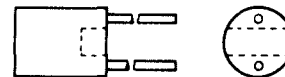
RESISTANCE

Nominal resistance, expressed in absolute ohms, is identified by five digits. First four digits represent significant figures. Last digit specifies the number of zeros to follow. When resistance values are less than 1,000 ohms, or when fractional values of an ohm are required, the letter "R" indicates the decimal point and the following digits represent significant figures.

STYLE



axial lead tubular case



single-ended tubular case

52 = $\frac{3}{8}$ " D. x 1" L., 0.50 watts
53 = $\frac{3}{8}$ " D. x $\frac{3}{4}$ " L., 0.33 watts
54 = $\frac{1}{4}$ " D. x $\frac{3}{4}$ " L., 0.25 watts
55 = $\frac{1}{4}$ " D. x $\frac{1}{2}$ " L., 0.15 watts
56 = $\frac{1}{4}$ " D. x $\frac{11}{32}$ " L., 0.12 watts
57 = $\frac{1}{2}$ " D. x 1" L., 0.75 watts
74 = $\frac{13}{64}$ " D. x $\frac{1}{2}$ " L., 0.12 watts
75 = $\frac{1}{4}$ " D. x $\frac{19}{64}$ " L., 0.12 watts
76 = $\frac{5}{16}$ " D. x $\frac{13}{16}$ " L., 0.50 watts

71 = $\frac{5}{16}$ " H. x $\frac{1}{4}$ " W., 0.12 watts



**Aerospace
Systems Division**

Attachment III

NO.	REV. NO.
ATM-241	D
PAGE 1-III	OF 5
DATE 7-27-70	

ATTACHMENT III
SUMMARY OF ELECTRONICS PART TYPE
USED IN ALSEP
(BxA DESIGNED EQUIPMENT)

This Attachment is provided for information only and should not be considered as an acceptable Parts List.

Attachment III
ATM 241 Rev D

Page 2-III of 5

SUMMARY OF ELECTRONICS PART TYPE USED IN ALSEP

Part No./Type	Part Name	MIL Spec	Vendor's Name	Commercial Equiv. Type
BR205134	RELAY		BABCOCK	
CKR05	CAPACITOR	C-39014	AEROVOX	
CKR06	CAPACITOR	C-39014	AEROVOX	
CKR12	CAPACITOR	C-39014	AEROVOX	
CKR13	CAPACITOR	C-39014	AEROVOX	
CMR01	CAPACITOR	C-39001	ELMENCO	
CSR13	CAPACITOR	C-39003	KEMET	
DHD490	DIODE		G. E.	1N4448
DT60818D	DIODE		DICKSON	1N970B
DT60826V	DIODE		DICKSON	1N4568A
DT61025C	DIODE		DICKSON	1N938B
ECY10	CAPACITOR	MSFC400A	CORNING	CYFR
FA40004	DIODE		FAIRCHILD	
JANTX2N2222A	TRANSISTOR	S-19500/	TEXAS INST.	
JMC3955-TC	CAPACITOR		JOHANSON	
JMC3956-TC	CAPACITOR		JOHANSON	
JMC3957-TC	CAPACITOR		JOHANSON	
JMC6003-TC	CAPACITOR		JOHANSON	
JMC6188-TC	CAPACITOR		JOHANSON	
JMC8554-TC	CAPACITOR		JOHANSON	
MS27216-1	SWITCH		MICROSWITCH	
OSM204CC	CONNECTOR		OMNISPECTRA	
RCR07, 20--	RESISTOR	R-39008	ALLEN BR.	
RER--	RESISTOR	R-39009	DALE	
RNR55--	RESISTOR	R-55182	MEPCO	
RNR57--	RESISTOR	R-55182	MEPCO	
RNR60--	RESISTOR	R-55182	MEPCO	
RNR65--	RESISTOR	R-55182	MEPCO	
RNR70--	RESISTOR	R-55182	MEPCO	
RWR70--	RESISTOR	R-39007	DALE	
RWR71--	RESISTOR	R-39007	DALE	
RWR80--	RESISTOR	R-39007	DALE	
RWR81--	RESISTOR	R-39007	DALE	
SL10455	MICROCKT		FAIRCHILD	9040
SL10456	MICROCKT		FAIRCHILD	9041
SL10457	MICROCKT		FAIRCHILD	9042

SUMMARY OF ELECTRONICS PART TYPE USED IN ALSEP

Part No./Type	Part Name	MIL Spec	Vendor's Name	Commercial Equiv. Type
SL35384	FLIP-FLOP		FAIRCHILD	9040
SL35394	GATE		FAIRCHILD	9041
SL35404	DUAL GATE		FAIRCHILD	9042
SL35424	EXPANDER		FAIRCHILD	933
SL35434	MULTI-VIBR.		FAIRCHILD	951
SL72742	AMPLIFIER		FAIRCHILD	702
SL72752	AMPLIFIER		FAIRCHILD	709
SZ50764	DIODE		MOTOROLA	1N4579A
S1N645	DIODE	MSFC338/6	TRW/G. E.	
S1N746A thru 759A	DIODE	MSFC338/6	DICKSON	
S1N944B	DIODE	85M01678	DICKSON	
S1N965B	DIODE	85M01309	DICKSON	
S2N491B	TRANSISTOR	85M01102	G. E.	
S2N708	TRANSISTOR	85M01675	RAYTHEON	
S2N722	TRANSISTOR	85M01103	MOTOROLA	
S2N2102	TRANSISTOR	85M01108	R. C. A.	
S51--	RESISTOR		ANGSTROHM	
TXIN914	DIODE	S-19500	FAIRCHILD	
UTR1135	DIODE		UNITRODE	UTR3310
UTR222	DIODE		UNITRODE	UTR52
UZ1094	DIODE		UNITRODE	UZ724
UZ1195	DIODE		UNITRODE	
UZ1207	DIODE		UNITRODE	
U5B770931XB1	MICROCKT		FAIRCHILD	
U5B7741312UNQ1	MICROCKT		FAIRCHILD	
VKR2BW--	CAPACITOR		VITRAMON	
VKR3BW--	CAPACITOR		VITRAMON	
WDL9814788515	THERMISTOR		FENWAL	
WQM2DM--	CAPACITOR		ELMENCO	
WST--	CONNECTOR		HUGHES	
1N4370A/ML3C	DIODE		MOTOROLA	
1250-700	FILTER		ERIE	
137D320	CAPACITOR		SPRAGUE	
16K--	CAPACITOR		G. E.	
2N2905A/ML3C	TRANSISTOR		MOTOROLA	

SUMMARY OF ELECTRONICS PART TYPE USED IN ALSEP

Part No./Type	Part Name	MIL Spec	Vendor's Name	Commercial Equiv. Type
2N3251A/ML3C	TRANSISTOR		MOTOROLA	
202D--	CAPACITOR		SPRAGUE	
21ER--	RESISTOR	R-38101	CORNING	
2330099-XX	DIODE		WESTINGHOUSE	
2330102	CHOKE		O. SCHOTT	
2330103	CHOKE		O. SCHOTT	
2330104	CHOKE		O. SCHOTT	
2330105	CHOKE		O. SCHOTT	
2330151-XX	RELAY		TELEDYNE	421-3032
2330380-XX	SOLAR CELL		HOFFMAN	
2333583	TRANSFORMER		O. SCHOTT	
2333584-XX	TRANSFORMER		O. SCHOTT	
2334458-XX	RESISTOR		SAGE	
2334459-XX	TRANSISTOR		RCA	2N3263
2334544-XX	RELAY		TELEDYNE	
2334684-XX	CRYSTAL		NORTHERN	
2335190-XX	TRANSISTOR, PNP, PAIR		TEXAS INST.	2N3049
2335191-XX	TRANSISTOR, NPN, PAIR		TEXAS INST.	2N3045
2335293-XX	SWITCH		HAYDON	
2335295-XX	RELAY		BABCOCK	BR17
2335661-XX	THERMISTOR		FENWAL	
2335662-XX	TEMP. SENSO		TYLAN	
2338162-XX	RESISTOR		PRECISION	
2340314-XX	CRYSTAL		MCCOY	
2340316-XX	SENSITOR		TEXAS INST.	
2340318-XX	DIODE		CRYSTALONICS	1N5140A
2340319-XX	COIL, RF		DELEVAN	1025
2340320-XX	DIODE		H. P. ASSOC.	5082-0180
2340321-XX	DIODE		H. P. ASSOC.	5082-80300
2340322-XX	TRANSISTOR		RCA	2N3375
2340323-XX	CONNECTOR		OMNISPECTRA	
2340328-XX	MICROCKT		AMI	UL02C
2340329-XX	MICROCKT		AMI	MX02D
2340330-XX	MICROCKT		AMI	SP01C
2340332-XX	TRANSISTOR		MOTOROLA	2N918
2340334-XX	COIL, RF		DELEVAN	2307

SUMMARY OF ELECTRONICS PART TYPE USED IN ALSEP

Part No. /Type	Part Name	MIL Spec	Vendor's Name	Commercial Equiv. Type
262--	FUSE		LITTLEFUSE	
265--	FUSE		LITTLEFUSE	
3204-387	METER		INT. INST.	
4JC5AR1200	SCR		G. E.	2N2324
40578	TRANSISTOR		RCA	2N3866
6HM-1	SWITCH		MICROSWITCH	
90515000002	FILTER		ERIE	
21-P11257B-XX	CAPACITOR, FXD, (NPO) CERAMIC		AEROVOX	MC562
RTR22D--	RESISTOR, VAR.	R-39015	BOURNS/WESTON	
2340338-1	DIODE		DICKSON	IN4568A
2340312-1	OP-AMP		NATIONAL	LM107F
2340307-1	BUFFER AMP.		NATIONAL	LM102F
2340308-1	COMPARA- TOR		NATIONAL	LM106F
2340311-1	COMP/ BUFFER		NATIONAL	LM111H
2340305-1	DUAL VOLTAGE TRANSLATOR		NATIONAL	DM7800H
2346201-XX	MICRO-CKT	Low Power TTL	TEXAS INST.	LOW
2346207-XX	MICRO-CKT	Med Power TTL	TEXAS INST.	
2121757-XX	MICRO-CKT	Med Power TTL	TEXAS INST.	
2340313-XX	CRYSTAL		MONITOR	CR19/UTO-8

