INTRODUCTION TO CAPACITOR COMPONENTS

GENERAL

Capacitors are typically used throughout IBM in applications such as energy storage, filtering, tuning, blocking, and switching. There are over 900 part numbers which have been released and controlled by SPD-P in approximately 13 different capacitor families. Obviously, it would be an unreasonable task for the circuit designer to become an authority on the particular characteristics of each of the capacitor families. This is particularly true since knowledgeable component engineers for each capacitor family exist in PCE. It is preferable to allow the component engineer to specify as many of the capacitor parameters as possible. By supplying the responsible component engineer with the following information, he can determine the optimum capacitor family, TCC, purchase tolerance, and body configuration which meet the performance and cost objectives:

1. Capacitance value
2. Circuit function
3. Working voltage
4. Dissipation factor or impedance
5. W.C. absolute EOL
6. Insulation resistance (dc leakage current)
7. AC current
8. Frequency
9. Machine ambient conditions

The capacitor product families presently available are:

Discrete (Axial and Radial-Leaded)	Modular	Other
Ceramic	Ceramic C-Pacs	Ceramic Chip
Tantalum (Solid, Wet, Foil)	Tantalum C-Pacs	
Plastic		
Polyester		
Polystyrene		
Polycarbonate		
Parylene		
Aluminum Electrolytic		
Mica		
Paper		

It should be realized that each capacitor family offers its own unique performance or economical advantages which must be considered in making trade-offs for a specific circuit application.

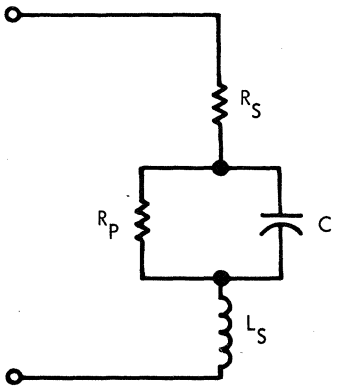
DEFINITIONS

Before the particular capacitor families can be meaningfully discussed, it is appropriate to define some of the more frequently referred to parameters and terms:

Capacitance - The capacitance of a capacitor is the ratio of the charge acquired to the voltage applied or $C = Q/V$. Capacitance is present between any two adjacent conductors and is effected by material between the conductors, the distance between the conductors and the area of the conductors or:

$$C = \varepsilon K \frac{A}{d} .$$

Capacitor Equivalent Circuit - The equivalent circuit of a capacitor may be represented as:



R_s represents the series resistance of the terminations, contacts and plates.

R_p represents the dc leakage or insulation resistance of the dielectric.

C represents the capacitance of the dielectric.

L_s represents the series inductance of the terminations, contacts and plates.

Dielectric - The material which separates the conductors of a capacitor. It may be air, gas, oil, paper, ceramic or film. Dielectrics are classified in two main groups - polar and nonpolar.

Polar Dielectric - The materials have a permanent unbalance in electric charges within the molecular structure. The dipoles within the structure consist of molecules whose ends are oppositely charged and will align themselves in the presence of an alternating electric field (if the frequency is not too high).

Non Polar Dielectric - The electric charges within the molecular structure are balanced and the dipoles do not align themselves under an applied field.

Nominal Capacitance Value - The specified initial capacitance value of the capacitor.

Purchase Tolerance - The maximum and minimum deviation from nominal value acceptable to IBM.

Dielectric Constant (K) - The ratio of the capacitance of a capacitor using a specific material as a dielectric, to the capacitance of the same capacitor using a vacuum as a dielectric.

Temperature Coefficient of Capacitance (TCC) - The transient change in capacitance due to a change in temperature, TCC is expressed in percent change in capacitance per degree centigrade (%ΔC/°C) or in parts per million per degree centigrade (ppm/°C or 10^{-4}%/°C) or as a maximum % C over a temperature range.

DC Working Voltage - The maximum recommended dc operating voltage for continuous duty at the rated temperature without dc voltage surges or ac ripple voltage superimposed.

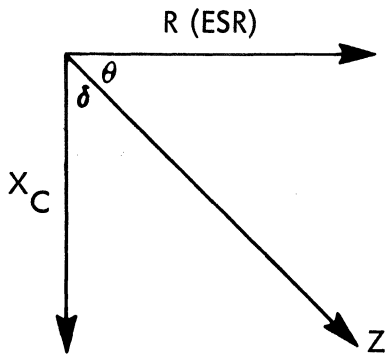
Equivalent Series Resistance (ESR) - The ESR is the sum total of all ac series resistance due to terminations, contacts, plates and dielectric losses. The ESR contributes to the total power dissipation.

Power Dissipation - The ac losses due to a series conduction resistance (terminations, contacts and plates) and the dielectric losses. Power dissipation is defined as:

$$P = \frac{E^2 \, Rac}{Z^2}$$

or may be calculated at low frequencies from $P = EI \times DF = wCE^2 \times DF$.

Dissipation Factor - The measure of power dissipated with respect to total energy stored and is expressed as a ratio of resistance to reactance.



The dissipation factor is the tangent of the angle δ, the loss angle.

Power Factor - The ratio of resistance to total impedance and is the cosine of θ, the phase angle. At low frequencies, where most of the impedance is from the capacitive reactance, the power factor (PF) approaches the dissipation factor (DF). They are assumed to be equal when the PF is less than 10%.

Figure of Merit (Q) - The ratio of pure reactance to the effective resistance. It is the reciprocal of the dissipation factor or Q = Xc/ESR.

CV Product - Maximum voltage available for a certain value and vice versa. The CV product is typically given in μF-volts and is related to a particular body size.

dc Leakage - The current that flows through the capacitor when a dc voltage is applied (Idc = Edc/Rdc, where Rdc is the insulation resistance). It is a function of the dielectric, applied voltage, time, and ambient temperature.

Insulation Resistance - The dc resistance of the dielectric. Insulation resistance is often referred to as parallel or shunt resistance and is substantially larger than the series resistance (ESR).

Volumetric Efficiency - The ratio of the capacitance voltage product to the volume of the capacitor. It is expressed in

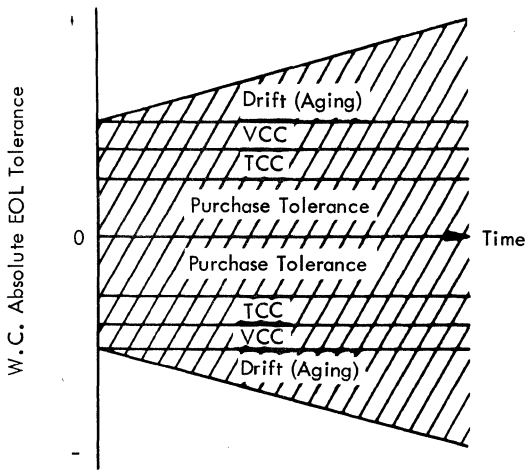
$$\frac{\mu F - volt}{in^3}$$

Capacitance Drift - The permanent change in capacitance value due to aging (capacitance degradation) in its application, during its useful life.

Short Term Effects - Permanent changes of capacitance caused by the soldering operation of the card line, temperature variations in shipment and storage, physical handling before and during card assembly and terminal stress during the lead insertion and clinching operation of the card line. The short term effects tend to be much less significant than frequency, temperature, voltage and degradation effects and are often neglected.

VCC - The transient change in capacitance due to a change in applied voltage. The VCC is typically expressed as a maximum %ΔC.

Worst Case Absolute End-of-Life Tolerance - The cumulative worst case expected changes in capacitance from its nominal value during its useful life. The worst case absolute EOL tolerance, is the sum of the purchase tolerance, capacitance drift, TCC, and the VCC. Permanent short-term changes are assumed to be negligible compared to these factors. Following is a chart which illustrates WC absolute EOL tolerance.



Dielectric Absorption

The charge which accumulates within a capacitor or has been absorbed by the dielectric material after a fully charged capacitor has been momentarily discharged and left open-circuited for a finite time.

Dielectric absorption is particularly important for capacitors, such as paper and plastic, whose application is to store energy and/or require rapid charge and discharge characteristics.

The IBM test for dielectric absorption states that the capacitor is charged at rated voltage for 15 minutes, discharged through a 5 Ω resistor for ten seconds and then measured to determine the maximum recovery voltage in a 15 minute interval. The D.A. is then determined by:

$$\% \text{ D.A.} = \frac{\text{maximum recovery voltage}}{\text{charging voltage}} \times 100\%$$

Statistical EOL Tolerance - The estimated total change in capacitance from nominal value, assuming a normal Gaussian distribution around zero, of each of the elements of change (that is, statistical EOL tolerance =

$$(\text{P.T.})^2 + (\text{TCC})^2 + (\text{VCC})^2 + (\text{Drift})^2$$

As previously mentioned, each capacitor family offers unique parameters and/or cost considerations which allow circuit designers trade-offs in their specific application. In general, the tighter the specified parameters and the higher the dc voltage, the more expensive the capacitor. Following is a summary of the typical characteristics of each capacitor family.

Ceramic - least expensive, fair stability, good volumetric efficiency, high voltage rating

Mica - moderately expensive, excellent stability, fair volumetric efficiency, high voltage rating

Paper - inexpensive, fair stability, fair volumetric efficiency, moderate voltage rating

Plastic - inexpensive to moderately expensive, very good stability, fair volumetric efficiency, moderate to high voltage rating

Tantalum - relatively expensive, good stability, excellent volumetric efficiency, low voltage rating

Aluminum Electrolytic - relatively expensive, poor stability, excellent volumetric efficiency, moderate voltage rating

Figures 4-1 through 4-5 present a quantitive graphical comparison of each of the capacitor families with respect to typical capacitance ranges, voltage ratings, EOL drifts, and cost.

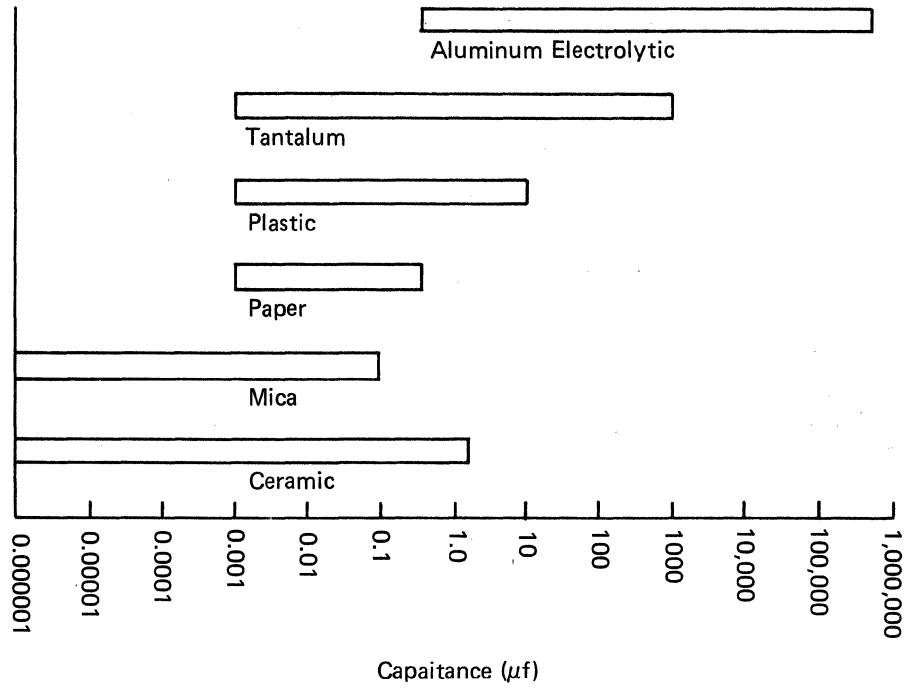


Figure 4-1. Capacitance Ranges by Capacitor Family

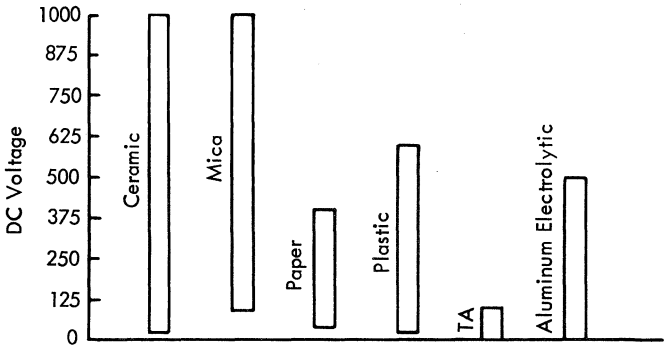


Figure 4-2. Maximum dc Voltage Rating by Capacitor Family

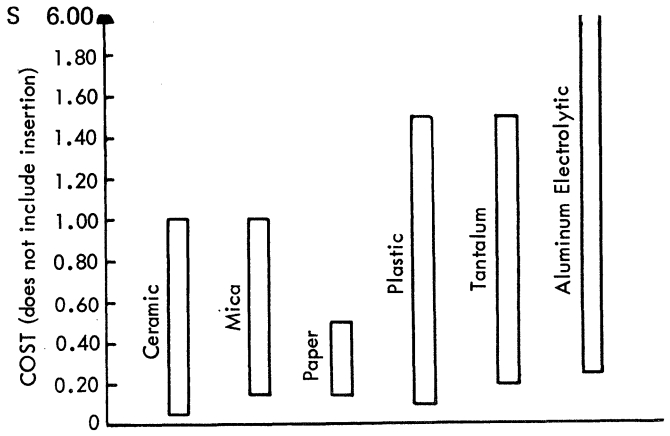


Figure 4-3. Typical "To User" Cost by Capacitor Family

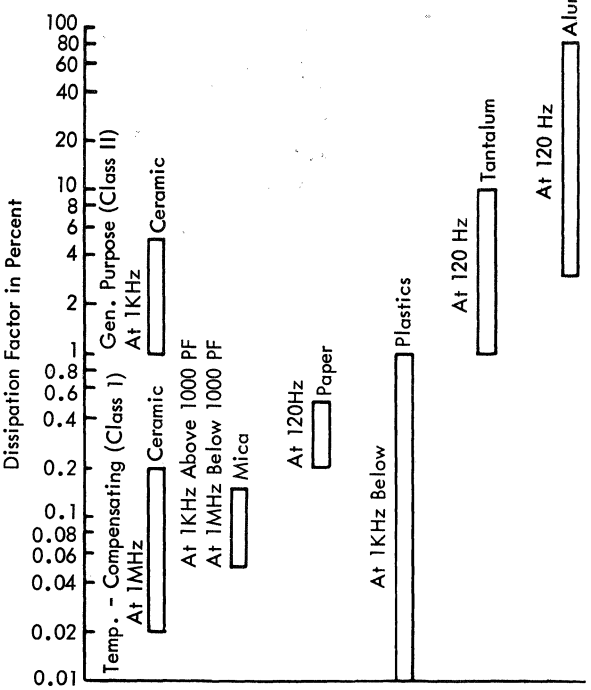


Figure 4-4. Dissipation Factor by Capacitor Family

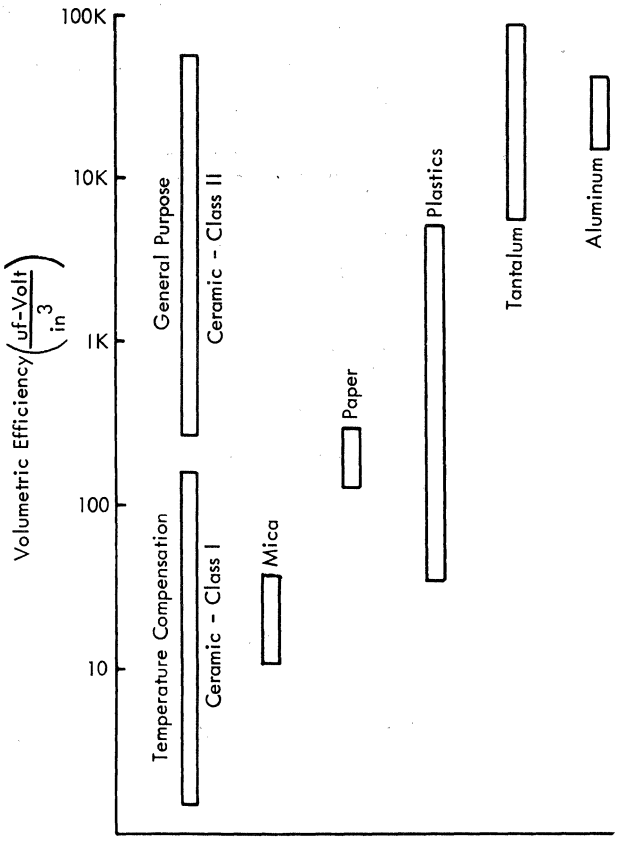


Figure 4-5. Comparison of Volumetric Efficiency by Capacitor Family

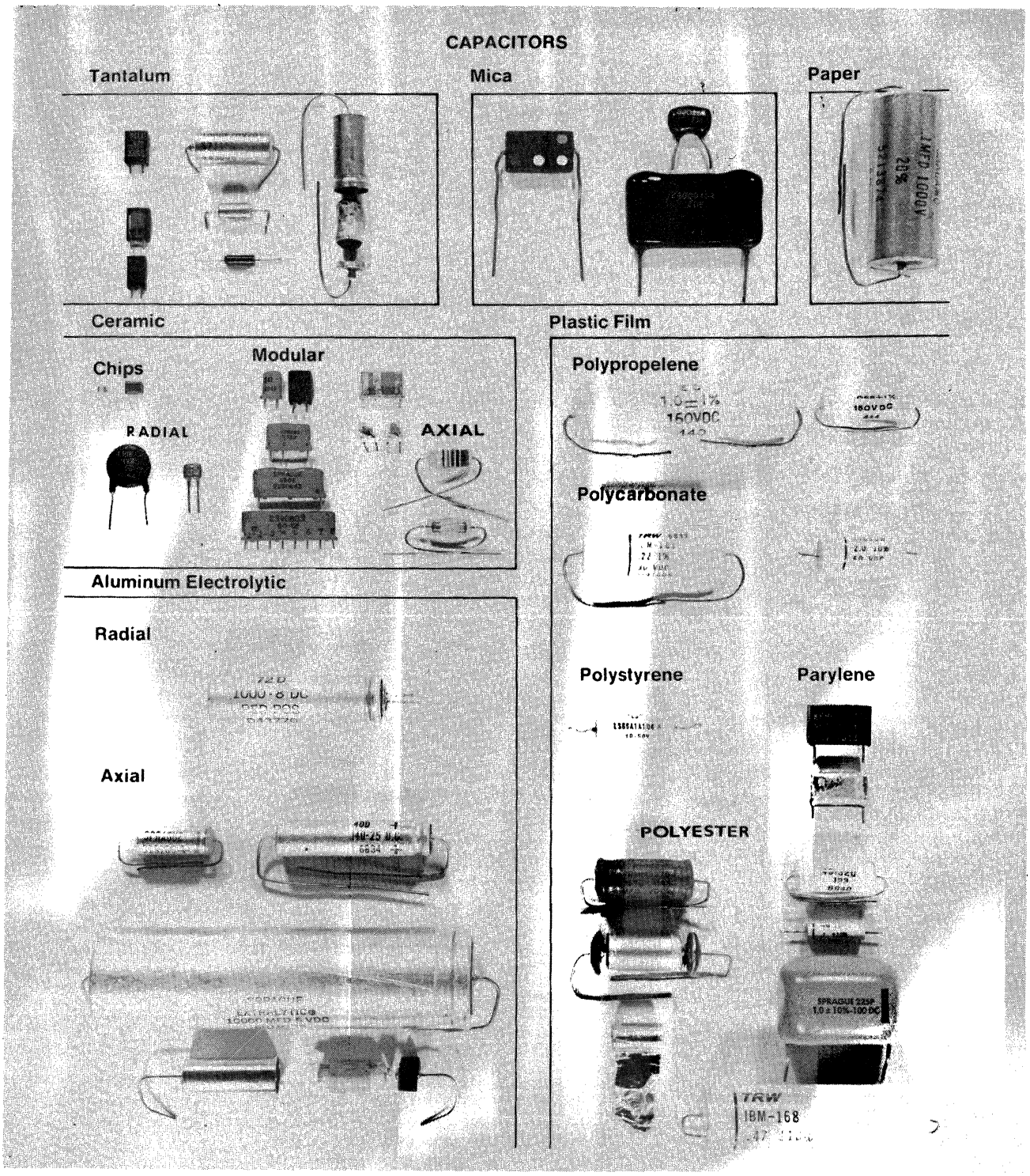


Figure 4-6. Examples of Capacitor Products Discussed in this Handbook

Larger Size Aluminum Electrolytes are Available Although not Shown Here

CERAMIC CAPACITORS

DESCRIPTION

Four basic types of ceramic capacitors are typically used in IBM. They are: Axial leaded, radial leaded (disc and dipped), modular (single-in-line, and dual-in-line), and chip. Two basic types of construction are utilized in manufacturing ceramic capacitors.

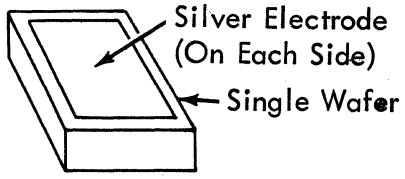
Plate Construction

The single wafer or plate capacitor is manufactured by coating the sides of sintered ceramic (square, rectangular, tubular, or disk) with a metallic (usually silver) thick film paste, which is fired at high temperatures (~750°C). (See Figure 4-7A.) The value of capacitance is a function of the thickness of the ceramic, the dielectric constant of the ceramic material and the area of the "fired on" metallic electrode. In some instances the capacitor is adjusted by abrading away a portion of the metallic plate. After the leads are attached the capacitor is either dip coated or molded for mechanical and environmental protection. The completed part is then either color coded or marked to identify part number and value.

Monolythic Construction

The second manufacturing method is utilized with multi-layer laminated ceramic capacitors. (See Figure 4-7B). The ceramic material is dispersed into a binder system which can be cast on a smooth surface. A thick film, noble metal paste is screened and fired on the ceramic to form the electrode pattern. The substrates are then stacked and either cut or punched to size. The capacitor is now fired (sintered). The cutting or punching operation before firing permits accurate electrode registration and good dimensional control over the finished piece. A noble metal (silver, palladium, gold, platinum, etc.) conductive paste or a combination of noble metals and a glass frit is screened on the electrodes of each plate or each plate is dipped in this noble metal paste to connect them in parallel. This forms the capacitor terminations. The glass frit melts during the termination firing and bonds the terminations to the capacitor plates forming a completed capacitor. The capacitance of a multi-layer laminated capacitor is a function of the electrode (plate) area, dielectric thickness between electrodes, the material's dielectric constant and the number of electrodes (plates). Multi-layer laminated capacitors are not adjusted to tolerance after the unit has been completed. The advantage of the multi-layer ceramic construction over the two plate ceramic construction is the increased capacitance per unit volume.

A.



B.

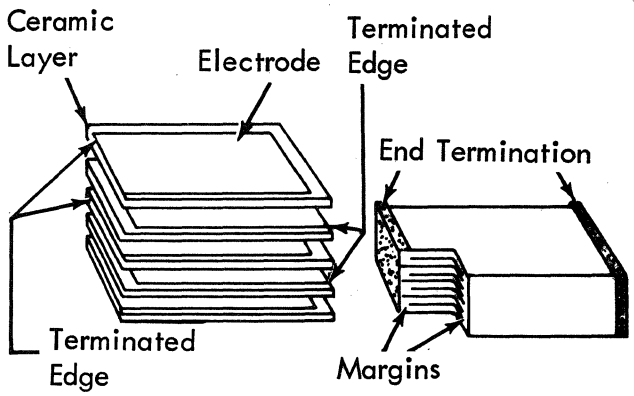


Figure 4-7. Ceramic Capacitor Construction

A characteristic of the basic ceramic material (barium titanate) is its extreme sensitivity to temperature. By doping the basic material with other ceramic materials of lower Curie points, the resulting material is no longer as temperature sensitive and now has lower dielectric constants which can meet the specific application requirements.

The characteristic of ceramic capacitors do not vary appreciably from those of the dielectric material below frequencies of 10 MHz. Above 10 MHz the resistance and inductance of the electrodes and leads cause some variation in the capacitor characteristics.

The ideal ceramic capacitor would have the following characteristics:

1. High capacitance per unit volume.
2. High insulation resistance.
3. Low loss.
4. Functional independence of temperature, voltage, frequency and environmental conditions.

The coincidence of ferroelectric behavior with high dielectric constant materials prevent the achievement of all of these characteristics simultaneously.

Ceramic capacitors are classified by the performance or characteristics of their dielectric material. The industry standard classifications are:

Class I - A temperature compensating dielectric with predictable TCC characteristics, primarily used in circuits requiring high Q-factor and stability. The dielectric constant (K) ranges from 8 to 150, but is typically between 30 and 40.

Class II - Dielectrics that are typically used for by-pass and coupling applications or for frequency discriminating circuits where the Q-factor and stability of capacitance are not of major importance. This category is divided into two subgroups, stable and high K (unstable), where the temperature characteristics define each of the subgroups.

Stable K - The stable K materials embody a range of dielectric constants from 250 to about 2400, with emphasis on temperature stability over a wide temperature range (-60°C to +125°C). The maximum capacitance excursion will not exceed 15% from a 25°C measurement.

High K (unstable) - High K materials obtain their unique dielectric constants from 3000 to 10,000 by shifting the Curie point to near room ambient. Dielectric constant losses from 30% to 80% may be experienced over a temperature range of -55°C to +85°C or less.

AVAILABLE TYPES

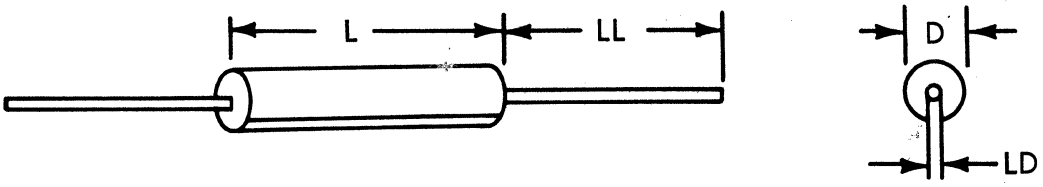
This section is a resume of additional information on ceramic capacitors that pertains to each specific family type. In most cases only physical information, as well as available values in a specific body style is presented, while in the chip capacitor family section, reflow, impedance, etc. are discussed.

Specific questions for each family should be directed to the appropriate component engineer if the information required is not contained here.

Axial/Radial Ceramic Capacitors

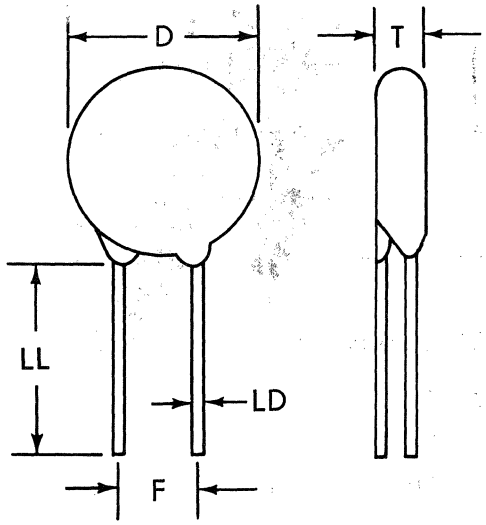
Typical dimensions of axial radial ceramic capacitors are provided in Tables 4-1 through 4-5.

Table 4-1. Typical Axial Leaded Ceramic Capacitor Physical Dimensions



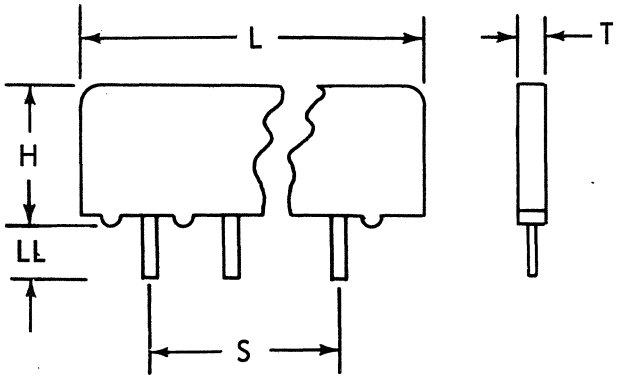
DIMENSIONS IN INCHES			
L (maximum)	D (maximum)	LD (maximum)	LL (maximum)
0.250	0.095	0.028	1.750
0.320	0.250	0.028	1.750
0.450	0.180	0.028	1.750
0.562	0.250	0.035	1.750
0.797	0.250	0.035	1.750
0.812	0.250	0.035	1.750

Table 4-2. Typical Disk Ceramic Capacitor Physical Dimensions



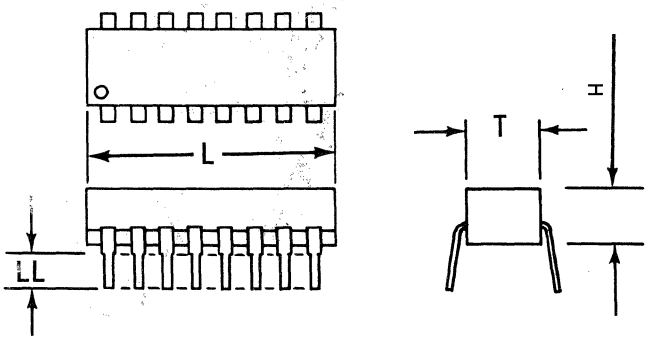
DIMENSIONS IN INCHES				
D (maximum)	T (maximum)	LD (maximum)	F	LL (maximum)
0.300	0.100	0.028	0.250	1.500
0.312	0.156	0.028		1.500
0.375	0.156	0.028		1.500
0.575	0.175	0.028		1.500
0.596	0.187	0.028		1.500
0.750	0.156	0.028		1.500
0.750	0.281	0.028		1.500
0.920	0.187	0.028		1.500

Table 4-3. Modular Ceramic Capacitor Physical Dimensions



DIMENSIONS IN INCHES					
Body Size	H (maximum)	L (maximum)	T (maximum)	S	LL (maximum)
2 Leads	0.350	0.190	0.090	0.100	0.095
2 Leads	0.350	0.240	0.120	0.125	0.095
4 Leads	0.350	0.490	0.120	0.375	0.095
6 Leads	0.350	0.740	0.120	0.625	0.095
8 Leads	0.350	0.990	0.120	0.875	0.095

Table 4-4. Typical Ceramic Dual-In-Line (DIP) Module Dimensions (100 Mil Centers; No Interconnections)



DIMENSIONS IN INCHES					
Body Size	Capacitors	H (maximum)	L (maximum)	T (maximum)	LL (maximum)
4 Leads	2	0.180	0.210	0.320	0.135
8 Leads	4	0.180	0.470	0.320	0.135
14 Leads	7	0.180	0.770	0.320	0.135
16 Leads	8	0.180	0.870	0.320	0.135

Table 4-5. Axial/Radial Parameter Capabilities

Body Type	Cap	P.T.	TCC	DF	IR	Rated Volts
*C-Pac (2 leads)	2 pF - 0.1 μF	±5 to $^{+100}_{-20}$	±1 to $^{+22}_{-82}$	0.001-0.01	10^{9} -10^{12}	25-50
DIP	18 pF - 0.1 μF	±5 to ±20	±1 to $^{+22}_{-56}$	0.001-0.04	10^{9} -10^{12}	100
Disc	5 pF - 0.1 μF	±1 to $^{+80}_{-20}$	±1 to $^{+22}_{-90}$	0.001	>10^{9}	3 kV
Axial	5 pF - 0.1 μF	±5 to ±20	±1 to $^{+22}_{-80}$	0.04-0.1	>10^{9}	100-500

*C-Pac's can also be made available in 4, 6 and 8 leaded packages for special applications. The capacitance value is in multiples of the 2 leaded values.

Ceramic Chip Capacitors

The following section outlines a series of standard body sizes and tolerances along with available capacitance values per dielectric material. These sizes and values are currently available from most ceramic chip capacitor vendors as standard devices. If application demands are not satisfied with these devices, an assessment can be made as to what devices/vendors exist to meet those demands, and appropriate action can be taken. See Figure 4-8 and Tables 4-6 to 4-8.)

Table 4-6. Chip Capacitor Ratings and Standard Body Sizes

1. Family A

L × W × H (±0.010 tolerance)*
0.080 × 0.050 × 0.045

	(NPO) 50 V	(X5R) 50 V
Low Limit	5.1 pF	200 pF
High Limit	270.0 pF	15 nF

2. Family B

L × W × H (±0.010 tolerance)*
0.120 × 0.100 × 0.045

	(NPO) 50 V	(X5R) 50 V
Low Limit	220.0 pF	12 nF
High Limit	2.7 nF	68 nF

3. Family C

L × W × H (±0.010 tolerance)*
0.175 × 0.125 × 0.045

	(NPO) 50 V	(X5R) 50 V
Low Limit	2.0 nF	47 nF
High Limit	3.3 nF	180 nF

*All edge band dimensions are 0.020 ± 0.10 with edge band separation to be 0.030 minimum.

4. Family D

L	W	H		
0.225	× 0.250 (±0.015 tolerance)	× 0.045 (± 0.010 tolerance)*		
			(NPO)	
			50 V	
			Low Limit	2.7 nF
			High Limit	10.0 nF

Table 4-7 is a guide to standard decade capacitance values that are available in the body sizes and ratings outlined in Table 4-6. These are considered standard values by most vendors, but all values may not be a stock item for each vendor.

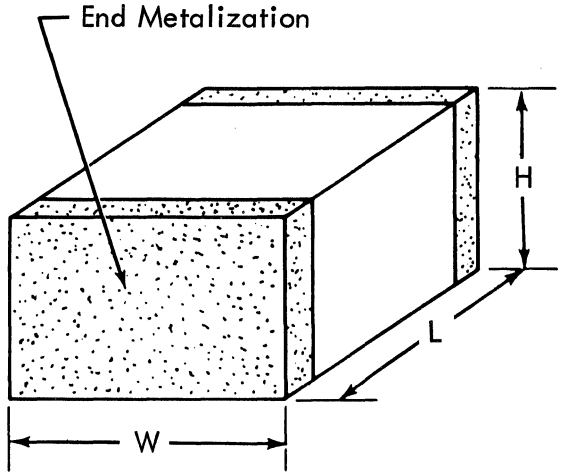


Figure 4-8. Ceramic Chip Capacitor Physical Dimensions

*All edge band dimensions are 0.020 ± 0.10 with edge band separation to be 0.030 minimum.

Table 4-7. Standard Initial Capacitance Values

5% (NPO) CAPACITANCE VALUES CLASS I						
5.1 pF	18 pF	62 pF	200 pF	620 pF	2.0 nF	6.8 nF
5.6	20	68	220	680	2.2	7.5
6.2	22	75	240	750	2.4	8.2
6.8	24	82	270	820	2.7	9.1
7.5	27	91	300	910	3.0	10.0
8.2	30	100	330	1000	3.3	
9.1	33	110	360	1100	3.6	
10	36	120	390	1200	3.9	
11	43	130	430	1300	4.3	
12	47	150	470	1500	4.7	
15	51	160	510	1600	5.1	
16	56	180	560	1800	5.6	
					6.2	

10% (X5R) CAPACITANCE VALUES CLASS II					
180 pF	680 pF	2.7 nF	10 nF	39 nF	150 nF
200	820	3.3	12	47	180
270	1000	3.9	15	56	
330	1200	4.7	18	68	
390	1500	5.6	22	82	
470	1800	6.8	27	100	
560	2200	8.2	33	120	

Table 4-8. Ceramic Chip Capacitor Maximum Performance Variations

Parameter	Class I	Class II
Purchase Tolerance (capacitance)	±5%	±10%
Temp. Coeff. Capacitance (Temp. Range)	±30 ppm/°C (-55°C to +125°C)	±15% (-55°C to +85°C)
Voltage Coeff. Capacitance (Maximum @ Rated Voltage)	0 (50 Vdc)	+2.5%, -10% (50 Vdc)
Aging (Maximum per decade)	±0.1%	0, -2.5%
Worse Case End-Of-Life Tolerance	±5.3%	+23.5%, -40%
IR (Minimum @ EOL)	10^{10} Ω	10^{8} Ω
Dissipation Factor (Maximum)	0.1%	2.5%

Impedance Performance - The characteristics of ceramic chip capacitors do not vary appreciably from those of the dielectric material below 10 MHz. Above 10 MHz, the reactance of the electrodes, terminations, etc., cause the impedance to increase approximately as the square root of the frequency. Figure 4-9 presents a family of typical values normally encountered for decoupling and filtering applications in the referenced body styles.

Reflow Information - The ceramic chip capacitor families contained in this section have been qualified for use in reflow profiles consistent with Figure 4-10.

A maximum of 4 reflow exposures for initial attach or additional rework are allowed in any combination. The capacitors are able to withstand the reflow exposure with little or no physical damage and no measurable electrical degradation.

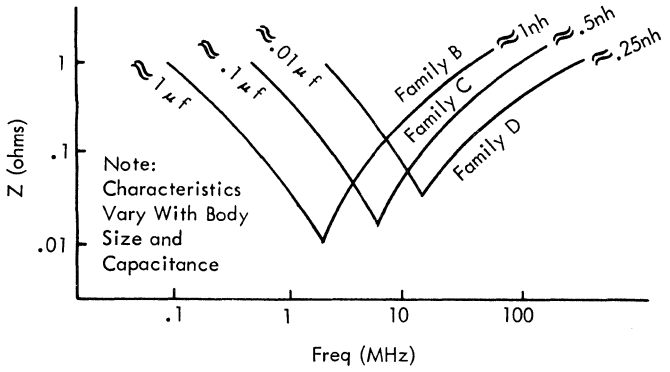


Figure 4-9. Typical Impedance Curves for Chip Capacitors

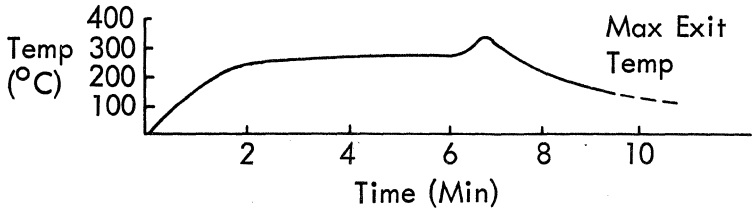


Figure 4-10. Typical Reflow Profile for Ceramic Chip Capacitors Contained in This Section

An exposure of reflow attach is ceramic fracturing. However, this exposure is minimized with close control of the reflow profile, and adequate incoming quality inspection to control capacitor integrity.

Chip Capacitor Metalization - Current specifications require metalizations that will withstand reflow attach temperatures without physical deterioration. Typical metalization systems in use are Ag/Pd and Ag/Ni/Au. Unalloyed Ag is not acceptable.

GENERAL CERAMIC CAPACITOR PERFORMANCE CHARACTERISTICS

This section contains information outlining general ceramic capacitor performance characteristics. Included are:

1. Temperature Coefficient of Capacitance
2. Voltage Characteristics
3. Dissipation Factors
4. Insulation Resistance
5. Frequency Characteristics
6. Aging Characteristics
7. EOL Estimates

The information is categorized by the following dielectric types:

1. Class I (NPO K 30-40)
2. Class II (Stable K 1800)
3. Class II (High K 8000)

This information is general and covers a wide range of temperature and voltage. An approximation of actual performance in a given application can be determined by estimating limits for specific temperature and voltage stress.

Temperature Coefficient of Capacitance

Temperature characteristics of ceramic capacitors are presented in Figure 4-11. These TCC characteristics are applicable to all ceramic capacitors regardless of package type. The ceramic chip capacitors do not utilize the Class II, High K material due to the extreme capacitance decrease in the higher temperature range.

Table 4-9 presents the EIA (Electronic Industries Association) standards that define the temperature range and the maximum percent change in capacitance allowed over the range. The coding for Z5U would indicate a dielectric specified for a +22%, -56% TCC over the range of +10°C to +85°C. Typically, only the X5R, X7R, and Z5U characteristics are used in IBM to specify ceramic capacitors.

EIA (Electronic Industries Association) standards define the temperature range and the maximum percent change in capacitance allowed over that range. The coding is presented in Table 4-9 and is used to identify class II ceramic capacitor characteristics.

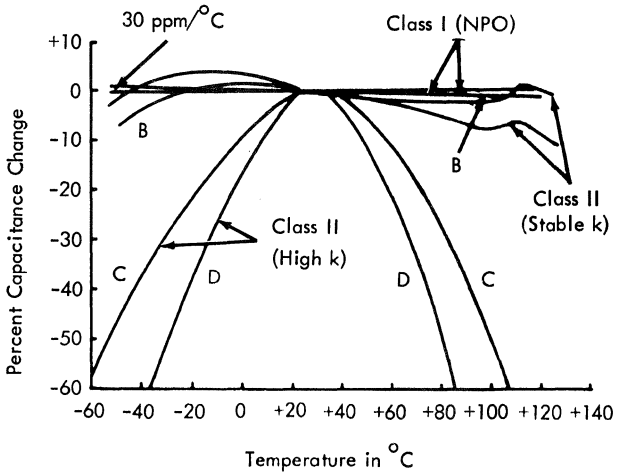


Figure 4-11. Typical Capacitance Change with Temperature Class I, Class II (Stable K, High K)

Table 4-9. EIA Class II Ceramic Capacitor Characteristics

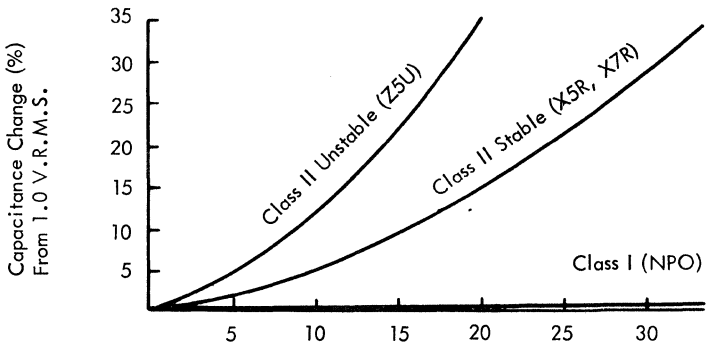
Code	Temperature Range
Z5	+10°C to +85°C
Y5	+30°C to +85°C
X5	-55°C to +85°C
X7	-55°C to +125°C

Code	%ΔC
A	±1%
B	±1.5%
C	±2.2%
D	±3.3%
E	±4.7%
F	±7.5%
P	±10%
R	±15%
S	±22%
T	+22%, -33%
U	+22%, -56%
V	+22%, -82%

VOLTAGE CHARACTERISTICS

AC Voltage - Low values of ac voltage (<20 volts) at 1 kHz tend to produce an increase in both dissipation factor and capacitance. The effect of ac voltage on ceramic capacitors is dependent upon the volts per mil of dielectric thickness and is normally minimal with plate capacitors. However, with multi-layer ceramics, where one mil thick dielectrics are not uncommon, the ac voltage effect could become significant. Figure 4-12 presents the effect on capacitance of ac voltage for Class I and II multi-layer ceramics.

DC Voltage - DC potential stress produces a negative change in capacitance as illustrated in Figure 4-13. Again, it should be noted that the higher k dielectrics have the greater change.



Note: Based on Standard Designs. These Curves Can Vary Depending on Dielectric Thickness

Figure 4-12. Typical Capacitance Change with Increasing AC Voltage

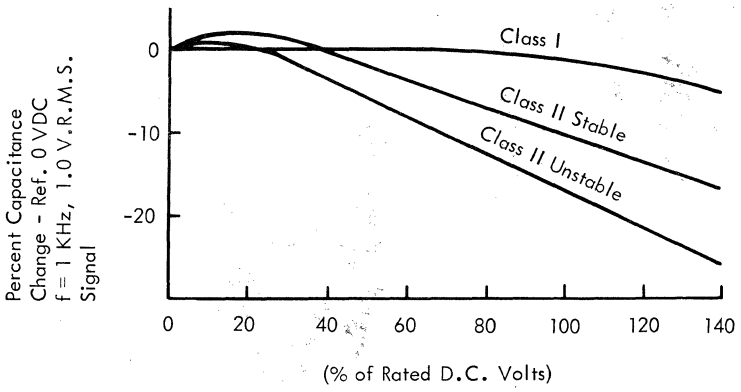


Figure 4-13. Typical Capacitance versus DC Volts, Typical Designs

Dissipation Factors

DF versus Temperature - Figure 4-14 presents dissipation factor variations due to temperature fluctuations. Class I and Class II decrease with temperature at about the same rate. However, the Class I DF valves are significantly lower than the Class II values.

DF versus Voltage - Dissipation factor is variable with respect to applied voltage stress and is a function of dielectric thickness. The values of DF for given standard designs are relatively consistent, and vary directly with ac voltage and indirectly with dc voltage. Figures 4-15 and 4-16 present the variations encountered for devices with standardized designs.

Insulation Resistance

Insulation resistance is affected by temperature and is presented in Figure 4-17. Both Class I and Class II dielectrics decrease in insulation resistance as the temperature increases.

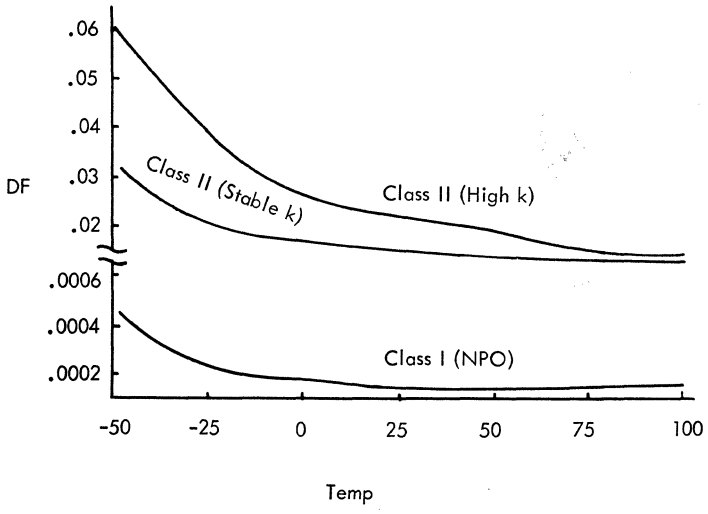


Figure 4-14. Dissipation Factor Variations Due to Temperature Fluctuations

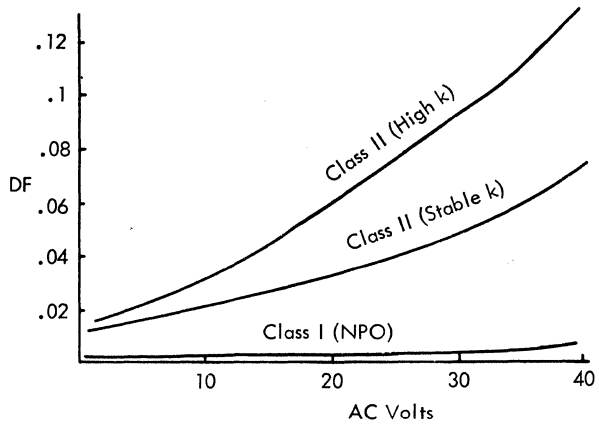


Figure 4-15. DF Variation Relative to AC Voltage

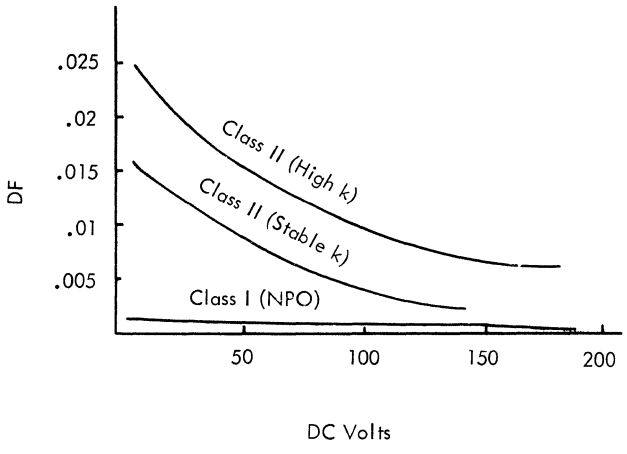


Figure 4-16. DF Variation Relative to DC Voltage

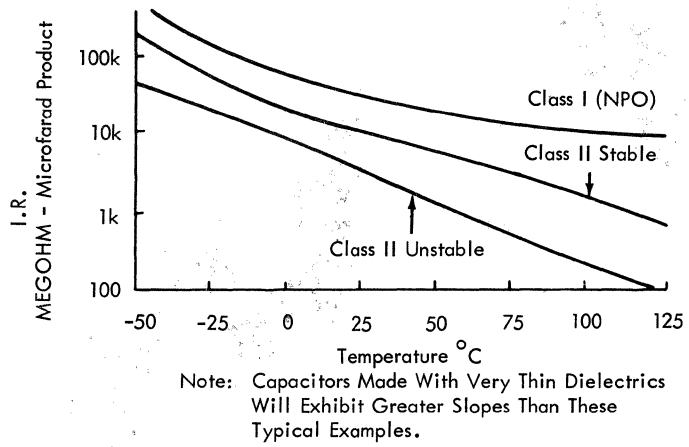


Figure 4-17. Typical Insulation Resistance (I.R.), as a Function of Temperature

Frequency Characteristics

Class II ceramic capacitors are frequency sensitive. The degree of sensitivity is dependent on the particular dielectric material used. Figure 4-18 presents a comparison of capacitance change versus frequency for class I and class II dielectric materials.

The dissipation factor is relatively unaffected by frequency for class I capacitance below 10 MHz. At 100 MHz the DF for class I ceramics is 0.0001. Class II ceramics range between 0.03 and 0.05 at 10 MHz.

The Q factor of a ceramic capacitance is the measure of the performance of the capacitor compared with that of pure reactance. The higher the Q, the more nearly the resistance and dissipation factor approach zero. The Q factor will vary with frequency for every type of ceramic capacitor and will vary from lot to lot of any given dielectric. The Q factor for both class I and class II ceramic capacitors increases with frequency below 10 kHz and then decreases substantially with increasing frequency. This is illustrated in Figure 4-19.

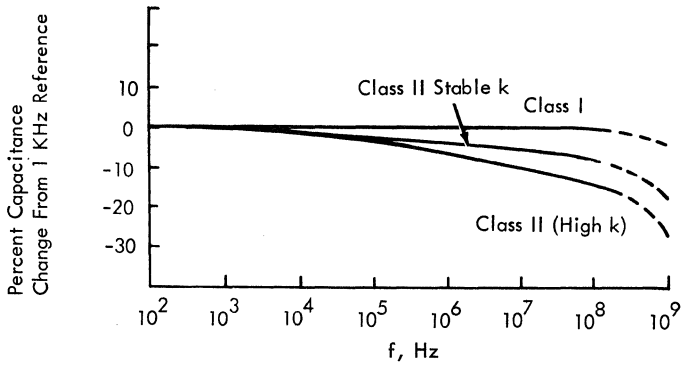


Figure 4-18. Typical Capacitance Change with Frequency

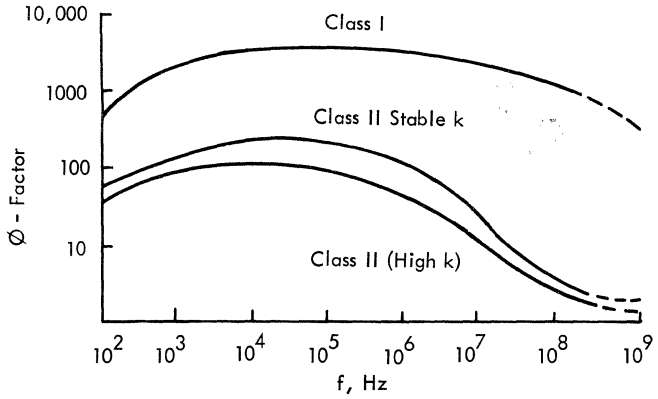


Figure 4-19. Typical "Q" Factor versus Frequency

The impedance of the various styles available is a function of capacitance value and the mechanical characteristics of the device. A ceramic chip capacitor would normally have the lowest impedance for the higher frequency ranges, whereas an axially leaded device depending on final lead length, would have a higher impedance. Figure 4-20 is a comparison of a number of styles with a 0.1 µF rating.

Aging Characteristics

A characteristic of ceramic capacitors is their loss of capacitance with time. The loss is associated with the ferroelectric state and geometry of the crystalline structure of the ceramic. Figure 4-21 presents capacitance loss per decade of hours for class I and class II dielectrics. The aging rate can be increased by a factor of 10 by applying a dc bias. Although the aging can be increased with a dc bias the slope of the stressed and unstressed curves will be the same. The aging effect can be reversed by application of thermal energy (~150°C), but begins again when the energy is removed. The dissipation factor also decreases with time, but since a decrease is desirable it is not generally considered.

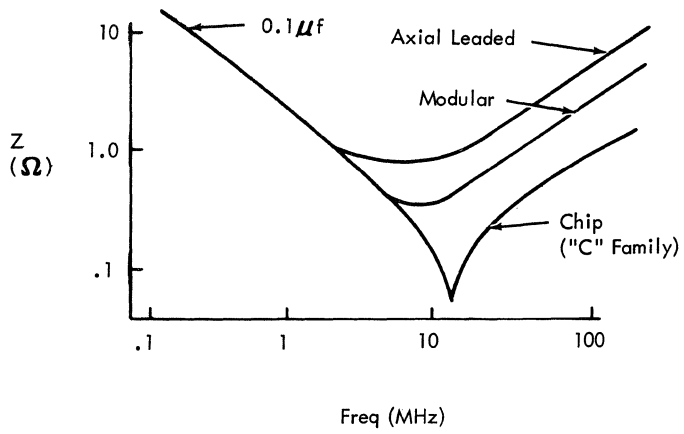


Figure 4-20. Impedance Comparison of Ceramic Capacitors With a 0.1 µF Rating

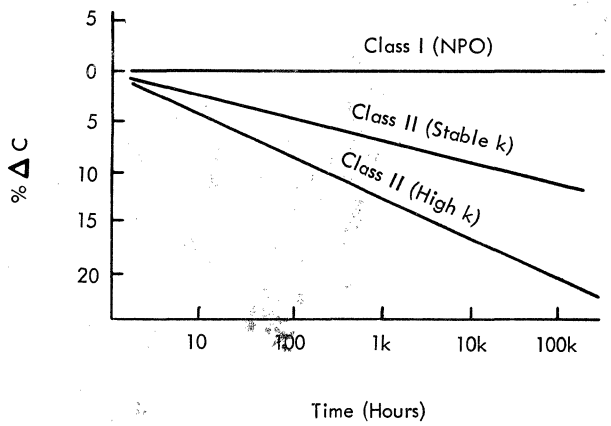


Figure 4-21. Class I and Class II Capacitance Loss With Time

The effect of aging in capacitor applications is of particular importance when the initial capacitance tolerance is tight. It would be impractical to specify a 5% initial tolerance for a unit with a 2% per decade aging rate.

EOL Characteristics

End of life capacitance limits for class I and class II capacitors are presented in Figures 4-22, 4-23 and 4-24. These figures depict EOL values when key capacitance variations are combined. Many applications will not encounter the worst case (WCEOL) values due to minimized voltage and temperature variations. Also, in some applications, purchase tolerance variations can be reduced or eliminated by circuit trimming.

These figures should be used as a guide when considering variations encountered for specific application conditions.

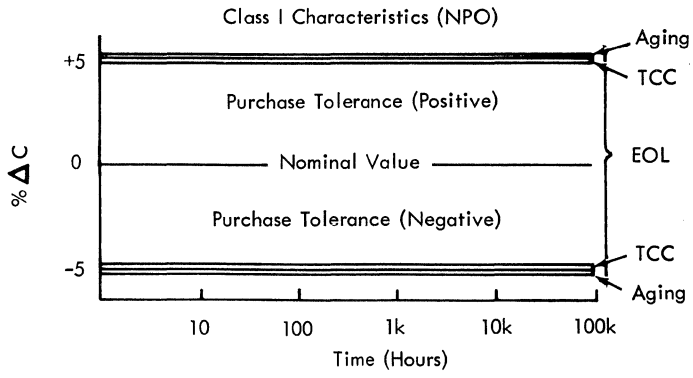


Figure 4-22. End-of-Life Capacitance Limits for Class I Capacitors

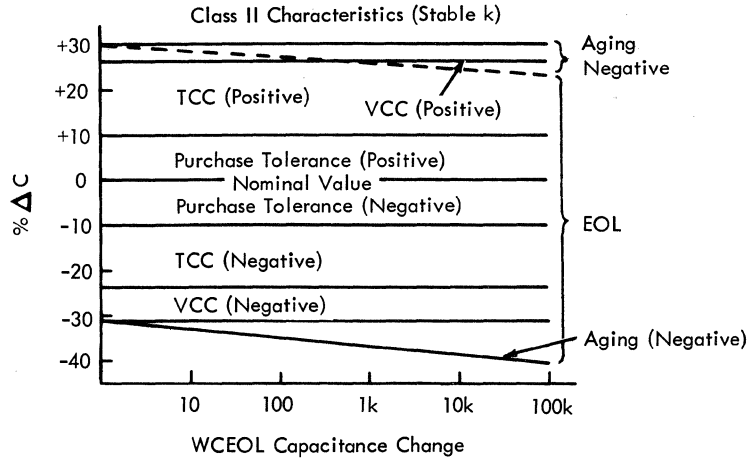


Figure 4-23. End-of-Life Capacitance Limits for Class II Capacitors (Stable K)

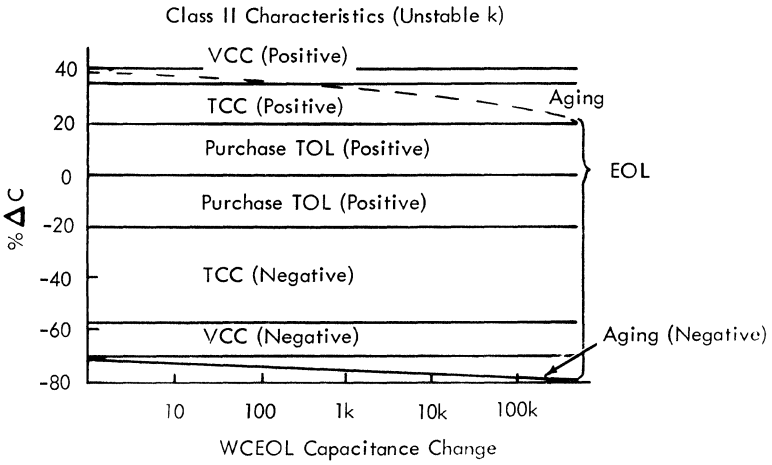


Figure 4-24. End-of-Life Capacitance Limits for Class II Capacitors (Unstable K)

Table 4-10 is an example of WCEOL capacitance change. The values assigned are all worse case limits for the chosen example. However, specific application stress can be determined from previous sections and applied to this example to approximate specific WCEOL capacitance variations.

Additional EOL considerations include capacitance change with stress, IR degradation, and short term degradation such as card or substrate mounting. Typical parameter degradation with long term temperature and voltage stress is minimal.

Class I dielectrics exhibit negligible short term degradation and approximately +0.2% capacitance change with 100k hours life. Class I insulation resistance will not normally degrade below 10^{10} @ 100k hours which is quite adequate in most all applications.

Class II dielectrics exhibit somewhat more capacitance and IR change. However, capacitance degradation is typically negative 2-3% and IR would not normally fall below 10^{8} Ω Once again, short term degradation is negligible.

A fairly close approximation of actual EOL performance for a specific application can be determined by combining performance outlined in sections A, B, D, and F with initial purchase tolerance assigned.

A resume of all parameters to be considered with identifying worst case EOL is presented in Table 4-11.

Table 4-10. WCEOL Example

	NEGATIVE LIMIT	CAPACITANCE VALUE	POSITIVE LIMIT
Nominal Value		1.0 nF	
Specification Limit	-10%	PURCHASE TOLERANCE	+10%
Actual Value/%Δ From Nominal	-10%	0.9 to 1.1	+10%
Specification Limit	-15%	TCC	+15%
Actual Value/%Δ From Nominal	-23.5%	0.765 to 1.265	+26.5%
Performance Limit	-10%	VCC	+ 2.5%
Actual Value/%Δ From Nominal	-31%	0.69 to 1.3	+30%
Performance Limit	-12.5%	AGING	- 5%
Actual Value/%Δ From Nominal	-40%	0.60 to 1.235	+23.5%
WCEOL Capacitance Value		0.60 nF to 1.235 nF	
WCEOL %Δ Capacitance		-40% to +23.5%	
Absolute WCEOL Tolerance		-47% to +22.5%	

Table 4-11. Worst Case End of Life Performance

Parameter	Class I (NPO)	Class II X5R X7R	Class II (Z50)
Purchase Tolerance	±5%	±10%	±20%
TCC (25°C to 85°C) (+30 PPM/%)	±0.18%	±15%	+22% -56%
Short Term Degradation	±0.1%	±0.5%	±1.0%
Long Term Degradation	±0.2%	±1.0%	±2.0%
Aging (per decade)	±0.1%	0% -2.0%	0% -4.5%
VCC	0%	+2.5% -10%	0% -2.5%
Insulator Resistance	10^{10}	10^{8}	10^{6}
Worst Case EOL Tol.	+5.29% to -5.26%	+31.7% to -38.8%	-74.4% to +50.82%
Absolute WCEOL Tol.	±5.58%	+29% to -38.8%	+45% to -86%

DESIGN/APPLICATION CONSIDERATIONS

The selection of a capacitor for a given application normally consists of matching mechanical and electrical requirements to existing or available styles and dielectrics.

The electrical requirements will dictate dielectric choice. The following sequence of choices would identify a reasonable, preliminary electrical specification

1. Identify the nominal capacitance required by the application.
2. Identify the following preliminary capacitor requirements to meet application needs:
   a. temperature coefficient of capacitance
   b. voltage coefficient of capacitance
   c. operating temperature range

3. Compare these limits to those in Table 4-8 to identify appropriate dielectric selection to meet short term application stability requirements.

4. When dielectric selection is complete, the following parameter characteristics will become a function of the chosen dielectric.

   a. purchase tolerance

   b. dissipation factor

   c. insulation resistance

   d. aging (per decade value times 3 decades)

5. Parameters 1, 2, 4 and 7, along with short and long term degradation values, see Figure 4-22 through 4-24, combine to establish long term EOL capacitance change. This combination should be similar to EOL application requirements.

   a. EOL capacitance variation

   b. EOL application limits

6. If items 8 and 9 are not compatible because of excessive negative drift, a larger capacitance value should be chosen. If the next larger value does not suffice, the most stable dielectric (NPO) must be chosen. If NPO material was the initial choice, then circuit adjustment must be made to accept NPO performance and EOL limits.

7. The assignment of a voltage rating to the capacitor should take into account the ac/dc voltage stress to be encountered. Normally, ac variations are small (1-5 Vac peak) and are added to any dc voltage stress. The ac/dc voltages combined to produce the overall voltage stress the capacitor must be able to withstand. As a rule-of-thumb, ac voltage rating is 10% of dc voltage rating as applied to account for the many various ac levels that could be encountered but are not specified. Larger ac variations (>10 VRMS) would most likely dictate an increase in dielectric thickness which will impact capacitance value ranges in the standard body sizes. AC variation in excess of 10 VRMS should be addressed separately to determine best capacitor design. Pulse applications should not exceed the same voltage levels and should be handled the same as RMS voltages with the exception of frequency. Frequencies above 100 kHZ will produce higher dissipation and power factors which when combined with high voltage variations (>0.5 Vac) can product excessive power dissipation. High frequency and low ESR applications should be referred to the appropriate component engineer.

8. Definition of initial capacitance requirements should be defined at this point. The initial capacitance value should be near or at a standard decade value (see Table 4-7). Selection of a decade value should be made where possible. Selection of a value not included in the decade value guide can significantly impact cost, delivery, and release schedules.

9. Section 4.1 outlines standard body sizes and associated available capacitor values ranges in those sizes. Some overlap exists. In the case of ceramic chip capacitors the smallest body size available should be chosen to minimize cost, module space, capacitor strain due to capacitor/substrate thermal mismatch, and capacitor/substrate bond failure rate. In the case of leaded capacitors, the body size and type chosen should be consistent with card or board constraints and still meet electrical demands.

10. The electrical and mechanical specifications should be reasonably defined at this point. If additional specifications are required (such as impedance, ESR, or VCC), the appropriate component engineer should be consulted as to the availability of devices to satisfy the application needs.

ECONOMICS

The cost of ceramic capacitors varies by capacitor type, volume, packaging, specified parameters etc. Tight tolerances, stringent stability and high voltage rating are a few factors that can significantly increase product cost. For this reason, required performance parameters should be realistically assessed in light of ceramic capacitor capabilities and limitations, to arrive at a reasonable specification.

Typical "to user" costs follow for each type of ceramic capacitor with "standard" designs. Note that ceramic chip capacitors (mounted on IBM modules) do not include module costs.

Axial and Disc	$0.10 to $0.50
C-Pacs	$0.15 to $0.75
DIP Modules	$0.40 to $0.75 (4 leads)
	$1.50 to $2.00 (16 leads)
Chip Capacitors	$0.13 to $0.25 "A" Size
	$0.25 to $0.65 "B" Size
	$0.60 to $0.78 "C" Size
	$0.70 to $0.90 "D" Size

SPECIFICATIONS

Following are the specifications which are applicable to ceramic capacitors.

Engineering Specifications

Ceramic Dielectric	-895659
Ceramic Chip	-873498
Failure Rate	-866451

Quality Specification:

Ceramic Dielectric	-873542
Ceramic Chip	-873549
General Quality Spec	-873705

DCS Codes:

2-3611 - Axial Leaded
2-3612 - Radial Leaded
2-3614 - Chip Capacitor
2-3613 - C-Pac

MICA CAPACITORS

DESCRIPTION

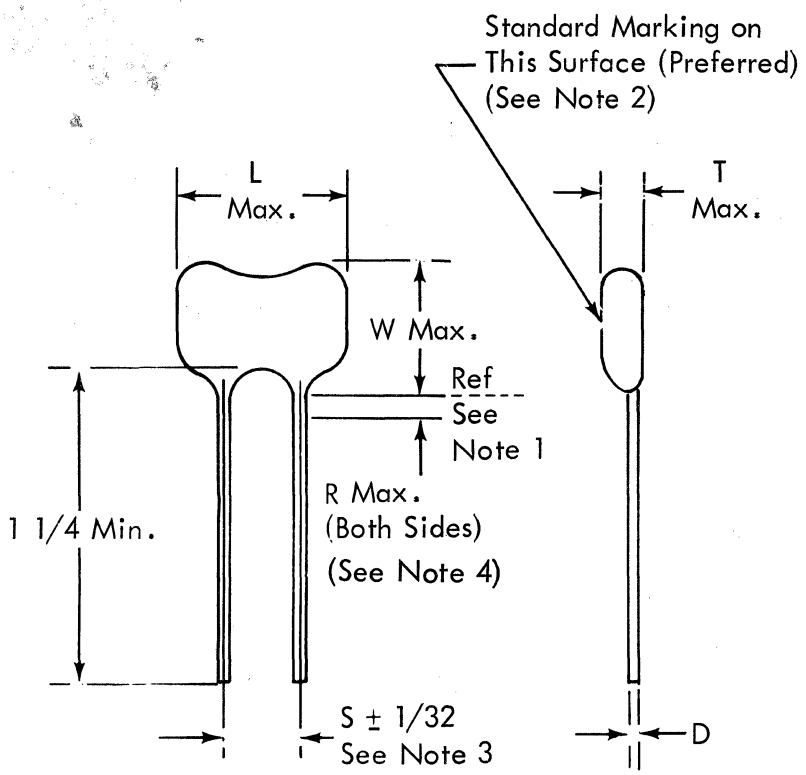
Mica capacitors are typically precision type (tight) TCC, high stability, etc.) capacitors with low loss and high breakdown voltage capabilities. They employ natural mica as the dielectric material and are typically used in applications such as high frequency filtering and high voltage tuning and blocking. They are constructed either by stacking very thin sheets of mica alternately between layers of foil or by bonding a silver deposit directly on the surface of the mica dielectric. The unit is then terminated and either moded (axial leaded) or dip coated (radial leaded) for mechanical and environmental protection.

AVAILABLE TYPES

Tables 4-12, 4-13, and 4-14 show the standard dimensions of the two package styles used by IBM and the color coding system.

The temperature cofficient of capacitance (TCC) of mica capacitors has been divided into six "characteristic ranges" which are designated "A" through "F". (See Table 4-15.) Each characteristic range is defined in terms of both the maximum cyclic (reversible) and non-cyclic (irreversible) variations in capacitance which are allowed.

Table 4-12. Standard Dipped Styles and Dimensions



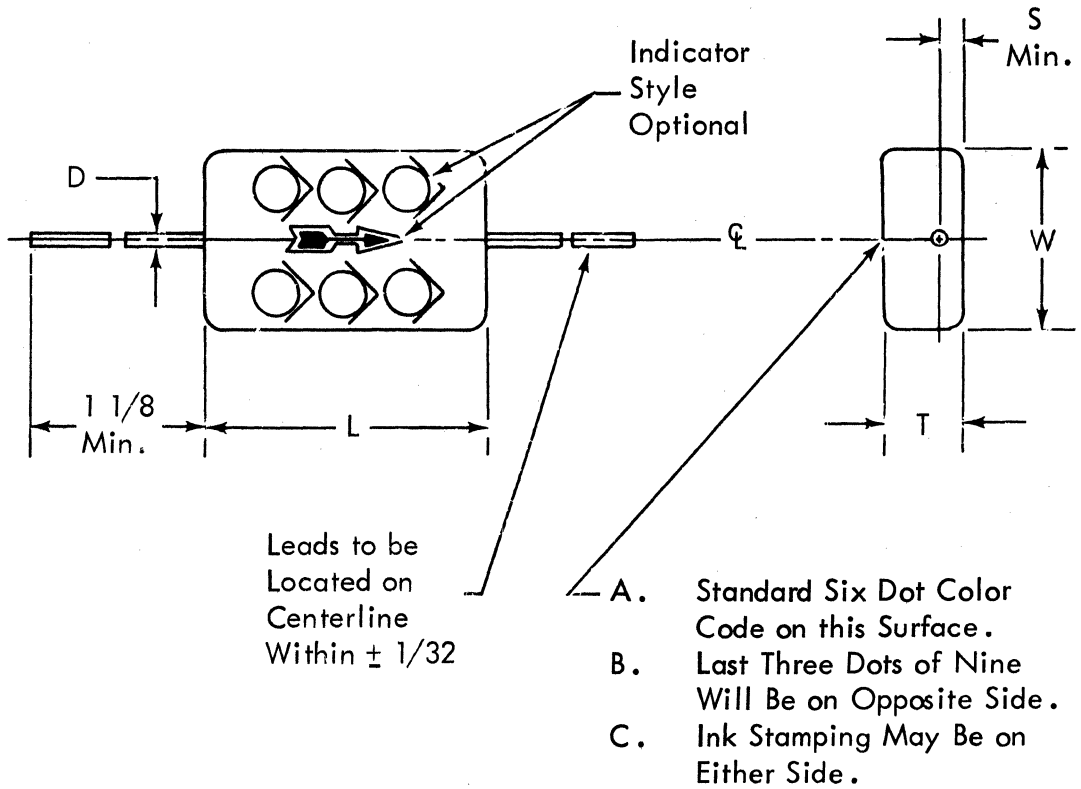
All Dimensions in Inches.

Notes:

1. Reference line is at point where case material cone becomes a cylinder.
2. Marking may be on either side.
3. Measured at point of exit of wires from case.
4. R dimension is a normally unsolderable area. Remainder of wire is solderable.
5. Maximum thickness of solder coating on lead wires is 0.0015.

STYLE	D	L	W	T	S	R
RDM 10	#26AWG 0.016	0.375 ± 0.015	0.355 ± 0.025	0.105 ± 0.015	0.140	0.125
RDM 15	#22AWG 0.025	0.470 ± 0.020	0.390 ± 0.030	0.105 ± 0.035	0.234	0.125
RDM 19	#20AWG 0.032	0.675 ± 0.035	0.545 ± 0.045	0.180 ± 0.090	0.343	0.140
RDM 20	#20AWG 0.032	0.785 ± 0.035	0.565 ± 0.065	0.315 ± 0.135	0.437	0.140
RDM 30	#18AWG 0.040	0.800 ± 0.040	0.885 ± 0.045	0.355 ± 0.125	0.437	0.171
RDM 42	#18AWG 0.040	1.44 ± 0.03	0.895 ± 0.025	0.375 ± 0.095	0.687	0.171

Table 4-13. Standard Molded Styles and Dimensions

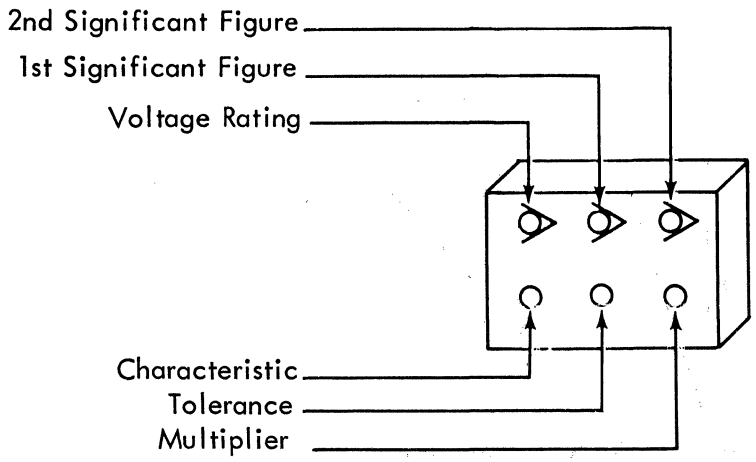


Note: Maximum Thickness of Solder Coating on Lead Wires is 0.0015.

STYLE	DIMENSIONS (INCHES) D	L	W	T	S
RCM 15	#22AWG 0.025	0.515 ± 0.031	±0.015 0.297 -0.031	±0.031 0.187 -0.046	0.065
RCM 20	#22AWG 0.025	0.734 ± 0.062	0.437 ± 0.031	0.187 ± 0.031	0.065
RCM 30	#18AWG 0.040	+0.062 0.797 -0.031	+0.062 0.797 -0.031	+0.031 0.250 -0.015	0.078
RCM 35	#18AWG 0.040	+0.062 0.797 -0.031	+0.062 0.797 -0.031	+0.046 0.312 -0.031	0.078

Table 4-14. Identification Code for Axial Leaded Mica Capacitors

Note: 1st and 2nd Significant figures indicate tens and units of pF.



Color Significance

Code	1st and 2nd Significant Figure	Voltage Multiplier	Rating	Tolerance	Characteristic
black	0	10^0	-	-	A
brown	1	10^1	100 V	±1%	B
red	2	10^2	-	±2%	C
orange	3	10^3	300 V	-	D
yellow	4	10^4	-	-	E
green	5	10^{-4}	500 V	±5%	F
blue	6	-	-	-	-
violet	7	-	-	-	-
gray	8	-	-	-	-
white	9	-	-	-	-
silver	-	10^{-2}	-	±10%	-

Table 4-15. TCC Ranges of Mica Capacitors

Characteristic	Temp. Coeff. of Cap. %/°C	Maximum Cap. Drift %
A	±0.1	±0.5 ± 1.0 pF
B	±0.05	±3.0 ± 1.0 pF
C	±0.02	±0.5 ± 0.5 pF
D	±0.01	±0.3 ± 0.1 pF
E	±0.01, -0.002	±0.1 ± 0.1 pF
F	±0.007, -0	±0.05 ± 0.1 pF

PERFORMANCE CHARACTERISTICS

The TCC characteristics of mica capacitors are a function of their physical properties (type of construction, type/amount of material); the larger the physical dimensions, the larger the capacitance change due to thermal effects. For a given package size and temperature excursion the physical changes and hence the capacitance variations are practically constant. As the nominal capacitance in a given package is reduced, therefore, the thermally induced change becomes a larger percentage of the nominal capacitance. The result is that there is a typical TCC characteristic associated with each package type (molded or dipped) and size, as illustrated in Figure 4-25. For each package size, there are capacitance values below which certain "characteristics" are not usually available.

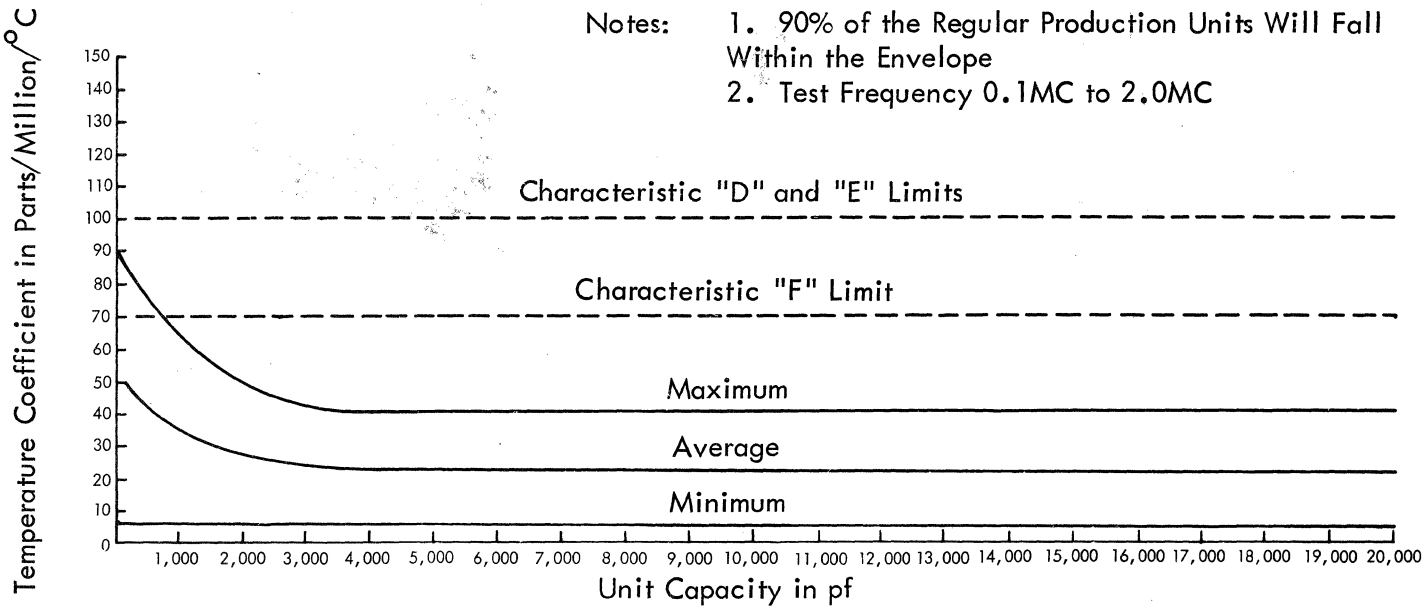


Figure 4-25. Typical Temperature Coefficient Range for Mica Capacitors Rated at 85°C

Capacitance versus DC Voltage

Mica capacitors when dry, exhibit little or no change in capacitance due to dc voltage stress. The reduction in the capacitance range with increasing dc bias (Table 4-16) is strictly the result of having to increase the dielectric thickness to avoid the possibility of dielectric breakdown.

Table 4-17 shows the relationship between voltage rating, case size, and capacitance value. Table 3-18 shows the relationship between case size, characteristic range, and capacitance value.

Table 4-16. Voltage and Capacitance Ranges

Working Voltage	Characteristic	Capacitance Range
100 Vdc	C	1 pF thru 820 pF
	D, E	20 pF thru 820 pF
	F	32 pF thru 820 pF
300 Vdc	C	1 pF thru 620 pF
	D, E	20 pF thru 620 pF
	F	32 pF thru 620 pF
500 Vdc	C	1 pF thru 510 pF
	D, E	20 pF thru 510 pF
	F	32 pF thru 510 pF

Table 4-17. Voltage Rating, Case Size, and Capacitance Value Relationships

Case Sizes and Capacitance Ranges - Molded Styles

Case Size	DC Working Voltage	Capacitance Range, pF See Preferred Values, 4.3
RCM 15	100	1-820
	300	1-510
	500	1-500
RCM 20	100	47-5100
	300	47-4700
	500	57-3300
	1000	1-1200
RCM 30	100	470-15000
	300	470-10000
	500	470-6200
	1000	470-3000
RCM 35	100	3300-20000
	300	3300-15000
	500	3300-10000
	1000	2700-5600

Case Sizes and Capacitance Ranges - Dipped Styles

Case Size	DC Working Voltage	Capacitance Range, pF See Preferred Values, 4.3
RDM 10	100	1-400
	300	1-300
	500	1-250
RDM 15	100	1-1000
	300	1-820
	500	1-510
RDM 19	100	47-8200
	300	47-6200
	500	47-5100
	1000	1-3000
RDM 20	100	47-18000
	300	47-12000
	500	57-10000
	1000	1-5600
RDM 30	100	470-39000
	300	470-30000
	500	470-22000
	1000	470-11000
RDM 42	100	16000-91000
	300	16000-68000
	500	16000-51000
	1000	3300-30000

Table 4-18. Case Size, Characteristic Range, and Capacitance Value Relationships

Case Size (Molded)	Characteristics	Minimum Capacitance For Characteristics
RCM 15	B, C D, E F	All values as listed 27 pF 51 pF
RCM 20	B, C D, E F	All values as listed 110 pF 200 pF
RCM 30 RCM 35	B, C, D, E, F	All values as listed
(Dipped) RDM 10 RDM 15	C D, E F	All values as listed 27 pF 91 pF
RDM 19 RDM 20	C D, E F	All values as listed 180 pF 560 pF
RDM 30 RDM 42	C, D, E, F	All values as listed

Capacitor losses, expressed as dissipation factor (D.F.), or "Q", which is equal to 1/D.F., are a function of the dielectric material and the measurement frequency. Figure 4-26 plots maximum dissipation factor versus capacitance in pico farads.

Aging Characteristics

Mica capacitors are very stable with temperature and frequency and have negligible changes in capacitance (<0.1%) with time. Typical frequency characteristics of mica capacitors show little change in capacitance up to 10 MHz. Capacitance changes of less than ±5% are exhibited at frequencies from 10 MHz to 100 MHz. The dissipation factor typically decreases with high capacitance values. Figure 4-26 is a plot of capacitance versus dissipation factor for mica capacitors. When operating mica capacitors at rated voltage and 85°C, the EOL drifts of the A and B characteristic types are normally expected to be approximately twice that of the C through F characteristic types.

The range of worst case obsolute EOL tolerances for mica capacitors is:

Purchase Tolerance	±1%	to ±10%
TCC	±0.05%	to ±5%
WC EOL Drift	±2%	to ±5%
WC Absolute EOL Tol	±3.05%	to ±20%

Most mica capacitors are supported with 0.001%/k hours failure rate through 100,000 hour life. For P/N confirmations, check F/R specification 8664510 or the comparent data bank.

ECONOMIC AND DESIGN CONSIDERATIONS

Many body designs, TC characteristics, and parameter tradeoffs exit within the mica capacitor family. However, in relation to other dielectrics, micas in general offer high stability, with respect to temperature, frequency, aging, high insulation resistance, low power factor, low inductance, and low dissipation factor. Disadvantages are, large physical size and a price range nominally around $0.30 in large quantities.

Component engineering should be consulted to determine the best available performance and cost for the application.

SPECIFICATIONS

Following are the applicable IBM specifications for mica capacitors:

Engineering Specification: 899599
Quality Specification: 873705
DCS Codes: 2-3601 - Axial leaded
2-3602 - Radial leaded

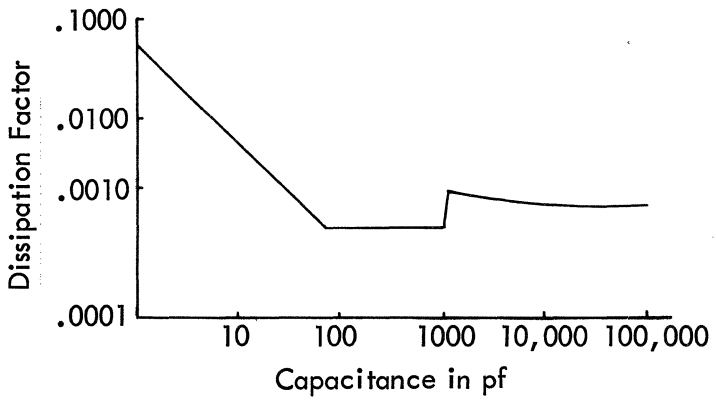


Figure 4-26. Dissipation Factor versus Capacitance

PLASTIC FILM CAPACITORS

DESCRIPTION

Plastic capacitors employ organic films as the dielectric which are metallized or wound with metallic foils to form a capacitor. In general, plastic film capacitors have the ability to provide high stability and dielectric strength with low dissipation factors.

There are five major types of organic films utilized by IBM in plastic capacitors. They are polyester (Mylar), polystyrene, polycarbonate, parylene, and polypropylene. The polyester film is considered to be a general purpose capacitor while the other four films have precision capabilities.

Plastic capacitors are used in both ac and dc applications such as blocking, buffering, filtering, timing, and tuning. Capacitance values of the plastic capacitors generally used in IBM range from 0.001 µF to 10 µF. The dissipation factor, which is due primarily to dielectric losses and is inherently low for most plastics, ranges from 0.01% to 0.3% at room ambient for the precision films, and 0.5% for the polyester or general purpose capacitor.

Two methods of manufacturing plastic capacitors are predominately used.

The Foil and Film Method

An organic film (typically less than 0.50 mils thick) is fed between two strips of metal foil (usually aluminum and less than 0.25 mils thick) from an antistatic winding machine. The film is the dielectric and the metal foils the electrodes. The film and foils are wound, wrapped with tape, and heat treated to further compress the foils and film together, remove stresses and stabilize the device. The ends are metallized with solder and leads are fastened.

The Metallized Method

An organic film is metallized on one side by vacuum deposition of aluminum, zinc or tin. When using parylene as a dielectric, a film of parylene is deposited on a metal foil. The metallized film (usually less than 0.5 mils thick) is wound, wrapped with tape and heat treated. The terminals are either soldered on or resistance welded on, depending on the type of metallized film.

The units are then encapsulated by one of the following methods:

Metal Case (Hermetically Sealed) - Most expensive of all methods and found, in most cases, to be unnecessary.

Molded - Used primarily with the parylene film but is available with other dielectrics.

Dip Coated - Fairly inexpensive with excellent anti-flammability qualities.

Wrap and Fill - The most commonly used encapsulent; inexpensive, and in most cases, sufficient protection against moisture penetration.

Available Types

Plastic film capacitors are divided into five types:

General Purpose - Polyester film (Mylar)

Precision Type I - Polystyrene film

Precision Type II - Polycarbonate film

Precision Type III - Parylene film

Precision Type IV - Polypropylene film

Table 4-19 presents the pertinent characteristics of each type of film.

Precision film capacitors are further classified as follows:

Class A - Hermetically sealed

Class B - Non-hermetically sealed

Film capacitors are available in the physical body designs shown in tables 4-20 through 4-24. The actual body dimensions for a particular part number are a function of the capacitance value, TCC, and voltage rating. The responsible component engineer should be consulted for each new application.

PERFORMANCE CHARACTERISTICS

Temperature and frequency affect the general purpose (polyester) films more than the precision film capacitors (see Figure 4-27). The following is a general guideline for the plastic film dielectrics utilized by IBM:

General Purpose

Polyester Film (Mylar). Low cost, high volumetric efficiency, fair temperature characteristics, for general use, and can be metallized.

Type I - (Polystyrene Film)

Excellent stability, high insulation resistance, negative temperature coefficient, and low dielectric absorbtion. Not available metallized.

Type II - (Polycarbonate Film)

Good temperature characteristics and dissipation factor, and can be metallized.

Type III - (Parylene Film)

Excellent stability, temperature characteristics, and dielectric absorbtion. Available only in molded radial package. Maximum voltage rating is 50 Vdc.

This is a dual dielectric. The dielectric material is a combination of polycarbonate and polypropylene. The combination of the two dielectric materials produces a capacitor with characteristics similar to the parylene type. In addition, it has a higher voltage capability. This combination is supplied by a single source at the time of this printing, but it is approved as an alternate source for parylene which is a proprietary material.

Type IV - (Polypropylene Film)

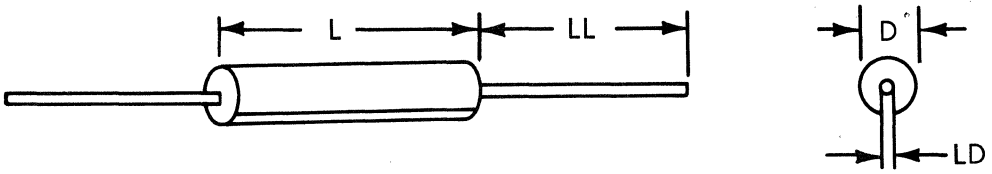
Excellent stability, negative temperature coefficient, extremely low moisture absorbtion, high insulation resistance, and low dissipation factor. Can be metallized.

It can be seen that the precision films vary between (+1,-2%) over the useful temperature range while the general purpose films typically vary between (+10,-5%). Figure 4-28 is a plot of temperature versus percent dissipation factor (%DF) for both general purpose and precision film capacitors. Figures 4-29 and 4-30 present the percent change in capacitance and DF with frequency for general purpose and precision films. It can be seen that the precision film capacitors change less than 1% in capacitance over a frequency range of 1 kHz to 10 MHz while the general purpose film capacitors decrease up to 7% in capacitance. The %DF for general purpose films is less than 1.3% over the frequency range while the precision film capacitors vary between 0.2% and 0.6%. Figure 4-31 is a plot of temperature versus insulation resistance for both general purpose and precision film.

Table 4-19. Plastic Film Capacitor Parameter Capabilities

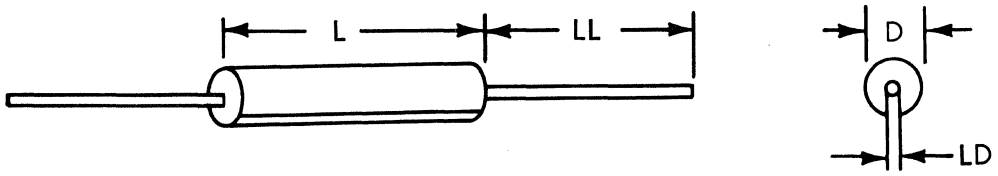
General Purpose Characteristic	Type I (Polyester)	Type II (Polystyrene)	Type III (Polycarbonate)	Type IV (Parylene)	Type V (Polypropylene)
Capacitance Range	0.001 to 10 uF	0.001 to 10 uF	0.001 to 10 uF	0.001 to 10 uF	0.001 to 10 uF
Purchase Tolerance	+5% to 10%	+1% to +10%	+1% to +10%	+1% to +10%	+1% to +10%
TCC	+10%	-120 +40 ppm/°C -30	+110 ppm/°C	-200 + 100 ppm/°C	-120 +40 ppm/°C -30
Temperature Range	-55°C to +85°C	-55°C to +85°C	-10°C to +85°C	-15°C to 85°C	-55°C to +85°C
Dielectric Absorption	0.3%	0.05%	0.2%	0.1%	0.1%
Dielectric Constant	3.2	2.5	3.0		2.3
Insulation Resistance	50×10^9	500×10^9	75×10^9	100×10^9	1000×10^9
Voltage Rating (dc)	50 to 600 volts	30 to 100 volts	30 to 50 volts	50 volts	1000 volts

Table 4-20. Typical Physical Dimensions for General Purpose Plastic Capacitors



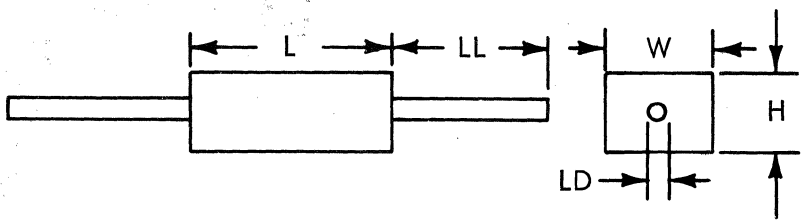
L (max)	D (max)	LD (max)	LL (max)
0.450	0.200	0.030	1.750
0.750	0.188	0.030	1.750
0.750	0.219	0.030	1.750
0.750	0.250	0.030	1.750
0.750	0.281	0.030	1.750
0.750	0.328	0.030	1.750
1.560	0.610	0.035	1.750
2.125	1.000	0.035	1.750
2.250	1.180	0.035	1.750
2.375	1.200	0.035	1.750

Table 4-21. Typical Physical Dimensions for Tubular Precision Plastic Capacitors



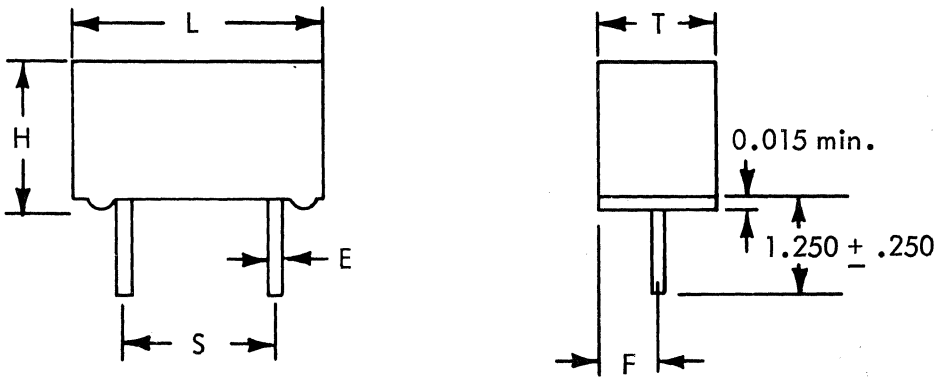
L (max)	D (max)	LD (max)	LL (max)
0.937	0.344	0.027	2.000
0.999	0.493	0.027	2.620
1.187	0.493	0.035	2.620
1.437	0.603	0.035	3.000
1.470	0.460	0.035	2.625
2.249	0.813	0.035	2.625
ALL DIMENSIONS IN INCHES			

Table 4-22. Typical Physical Dimensions for Precision Rectangular Plastic Capacitors



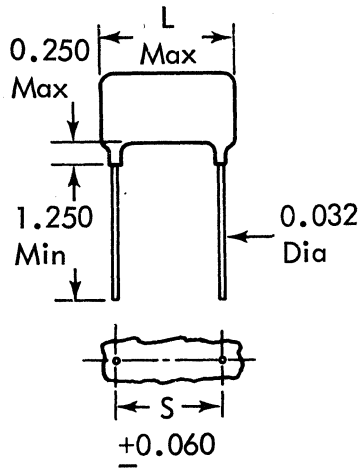
L (max)	H (max)	W (max)	LD (max)	LL (max)
0.485	0.250	0.170	0.023	2.500
1.281	0.370	0.500	0.035	2.500
1.312	0.350	0.550	0.028	2.500
1.500	0.460	0.600	0.035	2.500

Table 4-23. Typical Physical Dimensions for Precision Radial Leaded Capacitors



Capacitor Value (maximum)	Case Size	H(±0.030)	L(±0.015)	T(±0.015)	E(±0.002)	S(±0.005)	F(±0.010)
0.01 µF	A	0.295	0.500	0.125	0.020	0.400	0.062
0.04 µF	B	0.390	0.500	0.195	0.025	0.400	0.098
0.10 µF	C	0.390	0.600	0.195	0.025	0.500	0.098
ALL DIMENSIONS IN INCHES							

Table 4-24. Typical Physical Dimensions for Dipped Radial Leaded Capacitors (General Purpose and Precision Films)



Case Code	DIMENSION L	(INCH) S	Body Diameter
J	0.750	0.500	0.040
K	0.950	0.688	0.055
L	1.300	0.969	0.070
M	1.700	1.344	0.090

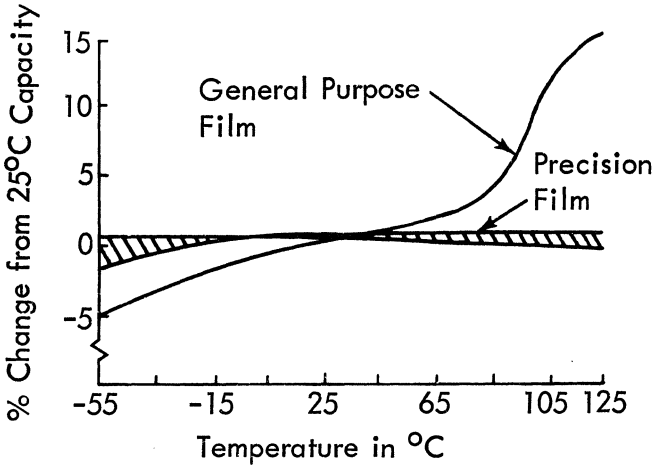


Figure 4-27. Capacitance versus Temperature at 1 kHz for Various Plastic Dielectrics

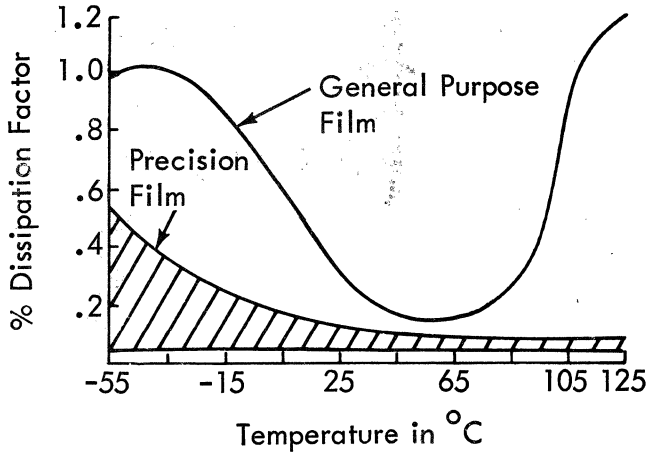


Figure 4-28. Dissipation Factor versus Temperature at 1 kHz for Various Plastic Dielectrics

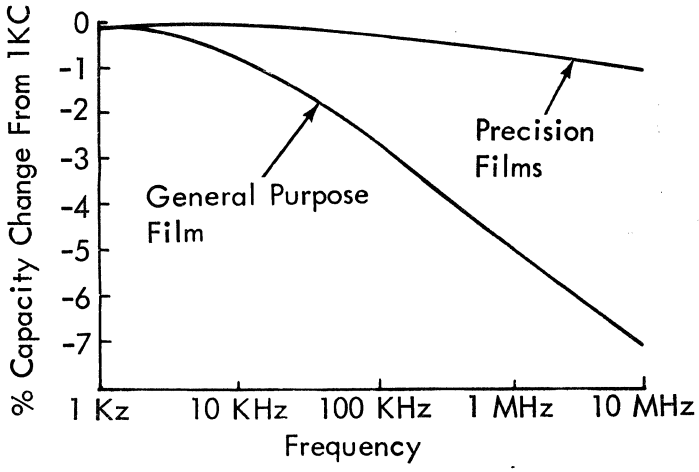


Figure 4-29. Capacitance Change versus Frequency at 25°C for Various Plastic Dielectrics

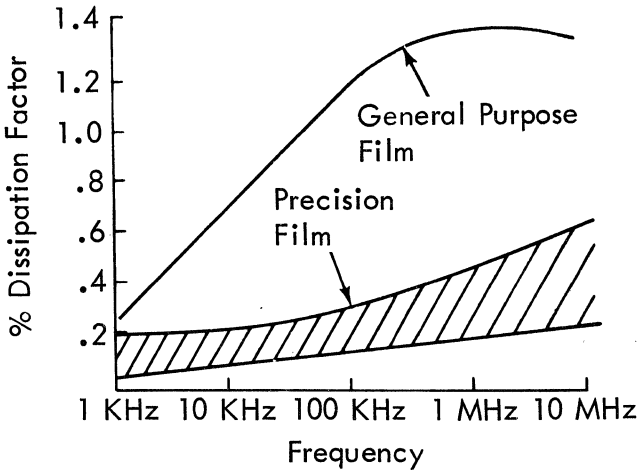


Figure 4-30. Dissipation Factor versus Frequency at 1 kHz for Various Plastic Dielectrics

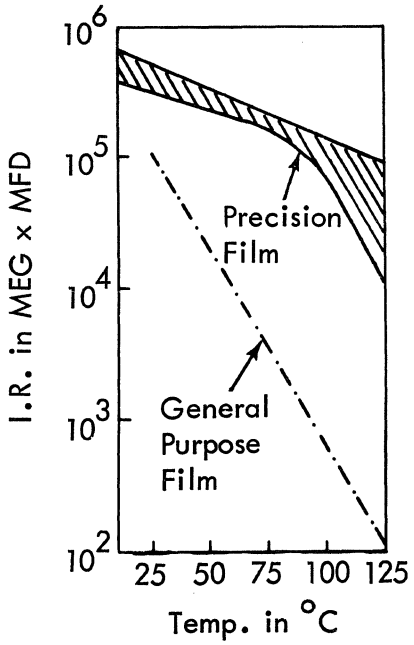


Figure 4-31. Insulation Resistance versus Temperature for Various Plastic Dielectrics

The effects of dc and ac voltage on the performance and the corona capabilities are becoming increasingly important factors in applications involving plastic capacitors. Several additional terms will be defined at this point to help clarify the following discussions.

Corona - is the term used to describe an electrical discharge mechanism occuring as the result of the process of continuous "ionization" of a gas. "Ionization" is the phenomenon wherein a normally nonconducting gas, consisting of essentially neutral atoms or molecules, is changed into a conducting medium consisting of positive and negative "ions".

The change results from some external agency supplying sufficient energy to strip some electrons from atoms or molecules of the gas. The atom or molecule that has lost an electron becomes a "positive" ion.

These free electrons, being in constant motion, can then collide with other atoms (molecules) or positive ions; and, depending on the energy of the collision, the electron will then create other free electrons, recombine with a positive ion, create negative ions by attachment to a neutral molecule, or rebound and remain a free electron (also a negative ion).

As the ionization process progresses, positive and negative ions formed into separated "space clouds" will re-combine locally, thus releasing their excess energy in the form of a minute local arc discharge. When the formulation and re-combination of these "space clouds" becomes practically instantaneous and continuous, still on a local basis, the phenomenon of "Corona Discharge" results.

The energy released during corona discharge manifests itself as heat, light, and electro-magnetic waves. The heat is a result of a very high density concentration of current flow; the light appears as a purplish-blue haze; and the electro-magnetic waves cause interference (noise) over a wide frequency band in nearby electronic equipment.

In a capacitor, the presence of corona discharges, which takes place in the tiny air film or pocket adjacent to the dielectric surface, causes rapid deterioration of the dielectric due to the "hot spot" temperature resulting from the heat concentrations of the corona discharges. Ultimate failure of the capacitor then follows in a relatively short time.

It should be noted that "corona" is not just an ac phenomenon. It is, of course, a factor that must be considered in dc applications, but the relative voltage levels concerned between dc and ac corona are considerably different.

Other factors in dc application generally control design parameters such that dc corona does not become a critical concern except in a few special cases. In ac applications, because of frequency and the relatively low voltage levels at which ac corona initates, designs must always factor in corona considerations.

As previously stated, corona discharges take place in the air film or pocket adjacent to the dielectric surface. The air film is always present in unimpregnated capacitors, no matter how tightly they are wound. This pocket is actually in series with the dielectric material. The voltage stress is applied across these two dielectrics. This stress is inversely proportional to the dielectric constants of the two materials (air and the capacitor dielectric). This is the reason some dielectric materials have a higher corona discharge resistance than others. Table 4-19 is a tabulation of plastic film characteristics. It should be noted that polypropylene has the lowest dielectric constant. It also has the highest resistance to corona discharges; or the highest corona "on-set voltage." Since air has a dielectric constant of 1 and the polypropylene has a dielectric constant of 2.3, there is a more even distribution of the stress than we have for the general purpose polyester capacitor. This also explains why unimpregnated paper capacitors are not used for ac applications unless they are impregnated. Paper has a dielectric constant of 5.

Corona Onset Voltage - The lowest ac rms voltage at which corona occurs as the voltage is increased from zero.

Corona Offset Voltage - The ac rms voltage at which corona pulses no longer occur as the voltage is decreased from above the corona onset voltage. The corona offset voltage should be used as one of the criteria for establishing safe operating levels. The corona onset voltage is not predictable, and could be 2 or 3 times the value of the offset voltage.

Internal Heating in AC Applications

The application of an ac voltage to a capacitor, unlike a dc voltage, results in a continuous heat generation within the capacitor. The total heat generated is from two distinctly different sources.

1. Dielectric heating is the result of the work (energy) required to first polarize the dielectric in one direction and then repolarize the dielectric in the other direction for each succeeding half-cycle of ac voltage applied.

2. Resistance heating is due to the continuous current flow in the series resistance elements of the capacitor. This current flow is the result of first charging in one direction and then discharging and charging in the other direction during each cycle of ac voltage applied.

Dielectric Heating is a natural phenomenon wherein the amount of heat generated due to this factor varies with the inherent polarization orientation of the dielectric material, the magnitude and frequency of the applied voltage, and the geometrical character of the voltage wave-shape.

Resistance Heating - In an ac application, a capacitor will appear to allow a constant flow of current through itself. The capacitor is really charging and discharging in opposite directions each half-cycle as the impressed ac voltage alternates polarity. To the rest of the circuit, this has the same effect as though the capacitor were allowing the passage of the ac current.

This constant movement of current through the leads, electrodes, and connections (series resistance) causes heat to be generated. The basic formula for calculating the heat generated due to the series resistance is:

$$W = I^2R_s$$

where: W = Heat (Watts)
I = Current (Amperes)
R_s = Total Series Resistance (Ohms)

Note that any action or circumstances that tends to increase R_s will in turn increase the heat generated. The factors controlling R_s and the circumstances controlling or affecting these factors are:

1. R_M - The resistance of the metals used for the leads, electrodes, solder, and metal spray. This resistance is initially controlled in the design stages by the choice of such variables as materials and sizes.

2. R_D - The inherent equivalent series resistance of the dielectric material. This resistance is also primarily controlled by initial design choice of material.

3. R_O - The resistance of the oxides resulting from the interface connections between the various elements comprising these connections. Primary controls on the resistance of these oxides are manufacturing processes and workmanship.

The total series resistance then can be denoted as the sum of three basic resistance elements:

$$R_S = R_M + R_D + R_O$$

By definition, the DF (dissipation factor) of a capacitor is the ratio of the equivalent series resistance (R_S) to the capacitive reactance (X_C):

$$DF = R_S/X_C = 2\ \Pi\ CR_S \text{ since } X_C = 1/2\ fC$$

When C = capacitance
f = frequency

$$\text{and } W = I_2R_S = I_2/\Pi\ 2\ fC \times DF \text{ since } R_S = DF/2\Pi\ fC$$

For a given current, frequency, and capacitance value; the DF figure can be used as a direct criteria for measuring the comparative heat generating capabilities of different capacitors under ac conditions.

For example, if we have two capacitors, each rated 1 microfared and one had a DF value that is twice the magnitude of the other, it will generate twice the amount of heat.

Polyester (Mylar) and Polypropylene film capacitors are the most widely used film capacitors for high voltage and high power applications. They may be operated under ac conditions as long as a few basic rules are observed:

1. The sum of the dc voltage and the ac peak voltage does not exceed the dc rating of the capacitor.

2. The ac component (rms) does not exceed the corona offset voltage.

3. Do not apply more than 250 Vac to any dc rated capacitor, even those rated at 1 kV dc.

   Applications requiring more than 250 Vac should use capacitors that are wound in series.

4. AC applications of plastic film capacitors should be reviewed with the responsible component engineer.

5. Across-the-line application of plastic film capacitors are subject to IBM Product Safety requirements.

Pulse Applications

These require the greatest attention to application parameters. It is difficult to give general rules. In selecting the proper capacitor, the following application parameters must be taken into consideration:

1. Temperature and humidity
2. Frequency
3. Wave shape
4. Peak voltage
5. Peak and RMS currents

In general, the following ground rules should be observed:

1. Metallized capacitors should not be used for high peak currents.
2. Capacitor temperature rise should be limited to 10°C maximum.
3. The voltage change across the capacitor should be limited to 200 volts per microsecond maximum.
4. The final selection of the appropriate capacitor should be reviewed by the responsible component application engineer.

Table 4-26 is a tabulation of released snubber capacitors.

The electrical characteristics of polyester capacitors are not adversely affected by applying various combinations of voltages as long as corona is not present. The worst case EOL drift of plastic capacitors is a function of the type of film and whether the package is hermetically sealed or not. The worst case absolute EOL tolerance for plastic capacitors is given in Table 4-25 by film type.

Refer to failure rate specification 866451 or component data bank for failure rates.

ECONOMICS AND DESIGN CONSIDERATIONS

The cost of plastic film capacitors varies by film type, yearly volume, and parameters. General purpose plastic film capacitors are typically in the range of $0.15 to $0.25 each. The precision plastic film capacitors are more expensive and are typically in the $0.50 to $1.75 range.

SPECIFICATIONS

Following are the specifications which are applicable to film capacitors.

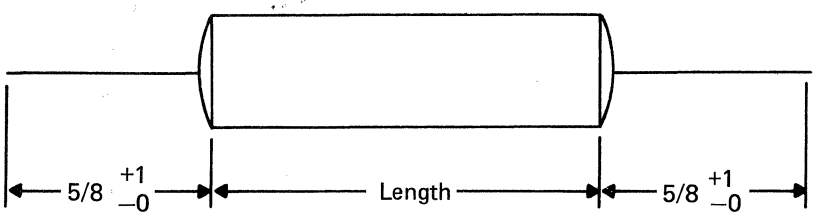
Engineering Specifications:	General Purpose Film (Polyester) - 895692 Precision Film - 877101
Quality Specifications:	873705*
DCS Codes:	2-3621 - General Purpose (Polyester) 2-3622 - Polystrene 2-3623 - Polycarbonate 2-3624 - Parylene 2-3625 - Polypropylene

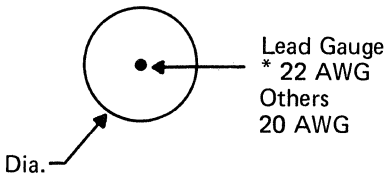
*Real and packaging specification. General specification.

Table 4-25. Worst Case Absolute EOL Tolerances for Plastic Capacitors

Parameter	G.P.	Type I	Type II	Type III	Type IV
Purchase Tolerance	±1% to ±10%	±1% to ±10%	±1% to ±10%	±1% to ±10%	±1% to ±10%
TCC (-15°C to +85°C)	±10%	-0.03% to -0.9%	(+0.7%,-0.4%)	-0.4% to -1.2%	-0.03% to -0.9%
W.C. EOL Drift	±10%	±3% to ±5%	±3% to ±5%	±2%	±3% to ±5%
W.C. Absolute EOL Tolerance	±21% to ±30%	+4.0% to +15.0% -4.03% to -15.9%	+4.7% to +15.7% -4.4% to -15.4%	+3.0% to +12.0% -3.2% to -13.2%	+3.7% to +14.7% -4.9% to -15.9%

Table 4-26. Special Polypropylene Capacitor for High Peak Current Snubber Applications





Cap	%Tol.	Volt Rating	Corona Free VRMS	Max. Dia.	Max. Length	IBM PT. #
0.00068	10	600	500 V	0.300	0.812*	
0.001	20	1000	750 V	0.400	1.437*	8272114
0.002	5	600	500 V	0.452	1.062*	1589039
0.0035	10	1100	750 V	0.515	1.437*	4430061
0.0039	5	1100	750 V	0.540	1.437*	4429917
0.0035	5	1100	750 V	0.515	1.437*	8272113
0.0036	5	600	500 V	0.300	0.812*	8279067
0.01	10	600	500 V	0.380	1.440	8279066
0.02	5	600	500 V	0.443	1.720	
0.027	5	600	500 V	0.470	1.720	1582638
0.033	5	600	500 V	0.521	1.720	
0.039	5	600	500 V	0.550	1.720	2397070
0.07	5	600	500 V	0.725	1.720	
0.1	5	400	250 V	0.500	1.437	1589040

Parameters:

1. Tolerance as marked, others available.
2. D.F. at 1 kHz 0.05%.
3. IR greater than Type II 877101.
4. Current peak capability (9 amps min.).

Table 4-27. AC Capacitors (Plastic Film)

Power Applications

0.047	20%	250 Vac	525622
0.47	20%	260 Vac	2396662
0.1	20%	330 Vac	5615965
1.0	10%	330 Vac	5616104
1.25	10%	330 Vac	5616105
1.5	10%	330 Vac	5616106
0.0003	20%	440 Vac	
0.15	10%	440 Vac	1821921
0.47	20%	440 Vac	2745032
0.002	20%	460 Vac	5615883
0.01	20%	460 Vac	5615854
0.03	20%	460 Vac	5616153
0.1	20%	460 Vac	4429918
0.33	10%	460 Vac	5615759
2.0	15%	460 Vac	5616805
0.27	10%	660 Vac	5616107
0.33	10%	660 Vac	5616108

SWITCHING POWER SUPPLY CAPS			
1.5	10%	100 V	8272112
2.0	10%	400 V	5616152
0.82	10%	100 V	8272111
2.0	20%	100 Vdc	8279070

PAPER CAPACITORS

The paper capacitors discussed in this section are molded, wrap and fill, or hermetically sealed axial leaded components. These capacitors are obsolete and should be considered for field replacement only. The wrap and fill or molded variety are not available as there is no supplier. Hermetically sealed units are still available from a single source. While these devices are reliable, they are expensive and do not offer any performance advantage. The plastic films, in general, offer lower cost and higher performance.

DESCRIPTION

Axial paper capacitors employ a paper dielectric and are relatively stable. They have a high dc breakdown voltage capability and are generally inexpensive. Paper capacitors are limited in use primarily to high voltage applications and are an extension of the paper-oil can type capacitor used in ac power supply applications. In most new applications, plastic capacitors, rather than paper capacitors, are being employed due to advantages of size and performance. There are two basic manufacturing processes used for paper capacitors.

Impregnated paper capacitors are general purpose capacitors constructed by rolling two or more sheets of paper between two metal foils and then filling with an oil or wax impregnate.

Metallized paper capacitors are constructed in such a way that the voids which exist between paper and foil in an ordinary capacitor are eliminated. In this type of capacitor one side of the paper is metallized before rolling. Metallized paper capacitors are smaller than ordinary impregnated paper capacitors and have voltage ratings up to 600 volts. This is particularly true of voltage ratings lower than 100 volts dc and capacitance values higher than 0.01 µF where the reduction in volume may be as much as 75%.

Paper capacitors are available in a capacitance range from 0.001 µF to 2 µF, purchase tolerances of ±5% to (+30,-20)%, TCC or (+5,-10)% and peak ac voltages up to 200 volts (at 60 Hz).

PERFORMANCE CHARACTERISTICS

Paper capacitors are relatively stable and may be used at temperatures up to 85°C at rated voltage. The dc voltage capabilities for paper capacitors range up to 1000 volts. In most instances paper capacitors may be utilized in ac applications. However, the ac voltage must not exceed 20% of the rated dc voltage at 60 Hz. Again, the component engineer should be consulted before utilizing a particular paper capacitor in an ac application.

The dissipation factor of a paper capacitor is typically less than 2% over its operating temperature, while the dielectric absorption varies between 0.60% to 3% at room temperature.

The worst case absolute EOL capacitance tolerance of paper capacitors is:

Purchase Tolerance	±5% to (+30,-20)%
TCC (-55°C to +85°C)	(+5,-10)%
EOL Drift	±2% to ±5%

WC Absolute EOL tolerance	(+12,-17)% to (+40,-35)%

The supported failure rate for paper capacitors is 0.5%/1k hours over a useful life of 40k hours.

SPECIFICATIONS

Following are the applicable IBM specifications for paper capacitors.

Engineering Specification:	895651
Hermetically Sealed:	896877
Quality Specifications:	873705
DCS Code:	2-3651

Capacitors, Paper, AC Oil Impregnated

Caution: These devices are potentially dangerous. They have high operating voltages, 220 to 660 Vac, with currents as high as two to three amperes or more, depending on VA loading. They are subject to case rupture in spite of the protective devices. The impregnants used have relative low flash points, 150°C to 170°C. Under fault conditions, hot oil can spew forth from a ruptured case. Under fault conditions, the cases if not properly grounded could expose maintenance personnel to lethal voltages.

Precautions have been taken in the design of these devices to prevent the previously explained hazards. However, it should always be assumed whenever it is necessary to work on equipment that is energized, that the safety devices incorporated may not operate. These devices contain phthalic acid ester oil (PAE) and will require controlled disposal. Consult location chemical coordinator for additional information.

Description

These capacitors are made by winding two sheets of aluminum foil with at least two sheets of high quality capacitor paper between them. Terminals are inserted between the paper and the foils while the capacitor is being wound. These terminals are for connection to the outside circuit. The section is placed in a metal case, cover assembly attached, and cover spun over to seal the device. A small hole is left in the top to permit vacuum impregnation with a suitable impregnant. The hole is then sealed with solder, the device cleaned, tested, and shipped.

One of the major changes to these devices in the last few decades was the change to a non PCB impregnant. Due to the low flame point of the impregnant, it was necessary to incorporate pressure activated interrupter. The interrupter removes the voltage under fault conditions.

The fluorescent lighting industry, and the air conditioning manufacturers are the largest users of these capacitors. Within IBM, these capacitors are used in ferro-resonant power supplies and in motor run applications. Compared to some of the other electronic components, these devices tend to be rather large physically. They are available in capacitance values from 0.5 μF through 60 μF; in voltage ratings from 220 Vac through 660 Vac.

A rough guide to the volume of dielectric required for a given capacitor is given by the following expression:

$v/c = 72.9\ d^2/K$

where: v is the volume in cc
c is the capacitance in μF
d is the dielectric thickness in mils and
K is the dielectric constant

Since the dielectric thickness is inversely proportional to the permissible operating stress, any increase in stress will change the volume as the inverse square of the stress.

Application

The ultimate performance of these devices depend on the paper, the impregnant, and the electrode material. Each contributes to the characteristics and performance. The choice of an impregnating liquid for a capacitor is governed not only by the properties of the liquid, but also by those of the solid.

One of the main points to be considered in capacitor design is the distribution of the stress between the oil and the paper. These may be considered as series dielectrics. At power frequencies assuming the absence of excessive leakage currents, the stress in each of the series dielectrics will be inversely proportional to its dielectric constant.

One of the advantages of PCB was the fact that the dielectric constant of the impregnant and the dielectric constant of the paper were almost the same. This provided capacitors having nearly uniform stress within the dielectric.

The PAE impregnants have lower dielectric constants than the PCBs. This results in the capacitors being slightly larger. It also results in the 660 Vac devices operating on the edge of the corona initiation voltage. The impregnant, has the high voltage stress. It is desirable that the liquid have a greater dielectric constant than the solid.

All of IBM's suppliers use the same basic impregnant; however, processing and the additives used differ. There is a certain amount of moisture given off within the dielectric system by the decomposition of cellulose paper. This is probably due to the hydrolysis of the ester by the water with the liberation of free acid. The additives are used to neutralize the free acid. This type of impurity would be expected to increase the conductivity of the oil and hence the dielectric loss. This kind of reaction leads to poor aging stability of the dielectric system.

All of the materials that comprise the dielectric system are very carefully prepared, stored, and assembled. The impregnant is part of a closed system and is purified after each use. There is only one domestic supplier for the paper and the paper is stored in a controlled environment. The winding is done with the humidity controlled between 40 and 50%. The wound devices are baked prior to impregnating.

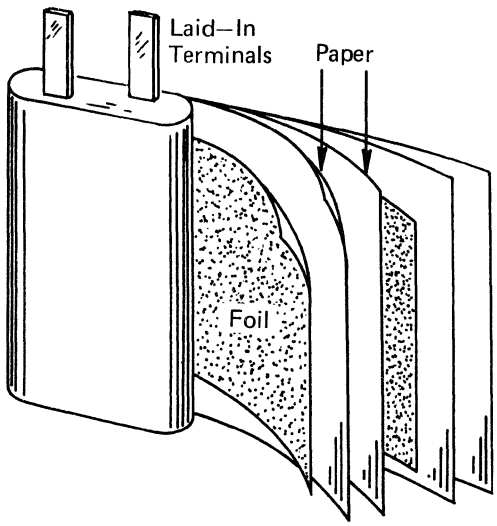
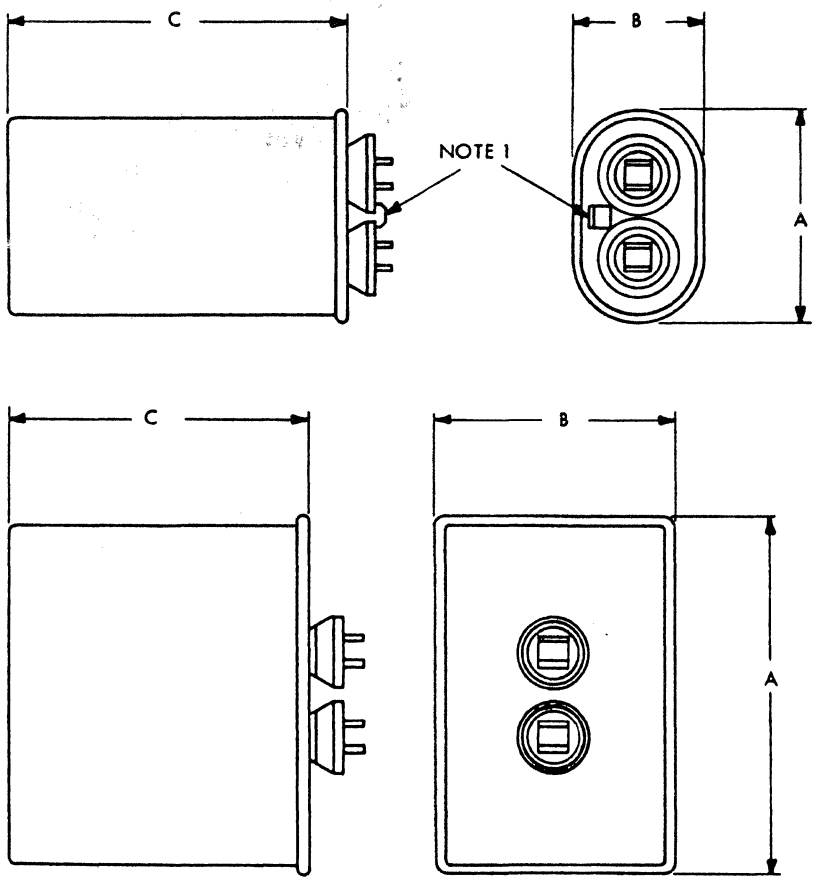


Figure 4-32. Paper Capacitor, ac, Oil, Impregnated



OVAL CROSS SECTION

SHAPES - O, AO, BO, CO, DO

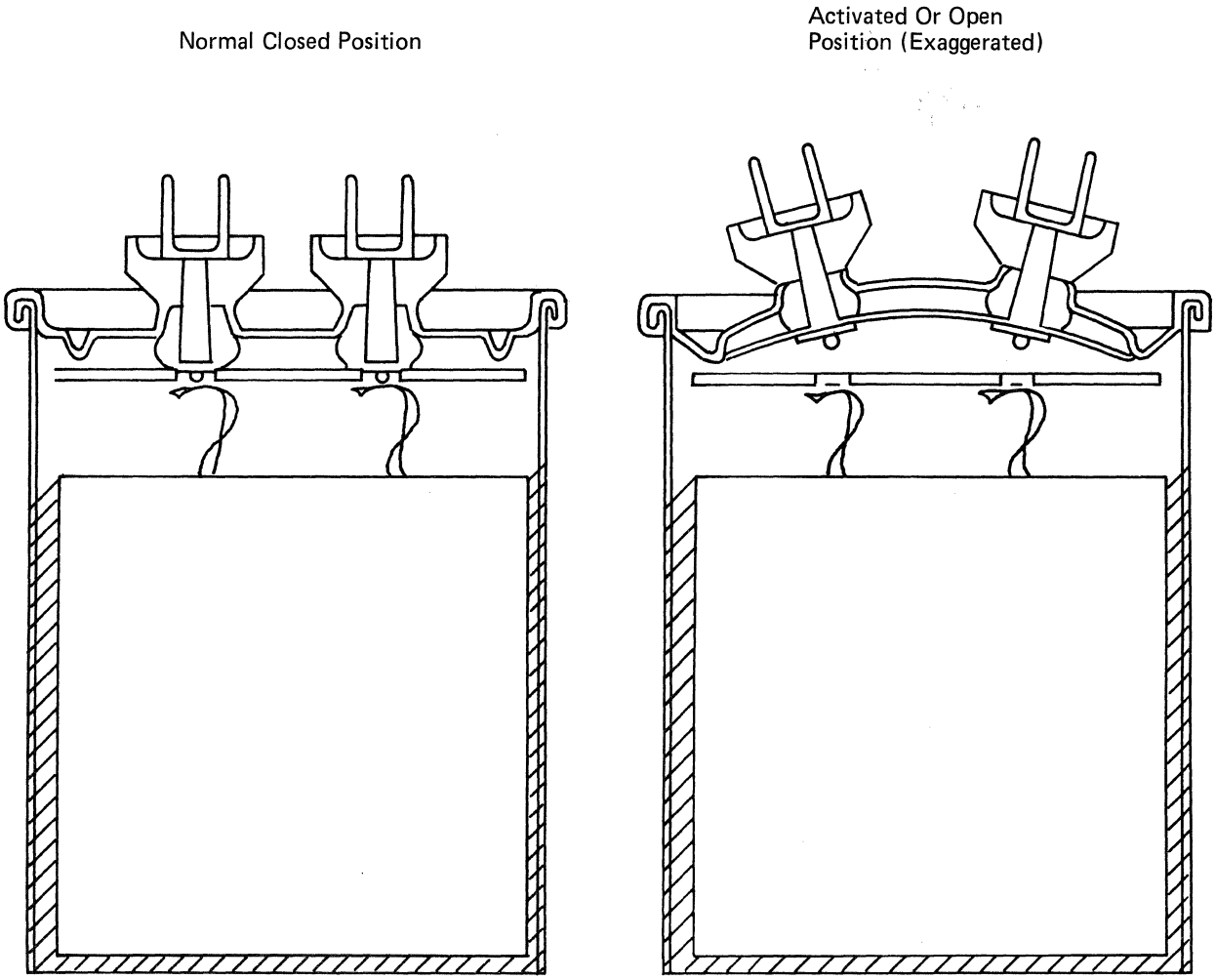
NOTE 1: GROUND TERMINAL (OPTIONAL)

RECTANGULAR CROSS SECTION

SHAPES - R, ER

A = LENGTH B = WIDTH C = HEIGHT

Figure 4-33. Paper, Oil Impregnated Capacitor Cross Sections



1 Fulcrum
2 Bridge
3 Terminals
4 Capacitor Section

Figure 4-34. Pressure Activated Interrupter

TANTALUM CAPACITORS

INTRODUCTION

The devices belong to the electrolytic family of capacitors. Their volumetric efficiencies are high and, therefore, they store considerable amounts of energy. Most of these capacitors are polar and care must be exercised in connecting them to the circuit. Some of them have solid dielectrics encapsulated in molded plastic cases. Although these cases are molded from materials that are self-extinguishing, they may "flare-up" and ignite the surrounding materials. They could also short the voltage planes on multilayer cards. This is most likely to happen to devices used as de-couplers, where the polarity is incorrect.

However, the characteristic failure mode for tantalum capacitors in low impedance circuit applications is a "short". This short may continue until solder holding the cathode melts and the circuit opens. This is the normal failure pattern. Occasionally however, the heat being generated causes the molding material to crack. This exposes the tantalum powder to oxygen and if the temperature is high enough, the anode will burn.

APPLICATION PRECAUTIONS

Axial leaded, hermetically sealed solid tantalum capacitors can also be hazardous. These devices are enclosed in metal cases with glass to metal end seals. The positive, or anode, end has the glass to metal end seal. When these are put in "backwards" the tantalum slug may be ejected from the metal case with considerable force. Safety glasses are recommended.

Axial leaded hermetically sealed tantalum capacitors are potentially hazardous to those who misapply them. However, they have not been a safety problem. Due to their size, cost, and performance, they are not used in the same volume as the molded two leaded devices.

The 1 × 2 with leads on 0.125 inch centers is being phased out and will not be supported in new applications. These devices are being replaced by the 1 × 2 capacitors with leads on 0.100 inch centers. These devices have one large lead, the anode lead and one small lead. The capacitors cannot be put into the circuit backwards, provided the holes tolerances are held to ±0.001 inch.

The 1 × 4 devices were designed to be non-reversible. The two outside leads are negative and the two inside leads are positive. The problem, however, may still be present if the cards are not manufactured to match the capacitors. It has been demonstrated that these capacitors can be connected with the wrong polarity.

Even though the type III capacitors (molded, solid tantalum) are connected properly they should still be used in conjunction with adequate circuit protection that removes power within 4 amp-seconds of a capacitor shorting.

DESCRIPTION

Tantalum capacitors are members of a family of capacitors designated as electrolytics. An electrolytic capacitor is one in which the dielectric is an oxide film produced by the anodic polarization of a suitable metal, in this case tantalum, immersed in a suitable electrolyte. The major attribute of an electrolytic capacitor is its large capacitance per volume ratio, which is primarily due to the very thin oxide dielectric layer produced on the tantalum surface by the anodizing process.

Two forms of tantalum capacitor anodes in wide use are the foil or dense anode, and the slug or porous anode. Three basic types of such capacitors are used at IBM and will be discussed in this section.

While non-polar devices are available, the capacitors to be described are all polar.

Tantalum Foil Construction

Essentially, a foil capacitor consists of two thin, plain or etched, tantalum foils. One foil, the anode, has been electrochemically treated to form tantalum oxide on its surface. Tantalum lead wires are welded to the foils. The foil electrodes are separated by means of a porous paper spacer, then rolled to form a conventional capacitor section with axial tantalum wires on either end. The section is then impregnated with a suitable electrolyte and sealed into a suitable container, usually an aluminum case with elastomer end seals. The assembly is completed by welding solderable leads to the tantalum leads.

Wet Slug Tantalum Construction

The wet slug tantalum capacitor is composed of a porous tantalum anode which has been prepared by pressing tantalum powder into a pellet or "slug" and sintering in a vacuum oven. A tantalum lead wire is welded to the pellet, which is then placed in a forming bath to electrochemically produce an oxide film over the surface area. It is then mounted and sealed in an electrolytic filled fine silver case.

Solid Tantalum Construction

The initial step in processing a solid electrolyte tantalum capacitor is analogous to that in the wet slug type. The pellets are pressed, sintered, and electrochemically formed. After formation of the oxide film, the pellets are impregnated with an aqueous solution of a manganous salt. This salt is pyrolytically decomposed to yield manganese dioxide. The manganese dioxide is the working electrolyte in solid form. The capacitor at this point is a func-

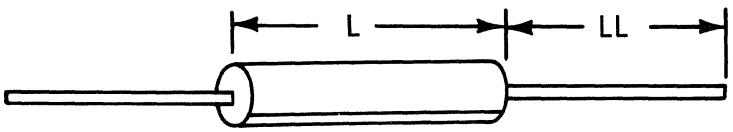
tional device. However, to allow encapsulation, a layer of carbon is applied over the MnO_2, followed by a metallized (usually silver in an organic binder) outer coating. A solderable lead is welded to the tantalum wire and the unit is either soldered into a can or transfer molded. If soldered into a can, a glass-to-metal cover is then soldered in place producing a hermetically sealed unit.

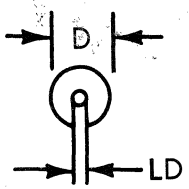
Table 4-28 is a comparison of the three types of tantalum electrolytic capacitors. The parameters listed are those generally considered as most pertinent for characterizing capacitors. In general, Table 4-29 is self-explanatory and is indicative of the present state-of-the-art. The solid electrolytic tantalum capacitor is the most widely used tantalum capacitor in IBM. This is primarily due to its high reliability, parametric stability, capacitance, working voltage, and temperature ranges. Therefore, the majority of this section will center around the solid tantalum capacitor. If any information is required for the foil and wet slug tantalum capacitors, the responsible component engineer should be contacted.

Table 4-28. Pertinent Parameters for Tantalum Capacitors

Parameter	Foil	Wet Slug	Solid
Maximum CV Product (μF-V)	130,000	50,000	6,000
Capacitance Range (μF)	0.15 to 8700	0.9 to 5000	0.001 to 1000
DC Working Voltage Range (85°C)	3 to 450	6 to 150	6 to 125
Purchase Tolerance (%)	±10% to (+75,-15)%	±5% to (+75,-15)%	±5% to ±20%
Maximum Operating Temperature (°C)	125	175	85 to 125
Dissipation Factor (25°C-120 Hz)	0.10 to 0.20	0.12 to 0.40	0.01 to 0.06
DC Leakage Current (μA at 25°C)	1.0 to 150	0.5 to 10.0	0.001 to 10
Volume Efficiency ($\mu F/in^3$)	1.0 k	2.2 k	1.3 k
Maximum DC Reverse Voltage (volts)	3	none	10% rated to 55°C 5% up to 85°C

Table 4-29. Class III A Case Dimensions





Case Size	DIMENSIONS (INCH) L	D	LL	LD
A	0.379 ± 0.062	0.140 + 0.016 - 0.20	1.500 ± 0.250	0.023 + 0.005 - 0.004
SB	0.388 ± 0.062	0.190 + 0.016 - 0.20	1.500 ± 0.250	0.023 + 0.005 - 0.004
B	0.567 ± 0.062	0.190 + 0.016 - 0.20	1.500 ± 0.250	0.023 + 0.005 - 0.004
C	0.718 ± 0.062	0.285 + 0.016 - 0.20	1.500 ± 0.250	0.023 + 0.005 - 0.004
D	0.922 ± 0.062	0.351 + 0.016 - 0.20	1.500 ± 0.250	0.023 + 0.005 - 0.004

IBM classifies tantalum capacitors into the following classes:

Class I Axial leaded, tubular metal case, tantalum foil non-hermetically sealed.

Class II Axial leaded, tubular metal case, wet slug tantalum, non-hermetically sealed.

Class IIIA Axial leaded, tubular metal case, solid tantalum, hermetically sealed.

Class IIIB Radial leaded, molded, solid tantalum, non-hermetically sealed.

The released Class IIIB capacitors are generally two and four leaded C-Pacs (modules). In the past, all two pin modules had leads on 0.125" centers. Voltages were restricted to 20 and 50 volts. This placed a limitation on the capacitance range. (Figure 4-35).

An additional family of two pin modules has been recently released having different diameter leads on 0.100" centers for non-reversibility. Typical of these is P/N 2396951. The anode lead, pin #1, is 32 mils diameter and the cathode lead, pin #2, is 20 mils diameter. The 0.100" center capacitors offer lower inductance and higher packaging density. NON-REVERSIBLE CAPACITORS ARE MANDATORY FOR NEW APPLICATIONS. (Figure 4-36.)

Class IIIA devices are available in five case sizes with voltages ranging from 6 to 75 volts dc.

Due to the size constraints the maximum capacitance values for the class IIIB* (C-Pac) capacitors are 6.8 microfarad for the 20 volt devices and 1.5 microfarads for the 50 volt devices. Each device has a surge voltage rating; which is approximately 130% of the rated voltage and is the maximum voltage allowable under transient conditions. The accepted maximum operating temperature at full rated voltage is 85°C. Operation at 125°C is possible with proper voltage derating which is usually 66% of the rated voltage. The maximum capacitance values for the 0.100 mil devices with dual lead sizes is 8.2 µF at 12 volts dc and 0.68 µF at 50 volts. The same voltage and temperature constraints are applicable. (Figure 4-37.)

Although the solid tantalum capacitor is a polar device, some small degree of voltage reversal is permissible. The allowable amount is as shown in Table 4-28 and is valid up to 85°C operation. Because of construction, no voltage reversal is permitted with the wet slug capacitor.

Foil and wet slug capacitors normally fail through degradation (a loss of capacitance and an increase in leakage current). Solid tantalum capacitors, however, may have two different modes of failure. Under high impedance usage the failure mode is typically through degradation, while under low impedance (<3 Ω/volt) the mode of failure is generally catastrophic (short, open, destruction, leakage current beyond acceptable limits). The principle cause of catastrophic failures is a phenomenon known as current flickering. This term is used to describe current surges occuring at imperfection points in the dielectric film. In low impedance applications, when the circuit resistance is not high enough to limit the current surges, catastrophic failures can occur. The incidence of flickering varies with the magnitude of the voltage and temperature.

*125 mil lead spacing.

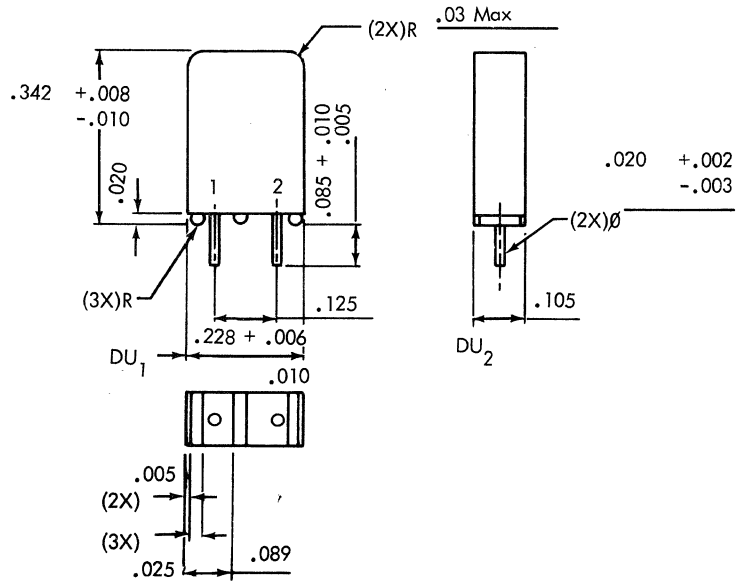


Figure 4-35. Physical Outline for Modular Tantalum Capacitor -125 mil

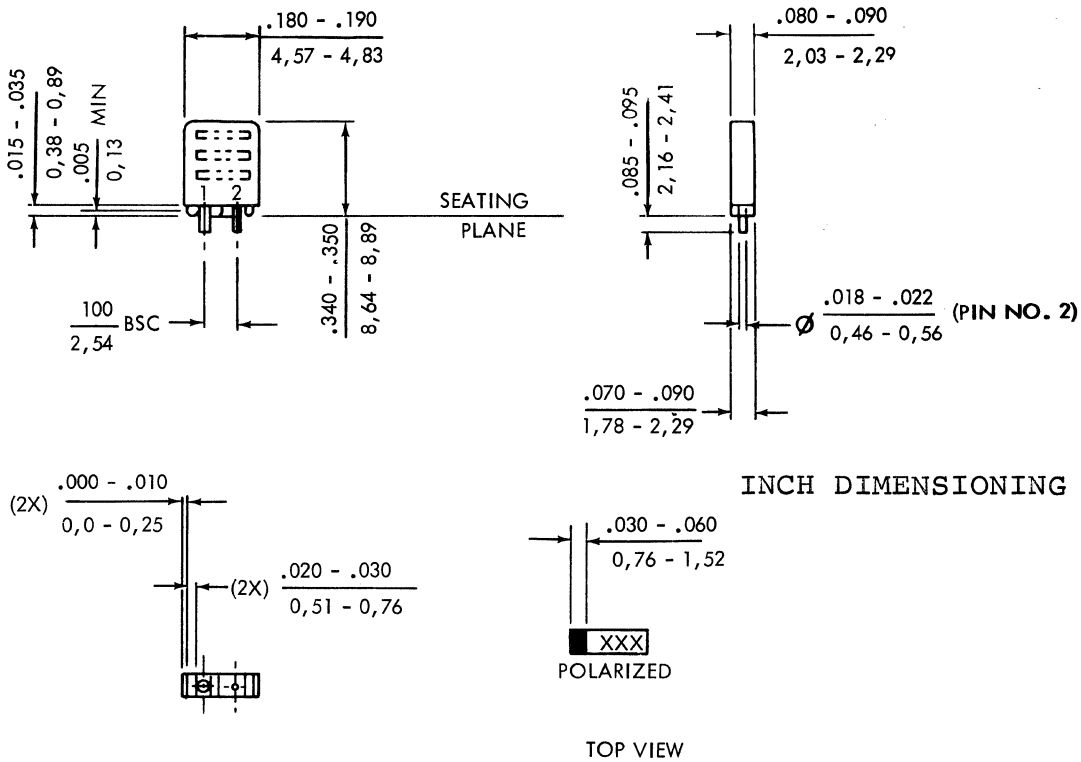


Figure 4-36. Physical Outline for Non-Reversible Modular Tantalum Capacitor -100 mil

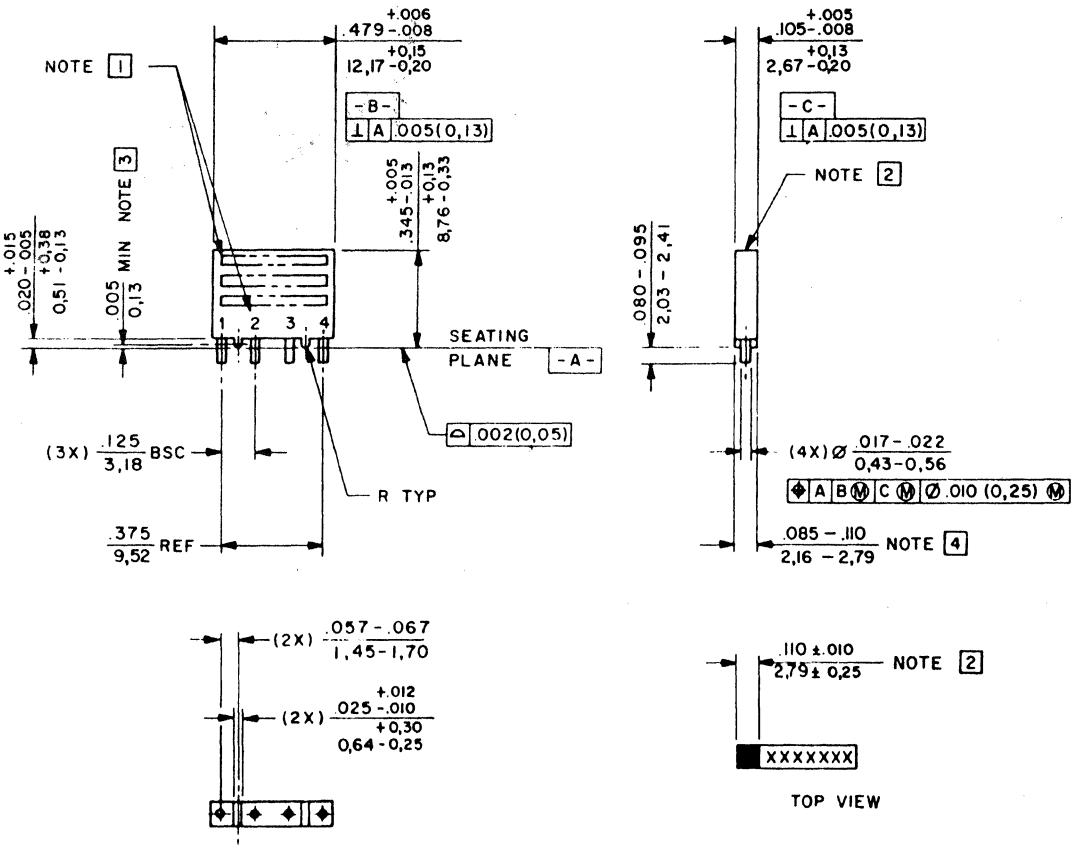


Figure 4-37. Physical Outline for Non-Reversible 1 × 4 Tantalum Module with Leads on 0.125 inch Centers

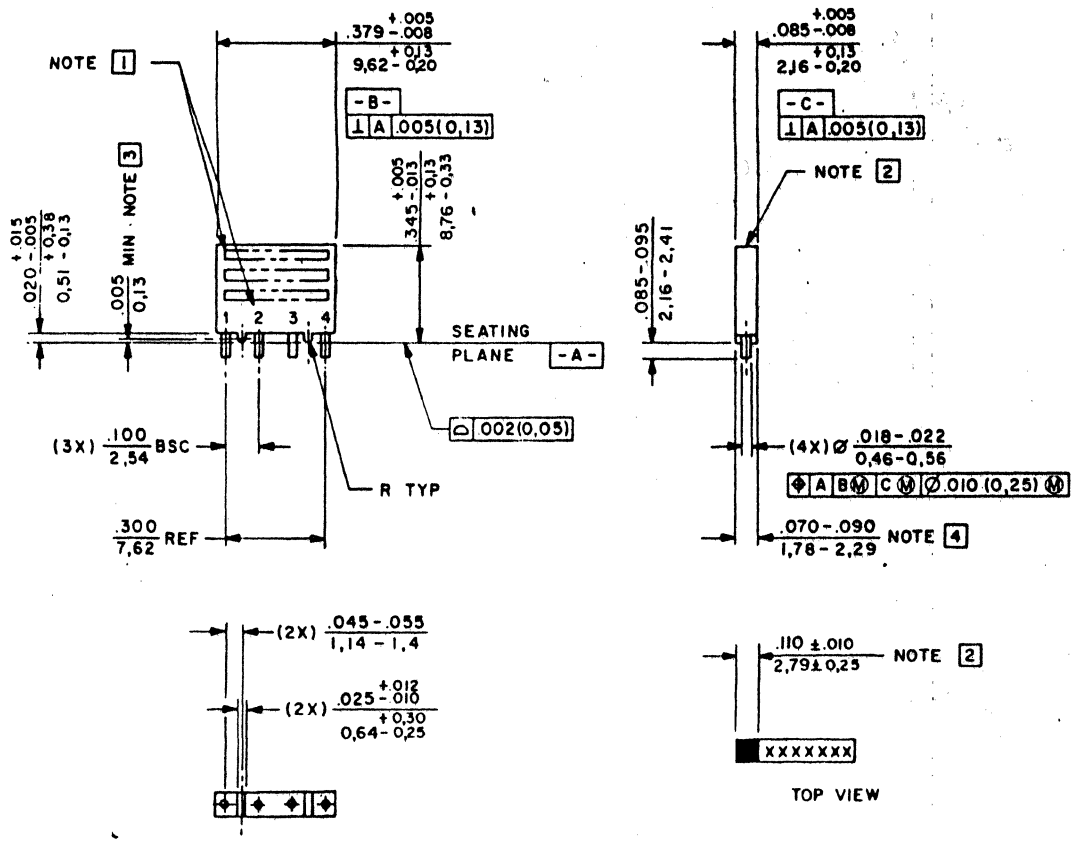


Figure 4-38. Physical Outline for Non-Reversible 1 × 4 Tantalum Module with Leads on 0.100 inch Centers

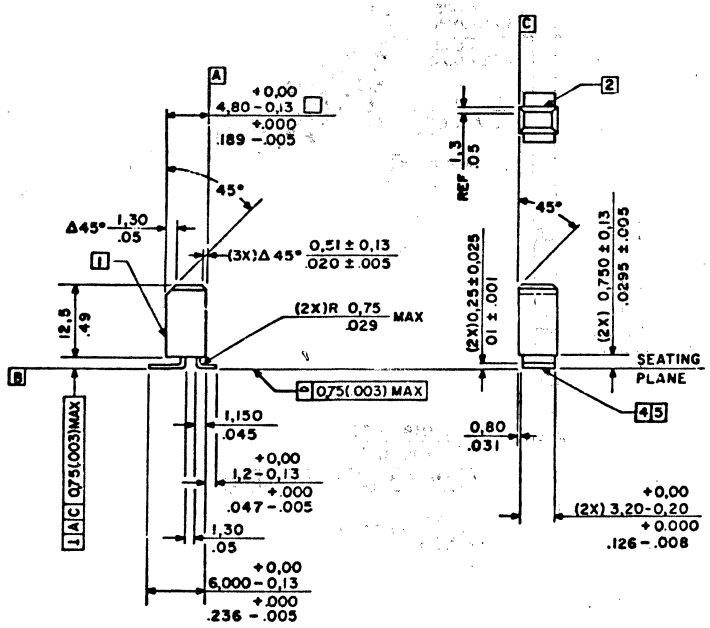


Figure 4-39. Ribbon Lead Fused Tantalum

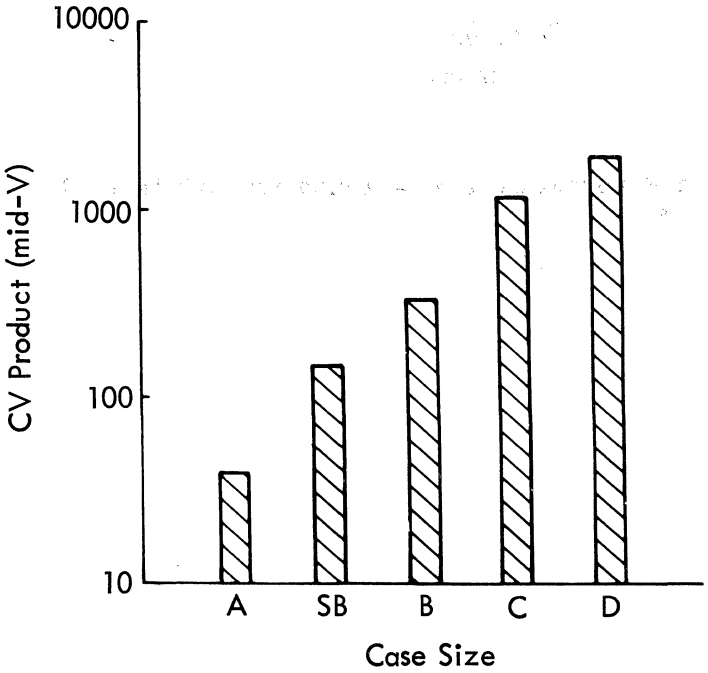


Figure 4-40. Maximum CV Product by Case Size

PERFORMANCE

Tantalum capacitor parameters and characteristics are typically affected in applications by temperature, frequency, voltage, and humidity.

Capacitance

Tantalum capacitors have non-linear capacitance versus temperature characteristics. Figure 4-41 presents the typical change in compacitance with temperature for the three types of tantalum capacitors. The large changes with low temperatures, for the foil and wet slug type tantalum, are due to the slow movement of ions in the electrolyte. This causes poor wetting of the electrode areas, thereby reducing the effective capacitance. For high temperatures the situation is reversed. The solid tantalum curve is relatively flat due to the wetting problem being eliminated and the ion conduction being replaced with electron conduction.

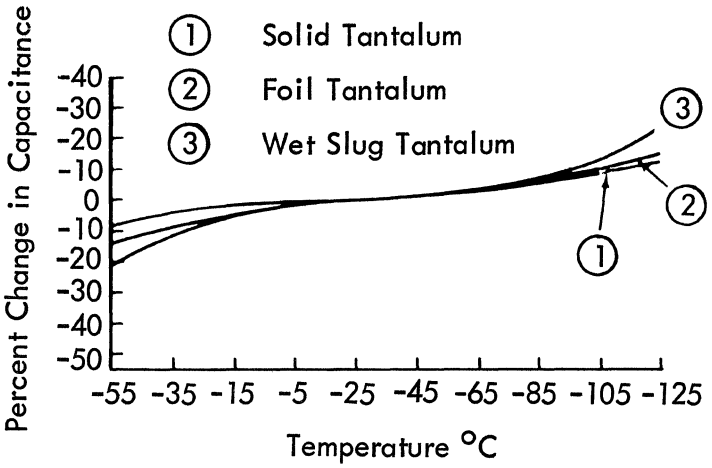


Figure 4-41. Typical Capacitance versus Temperature

Tantalum capacitors are also frequency and voltage sensitive. Figure 4-42 presents frequency characteristics for solid tantalum capacitors. The magnitude of the change in capacitance is also voltage dependent. Foil and wet slug capacitors would react to frequency similar to curve 2 below 5 kHz. Above this frequency the decrease in capacitance becomes dependent upon the electrolytic used.

Equivalent Series Resistance (ESR)/Dissipation Factor (DF)

The ESR of a tantalum capacitor is a function of the dielectric losses in the oxide film and the series resistance of the electrolyte. Figure 4-43 presents the behavior of the 120 Hz DF with temperature. The ESR characteristics would essentially duplicate these curves. The curves presented are generalized and only indicate typical behavior. Specific unit performance would depend on type and rating.

Both ESR and DF are frequency sensitive. Figure 4-44 is a typical plot of the DF and ESR performance with frequency. The curves were plotted as the ratio of the 120 Hz value over a range of frequencies. It can also be seen that units with a high capacitance and low voltage rating will increase in DF at a much faster rate than low capacitance and high voltage units.

The ESR also decreases with frequency. Figure 4-44 shows this decrease to be linear. The ESR is also rating dependent in that, for a given voltage rating, the 120 Hz ESR decreases with increasing capacitance.

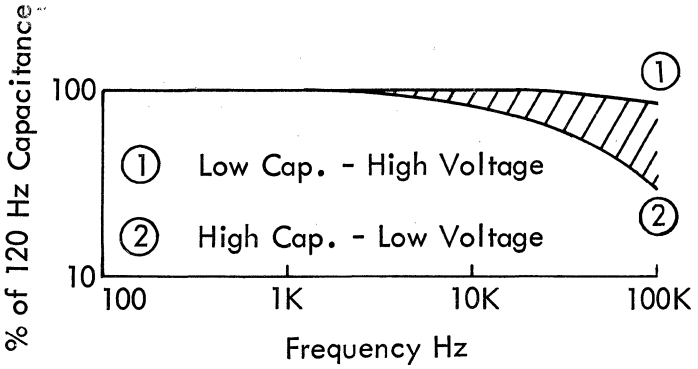


Figure 4-42. Typical Capacitance versus Frequency Range for Solid Tantalum Capacitors

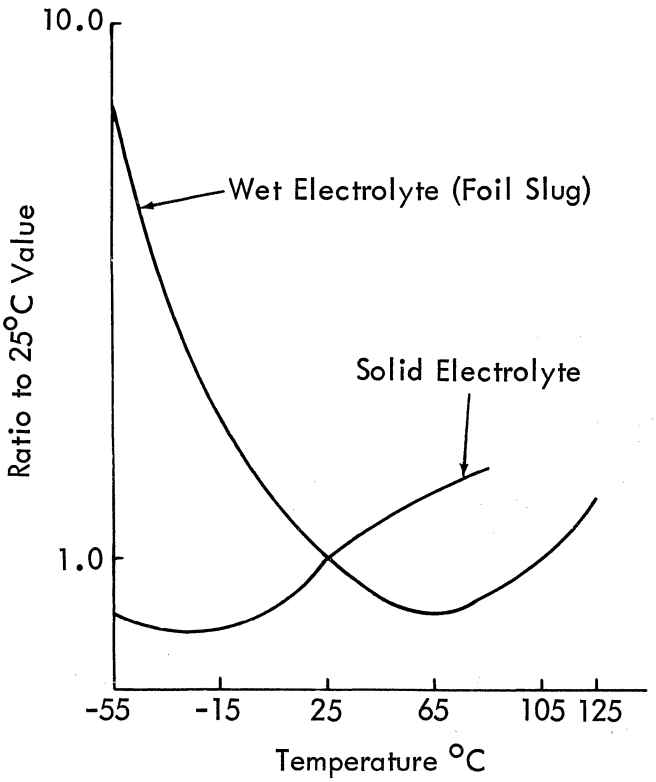


Figure 4-43. Typical 120 Hz DF versus Temperature

Impedance

Figures 4-45 and 4-46 illustrate the typical room temperature impedance versus frequency characteristics for the two classes of solid tantalum capacitors. Figure 4-46 is a plot of the characteristics in a radial-leaded (C-Pac) molded package, while Figure 4-45 is a plot of the characteristics for the axial-leaded, hermetically-sealed package. Temperature variations will also affect the impedance. Low temperature produces an increase in ESR while high temperature produces a decrease. Figure 4-48 presents the effect of temperature on the 120 Hz impedance of solid tantalum electrolytics. The impedance is plotted as a ratio of the 25°C impedance. The impedance ratio decreases with increasing temperature.

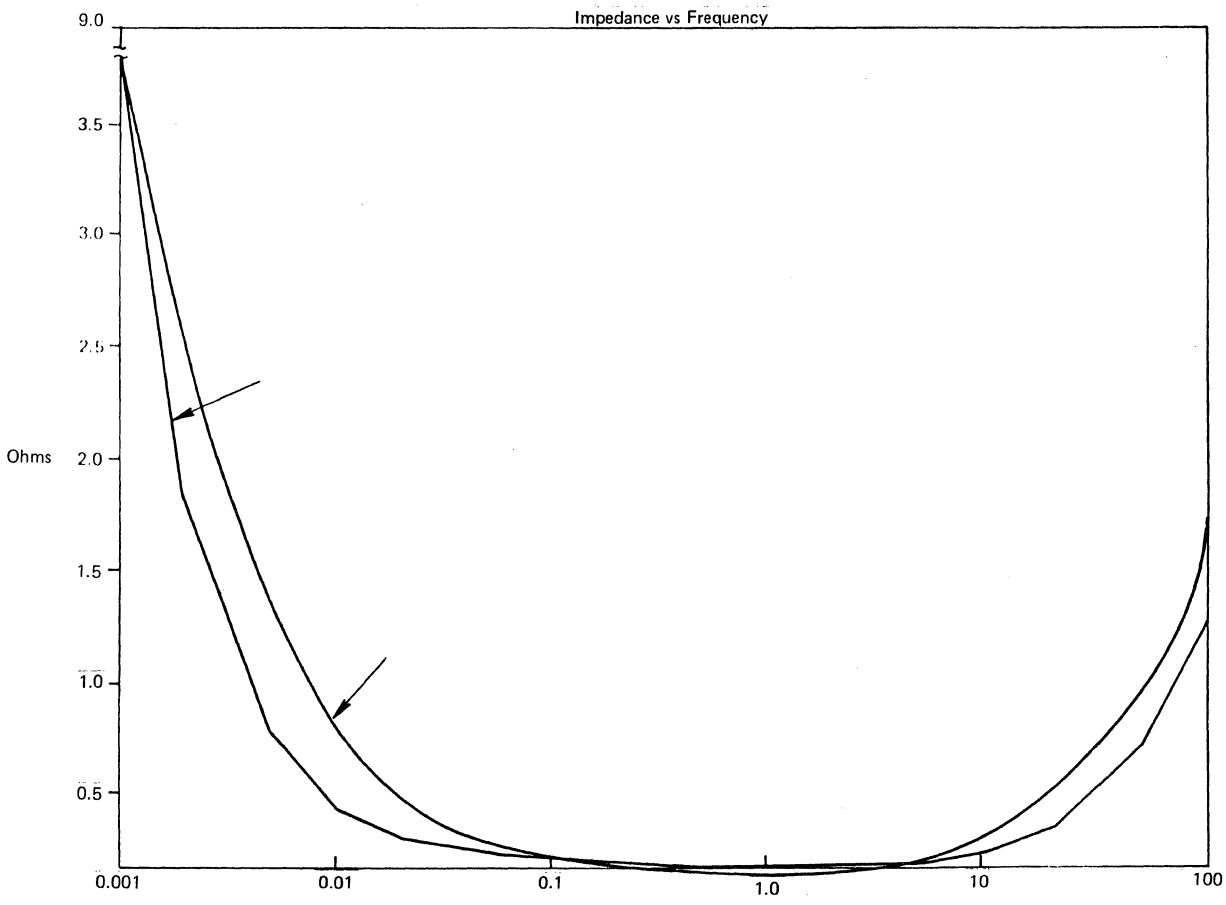


Figure 4-44. Impedance versus Frequency

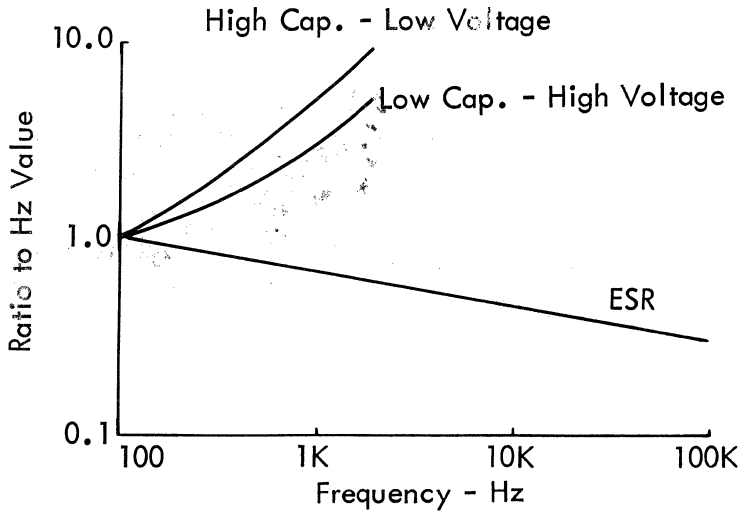


Figure 4-45. Typical DF and ESR versus Frequency for Solid Tantalum Capacitors

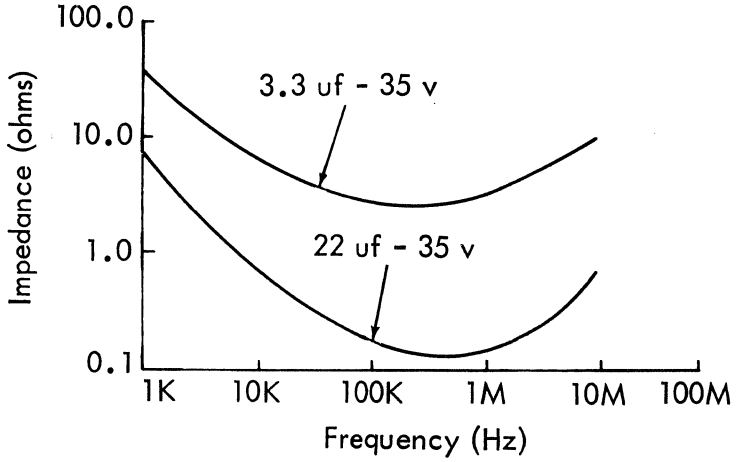


Figure 4-46. Typical Impedance (25°C) versus Frequency for Solid Tantalum Capacitors Class IIIA

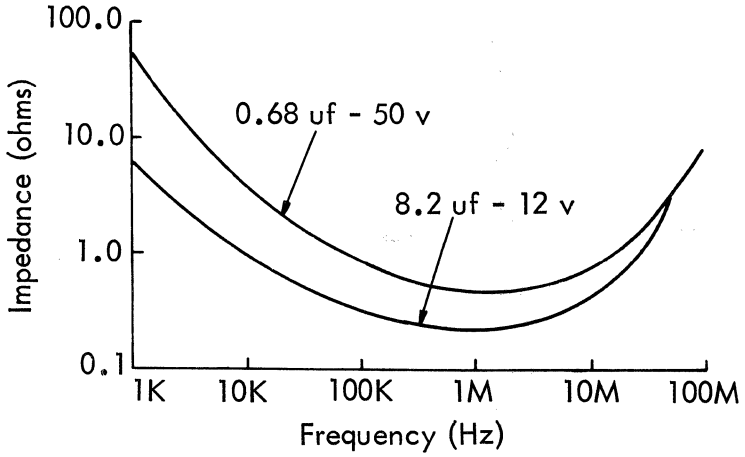


Figure 4-47. Typical Impedance (25°C) versus Frequency for Solid Tantalum Decoupling Capacitors Type IIIB

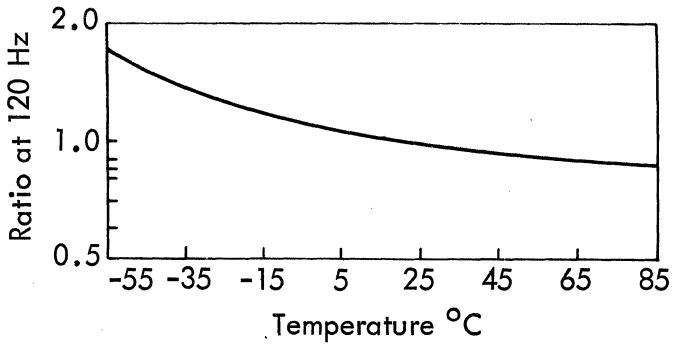


Figure 4-48. Typical Impedance versus Temperature for Solid Tantalum Capacitors

Leakage Current

All electrolytic capacitors pass a dc leakage current, which may be considered as a measure of overall capacitor defects. For tantalum electrolytic capacitors, leakage currents are generally in the very low microampere range. Figures 4-49 and 4-50 indicate the typical behavior of solid tantalum electrolytic capacitors with temperature and applied dc voltage.

AC Ripple Voltage and Current

One of the limitations on the ac voltage capabilities of solid tantalum capacitors is the amount of heating the capacitor can withstand without degrading.

Since the heat generated is mainly I^2R heating, the allowable ripple voltage is related to the ESR of the capacitor and the power dissipation capabilities of a particular case size. Power dissipation capabilities for the several axial leaded, metal cased, solid tantalum sizes have been determined empirically and are shown in Table 4-30.

The allowable ac ripple voltage which may be applied is limited by the following:

1. The positive peak ac voltage plus the dc bias voltage must not exceed the rated dc voltage of the capacitor.

2. The negative peak ac voltage in combination with the bias voltage, if any, must not exceed the allowable reverse voltage.

3. The power dissipated in the ESR of the capacitor must not exceed the values as shown in Table 4-30.

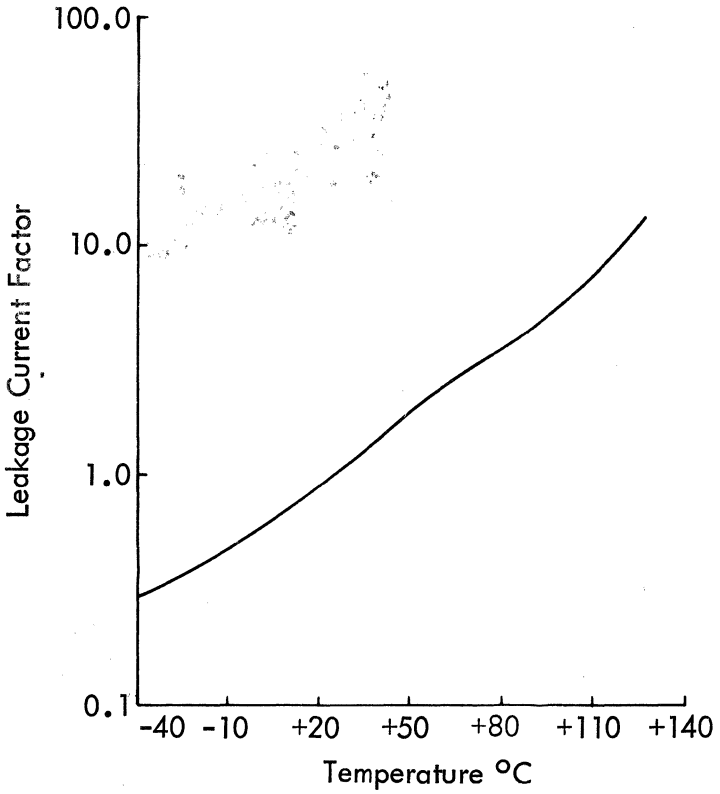


Figure 4-49. Typical Effect of Temperature Upon Leakage Current

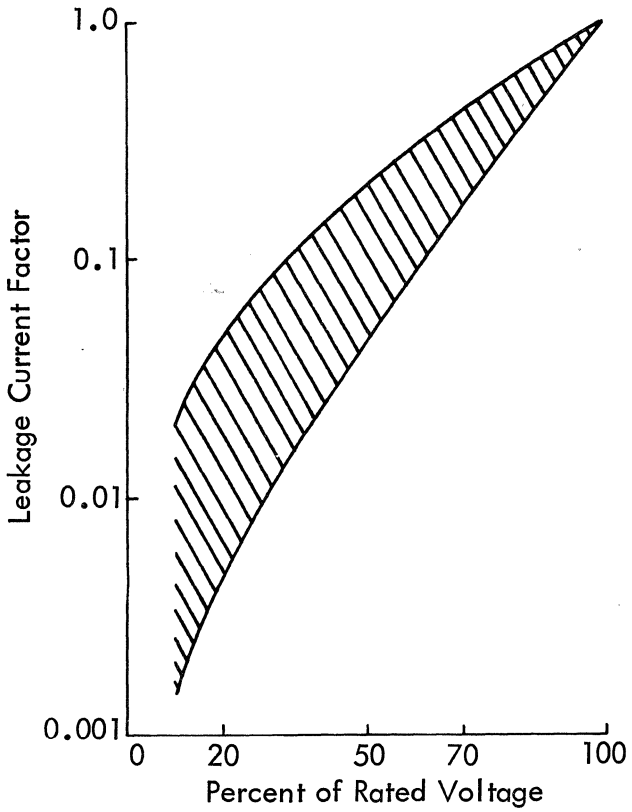


Figure 4-50. Typical Leakage Current Factor Range as a Function of Applied Voltage

Table 4-30. Maximum Power Dissipation by Case Size

Case Size	Power (Watts)
A	0.100
SB	0.110
B	0.115
C	0.140
D	0.200
0.125 mil	0.030
0.100 mil	0.020

Life Characteristics

Tantalum electrolytic capacitors are capable of being operated at rated voltage, in ambient temperatures up to 85°C. The capacitance tends to vary less than ±10%, while the ESR typically increases up to 40%, and the median dc leakage current may vary by a factor of 2 to 5. The worst case absolute EOL tolerance is specified by tantalum capacitor type, as shown in Table 4-31.

Class IIIA - Supported failure rate for class IIIA type tantalum electrolytic capacitors is reported in F/R specification 866451 or in the component Data Bank.

Type IIIB - Failure rates for type IIIB capacitors are determined by an algorithm. This algorithm is the product of the PA Technology Study conducted during the last half of 1975 and the first quarter of 1976. The user inputs his operating environment (temperature and humidity) and the ratio of applied dc voltage to rated dc voltage (%). He receives an average failure rate at 100K hours in %/K hours.

The penalties for higher percent rated voltage application can be quickly assessed by the following formula:

F/R for n% increase in R.V. in application usage $(1.053)^n$ times the old F/R.

Hypothetical Examples:*

Condition	Inputs	Hypothetical Ave. F/R @100K hours (%/K hours)
High RH/High Temp	44%RH/41°C/20%RV	0.00026
High Temp	10%RH/85°C/25%RV	0.0005
High Temp/High RH/High RV	44%RH/41°C/70%RV	0.003
MST/TTL	22%RH/37°C/20%RV	0.00005
	15%RH/70°C/77%RV	0.004

*SPA ELAL Newsletter issue #18, ENG 7-4, 9/22/76.

Table 4-31. Worst Case Absolute EOL Tolerances

Parameter	Solid	Wet	Foil
Purchase Tolerance	(+5,-5)% to (+20,-20)%	(+5,-5)% to (+75,-15)%	(+10,-10)% to (+75,-15)%
TCC (-55°C to +85°C)	(+8,-10)%	(+30,-65)%	(+15,-50)%
EOL Drift	(+10,-10)%	(+25,-15)%	(+20,-[illegible])%
W.C. Absolute EOL Tol.	(+23,-25)% to (+38,-40)%	(+65,-85)% to (+130,-95)%	(+45,-70)% to (+110,-75)%

This means going from 20% R.V. to 50% R.V. usage results in $(1.053)^{30}$ times old F/R, or a 4.71 times increase in F/R.

For each n degree C increase, the factor for F/R increase is $(1.058)^{n}$.

For each n percent RH increase, the factor for F/R increase is $(1.054)^{n}$.

Using these relationships and the preceding table, it is possible to compute average F/R's at any desired conditions. The user may experience factors as high as 40 times the F/R's shown in the table if he uses high percentages of rated voltage figures along with moderate temperatures and relative humidities. When such results occur, the user must ascertain that his application conditions are correct.

This algorithm is now in Sterling Forest.

E45-0359 Rev. 2 4-87 IBM Internal Use Only September 15, 1982

SPECIFICATIONS

Following are the specifications which are applicable to tantalum capacitors:

Engineering Specification:	896465
Quality Specification:	873463
DCS Codes:	2-3661 - Axial leaded
	2-3662 - Radial leaded
	2-3669 - Specials

Tantalum capacitors, as most commodities, are economically sensitive to volume and specified parameters. Low volume and tight electrical parameters or high voltage rating all tend to increase the cost. Following are typical "to user" costs for tantalum capacitors by type.

Type	Cost
Foil	$0.85 to $1.80
Wet Slug	$0.75 to $1.65
Solid "A" (Axial)	$0.25 to $1.25
Solid "B" (Module)	$0.20 to $0.30

From a cost, reliability and packaging viewpoint, the solid tantalum capacitor is the most desirable.

ALUMINUM CAPACITORS

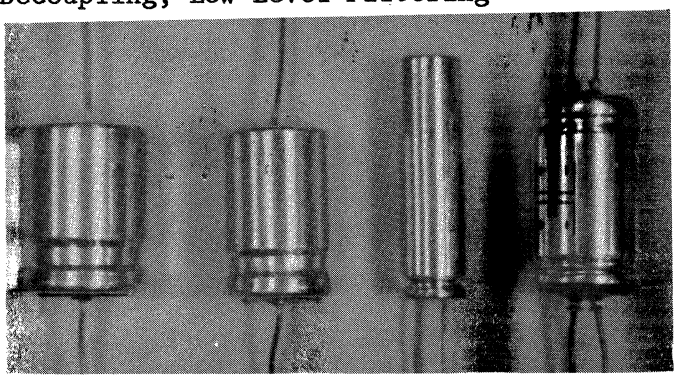
DESCRIPTION

Aluminum electrolytic capacitors employ anodized aluminum foil as the dielectric. They are utilized in such applications as bypass, filtering at power supply and audio frequencies, and high energy pulse storage. Two distinct types of aluminum electrolytic capacitors are available. Leaded devices, both polarized and non-polar, in either two lead axial and radial design, or four lead design for card and/or board mounted applications; and the larger "can type" capacitors with screw type terminals, generally used for power supply filtering applications. Within the basic types of electrolytic capacitors several subgroups exist; for example, high CV product ratings, low ESR/impedance, low inductance (ESL) type capacitors and capacitors with high ripple current and high temperature capabilities. These subgroup characteristics are the results of the various trade-offs available in aluminum electrolytic capacitor design including basic capacitor design (anode foil length-to-width ratio), type of anode foil, foil etch ratio, tabbing (single or multiple), and operating electrolyte systems such as conventional (glycol-borate) or non-aqueous (dimethlformamide-DMF). Some of these capacitor subgroups are illustrated in Figure 4-44. The two types of capacitors and subgroupings cover a capacitance range of 0.5 to 650,000 µF and a dc voltage range of 2.5 ot 450 volts.

Regardless of type, conventional aluminum electrolytic capacitors are manufactured in the following manner: Two aluminum foils separated by a porous paper separator are rolled into a cylinder. One foil (the anode) is electrochemically treated to form an aluminum oxide film on its surface.

This oxide is the dielectric material of the capacitor. This film is extremely thin and helps account for the very large capacitance/volume ratio (CV) of aluminum electrolytic capacitors. This rolled section is impregnated with an electrolyte. The separator paper absorbs the electrolyte, allowing it to maintain uniform and intimate contact with the anode foil. The second aluminum foil (the cathode) serves only as an electrical connection to the electrolyte. The electrolyte is the "true" cathode of the capacitor. The rolled capacitor section is then inserted into an aluminum container and sealed.

TUBULAR TYPES
Decoupling; Low-Level Filtering



From Left to Right:

1. Standard
2. High Ripple
3. Low ESR/Z (Radial)
4. Low ESL (4-Terminal)

CAN TYPES
Output Filtering

From Left to Right:

5. High CV
6. Low ESR/High Ripple
7. Low Z/Low ESL (Stack Foil Design)

Figure 4-51. Capacitor Subgroups

AVAILABLE TYPES

The generally recognized standard physical body sizes for leaded and can type aluminum electrolytic capacitors are shown in Tables 4-32, 4-33, 4-34, and Figures 4-52 through 4-54. Radial leaded aluminum electrolytic capacitor with body diameter greater or equal than 0.075 inches are also available in a "third lead" design. This third lead adds security against severe vibration and reverse mounting.

Typical aluminum electrolytic capacitors have capacitance purchased tolerances of -10% and +50, 75, and 100%. Maximum ambient operating temperatures are 65 and 85°, depending upon basic capacitor design. Typical can type capacitors used within IBM are rated for a 65°C operating ambient.

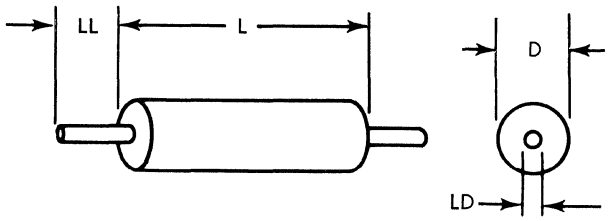


Figure 4-52. Typical Axial Leaded Type Capacitor Physical Dimensions

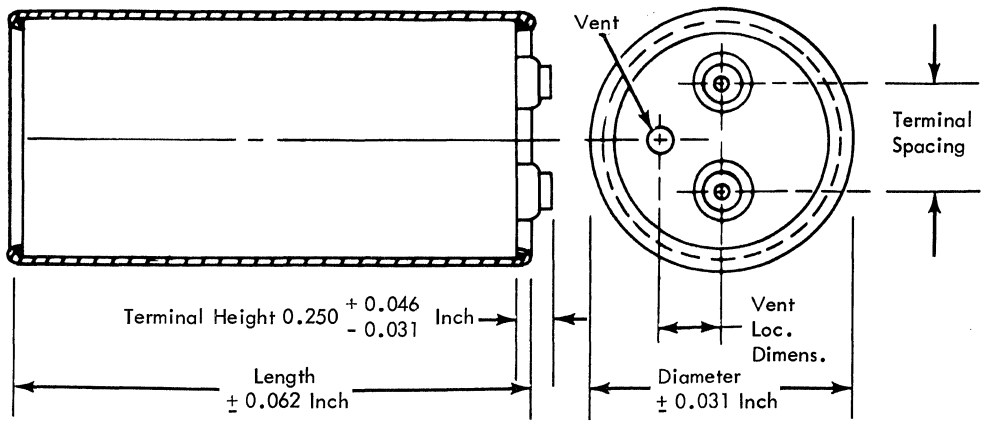


Figure 4-53. Typical Can Type Capacitor Physical Dimensions

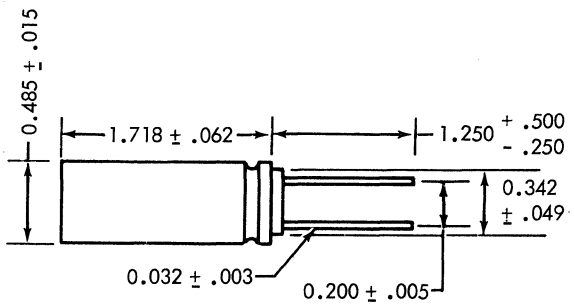


Figure 4-54. Typical Radial Leaded Type Capacitor Physical Dimensions

Table 4-32. Standard Sizes for Axial Leaded Aluminum Electrolytic Capacitors

With IBM Approved Sleeving Material Diameter (Inches) +0.016	Length (Inches) +0.031	Lead Length (Inches)	With IBM Approved Sleeving Material Diameter (Inches) +0.016	Length (Inches) +0.031	Lead Length (Inches)
0.260	0.625		0.760	1.161	
	0.812			1.661	
0.322	0.812			2.161	
	0.937			2.661	
		1.50 min			
0.385	0.937		0.885	1.161	
	1.062			1.661	+1.0
	1.375			2.161	2.5 -0.0
	1.625			2.661	
				3.161	
0.510	1.161		1.010	1.161	
	1.661			1.661	
	2.161	+1.0		2.161	
		2.5 -0.0		2.661	
0.635	1.161			3.161	
	1.661			3.661	
	2.161				
	2.661				

Lead Diameter = 0.032" for D ≤ 0.510"

Lead Diameter = 0.040" for D > 0.510"

Table 4-33. Standard Size for Can Type Aluminum Electrolytic Capacitors

With Sleeving (Heat Shrinkable PVC) Diameter (Inches)	Length (Inches)	Terminal Spacing (Inches)	Vent Location Dimension (Inches)
1.422	2.188 2.688 3.188 3.688 4.188 4.688 5.188 5.688	0.50 ± 0.03	0.312
1.797	2.188 2.688 3.188 3.688 4.188 4.688 5.188 5.688	0.75 ± 0.03	0.500
2.047	2.188 2.688 3.188 3.688 4.188 4.688 5.188 5.688	0.875 ± 0.03	0.500
2.547	3.188 3.688 4.188 4.688 5.188 5.688	1.125 ± 0.03	0.625
3.047	3.688 4.188 4.688 5.188 5.688 8.688	1.250 ± 0.03	0.750

Table 4-34. Standard Size for Radial Leaded Aluminum Electrolytic Capacitors

With IBM Approved Sleeving D ±0.15	L *	Lead Spacing (Inches) ±0.015	Lead Length (Inches) Anode	Cathode	Lead Diameter (Inches)
0.413	0.677				
	0.740	0.200			
	0.927				
0.500	1.165				
	1.437				
	1.790	0.200			0.032
0.635	1.124				
	1.437	0.300			
0.760	1.140				
	1.640				
	2.140				
	2.640	0.250			
	3.140		1.81 ± ±0.06	1.56 0.06	
	3.640				
0.885	1.140				
	1.640				
	2.140				0.040
	2.640	0.300			
	3.140				
	3.640				
1.010	1.140				
	1.640				
	2.140				
	2.640	0.400			
	3.140				
	3.640				

PERFORMANCE CHARACTERISTICS

Aluminum electrolytic capacitors are rated mainly by:

1. Nominal capacitance (μF) at dc working voltage.
2. Capacitance tolerance range.
3. Maximum allowable surge voltage.

*Length tolerance for diameters 0.635" and smaller is maximum. Length tolerance for diameters 0.760" and larger is ±0.062".

4. Maximum ESR (specified frequency).
5. Maximum impedance (at specified frequency.)
6. Maximum dc leakage current (specified temperature).
7. Maximum RMS current (specified frequency and temperature).
8. Operating temperature.

The performance characteristics of aluminum electrolytic capacitors are effected significantly by basic design, temperature, and frequency.

Temperature

Figures 4-55, 4-56, and 4-57 are typical ranges of parameter performance with temperature for a given frequency (120 Hz). It can be seen that capacitance typically increases with increasing temperature, while the ESR and impedance decrease. The dc leakage current typically increases with increasing temperature and at 85°C, it can be six to eight times its initial 25°C value.

Frequency

Figure 4-58 indicates the typical 25°C impedance characteristics of conventionally leaded aluminum electrolytic capacitors. Two curves are shown for axial lead capacitors covering the capacitance range of 10 to 10,000 µF and the voltage range of 6 to 150 volts. The third impedance curve is for a 1000 µF 8 volt radial lead, back panel decoupling capacitor, which is utilized throughout IBM in power supply filtering applications. Figure 4-59 shows the impedance characteristics for various, specifically designed can type aluminum electrolytic capacitors. Three curves are shown, representing typical high CV product devices to low impedance/inductance special design devices or the "stacked foil" capacitor.

The impedance is primarily affected by capacitance value, ESR (when operating at high frequencies), and termination techniques (for example, axial or radial lead, number of tabs, and tab placement for can types). The curves of Figures 4-58 and 4-59 in general, have three distinct characteristics:

1. At low frequency, the negative slope is due to capacitive reactance, and the impedance is approximately inversely proportional to frequency.
2. The trough of the curves is almost totally resistive and indicates a relatively constant impedance which is the equivalent series resistance (ESR).
3. The positive slope in the high frequency range represents the inductive reactive and is due to the self-inductance of the capacitor.

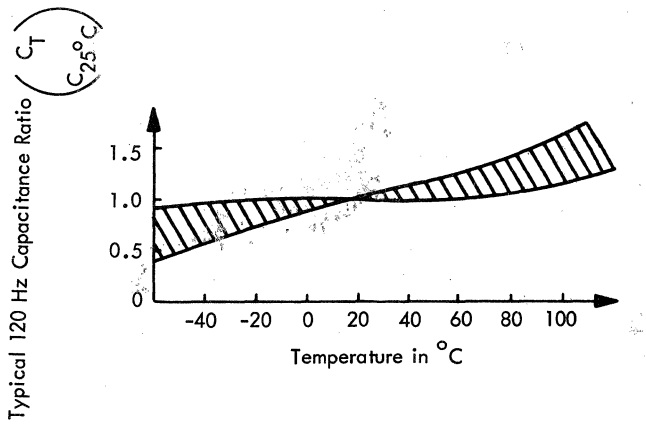


Figure 4-55. Typical Capacitance Ratio versus Temperature

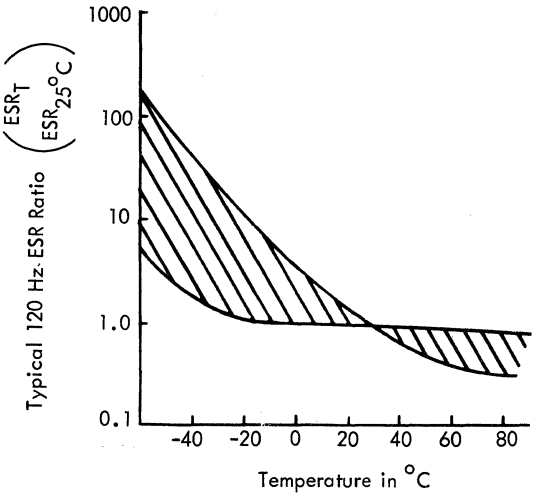


Figure 4-56. Typical ESR Ratio versus Temperature

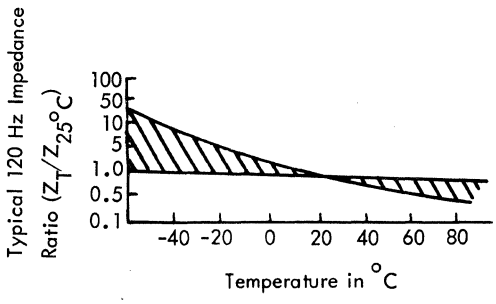


Figure 4-57. Typical Impedance Ratio versus Temperature

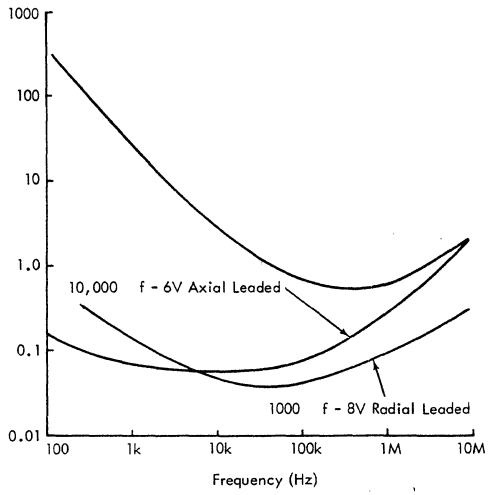


Figure 4-58. Typical 25°C Impedance Range for Aluminum Electrolytic Capacitors

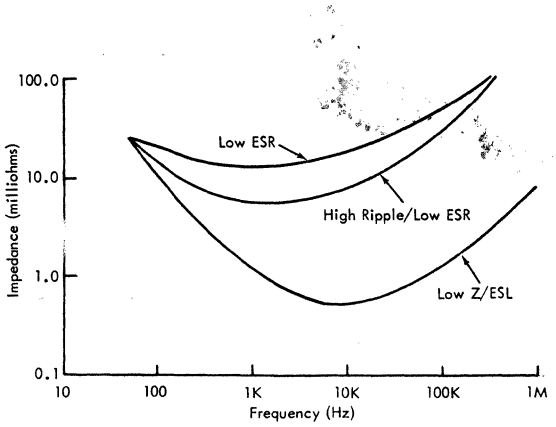


Figure 4-59. Typical 25°C Impedance-Frequency Curves Various Can Types - (Ratings - 150 Kf/5 Vdc High Capacitance)

Figure 4-60 presents a typical range of curves for frequency versus capacitance ratio. The curves indicate that capacitance decreases with increasing frequency. Figure 4-61 presents a typical range of curves for frequency versus ESR ratio. These curves show that the ESR typically decreases with increasing frequency, up to approximately 1 to 4 kHz, and then remains relatively constant.

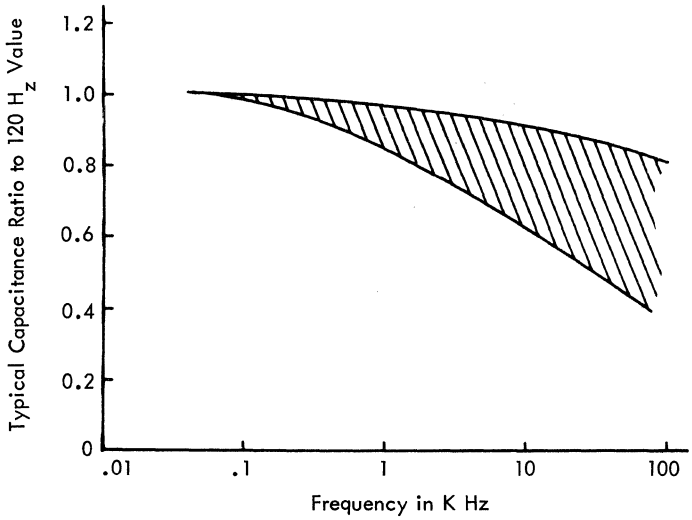


Figure 4-60. Typical Capacitance Ratio versus Frequency

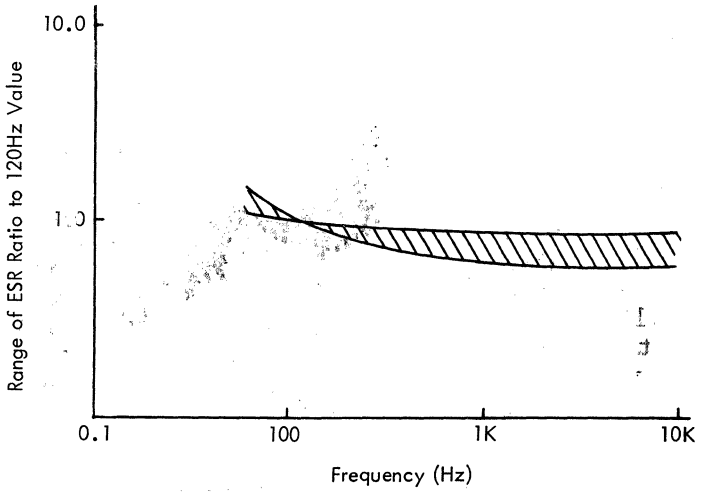


Figure 4-61. Typical Range of ESR versus Frequency

Life Characteristics

The operational life of an aluminum electrolytic capacitor is governed by its operating temperature, imposed surge voltages, and ripple currents. Aluminum electrolytic capacitors, unlike solid tantalums, have a "wear out" mechanism, and their primary failure mode is one of degradation. This degradation results from slow chemical and electrochemical reactions on the electrode surfaces. These reactions, which are accelerated by heat, are an inherent property of the system and are not necessarily due to the intrusion of contaminants. The primary cause of "wear out" is loss of electrolyte. As electrolyte is lost, capacitance will decrease, and both ESR and dc leadage current will increase with time.

Aluminum electrolytic capacitors, depending upon design, are capable of operating at rated voltage and maximum specified ripple currents in ambient temperatures of 65, 85, and 105°C. However, the operating life of an aluminum electrolytic capacitor can be extended, within limits by temperature, voltage, and ripple current derating. The absolute worst case end-of-life (EOL) capacitance tolerance, at rated operating conditions, for aluminum electrolytic capacitors, is dependent upon units meeting the initial capacitance purchased tolerance, the EOL capacitance drift, and the TCC purchased tolerance as follows:

Capacitance Purchase Tolerance	±25% to +100 -10 %
TCC (-40°C to +85°C)	+10% -25%
EOL Drift	±20%
Absolute W.C. EOL Tol. Tolerance	+55 % to -70 +130 % -55

RMS RIPPLE CURRENT

An aluminum electrolytic capacitor's ripple current capability is primarily a function of the permissible temperature rise within the core of the capacitor section. This temperature rise, which is due to I2R heating, is affected by the ambient temperature at which the capacitor is operated, the power dissipation capabilities of the capacitor, the ESR of the capacitor, and the ripple current flowing through the ESR. These properties, in turn, are a function of basic capacitor design (method of tabbing, electrolyte system), capacitance value, and operating frequency. Ripple current capabilities are generally given for a specified frequency (120 Hz) and maximum specified operating ambient of the capacitor.

A formula for ripple capability is:

$$\Delta T = \frac{\text{Power}}{KA} = \frac{I^2R}{KA}$$

ΔT%= Temperature Difference, Core - Ambient and is a function of capacitor design. For example, an 85°C rated capacitor is assumed to have a 10°C rise; that is, the core temperature can be operated at 95°C

K = Thermal Resistance = 0.006 Watts per square inch per °C. (in still air)

A = Surface area of case in square inches

I = Ripple Current

R = ESR

It can be seen from this formula, that by lowering the ambient temperature, the value of ΔT can be increased and the ripple capability can be increased. It also follows that capacitor life can be increased by operating with ambient temperatures and ripple currents which will result in reduced core temperatures.

When ac ripple voltage is superimposed on dc, the sum of the dc and ac voltage should not exceed the dc rated working voltage of the capacitor.

The performance characteristics presented here are in broad generalized terms. Therefore, specific information for a given application should be obtained from the responsible component engineer.

Application Guidelines

Shelf Life (Storage) - Aluminum electrolytic capacitors can deteriorate while in storage. The extent of deterioration is characterized by a significant increase in dc leakage current and is a function of the electrolyte system, ambient stor-

age temperatures, and storage time. Aluminum electrolytic capacitors when stored at ambient storage temperatures from -20°C to +40°C are specified to have a maximum shelf life of:

1. Three years for capacitors with a voltage rating greater than 100 Vdc.

2. Five years for capacitors with a voltage rating less or equal to 100 Vdc.

It is recommended that capacitors whose maximum shelf life is exceeded not be used in equipment unless they have been reformed. To ensure that our user's do not receive over-age devices, stocks are periodically monitored and capacitors older than two years (for voltage ratings greater than 100 V), and older than four years (for voltage ratings less or equal to 100 V), are removed for reformation or scrap, whichever approach is economically justified.

Reverse Voltage - Repeated and/or prolonged voltage reversal should be avoided with dc aluminum electrolytic capacitors. Excessive voltage reversal can result in gas generation, leading to capacitor venting, and oxide film formation on the cathode foil with resulting loss of capacitance. If reverse voltage cannot be avoided it is recommended that it should not exceed 0.5 volts.

Cleaning Agents - Halogenated hydrocarbon solvents are not recommended for use in cleaning aluminum electrolytic capacitors. Other solvents such as alcohols and some detergent formulations are suitable. Where it is necessary to use halogerated solvents, capacitors having a supplemental epoxy barrier protecting the end seal are recommended.

Mechanical Stress - Mechanical stresses particularly as related to the capacitor's leads and terminals should be kept to a minimum. Shock and vibration can break lead wires, lead welds, and terminations within the capacitor. It is recommended, particularly for the radial leaded capacitors, that care be exercised in lead bending and mounting.

Vent Requirements - The vent's function is to protect the capacitor against internal pressure build-up due to vaporizing or gassing of the electrolyte.

The can type aluminum electrolytic capacitors use a diaphragm type vent. The following precautions must be taken in order to guarantee proper venting:

1. The clearance between the tip or the outer surface of the vent and protective cover must be at least 5 mm (0.188 in.). The protective cover is needed to protect personnel from vapors or debris in case of venting.

2. The recommended location of the vent when mounting can type capacitors is in the upright position (Figure 4-62-a). If the application necessitates the capacitor to be in the horizontal position, it is mandatory to have the vent located in the 9 o'clock position (Figure 4-62-b), 12 o'clock (Figure 4-62-c), or 3 o'clock (Figure 4-62-d) position. When the 12 o'clock position is used, adequate support of the can should be provided. Otherwise screw loosening will occur because of vertical vibration. Mounting with the terminals down (Figure 4-64-a), or in the 6 o'clock position is not approved.

Failure to meet the above vent requirements can impede proper venting and capacitor explosion could occur.

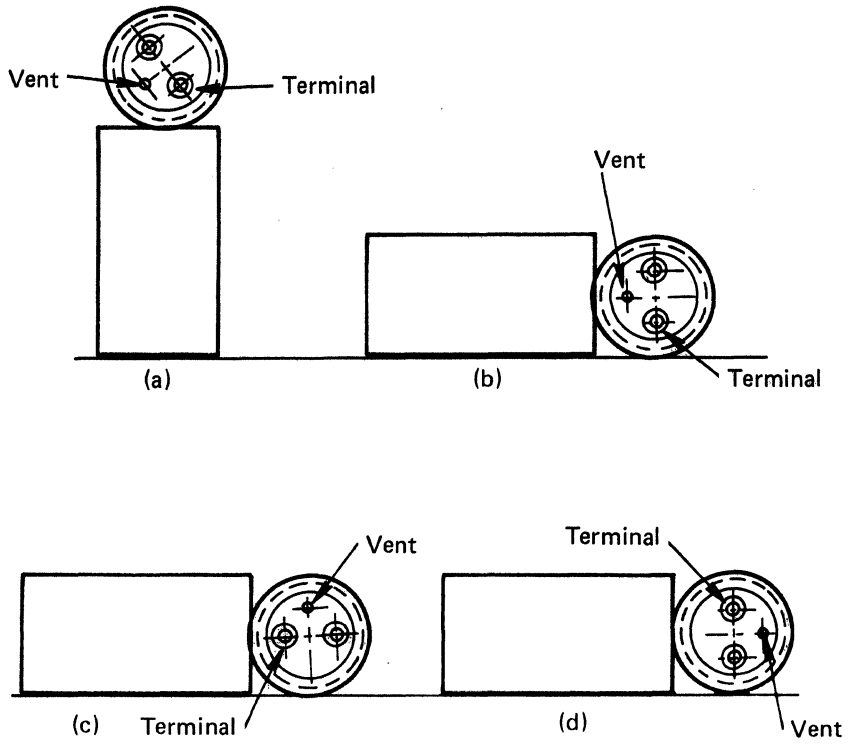


Figure 4-62. Approved Mounting

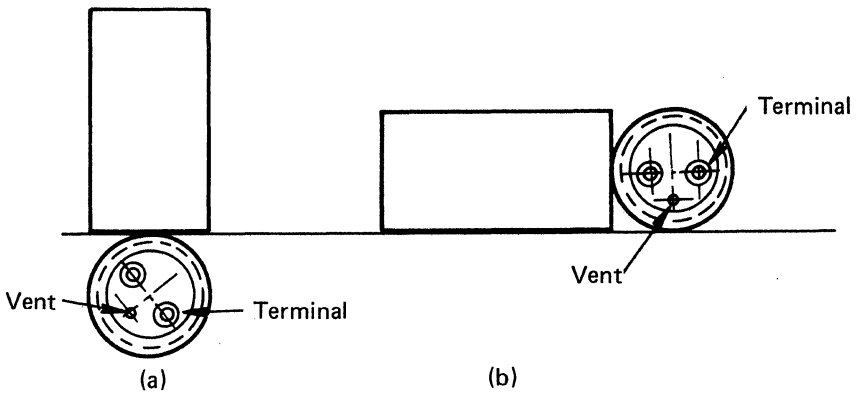


Figure 4-63. Non Approved Mounting

Tips for Increasing Capacitor Life Expectancy:

1. Keep away from heat sources.
2. Keep as cool as possible.
3. Avoid excessive transients.
4. Operate at derated ripple current.

RELIABILITY

Failure Rates

The supported failure rate for can type and axial type aluminum electrolytic capacitors is 0.01% per 1 k hours over a useful life of:

1. 5 years or 40 k hours for capacitors with a voltage rating greater than 100 V.
2. 8 years or 70 k hours for capacitors with a voltage rating less or equal than 100 V.

The hours of useful life are calendar hours with the capacitors operating within an IBM Class C environment.

An ELAL algorithm for radial type aluminum electrolytic capacitors has been developed relating stresses of temperature, ripple current, and voltage to failure rates. Aluminum electrolyte capacitors are not considered as being either reclaimable or "equivalent to new". Failure rates for axial and can type capacitors are available in either engineering specification 966451 or the component data bank.

ECONOMICS AND DESIGN CONSIDERATIONS

As with all capacitors, the to-the-user cost will be highly volume sensitive, both from a manufacturing and a usage standpoint. The basic capacitor cost is determined by CV product rating or case size. The trend today is for capacitors to be function oriented and selection should be based upon primary application requirements. The best capacitor for a specific end application will not necessarily be the one of lowest initial cost. In selecting a given device, consideration should be given to application requirements, and trade-offs made with respect to multiple devices use VS. a single device, space requirements and savings, as well as assembly cost, particularly where multiple use is contemplated.

The capacitor information presented here is representative of the types of contemporary products available. These products exist as standard lines and as such, are not necessarily the optimum in design for a specific use. Within the framework of these products, trade-off variations as foil types and processing, types of paper spacers, electrolyte systems, and construction techniques can lead to additional specific and/or overall improvements in electrical and performance characteristics.

For conventional leaded devices the "to-user" cost varies between $0.25 and $2.00 but is typically in the $0.25 to $1.00 range. For "can" type capacitors, the cost varies between $1.50 and $18.00 but is typically in the $1.50 to $6.00 range.

SPECIFICATIONS

Following are the applicable specifications for aluminum electrolytic capacitors.

Engineering Specification:	896452 - Leaded Capacitors
Engineering Specification:	895343 - Can Type Capacitors
Quality Specification:	873705
DCS Codes:	2-3641 - Axial Lead 2-3642 - Radial Lead 2-3645 - Can Type 2-3649 - Specials

CERAMIC CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODES
--- -----

23611 - Axial Lead

PG. 1 06/30/82 23:21 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23611 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT.	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
0483492	E	.00													
0350400	A	4.70	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350401	A	5.60	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350402	A	6.80	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350403	A	8.20	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0492412	A	9.10	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350404	A	10.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0483121	A	10.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350405	A	11.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350406	A	12.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
2154528	A	12.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350407	A	13.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350408	A	15.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0483441	A	15.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
5301513	A	15.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350409	A	16.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350410	A	18.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350411	A	20.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0492413	A	20.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350412	A	22.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0491224	A	22.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0814031	A	22.00	+10-10	100				NPO	1	100	260	330	190	AXIAL	MONOLITHIC AXIAL LEADED
0350413	A	24.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350414	A	27.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350415	A	30.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
2154529	A	30.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350416	A	33.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
5301511	A	33.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350417	A	36.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0338115	A	39.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350418	A	39.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
5301516	A	39.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC
0350419	A	43.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350420	A	47.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0529200	A	47.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
5301512	A	47.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350421	A	51.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350422	A	56.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350423	A	62.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350424	A	68.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
5301536	A	68.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350425	A	75.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0492464	C	75.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350426	A	82.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
2218762	A	82.00	+10-10	50				COG	1	100	260			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
5213088	A	82.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350427	A	91.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0300714	A	100.00	+10-10	100				NPO	1	100	260		250	AXIAL	MONOLITHIC AXIAL LEADED

PG. 2 06/30/82 23:21 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23611 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT. VOLTS	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
0317266	A	100.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350428	A	100.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0492512	A	100.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0505344	A	100.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
5301506	A	100.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC
0350429	A	110.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350430	A	120.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0492687	A	120.00	+ 5- 5	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350431	A	130.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350432	A	150.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0360031	A	150.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
5301514	A	150.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350433	A	160.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350434	A	180.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350435	A	200.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350436	A	220.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0360032	A	220.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0491225	A	220.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
2391064	A	220.00	+10-10	100				COG	1	100	260			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350437	A	240.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0491009	A	240.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350438	A	270.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0491249	A	270.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350439	A	300.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0491226	A	300.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0323923	A	330.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350440	A	330.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0491233	A	330.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
8493222	C	330.00	+ 5- 5	100				NPO	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEAD
0350441	A	360.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350442	A	390.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0360034	A	390.00	+10-10	100	25			NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350443	A	430.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0317281	C	470.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350444	A	470.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
2218761	A	470.00	+10-10	50				COG	1	100	260			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350445	A	500.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350446	A	510.00	+10-10	100				COG	1	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0483358	A	560.00	+20-20	100				X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0491222	C	560.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
2102686	C	560.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350448	A	620.00	+20-20	100				X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0492582	C	620.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
2218760	A	620.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350449	A	680.00	+20-20	100				X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350450	A	750.00	+20-20	100				X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0492438	C	750.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0492685	C	750.00	+10-10	100				NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED

Component Data Bank - P/N Catalog
Axial Lead Capacitors

PG. 3 06/30/82 23:21 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23611 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	C	T CAPAC U ITANCE PFD	TOLER ANCE +% -%	RATED DIS VOLT. SIP Q VOLTS FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
0350451	A	820.00	+20-20	100		X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350452	A	910.00	+20-20	100		X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0300715	A	1,000.00	+10-10	100		NPO	1	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350453	A	1,000.00	+20-20	100		X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350475	A	1,200.00	+20-20	100		X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350476	A	1,500.00	+20-20	100		Z5U	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
2390110	A	1,500.00	+10-10	100		X7R	2	100	260			AXIAL	MONOLITHIC AXIAL LEADED
2391630	A	1,500.00	+10-10	50		X7R	2	100	260			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350477	A	1,800.00	+20-20	100		Z5U	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350478	A	2,200.00	+20-20	100		Z5U	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350479	A	2,700.00	+20-20	100		Z5U	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0350480	A	3,300.00	+20-20	100		X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
2218711	A	3,300.00	+20-20	100		X7R	2	100	260			AXIAL	MONOLITHIC AXIAL LEADED
0350481	A	3,900.00	+20-20	100		X7R	2	100	170			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0813203	C	6,800.00	+20-20	100		X5R	2	100	260			AXIAL	MOLDED MONOLITHIC AXIAL LEADED
0813204	C	10,000.00	+20-20	100		X7R	1	100	260			AXIAL	MONOLITHIC
8493342	C	47,000.00	+20-20	50		Z5U	2	100	260			AXIAL	MOLDED MONOLITHIC AXIAL
8493341	C	100,000.00	+80-20	25		Z5U	2	100	260			AXIAL	MOLDED MONOLITHIC AXIAL

TOTAL RECORDS 114

CERAMIC CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODES
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23612 - Radial Lead

PG. 1 06/30/82 23:21 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
'DB/CC DCS#N EQ 23612 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLTS	DIS FAC	SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
5213577	A	.00	+20-20	25					Z5U	2		500	500	140	RADIAL	1 UF.
5213937	C	.00	+20-20	25						2		500	500	240	RADIAL	2.2 UF
1589133	C	2.70	+05-05	100					C0J	1		100	100	100	RADIAL	
2396538	A	3.30	+ 5- 5	50				100000	C0G	2		100	100	100	RADIAL	CLASS4
1589134	C	4.70	+10-10	100					C0H	1		100	100	100	RADIAL	
1589135	C	12.00	+10-10	100					C0G	1		150	150	100	RADIAL	
0317263	A	15.00	+10-10	500							240	460			RADIAL	
1589136	C	160.00	+10-10	100				100	T3D	1		150	150	100	RADIAL	
4429912	C	7,500.00	+ 5- 5	50					NPO	1		300	300	150	RADIAL	200 MIL LEAD SPACING
0419190	A	10,000.00	+10-10	75						2		750	750	125	RADIAL	
1582576	A	10,000.00	+80-20	50					Z5U	2		200	200	125	RADIAL	
1589137	C	10,000.00	+20-20	50				100	X5R	2		200	200	100	RADIAL	
1589405	C	10,000.00	+80-20	200		3			Z5U	2		300	300	150	RADIAL	
2410137	C	22,000.00	+20-20	50					Z5U	2		200	200	150	RADIAL	
1589406	C	47,000.00	+80-20	200		3			Z5U	2		300	300	150	RADIAL	
1134457	C	100,000.00	+20-20	25					Z5U	2		500	500	125	RADIAL	HOOKED LEADS
1582575	A	100,000.00	+80-20	50					Z5U	2		300	300	125	RADIAL	
1589178	C	100,000.00	+8020	100					Z5U	2		300	300	150	RADIAL	
5615549	C	220,000.00	+20-20	100		3			Z5U	2		300	300	150	RADIAL	0.22 MFD
1132757	A	470,000.00	+80-20	25	25				Z5Z	2		500		120	RADIAL	
8493167	C	470,000.00	+10-10	50					X7R	2		300	300	150	RADIAL	200 MIL LEAD SPACING
1582608	A	999,999.99	+20-20	50					Z5V	2		400	400	150	RADIAL	1 MFD
8519615	A	999,999.99	+10-10	50					X7R	2		400	400	150	RADIAL	200 MIL LEAD SPACING 1 MFD

TOTAL RECORDS 23

CERAMIC CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODES
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23613 - Modular

PG. 1 06/30/82 23:22 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23613 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT. VOLTS	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
1589256	A	2.00	+25-25	50	8			COJ	1	233	350	110		2PIN	
2391210	C	2.70	+02-02	50				COJ	1	250	350	125		2PIN	363 0150760 5-.5
2391048	C	5.60	+09-09	50				COJ	1	233	350	110		2PIN	363 0150760 5-.5
8493882	A	6.80	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493880	A	8.20	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493447	A	10.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493881	A	10.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
4481847	A	12.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493883	A	12.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2414998	A	15.00	+10-10	50				S6	1	233	350	110		2PIN	
8493333	A	15.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2391049	A	18.00	+05-05	50				S2L	1	233	350	110		2PIN	
8279292	A	18.00	+10-10	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493335	E	18.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
4481153	A	20.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2391304	A	22.00	+05-05	50				S2L	1	233	350	110		2PIN	
2396666	C	22.00	+05-05	50				S2L	1	233	350	110		2PIN	36573E142
8493133	A	22.00	+10-10	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493334	A	22.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
1589257	A	24.00	+05-05	50				S2L	1	233	350	110		2PIN	
2390803	E	25.00	+10-10	50				S3N	1	880	350	110		8PIN	2 DIFFERENT CAPS IN PN 2390803
4481085	C	25.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8272242	A	27.00	+10-10	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493339	A	27.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493345	A	27.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2414983	A	30.00	+10-05	50				COH	1	233	350	110		2PIN	
8272243	A	30.00	+10-10	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
4481848	A	33.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8278905	A	36.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8278945	A	39.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493346	A	39.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2391066	A	47.00	+10-10	50				S3N	1	233	350	110		2PIN	
2396681	C	47.00	+10-10	50				S3N	1	233	350	110		2PIN	36573E142
4481846	A	47.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
4481849	A	50.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
4718640	E	53.00	+ 5- 5	50		1000	NPO		1	190	350	90		2PIN	100 MIL LEAD SPACING
1589278	A	56.00	+10-10	50				C0G	1	190	350	90		2PIN	100 MIL LEAD SPACING
2391152	A	62.00	+10-10	50				Z5E	2	233	350	110		2PIN	
2396657	C	62.00	+10-10	50				X5E	2	233	350	110		2PIN	36573E142
8493337	A	62.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2414991	A	68.00	+10-10	50				Z5E	2	233	350	110		2PIN	
5616796	C	68.00	+ 5- 5	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
8493860	A	68.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2391314	A	69.00	+08-08	50				Z5E	2	233	350	110		2PIN	
8493861	A	75.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
1589469	C	80.00	+10-10	50				X5R	2	190	350	90		2PIN	100 MIL LEAD SPACING
4481850	A	82.00	+ 3- 3	50				NPO	1	190	350	90		2PIN	100 MIL LEAD SPACING
2414985	A	91.00	+05-05	50				S2L	1	233	350	110		2PIN	

PG. 2 06/30/82 23:22 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23613 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPAC ITANCE PFD	TOLER ANCE +% -%	RATED VOLT. VOLTS	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
1582792	A	100.00	+20-20	10				X5R			984		110	8PIN	
2390202	A	100.00	+10-10	50	100			Z5E	2		233	350	110	2PIN	
2390453	E	100.00	+10-10	50				S3N	2		483	350	110	4PIN	23172 10076
2396653	C	100.00	+10-10	50				Z5E	2		233	350	110	2PIN	36573E142
8493217	A	100.00	+10-10	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493862	A	100.00	+ 3- 3	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391001	A	110.00	+10-10	50				Z5E	2		233	350	110	2PIN	
2391271	A	120.00	+10-10	100				Z5E	2		233	350	110	2PIN	
2396680	C	120.00	+10-10	100				Z5E	2		233	350	110	2PIN	36573E142
5615471	A	120.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493291	A	130.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493344	A	130.00	+ 5- 5	50				NPO	1		233	350	110	2PIN	125 MIL LEAD SPACING
4481851	A	137.00	+ 3- 3	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391003	A	139.00	+10-10	50				Z5E	2		233	350	110	2PIN	
8493290	A	139.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
4481852	A	150.00	+ 3- 3	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493292	A	150.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2396585	A	160.00	+10-10	25				S2L	1		233	350	110	2PIN	
4481853	A	160.00	+ 3- 3	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493332	C	160.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391267	A	180.00	+05-05	50				S2L	1		233	350	110	2PIN	
5616797	A	180.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493863	A	187.00	+ 3- 3	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2395868	A	200.00	+10-10	25				COH	1		233	350	110	2PIN	
2396667	C	200.00	+10-10	25				COH	1		233	350	110	2PIN	36573E142
5617073	A	200.00	+10-10	50				COH	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493864	A	200.00	+ 3- 3	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391060	E	220.00	+10-10	50	25			Z5E	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
8519614	A	240.00	+ 1- 1	25				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493218	A	250.00	+10-10	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391266	A	260.00	+10-10	50				SZL	1		233	350	110	2PIN	
8493289	A	270.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2390205	A	300.00	+10-10	50				Y5F	2		233	350	110	2PIN	
2396654	C	300.00	+10-10	50				Y5F	2		233	350	110	2PIN	36573E142
8493183	A	300.00	+10-10	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391067	A	330.00	+10-10	50				S2L	1		233	350	110	2PIN	
2396656	C	330.00	+10-10	50				X26	1		233	350	110	2PIN	36573E142
2414997	E	330.00	+10-10	50				Z5E	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
8493195	A	330.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493313	A	330.00	+10-10	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING (.130LDLG)
2390466	E	360.00	+08-08	50				S3N	1		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
4481037	A	360.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493219	A	375.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391004	A	390.00	+20-20	50				X5R	2		233	350	110	2PIN	
2396992	A	390.00	+05-05	25				X5R	2		233	350	110	2PIN	
8493213	A	390.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL SPACING
8519116	A	410.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391199	A	430.00	+10-10	50				X5R	2		233	350	110	2PIN	

PG. 3 06/30/82 23:22 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23613 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT. VOLTS	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
2414996	E	430.00	+10-10	50				Z5E	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
8493220	A	430.00	+10-10	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2391037	A	470.00	+20-20	50				X5R	2		233	350	110	2PIN	
2396655	C	470.00	+20-20	50				X5R	2		233	350	110	2PIN	36573E142
4430082	A	470.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2395876	A	510.00	+10-10	25				COH	1		228	345	110	2PIN	
2414999	E	510.00	+10-10	50				Z5E	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
5616679	C	510.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
5615899	A	620.00	+05-05	50	1		1000	COH	1		233	350	110	2PIN	100 MIL LEAD SPACING
2390469	E	680.00	+10-10	50				Z5E	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
2414992	A	680.00	+20-20	50				X5U	2		233	350	110	2PIN	
5615588	C	680.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493178	A	680.00	+ 5- 5	50				NPO	1		233	350	110	2PIN	
2414994	A	750.00	+20-20	50				954	2		233	350	110	2PIN	
8493221	A	750.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2390412	E	820.00	+20-20	50				X5T	2		483	350	110	4PIN	23172 82076
2395869	A	820.00	+10-10	50				COH	1		233	350	110	2PIN	
8493165	A	820.00	+ 1- 1	50				NPO	1		190	350	90	2PIN	100 MIL SPACING
2396722	A	910.00	+05-05	50				COH	1		233	350	110	2PIN	
2414986	A	910.00	+10-10	50				COH	1		233	350	110	2PIN	
8272118	A	910.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2390622	E	1,000.00	+80-20	50				Z5U	2		733	350	110	6PIN	33172 100076
2396586	A	1,000.00	+10-10	25				S2L	1		233	350	110	2PIN	
2414993	A	1,000.00	+20-20	50				Z5U	2		233	350	110	2PIN	
4481017	C	1,000.00	+ 2- 2	25				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
5615550	C	1,000.00	+10-10	50				X5R	2	350	190		90	2PIN	100MIL
5616810	C	1,000.00	+ 5- 5	25				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493288	A	1,200.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2395875	A	1,300.00	+10-10	25				X5R	2		233	350	110	2PIN	
5615589	C	1,300.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8519117	A	1,300.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2396593	A	1,500.00	+10-10	25				X5R	2		233	350	110	2PIN	
2397063	A	1,500.00	+10-00	25				X5R	2		233	350	110	2PIN	
2414995	E	1,500.00	+20-20	50				954	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
4481038	A	1,500.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8493164	E	1,550.00	+ 1- 1	50				NPO	1		190	350	90	2PIN	100 MIL SPACING
1589276	A	1,600.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2395870	A	1,600.00	+10-10	25				X5R	2		233	350	110	2PIN	
5616680	C	1,600.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
2390663	E	1,800.00	+08-08	50				S2L	1		733	350	110	6PIN	
2396587	A	1,800.00	+10-10	25				S2L	1		233	350	110	2PIN	
5616216	A	1,800.00	+ 5- 5	50				COG	2		350	190	90	2PIN	100 MIL LEAD SPACING
1589466	C	2,000.00	+05-05	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
1589467	A	2,000.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2395874	A	2,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
2391002	A	2,200.00	+80-20	50				Y5V	2		233	350	110	2PIN	
2396663	A	2,200.00	+10-10	50				X5R	2		233	350	110	2PIN	
8493343	A	2,400.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING

PG. 4 06/30/82 23:22 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23613 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLTS	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
1589468	A	2,700.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396588	A	2,700.00	+10-10	25				X5R	2		233	350	110	2PIN	
2414984	A	2,700.00	+30-20	25				Z5V	2		233	350	110	2PIN	
8493331	C	2,700.00	+ 5- 5	50				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
5615544	C	3,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD LENGTH
2395872	A	3,300.00	+10-10	25	25			X5R	2	20000	30	3500	110	2PIN	
2414987	A	3,300.00	+20-20	50				X5R	2		233	350	110	2PIN	
5615551	C	3,300.00	+10-10	50				X5R	2	350	190		90	2PIN	100MIL
2395873	A	3,900.00	+10-10	25				X5R	2		233	350	110	2PIN	
1589471	A	4,000.00	+05-05	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493452	A	4,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING (.130LDLG)
2396532	A	4,700.00	+20-20	25				X5R	2		233	350	110	2PIN	
2396589	A	4,700.00	+10-10	25				X5R	2		233	350	110	2PIN	
2414988	A	4,700.00	+15-15	50				759	2		233	350	110	2PIN	
4481019	C	4,700.00	+ 2- 2	25				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
4481020	A	4,700.00	+ 5- 5	25				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING
8272119	E	4,700.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493340	A	4,700.00	+10-10	50				X5R	2		233	350	110	2PIN	125 LEAD SPACING-125 LD LENGTH
8493277	A	5,000.00	+ 5- 5	25				NPO	2		190	350	90	2PIN	100 MIL LEAD SPACING
8519689	A	5,100.00	+ 5- 5	25				NPO	1		190	350	90	2PIN	100 MIL LEAD SPACING (.085LDLG)
1589470	A	5,600.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396590	A	5,600.00	+10-10	25				X5R	2		233	350	110	2PIN	
5615545	C	6,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD LENGTH
2396591	A	6,200.00	+10-10	25				X5R	2		233	350	110	2PIN	
2396784	A	7,500.00	+10-10	25				X5R	2		233	350	110	2PIN	
5615552	C	7,500.00	+10-10	50				X5R	2	350	190		90	2PIN	100MIL
8272120	E	7,500.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2395871	A	8,200.00	+10-10	25				X5R	2		253	350	110	2PIN	
8519090	A	8,200.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396592	A	9,100.00	+10-10	25				X5R	2		233	350	110	2PIN	
1589422	A	10,000.00	+15-15	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396658	C	10,000.00	+15-15	50				X5R	2		233	350	110	2PIN	36573E142
2414989	A	10,000.00	+15-15	50				759	2		233	350	110	2PIN	
4718642	C	10,000.00	+15-15	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING 110 LL
5616058	C	10,000.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396996	A	12,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
5616059	C	14,000.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
5615553	C	15,000.00	+10-10	50				X5R	2	350	190		90	2PIN	100MIL
5616681	C	15,000.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493276	A	15,000.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493314	A	15,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8519091	A	18,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396659	C	20,000.00	+15-15	50				X5R	2		233	350	110	2PIN	36573E142
2414990	A	20,000.00	+15-15	50				759	2		233	350	110	2PIN	
5615554	C	20,000.00	+15-15	50				X5R	2	350	190		90	2PIN	100MIL
5616060	A	20,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396998	A	22,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
1589277	C	24,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING

PG. 5 06/30/82 23:22 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23613 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT. VOLTS	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
1589472	C	24,000.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2396772	A	24,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
2396673	A	27,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
2397051	A	33,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
5615555	C	33,000.00	+10-10	50				X5R	2	350	190		90	2PIN	100MIL
2397052	A	36,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
8493418	A	36,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
5616682	A	39,000.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
1589473	C	47,000.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2397000	A	47,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
4718643	C	47,000.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING 110 LL
8493315	A	47,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2397053	A	56,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
8519706	A	56,000.00	+10-10	50	3			X7R	2		190	350	90	2PIN	100 MIL LEAD SPACING
1589474	A	59,000.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2397054	A	59,000.00	+10-10	25				X5R	2		233	350	110	2PIN	
5615590	A	75,000.00	+10-00	50				05R	2		190	350	90	2PIN	100 MIL LEAD SPACING
1589293	C	100,000.00	+20-20	25				Z5U	2		233	350	110	2PIN	125 MIL LEAD LENGTH
1589453	A	100,000.00	+10-10	25				Z5U	2		190	350	90	2PIN	100 MIL LEAD SPACING
1589475	A	100,000.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
2391068	E	100,000.00	+30-20	25				Z54	2		505	350	125	4PIN	23172 1000007F.
2395830	E	100,000.00	+20-20	5				X5R	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
2396465	C	100,000.00	+20-20	25			5000	Z5U	2		233	350	110	2PIN	
2396625	C	100,000.00	+10-10	75				X5R	2		233	350	110	2PIN	
2414949	A	100,000.00	+20-20	25			5000	Z5U	2		233	350	110	2PIN	
2414961	E	100,000.00	+20-20	50			10000	X5R	2		490	350	120	2PIN	375 MIL LEAD SPACING 4PIN PKG
5616683	C	100,000.00	+ 5- 5	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493168	A	100,000.00	+10-10	50				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING (.125LDLG)
8519707	A	112,000.00	+10-10	50	3			X7R	2		190	350	90	2PIN	100 MIL LEAD SPACING
8493134	A	150,000.00	+10-10	25				X5R			190	350	90	2PIN	100 MIL LEAD SPACING
8519613	A	200,000.00	+10-10	25				X5R	2		190	350	90	2PIN	100 MIL LEAD SPACING

TOTAL RECORDS 223

CERAMIC CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23614 - Chip

PG. 1 06/30/82 23:22 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23614 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLTS	DIS FAC	SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
1582721	C	.00												35	CHIP	ID MARK IS LETTER O
2391288	C	.00														
2410068	A	.00												35	CHIP	ID MARK IS NUMBER 43
5615968	C	.00												35	CHIP	P/N ID MARK IS 8
8493223	A	10.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS NUMBER 20
8493396	A	24.00	+ 5- 5	50					NPO	1		90	50	35	CHIP	ID MARK IS NUMBER 26
5617003	C	36.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	P/N ID MARK IS 38
8493180	A	43.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS NUMBER 30
5617004	C	51.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS NUMBER 32
8493865	A	62.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS NUMBER 33
5616147	C	68.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS NUMBER 37
5616148	C	100.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS NUMBER 40
5616149	C	120.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS LETTER M
2391069	C	140.00	+20-20	25		2		10000	NPO	1		87	60	35	CHIP	ID MARK IS NUMBER 42
4481103	A	150.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS LETTER I
1582600	E	270.00	+ 5- 5	50		1		1000	NPO	1		105	80	35	CHIP	ID MARK IS NUMBER 5
5615373	C	330.00	+ 5- 5	50		1		10000	NPO	1		130	110	35	CHIP	ID MARK IS NUMBER 80
8519612	A	330.00	+ 5- 5	50					NPO	1		90	60	35	CHIP	ID MARK IS NUMBER 78
5616150	C	390.00	+ 5- 5	50					NPO	1		90	60	55	CHIP	P/N ID MARK IS 7
8493181	A	390.00	+ 5- 5	50					NPO	1		130	110	35	CHIP	ID MARK IS NUMBER 14 (SIZE B)
8493338	A	620.00	+ 5- 5	50					NPO	1		130	110	35	CHIP	ID MARK IS NUMBER 79
4481484	A	680.00	+ 5- 5	50					NPO	1		90	60	50	CHIP	ID MARK IS NUMBER 57
5616146	C	680.00	+10-10	50		30		1000	X5R	2		90	60	35	CHIP	ID MARK IS NUMBER 58
8493866	A	820.00	+10-10	50					X5R	2		90	60	35	CHIP	ID MARK IS LETTER A
1582937	C	1,500.00	+10-10	25		25		100	X5R	2		90	60	35	CHIP	FAMILY B SIZE CHIP CAPACITOR
4429942	C	2,000.00	+ 5- 5	50					NPO	1		130	110	55	CHIP	ID MARK IS NUMBER 17
5617005	C	3,300.00	+ 5- 5	50					NPO	1		185	135	35	CHIP	ID MARK IS NUMBER 70
4481158	A	3,900.00	+10-10	50					X5R	2		90	60	35	CHIP	ID MARK IS NUMBER 18
8493868	A	4,300.00	+ 5- 5	50					NPO	1		185	135	35	CHIP	ID MARK IS NUMBER 72
4481260	A	5,600.00	+10-10	50					X5R	2		90	60	35	CHIP	ID MARK IS NUMBER 73
4481261	A	6,800.00	+10-10	50					X5R	2		90	60	35	CHIP	ID MARK IS LETTER C
2391651	E	7,500.00	+20-15	75		30		10000	X5R	2		105	75	35	CHIP	ID MARK IS LETTER K
1582714	C	15,000.00	+10-10	50		25		1000	X5R	1		90	60	45	CHIP	ID MARK IS LETTER B
2391650	E	18,000.00	+50- 0	75		30		10000	X5R	2		105	75	35	CHIP	ID MARK IS NUMBER 40
8493867	A	27,000.00	+10-10	50					X5R	2		130	110	35	CHIP	ID MARK IS LETTER N
1582938	E	30,000.00	+10-10	25		25		100	X5R	2		190	60	35	CHIP	ID MARK IS NUMBER 80
4481485	A	47,000.00	+10-10	50					X5R	2		90	60	50	CHIP	P/N ID MARK IS 45
8493224	A	68,000.00	+10-10	50					X5R	1		130	110	35	CHIP	END METLZATN 10/90 SOLDER COAT
2410089	E	100,000.00	+10-10	25		25		100	X5R	2		190	75	50	CHIP	ID MARK IS NUMBER 47
4481105	A	100,000.00	+10-10	50					X5R	2		130	110	35	CHIP	ID MARK IS LETTER H
5616151	C	100,000.00	+10-10	50					X7R	2		100	80	50	CHIP	ID MARK IS NUMBER 46
8493265	A	150,000.00	+10-10	50					X5R	2		130	110	35	CHIP	ID MARK IS NUMBER 10
4481104	A	200,000.00	+10-10	50					X5R	2		185	135	35	CHIP	

TOTAL RECORDS 43

CERAMIC CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23616 - Disc

PG. 1 06/30/82 23:23 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23616 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT. VOLTS	DIS SIP FAC	Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
0440949	A	.02	100-10	600				Z5U	2	850			218	DISC	
2391643	A	18.00	+05-05	50				U2J	1	290			156	DISC	
0383609	A	36.00	+10-10	100				T2H	1	300			100	DISC	
2162701	A	82.00	+ 5- 5	200				NPO	1		475		125	DISC	
4718606	A	100.00	+20-20	2000				S3N	1	330			203	DISC	
8519108	A	150.00	+10-10	1000				S3N	1	300			156	DISC	
2102071	A	200.00	+ 5- 5	500	500			U2J	1	593			156	DISC	
0483308	A	250.00	+ 5- 5	100				T2H	1	575			175	DISC	
0483309	A	430.00	+ 5- 5	200				P3K	1	670			175	DISC	
1589485	C	500.00	+20-20	3000				Z5U	2	593			187	DISC	
8493512	C	500.00	+20-20	1000				N220	1	760			156	DISC	MIN CORONA 300 VRMS 60 CYCLES
8493511	C	680.00	+10-10	1000				N220	1	885			156	DISC	MIN CORONA 300 VRMS 60 CYCLES
4481269	A	750.00	+ 5- 5	500				S3B	1	750			203	DISC	
0492360	A	910.00	+ 5- 5	500				Z5E	2		593		156	DISC	
0321181	C	1,000.00	+100-0	500					2	375			156	DISC	
0355493	A	1,000.00	+20-20	500				Y5Y	2	593			156	DISC	
0424190	C	1,000.00	+05-05	75				X5R	2	360			125	DISC	
8493509	L	1,000.00	+20-20	10000				X5R	2	871			380	DISC	HIGH VOLTAGE DISC CAP
0335139	A	1,500.00	+20-20	500				S3N	1	770			187	DISC	
0254331	A	2,000.00	+99-10	600				Z5U	2	375			156	DISC	
0359530	A	2,000.00	GMV	500				Z5Z	2	375			156	DISC	
1582885	C	2,000.00	+20-20	3000				Z5U	2	593			187	DISC	
2392043	C	2,000.00	+20-20	1000				Z5U	2	365			156	DISC	
0334912	A	2,200.00	+20-20	500				Y5Y	2	593			156	DISC	
8519568	A	2,500.00	+20-20	3000				Z5U	2	530			250	DISC	
0334968	A	3,300.00	+20-20	500				0		593			156	DISC	
0471699	A	4,700.00	+20-20	500				Y5V	2	687			156	DISC	
4429899	C	4,700.00	+80-20	1000				Z5U	2	912			204	DISC	3 LEADS,2 CAPACITOR SECTIONS
0317342	C	5,000.00	+20-20	500				Y5Y	2	750			156	DISC	
1582915	C	5,000.00	+20-20	3000				Z5V	2	750		187		DISC	
2102173	A	5,000.00	+100-0	500				Z5U	2	438			156	DISC	
8493067	C	5,000.00	+20-20	1000				Z5U	2		490		156	DISC	
0454514	A	6,000.00	100 00	2100				Z5T	2	1100			187	DISC	
1589708	A	6,200.00	+20-20	500				Z5P	2	675			156	DISC	
0253765	A	10,000.00	100-10	500				Z5U	2	750			156	DISC	
0317262	A	10,000.00	+80-20	500				Z5U	2	594			156	DISC	
0357993	A	10,000.00	+100-0	500				Z5U	2	625			156	DISC	
0472639	A	10,000.00	+20-20	1000				Z5U	2	675			156	DISC	
0737805	A	10,000.00	+20-20	1000				X5V	2	920			187	DISC	
1134459	A	10,000.00	+20-20	50				Z5U	2	335			125	DISC	
8493066	C	15,000.00	+20-20	1000				Z5U	2		750		156	DISC	
0253851	A	20,000.00		500						912			204	DISC	
0356122	A	20,000.00	+20-20	500				Z5U	2		593		187	DISC	
0359775	A	20,000.00	+100-0	500				Z5U	2	593			187	DISC	
0471702	A	20,000.00	100 10	500				Z5Z	2		750		156	DISC	
5617107	C	20,000.00	+80-20	50				Z5U	2	590			156	DISC	
8519106	A	20,000.00	+20-20	500				Z5U	2	690			187	DISC	LEAD LENGTH 2.000
2396761	A	50,000.00	+80-20	100				Z5U	2	675			156	DISC	
8519382	C	50,000.00	+80-30	1000				Z5U	2	940			240	DISC	
0492447	C	100,000.00	+70-30	100				Z5V	2		760		172	DISC	
1165628	A	100,000.00	+80-20	10				Z5S	2	475			156	DISC	
5213736	C	100,000.00	+80-30	500				Z5U	2	920			218	DISC	
5615571	C	100,000.00	+80-30	500				Z5U	2	1100			256	DISC	DISC MAT 28 MILS

TOTAL RECORDS 53

CERAMIC CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23619 - Specials

PG. 1 06/30/82 23:24 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/CC DCS#N EQ 23619 PN TECH CC/PAR1 SEQ/LH CC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLTS	DIS VOLT. FAC	SIP Q FAC	IR MEGOHM	TEMP CHAR	CLASS	MAX DIAM MILS	MAX LENGH MILS	MAX WIDTH MILS	MAX THICK MILS	PACKAG	NOTES
1589051	C	680.00	+10-10	100	4			X7R	2	870	320	200		DIPMOD	8 CAPS 16 PINS
1589017	E	33,000.00	+10-10	100	4			X7R	2	870	320	200		DIPMOD	8 CAPS 16 PINS
5616721	E	47,000.00	+15-15	50				X5R	2	651	293	120		ASSEMB	PLUGGABLE BACK PANEL CAPACITOR

TOTAL RECORDS 3

MICA CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23601 - Axial

PG. 1 06/30/82 23:24 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/MC DCS#N EQ 23601 PN TECH MC/PAR1 SEQ/LH MC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT. VOLTS	TEMP CHAR	LENGTH MILS	WIDTH MILS	THICK MILS	PACKAG TYPE	NOTES
0813292	E	5.00	+10-10	500	C	546	327	187	AXIAL	
2109800	E	5.00	+ 5- 5	500	C	547	313	219	AXIAL	
0483540	E	6.00	+ 8- 8	100	C	546	327	187	AXIAL	
2109117	E	10.00	+ 5- 5	500	C	547	313	250	AXIAL	
5382120	A	10.00	+ 5- 5	100	C	546	327	187	MOLDED	
0813293	E	12.00	+ 4- 4	500	C	546	327	187	AXIAL	
2109801	E	12.00	+ 5- 5	500	C	547	313	219	AXIAL	
5617069	E	12.00	+ 2- 2	500	C	547	313	219	AXIAL	
0483541	E	13.00	+ 4- 4	100	C	546	327	187	AXIAL	
2109802	E	15.00	+ 5- 5	500	C	547	313	219	AXIAL	
2109803	E	18.00	+ 5- 5	500	C	547	313	219	AXIAL	
0317779	E	20.00	+ 5- 5	500	C	797	469	219	AXIAL	
0334938	E	20.00	+ 5- 5	500	D	500	281	187	AXIAL	
0355527	E	22.00	+ 5- 5	500	E	547	313	219	AXIAL	
0358768	A	24.00	+ 5- 5	500	E	547	313	219	AXIAL	
0483442	E	24.00	+ 2- 2	100	E	546	312	187	AXIAL	
0550063	A	27.00	+ 5- 5	500	C	530	310	170	AXIAL	
2109805	E	27.00	+ 5- 5	500	E	547	313	219	AXIAL	
0253737	E	33.00	+ 2- 2	500	C	720	470	220	AXIAL	
0335011	E	33.00	+ 5- 5	500	E	530	300	194	AXIAL	
2109807	E	33.00	+ 5- 5	500	E	547	313	219	AXIAL	
5382122	E	34.00	+ 1- 1	100	C	546	327	187	AXIAL	
0356734	E	36.00	+ 5- 5	500	E	547	313	219	AXIAL	
0097833	E	39.00	+ 5- 5	500	E	547	313	219	AXIAL	
0550064	E	43.00	+ 5- 5	500	C	530	310	170	AXIAL	
0334960	E	47.00	+ 5- 5	500						
0813294	E	47.00	+ 2 -2	500	C	546	327	187	AXIAL	
2109809	E	47.00	+ 5- 5	500	E	547	313	219	AXIAL	
0253762	E	50.00	+ 1- 1	500	C	720	470	220	AXIAL	
0550066	E	50.00	+ 5- 5	500	C	530	310	185	AXIAL	
0359973	E	51.00	+ 5- 5	500	E	547	310	250	AXIAL	
0483539	E	51.00	+ 1- 1	100	C	546	327	187	AXIAL	
0550067	E	56.00	+ 5- 5	500	C	530	310	190	AXIAL	
2109810	E	56.00	+ 5- 5	500	E	547	313	219	AXIAL	
0483430	E	60.00	+ 1- 1	100	F	546	312	187	AXIAL	
0099401	E	62.00	+ 5- 5	500	E	546	312	219	AXIAL	
0322797	E	68.00	+ 5- 5	500	F	546	313	219	AXIAL	
0358872	E	68.00	+ 5- 5	500	E	547	313	219	AXIAL	
0440396	E	68.00	+ 1- 1	500	E	796	469	219	AXIAL	
5617070	E	68.00	+ 2- 2	500	C	547	313	219	AXIAL	
0253736	E	75.00	+ 1- 1	500	E	796	469	219	AXIAL	
2109811	E	75.00	+ 5- 5	500	E	547	313	219	AXIAL	
0082330	E	82.00	+ 5- 5	500	E	546	312	219	AXIAL	
2175183	E	82.00	+ 1- 1	100	E	547	313	188	AXIAL	
0550068	E	91.00	+ 5- 5	500	C	530	310	170	AXIAL	
0253500	E	100.00	+ 1- 1	500	E	796	469	219	AXIAL	
0322804	E	100.00	+ 5- 5	500	E	547	312	219	AXIAL	
0358729	E	110.00	+ 5- 5	500	E	547	313	219	AXIAL	

PG. 2 06/30/82 23:24 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/MC DCS#N EQ 23601 PN TECH MC/PAR1 SEQ/LH MC/CAP/PFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLT. VOLTS	TEMP CHAR	LENGTH MILS	WIDTH MILS	THICK MILS	PACKAG TYPE	NOTES
0483431	E	117.00	+ 1- 1	100	F	546	312	187	AXIAL	
2109813	E	120.00	+ 5- 5	500	E	546	313	219	AXIAL	
2102301	E	130.00	+ 5- 5	500	E	547	313	250	AXIAL	
0483443	E	145.00	+ 1- 1	100	F	546	312	187	AXIAL	
0082052	E	150.00	+ 5- 5	500	E	546	313	219	AXIAL	
0335007	E	150.00	+ 5- 5	500	D					
2109814	E	160.00	+ 5- 5	500	E	547	313	219	AXIAL	
2109815	E	180.00	+ 5- 5	500	E	547	313	219	AXIAL	
0321198	E	200.00	+ 2- 2	500	C	719	469	219	MOLDED	
2109816	A	200.00	+ 5- 5	500	E	547	313	219	AXIAL	
0322803	E	220.00	+ 5- 5	500	D	550	310	190	AXIAL	
0358722	E	240.00	+ 5- 5	500	E	547	313	219	AXIAL	
2175184	E	240.00	+ 1- 1	100	E	547	313	188	AXIAL	
0213529	E	250.00	+ 5- 5	500	E	546	313	219	AXIAL	
2102136	E	250.00	+ 5- 5	500	E	547	313	219	AXIAL	
0082047	E	270.00	+ 5- 5	500	E	547	313	219	AXIAL	
2109817	E	300.00	+ 5- 5	300	E	546	313	219	AXIAL	
2102298	E	330.00	+ 1- 1	500	E	547	313	250	AXIAL	
2109818	A	330.00	+ 5- 5	300	E	547	313	219	AXIAL	
2102074	E	360.00	+ 5- 5	300	E	547	313	219	AXIAL	
2109853	E	360.00	+ 5- 5	500	E	797	467	219	AXIAL	
2114554	E	360.00	+ 2- 2	500	E	550	310	250	AXIAL	MOLDED MICA
0082669	E	390.00	+ 5- 5	500	E	546	312	219	AXIAL	
0213530	E	390.00	+ 5- 5	500	E	546	313	219	AXIAL	
0253901	A	390.00	+ 1- 1	500	E	781	438	219	AXIAL	
2102300	E	390.00	+ 1- 1	500	E	546	312	250	AXIAL	
2102073	E	430.00	+ 5- 5	300	E	547	313	219	AXIAL	
0097843	E	470.00	+ 5- 5	300	E	547	313	219	AXIAL	
0334922	C	470.00	+ 5- 5	500		688	438	219	AXIAL	
2102387	E	470.00	+ 5- 5	500	E	797	469	250	AXIAL	
2123855	A	470.00	+5 - 5	300	E	450	358	172	RADIAL	
0103195	E	500.00	+ 5- 5	500	E	546	313	219	AXIAL	
0206595	E	500.00	+ 5- 5	500	E	797	469	219	AXIAL	
2109819	E	510.00	+ 5- 5	300	E	547	313	219	AXIAL	
0492398	A	548.00	+ 2- 2	500	E	733	478	215	AXIAL	
0253734	E	560.00	+20-20	500	E	796	469	219	AXIAL	
2109857	E	560.00	+ 5- 5	300	E	797	467	219	AXIAL	
2109858	E	620.00	+ 5- 5	300	E	797	467	219	AXIAL	
0492414	A	625.00	+ 5- 5	500	E	719	469	200	AXIAL	
0512123	E	680.00	+ 5- 5	500		688	438	219	AXIAL	
2109859	E	680.00	+ 5- 5	300	E	797	467	219	AXIAL	
2114555	E	680.00	+ 1- 1	300	E	790	460	210	AXIAL	
0440397	E	750.00	+ 5- 5	500	E	737	469	219	AXIAL	
2109860	E	750.00	+ 5- 5	300	E	797	467	219	AXIAL	
2114556	E	750.00	+ 1- 1	300	E	800	470	220	AXIAL	
2109861	E	820.00	+ 5- 5	300	E	797	467	219	AXIAL	
0440400	E	910.00	+ 5- 5	500	E	859	859	271	AXIAL	
2109862	E	910.00	+ 5- 5	300	E	797	467	219	AXIAL	

Component Data Bank - P/N Catalog
Axial Mica Capacitors

PG. 3 06/30/82 23:24 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/MC DCS#N EQ 23601 PN TECH MC/PARI SEQ/LH MC/CAP/PFD NO/LIMIT.

PART NUMBER	C	T CAPAC U ITANCE PFD	TOLER ANCE +% -%	RATED VOLT. VOLTS	CHAR	TEMP	LENGTH MILS	WIDTH MILS	THICK MILS	PACKAG TYPE	NOTES
0440409	E	1,000.00	+ 5- 5	500	E		859	859	271	AXIAL	
2102333	E	1,000.00	+ 5- 5	500	E		828	828	344	AXIAL	
2109863	E	1,000.00	+ 5- 5	300	E		790	460	210	AXIAL	
0492399	A	1,040.00	+ 2- 2	500	C		843	843	296	AXIAL	
2111033	E	1,100.00	+ 5- 5	300	E		1109	469	219	AXIAL	
2111065	E	1,100.00	+ 5- 5	500	E		862	862	281	AXIAL	
2111035	E	1,300.00	+ 5- 5	300	E		1109	469	219	AXIAL	
2111067	E	1,300.00	+ 5- 5	500	E		862	862	281	AXIAL	
2111036	E	1,500.00	+ 5- 5	300	E		796	470	220	AXIAL	
2111038	E	1,800.00	+ 5- 5	500	E		796	469	219	AXIAL	
2111040	E	2,200.00	+ 5- 5	500	E		796	438	188	AXIAL	
2111042	E	2,700.00	+ 5- 5	500	E		1109	469	219	AXIAL	
0082378	A	3,900.00	+ 5- 5	500	E		859	859	271	AXIAL	
0440398	E	4,300.00	+ 1- 1	500	E		859	859	271	AXIAL	
2395896	E	4,300.00	+ 1- 1	100	F		796	462	218	AXIAL	
2111049	E	5,100.00	+ 5- 5	300	E		860	860	280	AXIAL	
0483459	E	5,600.00	+ 1- 1	100	F		860	860	280	AXIAL	
2111080	E	6,800.00	+ 5- 5	300	E		828	828	281	AXIAL	
2391634	E	15,000.00	+ 1- 1	100	F		860	860	280	AXIAL	

TOTAL RECORDS 115

MICA CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23602 - Radial

PG. 1 06/30/82 23:25 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/MC DCS#N EQ 23602 PN TECH MC/PAR1 SEQ/LH MC/CAP/PFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE PFD	TOLERANCE +% -%	RATED VOLTS	TEMP CHAR	LENGTH MILS	WIDTH MILS	THICK MILS	PACKAG TYPE	NOTES
2197828	A	.00								
0737503	A	3.00	+17-17	500	C	450	360	170	RADIAL	
0317431	A	5.00	+20-20	500	C	450	360	170	RADIAL	DIPPED
0814310	A	10.00	+5 - 5	100	C	360	330	190	RADIAL	
0814036	A	14.70	+ 3- 3	100	C	360	330	190	RADIAL	
1589245	A	18.00	+5 - 5	300	E	370	340	190	RADIAL	
0492400	A	20.20	+ 3- 3	300	C	446	351	162	RADIAL	
0814037	A	20.70	+ 2- 2	100	C	370	350	190	RADIAL	
5615791	A	21.00	+-2.5	100	C	270	350	150	RADIAL	MICA OR CERAMIC
0492387	A	22.00	+ 2- 2	300	C	446	351	162	RADIAL	
0492388	A	25.00	+ 2- 2	500	C	450	360	170	RADIAL	
2396876	A	27.00	+ 2- 2	100	E	360	330	190	RADIAL	
2109806	A	30.00	+ 5- 5	500	E	547	313	219	AXIAL	
0317339	A	33.00	+10-10	500	E	370	340	190	RADIAL	DIPPED
0814038	A	33.00	+ 2- 2	100	E	418	340	190	RADIAL	
0492389	A	34.00	+ 3- 3	500	C	450	360	170	RADIAL	
1589246	A	36.00	+5 - 5	300	E	370	340	190	RADIAL	
8272240	A	39.00	+ 2- 2	100	C	370	465	190	RADIAL	
0492390	A	41.50	+ 2- 2	500	C	450	360	170	RADIAL	
5615785	A	41.50	+ 2- 2	100	C	270	350	150	RADIAL	MICA OR CERAMIC
0492391	A	45.50	+ 2- 2	300	C	447	354	166	RADIAL	
0814039	A	46.40	+ 1 -1	100	E	370	340	190	RADIAL	
0492422	A	50.00	+ 2- 2	300	C	447	354	166	RADIAL	
5615789	A	50.00	+02-02	100	C	270	350	150	RADIAL	MICA OR CERAMIC
0492392	A	60.40	+ 2- 2	500	C	450	360	170	RADIAL	
5615786	A	60.40	+02-02	100	C	270	350	150	RADIAL	MICA OR CERAMIC
0492393	A	64.90	+ 2- 2	300	C	447	354	167	RADIAL	
5615787	A	64.90	+02-02	100	C	270	350	150	RADIAL	MICA OR CERAMIC
2396877	A	68.00	+ 2- 2	100	E	360	330	190	RADIAL	
5052709	A	75.00	+ 2- 2	100	E	370	340	190	RADIAL	
8272241	A	82.00	+ 1- 1	100	C	370	465	200	RADIAL	
0813295	A	91.00	+ 1 -1	100	F	370	465	190	RADIAL	MICA OR CERAMIC
0483294	A	100.00	+ 5- 5	500	E	460	360	180	RADIAL	
0814138	A	100.00	+ 1- 1	100	F	410	390	230	RADIAL	
5052710	A	100.00	+ 5- 5	100	E	370	340	190	RADIAL	
5615792	A	100.00	+ 1- 1	100	F	270	350	180	RADIAL	MICA OR CERAMIC
0492394	A	115.00	+ 2- 2	300	C	449	357	170	RADIAL	
2391633	A	117.00	+ 1- 1	500	F	491	401	201	RADIAL	
0737502	A	120.00	+ 1 -1	100	F	460	370	180	RADIAL	MICA OR CERAMIC
5615790	A	120.00	+ 1- 1	100	F	270	350	190	RADIAL	MICA OR CERAMIC
0492406	A	125.00	+ 5- 5	500	C	460	370	180	RADIAL	
0814040	A	132.00	+ 1- 1	100	E	370	350	200	RADIAL	
0492395	A	137.00	+ 2- 2	300	C	450	358	172	RADIAL	
5615788	A	137.00	+ 2- 2	100	C	270	350	170	RADIAL	MICA OR CERAMIC
0483295	A	150.00	+ 5- 5	500	E	460	370	190	RADIAL	
0492396	A	182.00	+ 2- 2	300	C	451	359	176	RADIAL	
0814041	A	187.00	+ 1- 1	100	E	380	350	200	RADIAL	
0492421	A	200.00	+ 5- 5	100	C	460	380	190	RADIAL	MICA OR CERAMIC

Component Data Bank - P/N Catalog
Radial Mica Capacitors

PG. 2 06/30/82 23:25 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/MC DCS#N EQ 23602 PN TECH MC/PAR1 SEQ/LH MC/CAP/PFD NO/LIMIT.

PART NUMBER	C	T CAPAC U ITANCE PFD	TOLER ANCE +% -%	RATED VOLT. VOLTS	TEMP CHAR	LENGTH MILS	WIDTH MILS	THICK MILS	PACKAG TYPE	NOTES
1589138	A	200.00	+ 1- 1	300	F	390	380	220	RADIAL	
2123846	A	200.00	+ 5- 5	300	E	460	380	190	RADIAL	
0483296	A	240.00	+ 5- 5	500	E	460	380	200	RADIAL	
0814011	C	240.00	+ 1- 1	100	E	380	360	210	RADIAL	
0483517	A	250.00	+ 1- 1	300	E	470	390	210	RADIAL	
0737505	A	250.00	+ 1 -1	500	F	470	390	210	RADIAL	
0492397	A	259.00	+ 2- 2	500	C	470	390	210	RADIAL	
0491284	A	270.00	+ 5- 5	500	C	470	390	210	RADIAL	
0737504	A	270.00	+ 2- 2	500	F	470	390	210	RADIAL	MICA OR CERAMIC
0492552	A	290.00	+ 2- 2	100	C	470	390	210	RADIAL	MICA OR CERAMIC
0483260	A	300.00	+ 5- 5	100	E	470	390	210	RADIAL	
0814292	A	330.00	+ 1- 1	100	E	470	390	210	RADIAL	
1589139	A	330.00	+ 5- 5	100	F	390	380	220	RADIAL	
0483288	A	360.00	+ 5- 5	500	E	470	400	220	RADIAL	
0483297	A	390.00	+ 5- 5	500	E	470	400	220	RADIAL	
2197830	A	390.00	+ 5- 5	100	E	390	380	220	RADIAL	
0492407	A	400.00	+ 5- 5	300	C	457	365	189	RADIAL	
0483298	A	430.00	+ 5- 5	300	E	460	380	200	RADIAL	
0483240	A	432.00	+ 1- 1	500	D	480	411	230	RADIAL	
2391632	A	492.00	+10-10	500	F	501	420	231	RADIAL	
0356503	A	500.00	+ 5- 5	300	C	490	420	240	RADIAL	DIPPED
0492386	A	500.00	+ 5- 5	300	C	460	368	197	RADIAL	
0483299	A	510.00	+ 5- 5	300	E	470	380	200	RADIAL	
0483300	A	560.00	+ 5- 5	300	E	470	390	210	RADIAL	
0814294	A	560.00	+ 1- 1	100	E	470	390	210	RADIAL	
2396993	A	560.00	+ 1- 1	50	E	470	390	210	RADIAL	MICA OR CERAMIC
0483426	A	620.00	+ 5- 5	300	E	470	390	210	RADIAL	
0483324	A	661.00	+ 1- 1	100	F	470	390	210	RADIAL	
0483118	A	750.00	+ 2- 2	300	C	468	376	216	RADIAL	
0737506	A	750.00	+ 5- 5	300	F	470	400	220	RADIAL	
2124677	A	750.00	+ 5- 5	300	E	470	400	220	RADIAL	
0483532	A	820.00	+ 1- 1	100	F	650	510	220	RADIAL	
1589208	A	820.00	+ 1- 1	820	F	470	400	220	RADIAL	
0813296	A	936.00	+ 1 -1	300	E	690	560	210	RADIAL	
0737501	A	1,000.00	+ 1 -1	300	F	490	420	260	RADIAL	MICA OR CERAMIC
2102424	A	1,000.00	+10-10	500	F	650	520	240	RADIAL	DIPPED
4429930	A	1,000.00	+ 1- 1	50	E	450	435	220	RADIAL	SINGLE DIP BODY
8272239	A	1,000.00	+05-05	1000	F	670	655	170	RADIAL	
0483192	A	1,199.00	+ 1- 1	300	D	660	520	240	RADIAL	
2396995	A	1,200.00	+ 1- 1	50	E	490	430	220	RADIAL	
4429931	A	1,200.00	+ 1- 1	50	E	450	455	260	RADIAL	SINGLE DIP BODY
0814144	A	1,500.00	+ 1- 1	100	E	750	510	180	RADIAL	DIPPED MICA
8278938	A	1,500.00	+ 1- 1	100	E	390	505	210	RADIAL	DIPPED MICA
0336617	A	1,800.00	+10-10	500	E	670	530	220	RADIAL	DIPPED
1582687	A	2,000.00	+5 - 5	300	C	670	530	240	RADIAL	DIPPED
5616811	A	2,200.00	+ 5- 5	1000	D	780	550	280	RADIAL	DIPPED SILVER
0483533	A	2,400.00	+ 1- 1	100	F	680	550	280	RADIAL	
1589305	A	2,500.00	+5 - 5	500	C	680	540	270	RADIAL	

Component Data Bank - P/N Catalog
Radial Mica Capacitors

PG. 3 06/30/82 23:25 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/MC DCS#N EQ 23602 PN TECH MC/PAR1 SEQ/LH MC/CAP/PFD NO/LIMIT.

PART NUMBER	T	CAPAC U ITANCE C PFD	TOLER ANCE +% -%	RATED VOLT. VOLTS	TEMP CHAR	LENGTH MILS	WIDTH MILS	THICK MILS	PACKAG TYPE	NOTES
50552754	A	3,300.00	+ 1- 1	500	F	820	590	320	RADIAL	
50552755	A	4,700.00	+ 1- 1	300	F	810	580	310	RADIAL	
1589306	A	5,000.00	+5 - 5	500	C	710	590	370	RADIAL	
1589048	A	5,100.00	+ 1- 1	1000	F	810	610	400	RADIAL	
2410088	A	6,800.00	+ 1- 1	100	F	690	570	320	RADIAL	
1589140	A	9,100.00	+ 1- 1	500	F	790	880	330	RADIAL	
1589198	A	10,000.00	+ 5- 5	100	F	790	570	340	RADIAL	
1589049	A	18,000.00	+ 1- 1	500	F	820	910	430	RADIAL	
50552756	A	18,000.00	+ 1- 1	30	F	820	620	440	RADIAL	
2396470	A	24,000.00	+ 5- 5	500	F	1430	880	320	RADIAL	

TOTAL RECORDS 106

PLASTIC FILM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23621 - Mylar/Polyester

PG. 1 06/30/82 23:25 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PC DCS#N EQ 23621 PN TECH PC/PAR1 SEQ/LH PC/CAP/NFD,PC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	CAPACITANCE NANO FAR	TOLERANCE +%	TOLERANCE -%	DC VOLT	TYPE	BODY DIAM MILS	BODY LENGTH MILS	WIDTH MILS	THICK MILS	NOTES
5615965	A	.00	.00									
5616153	A	.03	.00	20	20	600		371	1437			
8279074	C	10.00	.00	10	10	200	OVAL		1750	1030	635	W
8279073	C	16.00	.00	10	10	200	OVAL		1750	1240	845	W
8279069	C	20.00	.00	10	10	100	AXIA	1030	1625	630		OVAL SHAPE
0491227	A	.00	1.00	10	10	100	MYLR	169	396			
0492441	A	.00	1.00	05	05	100	MYLR	169	396			
0492408	A	.00	1.10	05	05	100	MYLR	169	396			
0217062	A	.00	1.20	10	10	100	MYLR	169	396			
0492676	A	.00	1.20	05	05	100	MYLR	169	396			
0721084	A	.00	1.20	02	02	100	MYLR	169	703			
0217024	A	.00	1.30	05	05	100	MYLR	169	396			
0491250	A	.00	1.50	10	10	100	MYLR	169	396			
0492437	A	.00	1.50	05	05	100	MYLR	169	396			
0492579	A	.00	1.60	05	05	100	MYLR	169	396			
0217063	A	.00	1.80	10	10	100	MYLR	169	396			
0492469	A	.00	1.80	05	05	100	MYLR	169	396			
0369433	A	.00	2.00	20	20	100	MYLR	200	450			
0492402	A	.00	2.00	05	05	100	MYLR	169	396			
5615883	A	.00	2.00	20	-20	600	MYLR	371	1437			460 V AC 2100V
0217079	A	.00	2.20	05	05	100	MYLR	169	396			
0491251	A	.00	2.20	10	10	100	MYLR	169	396			
0492403	A	.00	2.40	05	05	100	MYLR	169	396			
0492410	A	.00	2.50	05	05	100	MYLR	200	450			
0217064	A	.00	2.70	10	10	100	MYLR	169	396			
0491309	A	.00	2.70	05	05	100	MYLR	169	396			
0217026	A	.00	3.00	05	05	100	MYLR	169	396			
0217066	A	.00	3.30	10	10	100	MYLR	169	396			
0492426	A	.00	3.30	05	05	100	MYLR	169	396			
0217027	A	.00	3.60	05	05	100	MYLR	169	396			
0217028	A	.00	3.90	05	05	100	MYLR	169	396			
0217067	A	.00	3.90	10	10	100	MYLR	169	396			
0217029	A	.00	4.30	05	05	100	MYLR	169	396			
0491261	A	.00	4.70	10	10	100	MYLR	169	396			
0492470	A	.00	4.70	05	05	100	MYLR	169	396			
2396688	A	.00	4.90	01	01	100	MYLR	169	500			
2396483	A	.00	5.00	05	05	1000	MYLR	312	875			CLASS4
0217031	A	.00	5.10	05	05	100	MYLR	169	396			
0217032	A	.00	5.60	05	05	100	MYLR	169	396			
0492382	A	.00	5.60	10	10	100	MYLR	169	396			
0217033	A	.00	6.20	05	05	100	MYLR	169	396			
0491252	A	.00	6.80	10	10	100	MYLR	169	396			
0492500	A	.00	6.80	05	05	100	MYLR	169	396			
0217034	A	.00	7.50	05	05	100	MYLR	169	396			
0217036	A	.00	8.20	05	05	100	MYLR	169	396			
0217068	A	.00	8.20	10	10	100	MYLR	169	396			
4429629	C	.00	8.20	05	05	1000	MYLR	520	750			40VAC
0217037	A	.00	9.10	05	05	100	MYLR	169	396			

PG. 2 06/30/82 23:25 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PC DCS#N EQ 23621 PN TECH PC/PAR1 SEQ/LH PC/CAP/NFD,PC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFD	CAPACITANCE NANO FAR	TOLERANCE +%	TOLERANCE -%	DC VOLT	TYPE	BODY DIAM MILS	BODY LENGTH MILS	WIDTH MILS	THICK MILS	NOTES
0491228	A	.00	10.00	10	10	100	MYLR	169	396			
0492411	A	.00	10.00	05	05	100	MYLR	169	396			
2396813	C	.00	10.00	05	05	1000	MYLR	375	875			
2552339	C	.00	10.00	20	20	600	MYLR	400	1620			250VAC 10A FEEDTR
5214060	A	.00	10.00	20	10		MYLR	1000	1812			250VAC 50A FEEDTR
5616617	C	.00	10.00	5	5	1000	FILM	560	750			40VAC
5615854	A	.01	10.00	20	-20	600	MYLR	295	1437			460 VAC 2100VDC
0217038	A	.00	11.00	05	05	100	MYLR	157	703			
0217039	A	.00	12.00	05	05	100	MYLR	157	703			
0217069	A	.00	12.00	10	10	100	MYLR	157	703			
0217041	A	.00	13.00	05	05	100	MYLR	157	703			
0491262	A	.00	15.00	10	10	100	MYLR	157	703			
0492503	A	.00	15.00	05	05	100	MYLR	157	703			
0217042	A	.00	16.00	05	05	100	MYLR	157	703			
0217043	A	.00	18.00	05	05	100	MYLR	157	703			
0217071	A	.00	18.00	10	10	100	MYLR	157	703			
0721083	A	.00	18.00	02	02	100	MYLR	157	703			
0483293	A	.00	20.00	20	20	100	MYLR	188	703			
0491272	A	.00	20.00	05	05	100	MYLR	157	703			
0217044	A	.00	22.00	05	05	100	MYLR	157	703			
0507536	A	.00	22.00	10	10	100	MYLR	157	703			
0217046	A	.00	24.00	05	05	100	MYLR	188	703			
0492423	A	.00	25.00	05	05	100	MYLR	328	450			
0217047	A	.00	27.00	05	05	100	MYLR	188	703			
0217072	A	.00	27.00	10	10	100	MYLR	188	703			
0217048	A	.00	30.00	05	05	100	MYLR	188	703			
0217049	A	.00	33.00	05	05	100	MYLR	188	703			
0491263	A	.00	33.00	10	10	100	MYLR	188	703			
2245096	C	.00	33.00	10	10	600	MYLR	469	1188			DIPPED RADIAL
0217051	A	.00	36.00	05	05	100	MYLR	219	703			
0217052	A	.00	39.00	05	05	100	MYLR	219	703			
0217073	A	.00	39.00	10	10	100	MYLR	219	703			
0217053	A	.00	43.00	05	05	100	MYLR	219	703			
0364889	A	.00	47.00	10	10	100	MYLR	219	703			
0477972	A	.00	47.00	10	10	400	MYLR	389	1250			
0492432	A	.00	47.00	05	05	100	MYLR	219	703			
0721085	A	.00	47.00	02	02	100	MYLR	219	703			
0217054	A	.00	51.00	05	05	100	MYLR	250	703			
0217056	A	.00	56.00	05	05	100	MYLR	250	703			
0217074	A	.00	56.00	10	10	100	MYLR	250	703			
0217057	A	.00	62.00	05	05	100	MYLR	250	703			
0491264	A	.00	68.00	10	10	100	MYLR	250	703			
0492504	A	.00	68.00	05	05	100	MYLR	250	703			
0217058	A	.00	75.00	05	05	100	MYLR	297	671			
0217059	A	.00	82.00	05	05	100	MYLR	297	671			
0217076	A	.00	82.00	10	10	100	MYLR	297	671			
0217061	A	.00	91.00	05	05	100	MYLR	297	671			
0217077	A	.00	100.00	10	10	100	MYLR	297	671			

PG. 3 06/30/82 23:25 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PC DCS#N EQ 23621 PN TECH PC/PAR1 SEQ/LH PC/CAP/NFD,PC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	CAPACITANCE NANO FAR	TOLERANCE +%	TOLERANCE -%	DC VOLT	TYPE	BODY DIAM MILS	BODY LENGTH MILS	WIDTH MILS	THICK MILS	NOTES
0219641	A	.00	100.00	20	20	400	MYLR	470	1250			TUB MET.
0326367	A	.00	100.00	10	10	400	MYLR	500	1188			
0491320	A	.00	100.00	05	05	100	MYLR	297	671			
2245095	C	.00	100.00	10	10	400	MYLR	578	1188			DIPPED RADIAL
2396661	A	.00	100.00	20	20	600	MYLR	520	2250			CLASS3 440VAC
4429918	C	.00	100.00	20	20	600	MYLR	725	1500			
8279065	C	.10	100.00	10	10	100	RAD		700	400	550	
1821921	A	.00	150.00	10	10	440	MYLR	620	2250			
0477973	A	.00	220.00	10	10	400	MYLR	630	1593			
0491318	A	.00	220.00	05	05	100	MYLR	375	1220			
2396444	C	.00	220.00	20	20	600	MYLR	718	1812			CLASS3 .5A RIPPLE
2396691	A	.00	220.00	20	20	650	MYLR	790	2000			.6A RIPPLE
2396888	A	.00	220.00	20	20	200	MYLR	375	1250			
5616107	C	.00	270.00	10	-10	1000	FILM	860	2250			660VAC
0363408	A	.00	330.00	20	20	100	MYLR	453	1340			
5616108	C	.00	330.00	10	-10	1000	FILM	950	2250			660VAC
5615759	A	.33	330.00	10	-10	600	MYLR	511	1812			460 VAC
0477974	A	.00	470.00	10	10	400	MYLR	838	1750			
0491319	A	.00	470.00	05	05	100	MYLR	562	1340			
0513567	A	.00	470.00	10	10	200	MYLR	610	1590			
0721086	A	.00	470.00	02	02	100	MYLR	516	1340			
2396662	C	.00	470.00	20	20	600	MYLR	1000	2125			CLASS3 260VAC
5617002	C	.00	470.00	10	10	600	POLY		625	2125		260VAC
0824687	C	.00	500.00	20	10	100	MYLR	750	1812			20A FEED-THRU CAP
1590106	A	.00	500.00	10	10	600	MYLR	1000	2250			450 VRMS
8279062	C	.00	600.00	10	10	400	MYL	450	1187			
5213024	A	.00	620.00	2	2	100	MYLR	320	1600			
2396684	A	.00	680.00	20	20	600	MYLR	1180	2250			440VAC
5475075	C	.00	680.00	10	10	100	MYLR		1060	561	380	
1589248	A	.00	1,000.00	10	10	200	MYLR		1312	640	436	
1589412	A	.00	1,000.00	20	20	400	MYLR	900	2093			
2102459	A	.00	1,000.00	20	20	400	MYLR	900	2375			
2396690	C	.00	1,000.00	20	20	100	MYLR	700	1600			
2397005	C	.00	1,000.00	10	10		II		1250	720	980	
5422331	A	.00	1,000.00	20	20	200	MYLR		1312	640	436	AXIAL LEADED
5616104	C	.00	1,000.00	10	-10	450	FILM	765	1375			330VAC
5616105	C	.00	1,250.00	10	-10	600	FILM	855	1375			330VAC
5616106	C	.00	1,500.00	10	-10	600	FILM	930	1375			330VAC
2396443	C	.00	2,000.00	20	20	400	MYLR	1093	2250			CLASS3 1A RIPPLE
5422332	A	.00	2,000.00	20	20	200	MYLR		1400	780	380	AXIAL LEADED
5616805	C	.00	2,000.00	15	15		FILM	1650	2250			460 VAC 2100VDC
2396689	A	.00	4,000.00	10	10	100	MYLR	790	2000			1.5A RIPPLE
8279058	C	.00	4,000.00	10	-10	125	FILM	610	937			
8279059	C	.00	6,500.00	10	-10	125	FILM	610	1500			
8279068	C	8.00	8,000.00	10	10	200	III		1905	1249	749	

TOTAL RECORDS 141

PLASTIC FILM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23622 - Polycarbonate (Type II)

PG. 1 06/30/82 23:26 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PC DCS#N EQ 23622 PN TECH PC/PAR1 SEQ/LH PC/CAP/NFD,PC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	CAPACITANCE NANO FAR	TOLERANCE +%	TOLERANCE -%	DC VOLT	TYPE	BODY DIAM MILS	BODY LENGTH MILS	WIDTH MILS	THICK MILS	NOTES
2392049	A	10.00	.00	10	10	35	II	500	1250			
8279057	C	.00	.18	20	20	50	I	407	812			
1582753	A	.00	4.87	02	02	30	II	370	591			
2196267	A	.00	7.50	05	05	30	II		485	250	170	
5213921	A	.00	8.74	02	02	50	II	195	670			
5213920	A	.00	10.00	02	02	50	II	195	786			
5213919	C	.00	11.40	02	02	50	II	195	786			
5213918	C	.00	13.00	02	02	50	II	195	786			
5213917	A	.00	15.00	02	02	50	II	250	500			
5213916	C	.00	17.60	02	02	50	II	195	786			
5213915	C	.00	21.20	02	02	50	II	195	562			
1589161	C	.00	24.00	10	10	50	II		515	420	210	MATCHED TRIPLETS
5213914	C	.00	26.00	02	02	50	II	195	1024			
5213912	C	.00	30.00	02	02	50	II	236	786			
2397070	C	.00	39.00	05	05	600	I	550	1720			
5213911	C	.00	39.80	02	02	50	II	275	786			
5213910	A	.00	54.00	02	02	50	II	275	786			
2196268	A	.00	68.00	05	05	30	II		550	370	240	AXIAL LEADED
5213909	C	.00	70.80	02	02	50	II	313	786			
5213908	A	.00	102.00	02	02	50	II	313	1062			
5213907	C	.00	156.00	02	02	50	II	360	1062			
0814228	A	.00	180.00	05	05	30	II		650	270	178	
0483502	A	.00	270.00	05	05	30	II	350	1091			
5213906	C	.00	312.00	02	02	50	II	421	1298			
0483501	A	.00	330.00	01	01	30	II	350	1091			
5213905	A	.00	470.00	02	02	50	II	421	1378			
2396568	A	.00	560.00	05	05	50	II	266	562			
2199311	A	.00	700.00	05	05	30	II		1250	500	370	AXIAL LEADED
5052730	A	.00	700.00	02	02	30	II		1250	500	370	
2396445	C	.00	1,000.00	10	10	50	I	312	687			
5617161	C	.00	1,500.00	02	02	30	II	354	920			
2208531	A	.00	2,000.00	05	05	30	II		1500	600	460	AXIAL LEADED
2392030	C	.00	3,000.00	02	02	100	II	490	1250			
2396536	A	.00	3,000.00	05	05	50	II	406	812			

TOTAL RECORDS 34

PLASTIC FILM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23623 - Parylene (Type III)

PG. 1 06/30/82 23:26 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PC DCS#N EQ 23623 PN TECH PC/PAR1 SEQ/LH PC/CAP/NFD,PC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	CAPACITANCE NANO FAR	TOLERANCE +%	TOLERANCE -%	DC VOLT	TYPE	BODY DIAM MILS	BODY LENGTH MILS	BODY WIDTH MILS	BODY THICK MILS	NOTES
2391985	E	.00	1.00	05	05	50	III		500	295	125	
2391986	E	.00	1.10	05	05	50	III		500	295	125	
2391987	E	.00	1.20	05	05	50	III		500	295	125	
2391988	E	.00	1.30	05	05	50	III		500	295	125	
2391989	E	.00	1.50	05	05	50	III		500	295	125	
2391990	E	.00	1.60	05	05	50	III		500	295	125	
2391991	E	.00	1.80	05	05	50	III		500	295	125	
2391992	E	.00	2.00	05	05	50	III		500	295	125	
2391993	E	.00	2.20	05	05	50	III		500	295	125	
2391994	E	.00	2.40	05	05	50	III		500	295	125	
2391995	E	.00	2.70	05	05	50	III		500	295	125	
2391996	E	.00	3.00	05	05	50	III		500	295	125	
2391997	E	.00	3.30	05	05	50	III		500	295	125	
2391998	E	.00	3.60	05	05	50	III		500	295	125	
2391999	E	.00	3.90	05	05	50	III		500	295	125	
2392000	E	.00	4.30	05	05	50	III		500	295	125	
2392001	E	.00	4.70	05	05	50	III		500	295	125	
2392002	E	.00	5.10	05	05	50	III		500	295	125	
2392003	E	.00	5.60	05	05	50	III		500	295	125	
2392004	E	.00	6.20	05	05	50	III		500	295	125	
2392005	E	.00	6.80	05	05	50	III		500	295	125	
2392006	E	.00	7.50	05	05	50	III		500	295	125	
2392007	E	.00	8.20	05	05	50	III		500	295	125	
2392008	E	.00	9.10	05	05	50	III		500	295	125	
2392009	E	.00	10.00	05	05	50	III		500	295	125	
2392010	E	.00	11.00	05	05	50	III		500	390	195	
2392011	E	.00	12.00	05	05	50	III		500	390	195	
2392012	E	.00	13.00	05	05	50	III		500	390	195	
2392013	E	.00	15.00	05	05	50	III		500	390	195	
2392014	E	.00	16.00	05	05	50	III		500	390	195	
2391625	E	.00	18.00	05	05	50	III		500	390	195	
2392015	E	.00	20.00	05	05	50	III		500	390	195	
2396508	E	.00	20.00	05	05	50	III		500	390	195	
2391613	E	.00	22.00	10	10	50	III		500	195	390	MATCHED PAIR
2392016	E	.00	22.00	05	05	50	III		500	390	195	
2392017	E	.00	24.00	05	05	50	III		500	390	195	
2392018	E	.00	27.00	05	05	50	III		500	390	195	
1582638	C	.00	27.50	05	05	600	I	470	1720			POLYPROP.
2392019	E	.00	30.00	05	05	50	III		500	390	195	
2392020	E	.00	33.00	05	05	50	III		500	390	195	
2392021	E	.00	36.00	05	05	50	III		500	390	195	
2392022	E	.00	39.00	05	05	50	III		500	390	195	
2392023	E	.00	43.00	05	05	50	III		600	390	195	
2391679	E	.00	47.00	05	05	50	III		600	390	195	
2395762	E	.00	47.00	03	03	50	III		600	390	195	
2392024	E	.00	51.00	05	05	50	III		600	390	195	
2395834	E	.00	52.00	03	03	50	III		600	390	195	
2392025	E	.00	56.00	05	05	50	III		600	390	195	
2392026	E	.00	62.00	05	05	50	III		600	390	195	
2395835	E	.00	66.00	03	03	50	III		600	390	195	
2391626	E	.00	68.00	05	05	50	III		600	390	195	
2391640	E	.00	68.00	03	03	50	III		600	390	195	
2391680	E	.00	76.00	05	05	50	III		600	390	195	
2395763	E	.00	76.00	03	03	50	III		600	390	195	
2391641	E	.00	82.00	03	03	50	III		600	390	295	
2392027	E	.00	82.00	05	05	50	III		600	390	195	
2391642	E	.00	91.00	05	05	50	III		600	390	295	
2392028	E	.00	91.00	05	05	50	III		600	390	195	
2391627	E	.00	100.00	05	05	50	III		600	390	195	
2395839	E	.00	100.00	03	03	50	III		600	390	295	

TOTAL RECORDS 60

PLASTIC FILM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23624 - Polystyrene (Type I)

PG. 1 06/30/82 23:26 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PC DCS#N EQ 23624 PN TECH PC/PAR1 SEQ/LH PC/CAP/NFD,PC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	CAPACITANCE NANO FAR	TOLERANCE +%	TOLERANCE -%	DC VOLT	TYPE	BODY DIAM MILS	BODY LENGTH MILS	WIDTH MILS	THICK MILS	NOTES
5214600	C	.00	.68	01	01	30	I	187	750			
5214656	A	.00	1.10	01	01	30	I	187	750			
1589039	C	.00	2.00	05	05	600	PRO	550	1720			
5214277	C	.00	2.20	01	01	30	I	187	750			
2396844	A	.00	2.70	01	01	50	I	275	875			
0814202	A	.00	8.20	02	02	30	I	300	847			TWIN CAPS
0814308	A	.00	8.20	01	01	30	I	296	750			
5115636	A	.00	10.00	01	01	100	I	250	1188			
5214601	C	.00	10.00	01	01	30	I	296	750			
0814149	A	.00	15.00	02	02	30	I	350	767			
2396507	A	.00	17.00	01	01	30	I	312	875			
1582752	A	.00	18.00	05	05	50	I	344	937			
0483381	A	.00	20.00	02	02	50	I	340	905			
2396833	A	.00	22.00	05	05	50	I	350	940			
0814307	A	.00	27.00	05	05	30	I	343	875			
0814148	A	.00	33.00	05	05	300	I	284	891			
0483350	A	.00	36.00	01	01	30	I	327	875			
0813242	A	.00	38.00	01	01	30	I	281	875			
0483499	A	.00	39.20	01	01	30	I		937	460	430	
2391904	A	.00	44.20	02	02	100	I	367	875			
2396834	A	.00	47.00	05	05	50	I	410	940			
2391628	C	.00	51.00	05	05	100	I	460	1063			
2391905	A	.00	53.60	02	02	100	I	367	1062			
0814142	A	.00	56.00	10	10	30	I	380	920			
0814312	A	.00	56.00	05	05	30	I	375	1125			
0813276	A	.00	68.00	05	05	100	I	460	1063			
0814248	A	.00	82.00	05	05	100	I	460	1063			
0813243	A	.00	85.00	01	01	30	I	350	1125			
0814221	A	.00	99.10	.5	.5	30	I	880	1125			TWIN CAPS
1582865	C	.00	100.00	10	10	800	I	900	1700			300V RMS POLYPRO
1589040	C	.00	100.00	05	05	400	PRO	550	1720			
1589114	C	.00	100.00	05	05	100	I	500	1250			POLYPRO
0483500	A	.00	106.00	01	01	30	I	350	1312	550	350	
0814223	A	.00	111.00	.5	.5	30	I	880	1125			TWIN CAPS
0814225	A	.00	144.00	.5	.5	30	I	880	1125			TWIN CAPS
0483334	A	.00	150.00	05	05	30	I	418	1125			
0814141	A	.00	150.00	01	01	50	I	402	1328			
0814276	A	.00	172.00	01	01	30	I	460	1375			
0814227	A	.00	174.00	.5	.5	30	I	880	1125			TWIN CAPS
0814222	A	.00	217.00	.5	.5	30	I	940	1375			TWIN CAPS
0814143	A	.00	220.00	10	10	30	I	445	1420			
2391605	A	.00	220.00	01	01	30	I	516	1277			
2395837	A	.00	233.00	03	03	100	I	546	1312			
0483347	A	.00	270.00	05	05	30	I	538	1405			
0814224	A	.00	276.00	.5	.5	30	I	940	1375			TWIN CAPS
2395836	A	.00	281.00	03	03	100	I	562	1531			
0814220	A	.00	282.00	.5	.5	30	I	940	1375			TWIN CAPS
5052707	A	.00	300.00	02	02	30	I		1438	700	700	
0814226	A	.00	319.00	.5	.5	30	I	940	1375			TWIN CAPS
0483079	A	.00	330.00	5	05	50	I	615	1499			
0483348	A	.00	390.00	05	05	30	I	631	1375			
0483080	A	.00	680.00	05	05	50	I	687	1968			

TOTAL RECORDS 52

PLASTIC FILM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23625 - Polypropylene

PG. 1 06/30/82 23:27 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PC DCS#N EQ 23625 PN TECH PC/PAR1 SEQ/LH PC/CAP/NFD,PC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	CAPACITANCE NANO FAR	TOLERANCE +%	TOLERANCE -%	DC VOLT	TYPE	BODY DIAM MILS	BODY LENGTH MILS	WIDTH MILS	THICK MILS	NOTES
4429917	C	.00	.00									
8279070	C	2.00	.00	20	20	100	BB	550	938			W
8279071	C	5.00	.00	20	20	400		984	2250			ROUND
8279055	C	.00	.30	20	20	1000	FILM	300	750			POLYPROPYLENE
8272114	C	.00	1.00	20	20	1000	IV	400	1375			POLYPROP
8272113	C	.00	3.30	10	10	1100	POLY	500	1375			
4430061	C	.00	3.50	10	10	1100	PROP	515	1375			
8279067	C	.00	3.60	05	05	600	IV	300	812			
5616660	C	.00	10.00	20	20	800	PROP	500	1300			
8279066	C	.01	10.00	10	10	600	IV	380	1440			
8272110	C	.00	33.00	10	10	300	IV	375	875			POLYPROP
8272111	C	.00	820.00	10	10	100	IV	547	937			POLYPROP
8272112	C	.00	1,500.00	10	10	100	IV	609	1250			POLYPROP
5616152	C	.00	2,000.00	20	20	400	IV	766	1750			

TOTAL RECORDS 14

PAPER CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODES
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23651 - Card Mountable
23653 - Chassis Mount
23654 - Chassis

Paper capacitors impregnated with polychlorinated biphenyls (PCB) are not being made. Existing P/N's have been obsoleted. Those in the field have been identified and a procedure established to reclaim and dispose of them.

PG. 1 06/30/82 23:27 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PAP DCS#N EQ 23651 PN TECH PAP/PAR1 SEQ/LH PAP/CAP NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE NFD	TOLERANCE +-	DC VOLTS	AC VOLTS	TYPE	BODY DIAM MILS	BODY LGTH MILS	CAN HGHT INCH	CAN DPTH INCH	CAN WDTH INCH	SHAPE	IMPREGNANT	NOTES	MATERIAL
0347000	N	1.00	505	600		AX	375	1062	.00	.00	.00	TUB			
0347001	C	1.00	1010	600		AX	375	1062	.00	.00	.00	TUB			
0347002	C	1.00	2020	600		AX	375	1062	.00	.00	.00	TUB			
0264886	C	4.70	2020	600		AX	375	1062	.00	.00	.00	TUB			
0334961	C	4.70	1010	400		AX	372	875	.00	.00	.00	TUB			
0507834	A	5.60	505	600		AX	372	750	.00	.00	.00	TUB			
0347016	C	6.80	2020	600		AX	438	1312	.00	.00	.00	TUB			
0507835	C	10.00	505	400		AX	372	750	.00	.00	.00	TUB			
0529201	C	10.00	1010	100		AX	251	719	.00	.00	.00	TUB			
0347019	A	15.00	1010	600		AX	438	1312	.00	.00	.00	TUB			
0347020	C	15.00	2020	600		AX	438	1312	.00	.00	.00	TUB			
0509585	C	22.00	505	400		AX	438	875	.00	.00	.00	TUB			
0806983	C	22.00	505	1000		AX	450	1530	.00	.00	.00	TUB			
0347026	C	33.00	2020	600		AX	562	1562	.00	.00	.00	TUB			
0507833	C	47.00	1010	400		AX	478	905	.00	.00	.00	TUB			
0512510	C	47.00	505	400		AX	438	813	.00	.00	.00	TUB			
0214955	C	50.00	2020	150		AX	266	766	.00	.00	.00	TUB			
0254788	A	50.00	505	600		AX	500	1500	.00	.00	.00	TUB			
0347030	C	68.00	505	600		AX	750	1938	.00	.00	.00	TUB			
0347032	A	68.00	2020	600		AX	750	1938	.00	.00	.00	TUB			
0170611	C	100.00		600		AX	620	2000	.00	.00	.00	TUB			
0347033	A	100.00	505	600		AX	750	1938	.00	.00	.00	TUB			
0347034	A	100.00	1010	600		AX	750	1938	.00	.00	.00	TUB			
0358527	C	100.00	2020	400		AX	468	1125	.00	.00	.00	TUB			
0360664	C	100.00	1010	100		AX	375	938	.00	.00	.00	TUB			
0440422	C	100.00	2020	600		AX	813	2000	.00	.00	.00	TUB			
0347038	C	220.00	505	600		AX	875	2312	.00	.00	.00	TUB			
0347039	C	220.00	1010	600		AX	875	2312	.00	.00	.00	TUB			
0157907	C	250.00		600		AX		2188	.00	.00	.00	TUB			
0322821	C	250.00	1010	400		AX	462	1560	.00	.00	.00	TUB			
1127453	C	250.00	1010	600		AX	625	1156	.00	.00	.00	TUB			
0347040	C	330.00	505	600		AX	1062	2438	.00	.00	.00	TUB			
2102216	C	330.00	1010	400		AX	733	1656	.00	.00	.00	TUB			
0206593	C	470.00	2020	200		AX	642	1719	.00	.00	.00	TUB			
0347045	C	470.00	2020	600		AX	1062	2938	.00	.00	.00	TUB			
1589419	C	470.00	2020	1000		AX	1015	2000	.00	.00	.00	TUB			
5252849	C	470.00	606		400		755	2435	.00	.00	.00	ROUN	NONPCB		
0300709	C	500.00	2020	400		AX	630	1265	.00	.00	.00	TUB			
0440416	C	500.00	2020	600		AX	1125	3000	.00	.00	.00	TUB			
0347046	C	680.00	505	600		AX	1070	2938	.00	.00	.00	TUB			
0253826	C	1,000.00	3020	200		AX	594	1250	.00	.00	.00	TUB			
0253900	C	1,000.00	3020	600		AX	750	2250	.00	.00	.00	TUB			
0472532	C	1,000.00	2020	200		AX	250	780	.00	.00	.00	TUB			
2102144	C	1,000.00	3020	600		AX	1015	1907	.00	.00	.00	TUB			
0321270	C	2,000.00	1010	400		AX	1062	1812	.00	.00	.00	TUB	WAX		

TOTAL RECORDS 45

PG. 1 06/30/82 23:27 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PAP DCS#N EQ 23653 PN TECH PAP/PAR1 SEQ/LH PAP/CAP NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE NFD	TOLERANCE +-	DC VOLTS	AC VOLTS	TYPE	BODY DIAM MILS	BODY LGTH MILS	CAN HGHT INCH	CAN DPTH INCH	CAN WDTH INCH	SHAPE	IMPREGNANT	NOTES	MATERIAL

NO RECORDS MEET SPECIFICATIONS

PG. 1 06/30/82 23:28 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PAP DCS#N EQ 23654 PN TECH PAP/PAR1 SEQ/LH PAP/CAP NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE NFD	TOLERANCE +-	DC VOLTS	AC VOLTS	TYPE	BODY DIAM MILS	BODY LGTH MILS	CAN HGHT INCH	CAN DPTH INCH	CAN WDTH INCH	SHAPE	IMPREGNANT	NOTES	MATERIAL
8279056	L	.00							.00	.00	.00		NO NEW USAGE		PAE REQUIRES SPECIAL DISPOSAL
5252859	C	100.00	2020	400					2.50	3.06	.75	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252861	C	500.00	1010	600					2.56	1.37	.50	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252862	C	500.00	1010	400					2.50	3.06	.75	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252863	C	500.00	606	600					2.47	2.37	.76	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252866	C	1,000.00	606		300				2.47	1.82	.76	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252887	C	1,250.00	606		440				2.12	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252869	C	1,400.00	606		330				2.12	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252837	C	1,500.00	606		660				2.87	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252874	C	1,750.00	606		660				2.94	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252804	C	2,000.00	606		330				2.12	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252827	C	2,000.00	606		440				2.12	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252836	C	2,000.00	606		660				2.12	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252850	C	2,000.00	606		660				3.19	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252857	C	2,000.00	606		440				2.06	2.27	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252858	C	2,000.00	2020	100					.68	1.81	2.38	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252860	C	2,000.00	1010	400					3.22	3.06	1.44	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252875	C	2,000.00	606		400				5.81	2.97	1.94	OVAL	NONPCB	COMM	PAE REQUIRES SPECIAL DISPOSAL
5252888	C	2,000.00	606		330				2.12	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252873	C	2,100.00	606		660				3.44	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252838	C	2,500.00	606		660				3.94	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252823	C	3,000.00	606		370				2.37	2.22	2.14	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252839	C	3,000.00	606		660				3.69	2.75	1.62	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252848	C	3,000.00	606		370				2.31	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252868	C	3,000.00	606		660				4.56	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
8279060	C	3,000.00	606		440	CAN			2.32	2.16	1.31	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252886	C	3,500.00	606		330				2.37	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252805	C	4,000.00	606		330				2.44	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252824	C	4,000.00	606		370				2.87	2.22	2.14	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252828	C	4,000.00	606		440				3.50	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
6814311	C	4,000.00	606		660				3.25	2.91	1.91	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
8279051	C	4,000.00	606		660				3.88	1.56	2.69	OVAL	OIL	NONPCB	PAE REQUIRES SPECIAL DISPOSAL
5252802	C	4,700.00	606		330				2.69	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252806	C	5,000.00	606		330				2.80	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252829	C	5,000.00	606		440				4.50	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252840	C	5,000.00	606		660				4.86	2.97	1.97	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252864	C	5,000.00	1010	300					3.63	3.06	1.42	RECT	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252807	C	6,000.00	606		330				3.19	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
6814312	C	6,000.00	606		660				4.50	2.91	1.91	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252856	C	6,350.00	606		330				3.19	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252808	C	7,000.00	606		330				3.80	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
8279054	C	7,000.00	606		660				4.75	2.69	1.56	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252825	C	7,500.00	606		370				4.50	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252809	C	8,000.00	606		330				3.94	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252826	C	8,000.00	606		370				4.75	2.22	1.37	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
5252841	C	8,000.00	606		660				5.81	2.97	1.97	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL
8279078	C	8,000.00	606		370				4.74	2.16	1.31	OVAL	NONPCB		
5252810	C	10,000.00	606		330				3.56	2.75	1.62	OVAL	NONPCB		PAE REQUIRES SPECIAL DISPOSAL

Component Data Bank - P/N Catalog
Paper Capacitors

PG. 2 06/30/82 23:28 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/PAP DCS#N EQ 23654 PN TECH PAP/PARI SEQ/LH PAP/CAP NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE NFD	TOLERANCE +-	DC VOLTS	AC VOLTS	TYPE	BODY DIAM MILS	BODY LGTH MILS	CAN HGHT INCH	CAN DPTH INCH	CAN WDTH INCH	SHAPE	IMPREG-NANT	NOTES	MATERIAL		
5252830	C	10,000.00	606		440				4.31	2.97	1.97	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252853	C	10,000.00	606		330				4.81	2.22	1.37	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
6814313	C	10,000.00	606		660				5.38	3.66	1.97	OVAL	NONPCB	PSI	PAE REQUIRES	SPECIAL	DISPOSAL
5252811	C	12,000.00	606		330				3.94	2.75	1.62	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252843	C	12,000.00	606		660				6.31	3.72	2.03	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252870	C	12,000.00	606		330				5.56	2.22	1.37	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252865	C	12,500.00	606		330				6.12	2.22	1.37	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252867	C	12,500.00	606		370				3.94	2.97	1.97	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252812	C	15,000.00	606		330				3.94	2.97	1.97	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
8279052	C	15,000.00	606		660				7.56	1.97	3.66	OVAL	YES		PAE REQUIRES	SPECIAL	DISPOSAL
5252813	C	18,000.00	606		330				4.56	2.97	1.97	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252845	C	18,000.00	606		660				9.06	3.72	2.03	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252815	C	20,000.00	606		330				5.31	2.97	1.97	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252831	C	20,000.00	606		440				5.94	3.72	2.03	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252846	C	20,000.00	606		660				5.94	4.56	2.84	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252816	C	25,000.00	606		330				4.81	3.72	1.97	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252817	C	30,000.00	606		330				4.25	4.62	2.90	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
8279053	C	30,000.00	606		370				5.75	2.91	1.91	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252818	C	35,000.00	606		330				4.69	4.62	2.90	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252819	C	40,000.00	606		330				5.25	4.62	2.90	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252820	C	45,000.00	606		330				5.31	4.62	2.90	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
8279076	C	45,000.00	606		330			9999	3.66	1.97	.00	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252821	C	50,000.00	606		330				5.69	4.62	2.90	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
5252822	C	60,000.00	606		330				6.81	4.62	2.90	RECT	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL
8279075	C	60,000.00	606		330			9999	3.66	1.97	.00	OVAL	NONPCB		PAE REQUIRES	SPECIAL	DISPOSAL

TOTAL RECORDS 73

TANTALUM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23661 - Axial Lead

PG. 1 06/30/82 23:28 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/TC DCS#N EQ 23661 PN TECH TC/PAR1 SEQ/LH TC/CAP/NFD,TC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE NANO FAR	CAPACITANCE MFARAD	TOLERANCE +%	TOLERANCE -%	ESR OHMS	DF/% 120 HZ	IMPEDANCE OHMS	DC LEAK MICAMP	DC VOLT	POL AR	RIPPLE CURRENT MILAMP	SIZE	TYPE	NOTES
2391355	N	.00	.00			.00	.0	.00	.00			.00			NO DATA
0124555	A	.10	.00	1010		668.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0492446	A	.10	.00	1010		.00	.0	.00	.00	35	NO	.00	MISC	IIIA	L.750IN D.220IN
0492540	A	.10	.00	2020		750.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0133707	A	.12	.00	1010		556.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0491255	A	.15	.00	1010		444.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
2414928	A	.15	.00	1010		266.00	.0	.00	.00	50	YES	.00	A	IIIA	
0133708	A	.18	.00	1010		370.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124575	A	.22	.00	1010		303.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0222075	A	.22	.00	2020		341.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0492613	A	.22	.00	2020		.00	.0	.00	.00	35	NO	.00	MISC	IIIA	L.750IN D.220IN
2391260	A	.22	.00	1010		302.00	4.0	.00	.00	35	NO	.00	MISC	IIIA	L.776IN D.172IN
0595356	A	.25	.00	2020		530.00	10.0	.00	2.00	50	NO	14.00	MISC	I	L.875IN D.250IN
0133743	A	.27	.00	1010		247.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124577	A	.33	.00	1010		202.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0222076	A	.33	.00	2020		227.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0222061	A	.39	.00	1010		172.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124580	A	.47	.00	1010		142.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0492614	A	.47	.00	2020		170.00	6.0	.00	.00	35	NO	.00	MISC	IIIA	L.750IN D.220IN
0529203	A	.47	.00	2020		160.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
2391261	A	.47	.00	1010		141.00	4.0	.00	.00	35	NO	.00	MISC	IIIA	L.776IN D.172IN
0133820	A	.56	.00	1010		119.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124581	A	.68	.00	1010		98.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0492589	A	.68	.00	2020		110.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
2123010	A	.80	.00	2020		.00	.0	.00	2.00	100	YES	.00	MISC	I	L.800IN D.203IN
0222062	A	.82	.00	1010		81.50	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124582	A	1.00	.00	1010		66.80	4.5	.00	.00	35	YES	1.78	A	IIIA	
0351150	A	1.00	.00	8020		120.00	7.2	.00	.00	35	YES	10.00	A	IIIA	
0483071	A	1.00	.00	2020		.00	.0	.00	.00	35	NO	.00	MISC	IIIA	L.780IN D.220IN
0491315	A	1.00	.00	1010		.00	.0	.00	.00	35	NO	.00	MISC	IIIA	L.750IN D.220IN
0492558	A	1.00	.00	2020		75.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
2391299	A	1.00	.00	0505		66.80	4.5	.00	.00	35	YES	1.78	A	IIIA	
2391254	A	1.10	.00	0505		72.00	4.8	.00	.00	35	YES	.00	MISC	IIIA	L.441IN D.140IN
0133840	A	1.20	.00	1010		55.60	4.5	.00	.00	35	YES	1.99	B	IIIA	
2396898	A	1.30	.00	1010		60.00	.0	.00	.00	35	NO	.00	MISC	IIIA	L.1.000IN D..220IN
0124583	A	1.50	.00	1010		44.40	4.5	.00	.00	35	YES	2.30	B	IIIA	
0492590	A	1.50	.00	2020		50.00	4.5	.00	.00	35	YES	2.30	B	IIIA	
0133858	A	1.80	.00	1010		37.00	4.5	.00	.00	35	YES	2.56	B	IIIA	
0124584	A	2.20	.00	1010		30.30	4.5	.00	.00	35	YES	2.96	B	IIIA	
0492630	A	2.20	.00	2020		34.10	4.5	.00	.00	35	YES	2.96	B	IIIA	
2391032	A	2.20	.00	2020		34.10	4.5	.00	.00	50	YES	.00	C	IIIA	
2391801	A	2.20	.00	1010		30.00	5.5	.00	.00	75	YES	.00	C	IIIA	
2414817	A	2.20	.00	3	3	28.30	4.5	.00	.00	35	YES	2.96	B	IIIA	
0133859	A	2.70	.00	1010		24.70	4.5	.00	.00	35	YES	3.35	B	IIIA	
0595355	A	3.00	.00	7515		45.00	10.0	.00	4.50	75	YES	14.00	MISC	I	L.875IN D.250IN
0124585	A	3.30	.00	1010		20.20	4.5	.00	.00	35	YES	3.78	B	IIIA	
0351151	A	3.30	.00	8020		36.30	7.2	.00	.00	35	YES	10.00	B	IIIA	
0492592	A	3.30	.00	2020		22.70	4.5	.00	.00	35	YES	3.78	B	IIIA	

PG. 2 06/30/82 23:28 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/TC DCS#N EQ 23661 PN TECH TC/PAR1 SEQ/LH TC/CAP/NFD,TC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFARAD	CAPACITANCE NANO FAR	TOLERANCE +% -%	ESR OHMS	DF/% 120 HZ	IMPEDANCE OHMS	DC LEAK MICAMP	DC VOLT VOLT	POLAR	RIPPLE CURRENT MILAMP	SIZE	TYPE	NOTES
2391303	A	3.30	.00	2020	.00	10.0	2,000.00	.00	6	YES	.00	MISC	IIIB	L.280IN D.100IN
2145014	A	3.40	.00	1010	.00	.0	.00	.00	35	NO	.00	MISC	IIIA	L.960IN D.200IN
0133860	A	3.90	.00	1010	17.20	4.5	.00	.00	35	YES	4.24	C	IIIA	
0222081	A	3.90	.00	1010	17.20	4.5	.00	.00	20	YES	4.24	B	IIIA	
0124586	A	4.70	.00	1010	14.20	4.5	.00	.00	35	YES	4.73	C	IIIA	
0222082	A	4.70	.00	1010	14.20	4.5	.00	.00	20	YES	4.73	B	IIIA	
0222087	A	4.70	.00	2020	16.00	4.5	.00	.00	20	YES	4.73	B	IIIA	
0492559	A	4.70	.00	2020	16.00	4.5	.00	.00	35	YES	4.73	C	IIIA	
2391096	A	4.70	.00	2020	14.20	4.0	.00	.00	6	YES	5.00	A	IIIA	
0483239	A	5.00	.00	1010	16.00	4.8	.00	.00	20	NO	10.00	MISC	IIIA	L.986IN D.217IN
0491017	A	5.00	.00	2015	.00	.0	.00	.00	50	YES	.00	MISC	IIIA	L.468IN D.185IN
2123013	A	5.00	.00	1010	.00	.0	.00	.00	100	NO	.00	MISC	IIIA	L1.56IN D.390IN
2391763	A	5.00	.00	2020	6.00	.0	.00	.00	75	YES	.00	MISC	II	L.545IN D.203IN
0133861	A	5.60	.00	1010	11.90	4.5	.00	.00	35	YES	5.30	C	IIIA	
0483000	A	5.60	.00	1010	11.90	4.5	.00	.00	20	YES	5.30	B	IIIA	
0813274	A	5.60	.00	1010	12.00	.0	.00	.00	35	YES	.00	MISC	IIIA	L.541IN D.185IN
2391255	A	5.60	.00	0505	11.90	4.5	.00	.00	35	YES	.00	MISC	IIIA	L.629IN D.190IN
0383608	A	6.20	.00	8020	19.30	7.2	.00	.00	25	YES	10.00	B	IIIA	
0483330	A	6.20	.00	0505	8.00	3.0	.00	10.00	20	YES	5.80	SB	IIIA	
0124587	A	6.80	.00	1010	9.80	4.5	.00	.00	20	YES	6.02	B	IIIA	
0222063	A	6.80	.00	1010	9.80	4.5	.00	.00	35	YES	6.02	C	IIIA	
0222077	A	6.80	.00	2020	11.00	4.5	.00	.00	35	YES	6.02	C	IIIA	
0222088	A	6.80	.00	2020	11.00	4.5	.00	.00	20	YES	6.02	B	IIIA	
0133862	A	8.20	.00	1010	8.20	4.5	.00	.00	20	YES	6.76	C	IIIA	
0222064	A	8.20	.00	1010	10.58	6.0	.00	.00	35	YES	6.76	D	IIIA	
0124588	A	10.00	.00	1010	6.70	4.5	.00	.00	20	YES	7.69	C	IIIA	
0222065	A	10.00	.00	1010	8.67	6.0	.00	.00	35	YES	7.69	D	IIIA	
0222078	A	10.00	.00	2020	9.75	6.0	.00	.00	35	YES	7.69	D	IIIA	
0351152	A	10.00	.00	8020	12.00	7.2	.00	.00	15	YES	10.00	B	IIIA	
0491316	A	10.00	.00	1010	.00	.0	.00	.00	20	NO	.00	MISC	IIIA	L1.50IN D.327IN
0492541	A	10.00	.00	2020	7.50	4.5	.00	.00	20	YES	7.69	C	IIIA	
0813279	A	10.00	.00	1010	9.00	.0	.00	.00	50	YES	.00	D	III	
2391256	A	10.00	.00	0505	8.00	4.8	.00	.00	20	NO	.00	MISC	IIIA	L1.55IN D.327IN
2391764	A	10.00	.00	2020	5.00	.0	.00	.00	75	YES	.00	MISC	II	L.735IN D.321IN
2391829	A	10.00	.00	0505	6.70	4.5	.00	.00	20	YES	.00	C	IIIA	
2414889	A	10.00	.00	1010	6.70	4.5	.00	2.00	20	YES	7.69	C	IIIA	
0133863	A	12.00	.00	1010	5.60	4.5	.00	.00	20	YES	8.52	C	IIIA	
0222066	A	12.00	.00	1010	7.22	6.0	.00	.00	35	YES	8.52	D	IIIA	
0124589	A	15.00	.00	1010	4.40	4.5	.00	.00	20	YES	9.86	C	IIIA	
0222067	A	15.00	.00	1010	5.78	6.0	.00	.00	35	YES	9.86	D	IIIA	
0222079	A	15.00	.00	2020	6.50	6.0	.00	.00	35	YES	9.86	D	IIIA	
0222089	A	15.00	.00	2020	5.00	4.5	.00	.00	20	YES	9.86	C	IIIA	
0640578	A	15.00	.00	1010	2.00	.0	.00	.00	35	YES	9.86	D	IIIA	
2391097	A	15.00	.00	2020	4.40	4.0	.00	.00	10	YES	14.40	B	IIIA	
0129333	A	18.00	.00	1010	3.70	4.5	.00	.00	15	YES	1.11	C	IIIA	
0222068	A	18.00	.00	1010	4.82	6.0	.00	.00	35	YES	11.10	D	IIIA	
2391257	A	18.00	.00	0505	3.70	4.5	.00	.00	15	YES	.00	MISC	IIIA	L.629IN D.190IN
0124591	A	22.00	.00	1010	3.00	4.5	.00	.00	15	YES	12.60	C	IIIA	

PG. 3 06/30/82 23:28 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/TC DCS#N EQ 23661 PN TECH TC/PAR1 SEQ/LH TC/CAP/NFD,TC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFARAD	CAPACITANCE NANO FAR	TOLERANCE +% -%	ESR OHMS	DF/% 120 HZ	IMPEDANCE OHMS	DC LEAK MICAMP	DC VOLT VOLT	POLAR	RIPPLE CURRENT MILAMP	SIZE	T[illegible]	NOTES
0222069	A	22.00	.00	1010	3.94	6.0	.00	.00	35	YES	12.60	D	IIIA	
0222080	A	22.00	.00	2020	4.43	6.0	.00	.00	35	YES	12.60	D	IIIA	
0222093	A	22.00	.00	2020	3.40	4.5	.00	.00	15	YES	12.60	C	IIIA	
2129505	A	22.00	.00	2020	.00	.0	.00	.00	100	YES	250.00	MISC	II	L.703IN D.297IN
0222083	A	27.00	.00	1010	321.00	6.0	.00	.00	20	YES	14.40	D	IIIA	
0222094	A	27.00	.00	1010	2.50	4.5	.00	.00	10	YES	14.40	C	IIIA	
0124592	A	33.00	.00	1010	2.00	4.5	.00	.00	10	YES	16.30	C	IIIA	
0222084	A	33.00	.00	1010	2.63	6.0	.00	.00	20	YES	16.30	D	IIIA	
0222097	A	33.00	.00	2020	2.30	4.5	.00	.00	10	YES	16.30	C	IIIA	
0474820	A	33.00	.00	2020	.00	.0	.00	.00	75	YES	.00	MISC	II	L.735IN D.296IN
0492473	A	33.00	.00	2020	2.96	6.0	.00	.00	20	YES	16.30	D	IIIA	
0813277	A	33.00	.00	1010	3.00	.0	.00	.00	35	YES	.00	MISC	IIIA	L.921IN D.363IN
0124594	A	39.00	.00	1010	1.70	4.5	.00	.00	10	YES	18.10	C	IIIA	
0222085	A	39.00	.00	1010	2.22	6.0	.00	.00	20	YES	18.10	D	IIIA	
0124595	A	47.00	.00	1010	1.40	4.5	.00	.00	6	YES	20.40	C	IIIA	
0222086	A	47.00	.00	1010	1.84	6.0	.00	.00	20	YES	20.40	D	IIIA	
0222090	A	47.00	.00	2020	2.07	6.0	.00	.00	20	YES	20.40	D	IIIA	
0222099	A	47.00	.00	2020	1.60	4.5	.00	.00	6	YES	20.40	C	IIIA	
2414867	A	47.00	.00	1010	1.40	.0	.00	4.00	20	YES	44.00	D	IIIA	
0124611	A	56.00	.00	1010	1.20	4.5	.00	.00	6	YES	22.70	C	IIIA	
0222091	A	56.00	.00	1010	1.55	6.0	.00	.00	15	YES	22.70	D	IIIA	
0222092	A	68.00	.00	1010	1.27	6.0	.00	.00	15	YES	25.80	D	IIIA	
0492569	A	68.00	.00	2020	1.44	6.0	.00	.00	15	YES	25.80	D	IIIA	
2391050	A	68.00	.00	1010	1.00	4.1	.00	.50	20	YES	.00	MISC	IIIA	L.822IN D.351IN
2414980	A	68.00	.00	0505	1.27	.6	.00	.00	15	YES	25.80	D	IIIA	
0222095	A	82.00	.00	1010	1.05	6.0	.00	.00	10	YES	29.00	D	IIIA	
0222098	A	100.00	.00	2020	.97	6.0	.00	.00	10	YES	32.50	D	IIIA	
0483008	A	100.00	.00	2020	1.00	6.0	.00	.00	20	YES	.00	MISC	IIIA	L.921IN D.347IN
0492566	A	100.00	.00	1010	.86	6.0	.00	.00	10	YES	32.50	D	IIIA	
0222096	A	120.00	.00	1010	.72	6.0	.00	.00	10	YES	36.70	D	IIIA	
1582524	C	125.00	.00	2020	1.00	8.0	.00	.00	6	YES	.00	MISC	IIIA	L.921IN.D.363IN
2391052	A	150.00	.00	0505	6.00	.0	.00	5.00	15	YES	.00	MISC	IIIA	L.822IN D.351IN
2391098	A	150.00	.00	2020	.70	6.3	.00	.00	6	YES	22.70	D	IIIA	
2391743	C	150.00	.00	7515	2.00	40.0	.00	.00	50	YES	.00	MISC	I	L2.88IN D.390IN
0492570	A	220.00	.00	2020	.45	6.0	.00	.00	10	YES	.00	MISC	IIIA	L.921IN D.363IN
1582525	C	250.00	.00	2020	.50	8.0	.00	.00	6	YES	.00	MISC	IIIA	L.921IN D.363IN
5214275	A	330.00	.00	2020	.50	12.0	.61	20.00	6	YES	.00	MISC	IIIA	L.922IN D.367IN
0124441	A	.00	4.70	1010	14,200.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124442	A	.00	5.60	1010	11,900.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124443	A	.00	6.80	1010	9,800.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124453	A	.00	8.20	1010	8,150.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124455	A	.00	10.00	1010	6,680.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0222358	A	.00	10.00	2020	7,500.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124458	A	.00	12.00	1010	5,560.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124461	A	.00	15.00	1010	4,440.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0222072	A	.00	15.00	2020	5,000.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124469	A	.00	18.00	1010	3,700.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124470	A	.00	22.00	1010	3,030.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0222073	A	.00	22.00	2020	3,410.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124474	A	.00	27.00	1010	2,470.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124475	A	.00	33.00	1010	2,020.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124486	A	.00	39.00	1010	1,720.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124513	A	.00	47.00	1010	1,420.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0222074	A	.00	47.00	2020	1,600.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124514	A	.00	56.00	1010	1,190.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124515	A	.00	68.00	1010	980.00	4.5	.00	.00	35	YES	1.78	A	IIIA	
0124522	A	.00	82.00	1010	815.00	4.5	.00	.00	35	YES	1.78	A	IIIA	

TOTAL RECORDS 153

TANTALUM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23662 - Modular (C-Pac)

PG. 1 06/30/82 23:28 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/TC DCS#N EQ 23662 PN TECH TC/PAR1 SEQ/LH TC/CAP/NFD,TC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFARAD	CAPACITANCE NANO FAR	TOLERANCE +% -%	ESR OHMS	DF/% 120 HZ	IMPEDANCE OHMS	DC LEAK MICAMP	DC VOLT	POL AR	RIPPLE CURRENT MILAMP	SIZE TYPE NOTES
2390105	C	.15	.00	1010	246.00	.0	.00	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2414904	C	.22	.00	1010	200.00	.0	.00	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
8493239	A	.22	.00	1010	125.00	.0	2.50	1.00	50	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
2396809	C	.39	.00	1010	105.00	.0	4.00	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2396565	C	.47	.00	1010	85.00	3.0	.00	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2414902	C	.56	.00	1010	50.00	.0	.00	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
5616067	A	.56	.00	1010	50.00	.0	2.50	1.00	50	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
8493137	A	.56	.00	1010	50.00	.0	2.50	1.00	50	YES	.00	2PIN IIIB 2,54 SPAC 3,18 LD LENGTH
1589297	C	.68	.00	2020	78.00	.0	2.50	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 3,18 LD LENGTH
2414883	C	.68	.00	2020	78.00	.0	2.50	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
5374453	A	.68	.00	2020	78.00	.0	2.50	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC28,58 LD LENGTH
2396810	C	1.00	.00	1010	40.00	.0	2.00	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
1589294	C	1.20	.00	1010	35.00	.0	.00	.00	50	YES	.00	2PIN IIIB 3,18 SPAC 3,18 LD LENGTH
2391013	C	1.20	.00	1010	35.00	.0	.00	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
4429650	A	1.20	.00	2010	35.00	.0	2.00	1.00	50	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
8493138	A	1.20	.00	1010	35.00	.0	2.00	1.00	50	YES	.00	2PIN IIIB 2,54 SPAC 3,18 LD LENGTH
1589298	C	1.50	.00	1010	24.60	.0	.00	.00	50	YES	.00	2PIN IIIB 3,18 SPAC 3,18 LD LENGTH
2414907	C	1.50	.00	1010	24.60	.0	.00	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
8493647	A	1.50	.00	1010	25.00	.0	1.80	1.00	50	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
8493646	A	2.00	.00	5 5	20.00	.0	1.50	1.00	20	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
2396811	C	2.20	.00	1010	18.00	.0	1.70	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
8493240	A	2.20	.00	1010	20.00	.0	1.50	1.00	20	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
1589299	C	3.30	.00	2020	17.60	.0	.00	1.50	20	YES	.00	2PIN IIIB 3,18 SPAC 3,18 LD LENGTH
2414919	C	3.30	.00	2020	17.60	.0	.00	1.50	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
4429649	A	3.30	.00	2010	12.00	.0	.80	1.00	25	YES	.00	2PIN IIIB 2,54 SPAC 3,18 LD LENGTH
5615363	A	3.30	.00	2010	12.00	.0	.80	1.00	25	YES	30.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
2414908	C	3.90	.00	1010	17.10	.0	.00	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
5616808	A	3.90	.00	1010	12.00	.0	.80	1.00	20	YES	20.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
2396812	C	4.70	.00	1010	9.00	.0	1.50	2.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
6824156	A	5.00	.00	1010	8.00	.0	.20	3.00	50	YES	.00	4PIN IIIB 2,54 SPAC 2,16 LD LENGTH
1589295	C	6.80	.00	2010	8.00	.0	1.50	2.75	20	YES	.00	2PIN IIIB 3,18 SPAC 3,18 LD LENGTH
1589296	C	6.80	.00	0505	8.00	.0	1.50	2.75	20	YES	.00	2PIN IIIB 3,18 SPAC 3,18 LD LENGTH
1589300	C	6.80	.00	2020	8.00	.0	.00	2.75	20	YES	.00	2PIN IIIB 3,18 SPAC 3,18 LD LENGTH
2391268	A	6.80	.00	2010	8.00	.0	1.50	2.75	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2391298	C	6.80	.00	0505	8.00	.0	1.50	2.75	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2414920	C	6.80	.00	2020	8.00	.0	1.50	2.75	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
4481436	A	6.80	.00	1010	8.00	.0	1.50	1.00	15	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
2396951	A	8.20	.00	2010	6.70	.0	1.20	.00	12	YES	.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
8279077	A	8.20	.00	2010	6.70	.0	1.20	1.00	12	YES	.00	RAD
2414906	A	10.00	.00	1010	6.00	.0	.00	.00	20	YES	.00	4PIN IIIB 3,18 SPAC 2,16 LD LENGTH
4481002	A	20.00	.00	1010	2.50	.0	.00	3.00	20	YES	.00	4PIN IIIB 2,54 SPAC 3,18 LD LENGTH
5615372	A	20.00	.00	1010	2.50	.0	.20	3.00	20	YES	.00	4PIN IIIB 2,54 SPAC 2,16 LD LENGTH
5616702	A	20.00	.00	1010	2.50	.0	.20	3.00	20	YES	.00	4PIN 111B 3,18 SPAC 2,16 LD LENGTH
8279072	A	20.00	.00	1010	2.50	.0	.00	3.00	20	NO	.00	D DD
2396643	C	22.00	.00	2020	2.50	.0	1.50	1.00	6	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2414903	E	27.00	.00	1010	3.00	.0	.00	.00	20	YES	.00	6PIN IIIB 3,18 SPAC 2,16 LD LENGTH
4429914	C	40.00	.00	MIN	1.00	.0	.20	3.00	10	YES	.00	RIBN IIIC FUSED RIBBON LEADED
2396562	C	.00	15.00	1010	2,652.00	3.0	.00	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH

PG. 2 06/30/82 23:28 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/TC DCS#N EQ 23662 PN TECH TC/PAR1 SEQ/LH TC/CAP/NFD,TC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFARAD	CAPACITANCE NANO FAR	TOLERANCE +% -%	ESR OHMS	DF/% 120 HZ	IMPEDANCE OHMS	DC LEAK MICAMP	DC VOLT	POL AR	RIPPLE CURRENT MILAMP	SIZE TYPE NOTES
2396563	C	.00	27.00	1010	1,473.00	3.0	.00	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2396564	C	.00	47.00	1010	847.00	3.0	.00	1.00	20	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
2414905	C	.00	82.00	1010	485.00	.0	.00	1.00	50	YES	.00	2PIN IIIB 3,18 SPAC 2,16 LD LENGTH
1589441	A	.15	150.00	2020	246.00	.0	.00	1.00	50	YES	20.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
1589440	A	.68	680.00	2020	78.00	.0	2.50	1.00	50	YES	20.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH
1589442	A	1.00	999.99	1010	40.00	.0	2.00	1.00	20	YES	20.00	2PIN IIIB 2,54 SPAC 2,16 LD LENGTH

TOTAL RECORDS 54

TANTALUM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23669 - Specials

PG. 1 06/30/82 23:29 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/TC DCS#N EQ 23669 PN TECH TC/PAR1 SEQ/LH TC/CAP/NFD,TC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE NANO FAR	CAPACITANCE +% -%	TOLERANCE OHMS	ESR DF/% 120 HZ	IMPEDANCE OHMS	DC LEAKAGE MICAMP	DC VOLT AR	POL CURRENT MILAMP	SIZE	TYPE	NOTES
1589496	N	.00	.00	.00	.0	.00	.00		.00		RIBN	Z TEST FIXTURE

TOTAL RECORDS 1

ALUMINUM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23641 - Axial, DC

PG. 1 06/30/82 23:29 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23641 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLE EVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
2396601	A	2,600.00	10	75	2.50	3	.00	280.00	161.00	.00	1.11	85	YES	YES	AXIAL	2812	760
0482180	A	400.00	10	100	3.00	4	1.32	.00	.00	240.00	.00	85	YES	YES	AXIAL	1374	468
0482181	A	500.00	10	100	3.00	4	1.05	.00	.00	300.00	.00	85	YES	YES	AXIAL	1624	468
2396501	A	7,100.00	10	100	5.00	7	.00	80.00	374.00	.00	2.70	85	YES	YES	AXIAL	2312	1093
2396693	A	10,000.00	10	75	5.00	7	.00	.00	.00	.00	3.62	85	YES	YES	AXIAL	3812	1093
0207368	A	35.00	10	100	6.00	9	14.30	.00	.00	52.00	.00	65	YES	YES	AXIAL	780	295
0482178	A	50.00	10	100	6.00	9	10.00	.00	.00	73.30	.00	85	YES	YES	AXIAL	780	350
1582754	A	200.00	10	50	6.00	8	1.25	.00	2.80	265.00	.00	85	YES	YES	AXIAL	936	456
5115628	A	200.00	10	100	6.00	9	.00	.00	3.20	350.00	.00	65	YES	YES	AXIAL	1625	362
0482179	A	300.00	10	100	6.00	9	1.67	.00	.00	273.50	.00	85	YES	YES	AXIAL	1624	468
1582755	A	350.00	10	50	6.00	8	1.00	.00	4.00	265.00	.00	85	YES	YES	AXIAL	1374	456
1589323	A	3,000.00	10	75	7.50	10	.17	.00	346.00	.00	1.62	85	YES	YES	AXIAL	2312	968
2395840	A	6,000.00	10	100	7.50	10	.00	91.00	498.00	.00	2.58	85	YES	YES	AXIAL	2312	1093
2396694	A	8,500.00	10	75	7.50	10	.00	.00	.00	.00	3.60	85	YES	YES	AXIAL	3812	1093
2396900	A	150.00	10	75	10.00	15	3.00	.00	77.00	220.00	.00	85	YES	YES	AXIAL	1312	593
5214422	C	4,200.00	10	75	10.00	15	.00	83.00	101.00	.00	3.50	65	YES	YES	AX DMF	2812	968
2396695	A	4,500.00	10	75	10.00	15	.00	.00	.00	.00	2.50	85	YES	YES	AXIAL	2812	1093
2396502	A	5,000.00	10	100	10.00	15	.00	90.00	414.00	.00	2.49	85	YES	YES	AXIAL	2312	1093
0360268	A	5.00	10	100	12.00	14	60.00	.00	2.00	16.00	.00		YES	YES	AXIAL	750	344
0482176	A	25.00	10	100	12.00	14	18.90	.00	.00	52.00	.00	85	YES	YES	AXIAL	780	295
0521737	A	50.00	10	100	12.00	14	10.00	.00	2.80	35.00	.00		YES	YES	AXIAL	812	469
0482177	A	250.00	10	100	12.00	14	1.89	.00	.00	298.50	.00	85	YES	YES	AXIAL	1624	468
2391602	A	280.00	10	100	12.00	14	1.56	.00	6.70	240.00	.00	65	YES	YES	AXIAL	1320	437
0492618	A	1.00	10	100	15.00	18	500.00	.00	2.50	8.00	.00	65	YES	YES	AXIAL	812	343
0363411	A	10.00	10	100	15.00	18	.00	.00	2.50	32.00	.00		YES	YES	AXIAL	780	312
0483030	A	20.00	10	100	15.00	18	22.20	.00	.00	52.00	.00	85	YES	YES	AXIAL	780	295
0482174	A	35.00	10	100	15.00	18	12.70	.00	.00	86.60	.00	65	YES	YES	AXIAL	780	350
0363414	A	50.00	10	100	15.00	18	.00	.00	3.50	77.00	.00		YES	YES	AXIAL	750	438
0363413	A	150.00	10	100	15.00	18	2.96	.00	.00	237.00	.00	65	YES	YES	AXIAL	1374	468
0482175	A	200.00	10	100	15.00	18	2.22	.00	.00	298.50	.00	85	YES	YES	AXIAL	1624	468
0095845	C	250.00			15.00		.00	.00	.00	.00	.00				AXIAL	2000	813
0316668	A	300.00	10	100	15.00	20	1.00	.00	90.00	200.00	.00		YES	YES	AXIAL	1813	720
0363407	A	1,000.00	10	100	15.00	20	.00	.00	.00	400.00	.00		YES	YES	AXIAL	2312	968
5214431	A	1,000.00	10	100	15.00	20	.00	400.00	368.00	.00	1.26	65	YES	YES	AXIAL	2312	968
2396600	A	3,000.00	10	75	15.00	20	.00	140.00	425.00	.00	2.26	85	YES	YES	AXIAL	3192	901
2396696	A	3,500.00	10	75	15.00	20	.00	.00	.00	.00	2.42	85	YES	YES	AXIAL	2812	1093
2395841	A	3,800.00	10	100	15.00	20	.00	105.00	458.00	.00	2.40	85	YES	YES	AXIAL	2312	1093
2396931	A	100.00	10	75	20.00	30	4.20	.00	89.00	240.00	.00	85	YES	YES	AXIAL	1812	593
0620123	A	.68	10	150	25.00		.00	.00	.00	.00	.00		YES	YES	AXIAL	800	360
0440417	A	10.00	10	75	25.00	35	22.10	.00	2.63	45.40	.00	65	YES	YES	AXIAL	812	499
0482169	A	10.00	10	100	25.00	40	30.90	.00	.00	42.70	.00	65	YES	YES	AXIAL	780	295
0482170	A	15.00	10	100	25.00	40	25.90	.00	.00	66.60	.00	65	YES	YES	AXIAL	780	350
0424202	A	50.00	10	100	25.00	35	.00	.00	.00	589.00	.00		NO	YES	AXIAL	938	338
0482171	A	75.00	10	100	25.00	40	5.18	.00	.00	209.20	.00	65	YES	YES	AXIAL	1374	468
0207310	A	100.00	10	100	25.00	40	3.89	.00	.00	266.60	.00		YES	YES	AXIAL	1624	468
0492572	C	100.00	10	100	25.00	40	5.00	.00	8.30	200.00	.00	65	YES	YES	AXIAL	1625	468
2391378	A	200.00	10	75	25.00	35	1.25	.00	11.70	400.00	.00	65	YES	YES	AXIAL	1624	401
0609391	A	500.00	10	100	25.00	40	.00	.00	335.00	400.00	.00		YES	YES	AXIAL	2312	843

PG. 2 06/30/82 23:29 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23641 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
0207362	A	600.00	10	100	25.00	35	.00	.00	300.00	488.00	.00	65	YES	YES	AXIAL	2312	968
2391947	A	1,500.00	10	75	25.00	35	1.00	10.00	.00	940.00	.00	65	YES	YES	AXIAL	3312	968
2396697	A	1,900.00	10	75	25.00	40	.00	.00	.00	.00	1.47	85	YES	YES	AXIAL	2812	1093
2395842	A	2,000.00	10	100	25.00	40	.00	175.00	448.00	.00	2.12	85	YES	YES	AXIAL	2312	1093
2391946	A	5,000.00	10	75	25.00	35	.15	.00	1,000.00	.00	2.40	65	YES	YES	AXIAL	3812	1093
4718605	C	50.00	10	75	30.00	40	5.00	.00	.00	200.00	.00	65	YES	NO	AX DMF	937	401
0208236	A	350.00	10	100	30.00	45	.00	.00	.00	.00	.00			YES	AXIAL	2328	845
2190021	A	500.00	10	100	30.00	45	.80	.00	367.00	447.00	.00	85	YES	YES	AXIAL	2320	970
2396692	A	500.00	10	75	30.00	45	.00	.00	.00	660.00	.00	85	YES	YES	AXIAL	2812	760
8279280	C	500.00	20	20	30.00	40	.00	500.00	22.00	.00	.00	85	YES	YES	AXIAL	1625	516
2395844	A	580.00	10	100	30.00	45	.00	700.00	272.00	870.00	.00	85	YES	YES	AXIAL	2312	760
0521736	A	1.00	10	100	50.00	65	145.00	.00	4.00	10.00	.00		YES	YES	AXIAL	780	344
0482162	A	2.00	10	100	50.00	65	167.00	.00	.00	18.70	.00	65	YES	YES	AXIAL	780	295
0482164	A	4.00	10	100	50.00	65	83.40	.00	.00	26.60	.00	65	YES	YES	AXIAL	780	295
0422582	A	5.00	10	100	50.00		.00	.00	.00	.00	.00	85	YES	YES	AXIAL	692	270
0527871	C	5.00	10	100	50.00	65	60.00	.00	4.00	16.00	.00		YES	YES	AXIAL	750	344
0482166	A	6.00	10	100	50.00	65	55.50	.00	.00	44.00	.00	65	YES	YES	AXIAL	780	295
4481766	C	6.00	10	50	50.00	65	25.00	.00	4.10	.00	.00	85	YES	YES	AXDMF	811	336
0169108	A	10.00	10	100	50.00	75	.00	.00	10.00	63.00	.00	65	YES	YES	AXIAL	1312	593
0317359	A	10.00	10	50	50.00	70	29.47	.00	5.27	45.40	.00	65	YES	YES	AXIAL	811	436
0803005	A	10.00	10	100	50.00	65	33.40	.00	.00	56.00	.00	217	YES	YES	AXIAL	780	350
0472530	A	20.00	10	100	50.00	75	20.00	.00	20.00	.00	.00		YES	YES	AXIAL	1000	391
0419205	A	25.00	20	20	50.00	65	.00	.00	.00	.00	.00		YES	YES	AXIAL	1094	432
5213819	A	25.00	10	75	50.00	65	10.00	.00	9.90	106.00	.00	85	YES	YES	AXIAL	937	362
0482168	A	35.00	10	100	50.00	65	9.53	.00	.00	141.20	.00	65	YES	YES	AXIAL	1374	468
0369849	A	50.00	10	100	50.00	65	6.67	.00	.00	188.00	.00	65	YES	YES	AXIAL	1624	468
0603107	C	50.00	10	100	50.00	65	.00	.00	11.80	.00	.00		YES	YES	AXIAL	1620	440
5214389	A	150.00	10	75	50.00	75	2.20	.00	175.00	360.00	.00	85	YES	YES	AXIAL	1312	968
0254869	A	250.00	10	100	50.00	70	.00	.00	250.00	316.20	.00	65	YES	YES	AXIAL	2312	968
2109462	A	250.00	10	150	50.00	75	.00	.00	.00	.00	.00	65	YES	YES	AXIAL	1810	1120
2396447	C	250.00	10	75	50.00	65	1.40	.00	112.00	.00	.00		YES	YES	AXIAL	1812	718
2396699	A	300.00	10	75	50.00	75	.00	.00	.00	590.00	.00	85	YES	YES	AXIAL	2812	718
2163287	A	500.00	10	75	50.00	75	.80	.00	320.00	880.00	.00	85	YES	YES	AXIAL	2200	910
2396698	A	950.00	10	75	50.00	75	.00	.00	.00	.00	1.36	85	YES	YES	AXIAL	2812	1093
2396503	A	1,000.00	10	100	50.00	75	.00	150.00	447.00	.00	1.82	85	YES	YES	AXIAL	2312	1093
5214133	C	1,000.00	10	75	50.00	75	.15	.00	115.00	.00	2.79	65	YES	YES	AX DMF	2312	1093
0364113	A	10.00	15	100	60.00	75	50.00	.00	7.00	47.00	.00		YES	YES	AXIAL	750	406
0332597	A	50.00	20	20	60.00	85	5.00	.00	600.00	240.00	.00	65	YES	YES	AXIAL	1062	401
6833784	C	15.00	10	10	75.00	100	13.00	.00	10.00	.00	.00		NO		AX DMF	1625	421
6833783	E	25.00	10	40	75.00	100	7.50	.00	15.00	.00	.00		NO		AX DMF	2937	421
8493857	E	27.00	10	10	75.00	100	7.50	.00	15.00	.00	.00		YES	NO	AX DMF	2937	421
2102177	A	50.00	10	50	75.00	100	4.50	.00	125.00	240.00	.00	85	YES	YES	AXIAL	1312	844
2396446	A	100.00	10	100	75.00	100	2.50	.00	.00	450.00	.45	85	YES	YES	AXIAL	1812	968
5214200	C	150.00	50	100	75.00	100	1.67	.00	212.00	765.00	.00	65	YES	YES	AXIAL	2310	843
2395843	A	440.00	10	100	75.00	100	.00	400.00	358.00	.00	1.52	85	YES	YES	AXIAL	2312	1093
0482157	A	1.00	10	100	100.00	125	278.00	.00	.00	286.60	.00	65	YES	YES	AXIAL	1062	350
0492495	A	3.00	10	100	100.00	125	92.60	.00	.00	46.60	.00	85	YES	YES	AXIAL	780	350
0603258	A	8.00	10	100	100.00	125	.00	.00	9.40	.00	.00	65	YES	YES	AXIAL	1062	430

Component Data Bank - P/N Catalog
Axial, DC Aluminum Capacitors

PG. 3 06/30/82 23:29 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23641 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
0526498	A	10.00	10	100	100.00	125	50.00	.00	10.50	63.00	.00	65	YES	YES	AXIAL	1032	422
0721087	A	10.00	10	100	100.00	125	28.00	.00	10.50	84.00	.00		YES	YES	AXIAL	1062	937
0482160	A	15.00	10	100	100.00	125	18.50	.00	.00	100.30	.00	65	YES	YES	AXIAL	1374	468
0482161	A	20.00	10	100	100.00	125	13.90	.00	.00	118.60	.00	65	YES	YES	AXIAL	1624	468
5214639	A	50.00	10	75	100.00	150	4.00	.00	142.00	390.00	.00	65	YES	YES	AXIAL	1192	901
0222701	A	2.00	10	100	150.00	175	125.00	.00	.00	37.40	.00	65	YES	YES	AXIAL	1062	468
0482145	A	4.00	10	100	150.00	175	62.50	.00	.00	53.30	.00	65	YES	YES	AXIAL	1062	468
0482148	A	5.00	10	100	150.00	175	50.00	.00	.00	60.00	.00	65	YES	YES	AXIAL	1062	468
0213535	A	8.00	10	250	150.00		.00	.00	.00	.00	.00			YES	AXIAL	1180	690
0482152	A	8.00	10	100	150.00	175	31.30	.00	.00	76.00	.00	65	YES	YES	AXIAL	1374	468
0482155	A	10.00	10	100	150.00	175	25.00	.00	.00	84.00	.00	65	YES	YES	AXIAL	1374	468
0482156	A	12.00	10	100	150.00	175	20.80	.00	.00	92.00	.00	65	YES	YES	AXIAL	1624	468
0358864	C	25.00	10	150	150.00		.00	.00	.00	.00	.00		YES	YES	AXIAL	1625	813
5615381	A	25.00	10	50	150.00	200	8.00	.00	122.00	185.00	.00	85	YES	YES	AXIAL	1812	718
0322778	A	50.00	10	50	150.00	200	4.00	.00	1,039.00	320.00	.00	85	YES	YES	AXIAL	1781	953
0252804	A	80.00	10	100	150.00	175	.00	.00	1,300.00	470.00	.00	85	YES	YES	AXIAL	2692	776
0438941	C	80.00	10	250	150.00		.00	.00	.00	.00	.00		YES	YES	AXIAL	2312	1063
4430004	C	80.00	10	100	175.00	200	.00	.00	1,400.00	.00	.00	85	YES	YES	AXIAL	2312	843
8493308	C	200.00	10	50	200.00	250	.00	.00	1,200.00	960.00	.00	85	YES	YES	AXIAL	2800	1166
8493310	C	400.00	10	50	200.00	250	.00	.00	1,700.00	.00	1.46	85	YES	YES	AXIAL	3300	1291
8493312	C	600.00	10	50	200.00	250	.00	.00	2,080.00	.00	1.84	85	YES	YES	AXIAL	3800	1416
0286533	A	4.00	10	75	250.00	300	.00	.00	94.80	40.00	.00	65	YES	YES	AXIAL	1312	578
0444984	A	16.00	10	75	250.00	300	15.70	.00	190.00	80.00	.00	65	YES	YES	AXIAL	1812	718
0321019	C	20.00	10	50	250.00		.00	.00	.00	.00	.00		YES	YES	AXIAL	1812	812
4430002	C	100.00	10	75	250.00	300	.00	900.00	.00	700.00	.00	85	YES	YES	AXIAL	3132	968
2396868	A	3.00	10	75	300.00	350	66.00	.00	60.00	45.00	.00	85	YES	YES	AXIAL	1312	593
1582892	A	20.00	10	75	300.00	350	15.00	.00	150.00	150.00	.00	85	YES	YES	AXIAL	2312	718
0358828	C	50.00	10	150	300.00		.00	.00	.00	.00	.00		YES	YES	AXIAL	2000	1000
2396933	A	90.00	10	75	350.00	400	2.20	.00	354.00	600.00	.00	85	YES	YES	AXIAL	3312	1093
2396932	A	110.00	10	75	350.00	400	1.80	.00	352.00	710.00	.00	85	YES	YES	AXIAL	3812	1093
2396948	A	10.00	10	75	400.00	475	20.00	.00	126.00	120.00	.00	85	YES	YES	AXIAL	1312	968
2109487	C	40.00	20	85	400.00	475	.00	.00	.00	.00	.00		YES	YES	AXIAL	2125	1125
8493307	C	50.00	10	50	400.00	475	.00	.00	950.00	365.00	.00	85	YES	YES	AXIAL	2300	1041
8493309	C	100.00	10	50	400.00	475	.00	.00	1,300.00	715.00	.00	85	YES	YES	AXIAL	2800	1291
8493311	C	200.00	10	50	400.00	475	.00	.00	1,800.00	.00	1.01	85	YES	YES	AXIAL	3800	1291
0241653	A	.50	10	50	450.00	525	50.00	.00	45.00	21.20	.00	65	YES	YES	AXIAL	1312	593
0206592	A	4.00	10	50	450.00	525	.00	.00	127.00	63.00	.00	65	YES	YES	AXIAL	1812	718
2109145	C	10.00	10	150	450.00		.00	.00	.00	.00	.00		YES	YES	AXIAL	1750	813
0103615	C	8.00			500.00		.00	.00	.00	.00	.00			YES	AXIAL	2203	1078

TOTAL RECORDS 135

ALUMINUM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23642 - Radial, DC

PG. 1 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23642 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLE EVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
1582968	A	1,200.00	10	75	6.30	9	.00	.00	7.00	.00	1.70	85	YES	YES	RADDMF	1817	510
6833155	C	5,600.00	10	75	6.30	9	.00	34.00	706.00	.00	.00		YES	YES	RADDMF	1750	1063
4430001	C	800.00	10	75	7.50	10	.00	.00	120.00	.00	.00	85	YES	YES	RADDMF	1124	650
5617052	C	1,200.00	10	75	7.50	9	.00	.00	7.00	.00	1.70	85	YES	YES	RADDMF	1817	510
0816933	A	1,000.00	10	75	8.00	10	.00	.00	8.00	.00	.00		NO	YES	RADDMF	1718	500
2396540	A	1,000.00	10	75	8.00	10	.00	.00	8.00	.00	1.65	85	YES	YES	RADDMF	1817	510
4481547	C	1,000.00	10	75	8.00	10	.00	.00	8.00	.00	1.65	85	YES	YES	RADDMF	1817	510
5617042	C	1,000.00	10	75	8.00	10	.00	.00	8.00	.00	1.65	85	YES	YES	RADDMF	1817	510
4430003	C	600.00	10	75	10.00	12	.00	.00	200.00	.00	.00	85	YES	YES	RADDMF	1165	515
2395816	A	850.00	10	75	10.00	13	.00	.00	10.00	.00	1.55	85	YES	YES	RADDMF	1817	510
5617043	C	850.00	10	75	10.00	13	.00	.00	10.00	.00	1.55	85	YES	YES	RADDMF	1817	510
5616100	C	8,500.00	10	75	10.00	14	.00	25.00	140.00	.00	8.00	65	YES	YES	RADDMF	2812	1063
8272121	C	1,000.00	10	75	12.00	16	.00	.00	12.00	.00	1.50	85	YES	YES	RADDMF	1817	510
4429999	C	500.00	10	75	15.00	20	.00	.00	60.00	.00	.00		YES	YES	RADDMF	1124	650
2395817	A	600.00	10	75	15.00	20	.00	.00	12.00	.00	1.55	85	YES	YES	RADDMF	1817	510
5617044	C	600.00	10	75	15.00	20	.00	.00	12.00	.00	1.55	85	YES	YES	RADDMF	1817	510
1582966	A	820.00	10	75	15.00	20	.00	.00	14.00	.00	1.50	85	YES	YES	RADDMF	1817	510
5617050	C	820.00	10	75	15.00	20	.00	.00	14.00	.00	1.50	85	YES	YES	RADDMF	1817	510
8519221	C	1,000.00	10	75	15.00	20	.00	170.00	300.00	.00	.00		YES	YES	RADDMF	1437	635
4481390	C	3,300.00	10	75	15.00	20	.00	46.00	111.00	.00	.00	85	YES	YES	RADDMF	1702	1025
4481806	C	10,000.00	10	100	15.00	20	.00	.00	193.00	.00	.00	85	YES	YES	RADDMF	3712	1035
4481347	C	100.00	10	75	20.00	30	1.30	.00	370.00	.00	.00	85	YES	YES	RADDMF	927	444
1582967	A	560.00	10	75	20.00	30	.00	.00	16.00	.00	1.50	85	YES	YES	RADDMF	1817	510
5617051	C	560.00	10	75	20.00	30	.00	.00	16.00	.00	1.50	85	YES	YES	RADDMF	1817	510
8272123	C	3,900.00	10	75	20.00	30	.00	32.00	140.00	.00	.00		YES	YES	RADDMF	2250	1062
2395818	A	450.00	10	75	24.00	35	.00	.00	17.00	.00	1.46	85	YES	YES	RADDMF	1817	510
5617045	C	450.00	10	75	24.00	35	.00	.00	17.00	.00	1.46	85	YES	YES	RADDMF	1817	510
4481389	C	470.00	10	75	25.00	35	.00	280.00	989.00	.00	.00	85	YES	YES	RADDMF	1437	650
2410128	C	300.00	10	75	30.00	45	.00	.00	17.00	710.00	.00	85	YES	YES	RADDMF	1817	510
5617046	C	300.00	10	75	30.00	45	.00	.00	17.00	.00	1.16	85	YES	YES	RADDMF	1817	510
5617055	C	1,000.00	10	75	30.00	45	.09	.00	30.00	.00	3.00	65	YES	YES	RADDMF	1750	1063
8272122	C	1,500.00	10	75	30.00	45	.00	75.00	100.00	.00	.00		YES	YES	RADDMF	1750	1062
4481733	C	3,000.00	10	75	30.00	45	.00	32.00	150.00	.00	.00	85	YES	YES	RADDMF	2712	1035
1582940	A	390.00	10	75	40.00	55	.00	.00	26.00	.00	1.13	85	YES	YES	RADDMF	1817	510
5617049	C	390.00	10	75	40.00	55	.00	.00	26.00	.00	1.13	85	YES	YES	RADDMF	1817	510
6833153	C	820.00	10	75	40.00	55	.00	93.00	656.00	.00	.00		YES	YES	RADDMF	2250	813
6833152	C	1,000.00	10	75	40.00	55	.00	74.00	800.00	.00	.00		YES	YES	RADDMF	2812	813
4429998	C	4,000.00	10	75	40.00	55	.00	26.00	200.00	.00	3.00		YES	YES	RADDMF	3702	1025
2395819	A	200.00	10	75	48.00	70	.00	.00	22.00	910.00	.00	85	YES	YES	RADDMF	1817	510
5617047	C	200.00	10	75	48.00	70	.00	.00	22.00	.00	.91	85	YES	YES	RADDMF	1817	510
8493271	C	200.00	10	75	48.00	70	.00	.00	22.00	.00	.00		YES	YES	RADDMF	1817	510
4481443	C	82.00	10	75	50.00	75	.00	.00	15.10	.00	.00	85	YES	YES	RADDMF	1165	515
4481805	C	1,500.00	10	100	60.00	85	.00	.00	150.00	.00	.00	85	YES	YES	RADDMF	3712	1035
6833154	C	180.00	10	75	75.00	100	.00	500.00	270.00	.00	.00		YES	YES	RADDMF	1750	813
8519695	C	390.00	10	75	75.00	100	.00	320.00	585.00	.00	.00		YES	YES	RADDMF	1750	1063
4430042	C	1,200.00	10	75	75.00	100	.00	95.00	.00	.00	.00	85	YES	YES	RADDMF	3202	1025
2396647	A	100.00	10	100	80.00	100	.00	.00	25.00	.00	.00		NO	YES	RADDMF	1780	500
5617048	C	100.00	10	75	80.00	100	.00	.00	25.00	.00	.71	85	YES	YES	RADDMF	1817	510
8279288	C	27.00	10	75	150.00	175	.00	.00	125.00	.00	.00		YES	YES	RADDMF	1817	510

TOTAL RECORDS 49

ALUMINUM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODE
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23645 - Chassis, Can

PG. 1 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23645 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
5131569	C	330,000.00	10	100	5.00	7	.00	19.00	9,999.00	.00	28.00	65	YES	YES	CAN	6000	3093
5252965	C	330,000.00	10	100	5.00	7	.00	19.00	9,999.00	.00	18.00	65	YES	YES	CAN	5750	3078
5261089	A	10,000.00	10	100	6.00	8	.00	.00	2,440.00	.00	1.60	65	YES	YES	CAN	3250	1453
8493497	C	10,000.00	10	75	6.00	8	.00	.00	2,400.00	.00	1.60	65	YES	YES	CAN	3562	1468
5616999	C	15,000.00	10	75	6.00	8	.00	180.00	6,000.00	.00	3.20	65	YES	YES	CAN	2250	1453
0598343	C	25,000.00	10	150	6.00	8	.00	20.00	3,870.00	.00	.00			YES	CAN	4250	2078
4430081	C	25,000.00	10	75	6.00	7	.00	90.00	6,000.00	.00	4.50	65	YES	YES	CAN	2250	1453
4481170	C	25,000.00	10	150	6.00	8	.00	20.00	3,870.00	.00	3.50	65	YES	YES	CAN	4562	2093
0597955	C	55,000.00	10	150	6.00	8	.00	15.00	5,740.00	.00	.00			YES	CAN	5750	2078
5213311	A	66,000.00	10	100	6.00	8	.00	.00	6,290.00	.00	5.10	65	YES	YES	CAN	4750	2578
5709380	C	66,000.00	10	50	6.00	8	.00	38.00	629.00	.00	9.70	65	YES	YES	CAN	5250	2078
5709381	A	100,000.00	10	50	6.00	8	.00	32.00	6,000.00	.00	10.90	65	YES	YES	CAN	4750	2578
8493324	C	100,000.00	10	75	6.00	8	.00	15.60	6,000.00	.00	11.80	65	YES	YES	CAN	4250	2078
5617108	C	180,000.00	10	75	6.00	8	.00	18.00	6,000.00	.00	15.00	65	YES	YES	CAN	4250	3078
5615354	C	220,000.00	10	75	6.00	8	.00	25.00	6,000.00	.00	18.60	65	YES	YES	CAN	4750	3077
5616998	C	280,000.00	10	75	6.00	8	.00	14.00	6,000.00	.00	16.00	65	YES	YES	CAN	4250	3078
4429945	C	330,000.00	10	75	6.00	8	.00	14.00	6,000.00	.00	16.00	65	YES	YES	CAN	4250	3078
4481966	C	450,000.00	7	75	6.30	8	.00	6.00	6,000.00	.00	15.00	65	YES	YES	CAN	6000	3078
5616823	C	450,000.00	7	75	6.30	8	.00	6.00	6,000.00	.00	23.00	65	YES	YES	CAN	5750	3780
4430000	C	650,000.00	10	50	6.30	8	.00	3.50	6,000.00	.00	32.80	65	YES	YES	CAN	6000	3056
4481623	C	650,000.00	10	50	6.30	8	3.50	.00	6,000.00	.00	32.80	65	YES	YES	CAN	6000	3051
5214530	L	320,000.00	10	75	6.50	8	.00	7.00	9,999.99	.00	40.00	65	YES	YES	CAN	8750	3078
0749449	A	87,000.00		50	7.00	8	.00	.00	.00	.00	4.00		YES	YES	CAN	4560	3090
1582624	C	68,000.00		100	7.50	10	.00	2.00	750.00	.00	45.00	85	YES	YES	CAN	5750	3078
4481475	E	240,000.00	10	75	7.50	9	.00	13.00	.00	.00	18.00	65	YES	YES	CAN	6062	3093
5252526	C	240,000.00	10	75	7.50	9	.00	13.00	9,999.00	.00	18.00	65	YES	YES	CAN	5750	3078
8493377	C	240,000.00	10	75	7.50	9	.00	13.00	9,999.99	.00	18.00	65	YES	YES	CAN	5750	3078
1646686	C	300,000.00	10	75	7.50	9	.00	14.00	6,000.00	.00	16.80	65	YES	YES	CAN	4718	3078
0360291	C	19,000.00	10	150	8.00	12	.00	.00	3,900.00	.00	.00			YES	CAN	4250	2078
5261247	C	60,000.00	10	50	8.00	9	.00	.00	6,000.00	.00	.00		YES	YES	CAN	4750	2578
0479953	A	1,500.00	10	150	10.00		.00	.00	.00	.00	.00	65	YES	YES	CAN	4562	2093
1582545	C	5,600.00		100	10.00	15	.00	22.00	1,000.00	.00	13.00	65	YES	YES	CAN	4250	1453
5261128	A	7,300.00	10	100	10.00	12	.00	.00	2,700.00	.00	1.58	65	YES	YES	CAN	3250	1453
0207296	A	7,750.00	10	100	10.00	13	.00	.00	2,780.00	.00	.00			YES	CAN	4250	1453
0730429	C	11,000.00	10	100	10.00	12	.00	.00	3,310.00	.00	2.18		YES	YES	CAN	4562	1468
5261370	A	11,000.00	10	50	10.00	12	.00	.00	3,310.00	.00	.00		YES	YES	CAN	4250	1453
0316137	C	15,500.00	10	150	10.00	12	.00	.00	.00	.00	.00		YES	YES	CAN	4250	2078
5253847	A	16,000.00	10	100	10.00	12	.00	70.00	4,380.00	.00	5.00	65	YES	YES	CAN	4750	1473
5475845	C	18,000.00	10	100	10.00	12	.00	50.00	4,000.00	.00	5.50	65	YES	YES	CAN	4250	1453
5261067	A	24,000.00	10	100	10.00	12	.00	.00	4,900.00	.00	3.92	65	YES	YES	CAN	4250	2078
5615358	C	27,000.00	10	75	10.00	12	.00	72.00	3,100.00	.00	5.80	65	YES	YES	CAN	4250	1453
2396956	C	33,000.00		100	10.00	15	.00	3.00	1,000.00	.00	33.00	85	YES	YES	CAN	4250	3078
5615357	C	36,000.00	10	75	10.00	12	.00	60.00	3,600.00	.00	7.90	65	YES	YES	CAN	5250	1453
5616661	C	36,000.00	10	75	10.00	12	.00	.00	6,000.00	.00	7.10	65	YES	YES	CAN	4750	1453
5213954	C	38,000.00	10	50	10.00	12	.00	.00	4,000.00	.00	9.20	65	YES	YES	CAN	4250	2078
8519672	B	46,000.00	20	20	10.00	12	.00	7.60	4,100.00	.00	.00	65	YES	YES	CANDMF	2687	2047
5214368	A	48,000.00	10	75	10.00	12	.00	37.00	4,100.00	.00	8.60	65	YES	YES	CAN	3250	2578
5617000	C	48,000.00	10	75	10.00	12	.00	50.00	6,000.00	.00	7.00	65	YES	YES	CAN	3750	1828

PG. 2 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23645 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
5709382	A	49,000.00	10	50	10.00	12	.00	42.00	6,000.00	.00	8.60	65	YES	YES	CAN	4750	2078
5252514	C	60,000.00	10	75	10.00	15	.00	30.00	5,000.00	.00	6.00	65	YES	YES	CAN	5250	2078
5475843	C	66,000.00	10	100	10.00	12	.00	21.00	5,000.00	.00	11.00	65	YES	YES	CAN	4250	2578
5213162	A	74,000.00	10	100	10.00	12	.00	.00	8,600.00	.00	6.64	65	YES	YES	CAN	4750	3078
5214966	C	84,000.00	10	75	10.00	12	.00	18.00	6,000.00	.00	10.80	65	YES	YES	CAN	4750	2578
5615356	C	97,000.00	10	75	10.00	12	.00	30.00	5,900.00	.00	14.40	65	YES	YES	CAN	5750	2078
5214505	A	100,000.00	10	75	10.00	12	.00	25.00	6,000.00	.00	14.20	65	YES	YES	CAN	4250	2077
8519125	C	100,000.00	10	75	10.00	12	.00	25.00	6,000.00	.00	14.20	65	YES	YES	CAN	4250	3047
1655420	C	130,000.00	10	75	10.00	12	.00	23.00	6,000.00	.00	9.00	65	YES	YES	CAN	5749	2080
5615355	C	130,000.00	10	75	10.00	12	.00	29.00	6,000.00	.00	15.00	65	YES	YES	CAN	5250	2578
1864291	C	150,000.00	10	75	10.00	12	.00	20.00	6,000.00	.00	15.00	65	YES	YES	CAN	4749	2593
5796430	A	160,000.00	10	75	10.00	12	.00	20.00	6,000.00	.00	17.20	65	YES	YES	CAN	6062	3093
1655419	C	180,000.00	10	75	10.00	12	.00	15.00	6,000.00	.00	10.00	65	YES	YES	CAN	5249	2580
5252966	C	225,000.00	10	100	10.00	12	.00	15.00	9,999.00	.00	20.00	65	YES	YES	CAN	5750	3078
5615515	C	230,000.00	10	75	10.00	12	.00	20.00	6,000.00	.00	19.80	65	YES	YES	CAN	5750	3078
4430026	C	320,000.00	10	75	10.00	12	.00	6.00	.00	.00	18.00	65	YES	YES	CAN	5750	3078
5617165	C	320,000.00	10	75	10.00	12	.00	10.00	6,000.00	.00	18.00	65	YES	YES	CAN	5750	3078
4430041	C	450,000.00	10	75	10.00	12	.00	4.70	6,000.00	.00	28.30	65	YES	YES	CAN	6000	3056
0597944	C	3,500.00	10	150	12.00	15	.00	15.00	6,480.00	.00	.00			YES	CAN	5750	2078
0598342	C	15,000.00	10	150	12.00	15	.00	20.00	4,240.00	.00	.00			YES	CAN	4250	2078
0208230	C	7,000.00	10	75	13.00	15	.00	.00	.00	.00	.00	65		YES	CAN	4250	1453
0208224	A	14,000.00	10	150	13.00	15	.00	.00	.00	.00	3.85	65	YES	YES	CAN	4562	2093
5261826	C	42,000.00	10	100	13.00	18	.00	35.00	1,610.00	.00	10.00	65	YES	YES	CAN	4250	2578
5239120	C	70,000.00	10	75	13.00	18	.00	32.00	2,000.00	.00	10.70	65	YES	YES	CAN	4750	2578
5261825	C	70,000.00	10	50	13.00	18	.00	30.00	.00	.00	13.50	65	YES	YES	CAN	4562	3093
0626589	C	17,000.00	10	100	14.00	16	.00	.00	.00	.00	.00			YES	CAN	4250	2078
5261297	C	17,000.00	10	50	14.00	16	.00	.00	4,880.00	.00	.00		YES	YES	CAN	5250	1453
0209561	C	4,000.00	10	100	15.00	20	.00	.00	.00	.00	1.40			YES	CAN	2437	2281
5475846	C	4,600.00	10	100	15.00	18	.00	150.00	2,000.00	.00	2.50	65	YES	YES	CAN	2250	1453
6824154	C	4,700.00		100	15.00	20	.00	25.00	1,000.00	.00	7.10	65	YES	YES	CAN	4250	3078
0441174	A	5,000.00	10	100	15.00	20	.00	.00	.00	.00	3.50	65		YES	CAN	4562	1468
1655383	C	5,300.00	10	75	15.00	18	.00	600.00	2,800.00	.00	1.58	65	YES	YES	CAN	3262	1438
5261127	A	5,300.00	10	100	15.00	18	.00	.00	2,820.00	.00	1.58	65	YES	YES	CAN	3250	1453
0730428	C	8,000.00	10	75	15.00	18	.00	.00	3,460.00	.00	.00		YES	YES	CAN	4562	1468
1655384	C	8,000.00	10	75	15.00	18	.00	200.00	3,500.00	.00	2.16	65	YES	YES	CAN	4262	1438
0598341	C	10,000.00	10	150	15.00	20	.00	20.00	3,870.00	.00	.00			YES	CAN	4250	2078
0207311	A	12,500.00	10	100	15.00	20	.00	.00	4,333.00	.00	.00			YES	CAN	4250	2078
4481769	E	12,500.00	10	75	15.00	18	.00	100.00	4,300.00	.00	4.20	65	YES	YES	CAN	2750	1453
5214347	A	13,000.00	10	75	15.00	18	.00	11.00	3,000.00	.00	4.00	65	YES	YES	CAN	4250	1473
0501545	C	13,500.00	10	100	15.00	20	.00	64.00	4,500.00	.00	.00			YES	CAN	4250	2078
5615956	C	15,000.00	10	75	15.00	18	.12	120.00	3,000.00	3.00	4.30	65	YES	YES	CAN	3250	1453
5214968	A	16,000.00	10	75	15.00	18	.00	66:00	4,900.00	.00	4.60	65	YES	YES	CAN	4750	1453
5261057	A	17,000.00	10	100	15.00	18	.00	.00	5,040.00	.00	3.88	65	YES	YES	CAN	4250	2077
5214180	A	21,000.00	10	75	15.00	20	.00	42.00	1,700.00	.00	6.70	85	YES	YES	CAN	4250	2078
0597943	C	25,000.00	10	150	15.00	20	.00	15.00	.00	.00	3.50	65		YES	CAN	6062	2093
6824153	C	27,000.00		100	15.00	20	.00	6.00	1,000.00	.00	23.00	85	YES	YES	CAN	4250	3078
1176712	A	31,000.00	10	100	15.00	18	.00	.00	.00	.00	10.50		YES	YES	CAN	4562	2593
5789792	C	31,000.00	10	100	15.00	18	.00	36.00	6,800.00	.00	7.00	65	YES	YES	CAN	4250	2078

PG. 3 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23645 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
5214367	A	36,000.00	10	75	15.00	18	.00	39.00	4,000.00	.00	8.30	65	YES	YES	CAN	3250	2578
5617166	C	36,000.00	10	75	15.00	18	.00	35.00	6,000.00	.00	8.00	65	YES	YES	CAN	5750	1453
5252739	C	52,000.00	10	75	15.00	18	.00	34.00	5,000.00	.00	8.20	65	YES	YES	CAN	4249	2073
5760613	A	54,000.00	10	50	15.00	18	.00	34.00	5,400.00	.00	10.50	65	YES	YES	CAN	4250	2578
5214963	A	63,000.00	10	75	15.00	18	.00	20.00	6,000.00	.00	10.70	65	YES	YES	CAN	4750	2578
5616166	C	63,000.00	10	75	15.00	18	.00	20.00	6,000.00	.00	10.70	65	YES	YES	CAN	4750	2605
5796429	C	93,000.00	10	75	15.00	18	.00	28.00	6,000.00	.00	13.60	65	YES	YES	CAN	5062	3093
8493425	C	93,000.00	10	75	15.00	18	.00	28.00	6,000.00	.00	13.60	65	YES	YES	CAN	4750	3078
5796393	C	120,000.00	10	75	15.00	18	.00	14.00	9,999.00	.00	24.00	65	YES	YES	CAN	5750	3078
8493424	C	120,000.00	10	75	15.00	18	.00	14.00	9,999.99	.00	24.00	65	YES	YES	CAN	4750	3078
5615516	C	180,000.00	10	75	15.00	18	.00	22.00	6,000.00	.00	19.40	65	YES	YES	CAN	5750	3078
2307044	C	210,000.00	10	75	15.00	18	.00	10.00	6,000.00	.00	23.60	65	YES	YES	CAN	5750	3073
4429631	C	240,000.00	10	75	15.00	18	.00	11.00	6,000.00	.00	18.00	65	YES	YES	CAN	5749	3078
5617164	C	300,000.00	10	75	15.00	18	.00	12.00	6,000.00	.00	20.00	65	YES	YES	CAN	7750	3078
0316139	A	12,500.00	10	150	16.00	20	.00	.00	4,470.00	.00	.00			YES	CAN	4250	2078
8519671	B	43,000.00	20	20	16.00	18	.00	7.20	5,000.00	.00	.00	65	YES	YES	CANDMF	3187	2078
0518151	C	11,500.00	10	100	18.00	25	.00	68.00	.00	.00	3.00		YES	YES	CAN	4250	2078
4429927	C	240,000.00	10	75	18.00	22	.00	10.00	6,000.00	.00	18.00		YES	YES	CAN	5749	3078
0208228	C	5,500.00	10	75	19.00	21	.00	.00	3,230.00	.00	.00	65	YES	YES	CAN	4250	1453
0208221	C	11,000.00	10	100	19.00	21	.00	.00	4,570.00	.00	.00		YES	YES	CAN	4250	2078
5475847	C	3,600.00	10	100	20.00	24	.00	160.00	2,000.00	.00	2.50	65	YES	YES	CAN	2250	1453
5616139	C	3,900.00	10	75	20.00	30	.00	90.00	.00	.00	2.90	65	YES	YES	CAN	2234	2500
0563839	C	7,000.00	10	50	20.00	30	.00	64.00	3,740.00	.00	3.00		YES	YES	CAN	4250	2078
5270508	C	8,400.00	10	100	20.00	30	.00	60.00	4,100.00	.00	.00		YES	YES	CAN	5250	1453
0589727	C	20,000.00	10	150	20.00	25	.00	15.00	6,320.00	.00	3.50			YES	CAN	6062	2093
1582840	A	46,000.00	10	75	20.00	24	.00	30.00	5,000.00	.00	11.00	65	YES	YES	CAN	4749	2077
2524760	C	180,000.00	10	75	20.00	25	.00	9.00	6,000.00	.00	23.60		YES	YES	CAN	8812	3109
5261277	C	7,500.00	10	50	21.00	24	.00	.00	3,970.00	.00	.00		YES	YES	CAN	4750	1453
0483106	C	1,500.00	10	100	25.00	30	.00	100.00	1,940.00	.00	.00			YES	CAN	2250	1453
5616535	C	1,500.00	10	100	25.00	30	1.00	.00	.00	940.00	.00	65	YES	YES	CAN	2432	1500
0483107	A	3,100.00	10	100	25.00	30	.00	500.00	.00	.00	1.54	65		YES	CAN	3562	1468
5252512	C	3,100.00	10	100	25.00	30	.00	500.00	2,780.00	.00	1.54	65	YES	YES	CAN	2250	1453
5214657	A	3,800.00	10	75	25.00	30	.00	32.00	2,000.00	.00	10.00	65	YES	YES	CAN	4750	2578
0360244	C	5,000.00	10	150	25.00	30	.00	300.00	.00	.00	2.40		YES	YES	CAN	4250	1453
5214699	C	5,200.00	10	50	25.00	30	.00	40.00	2,000.00	.00	9.50	60	YES	YES	CAN	4156	2016
5213591	C	6,600.00	10	50	25.00	30	.00	40.00	2,000.00	.00	.00		YES	YES	CAN	5656	1391
5214710	C	6,600.00	10	50	25.00	30	.00	40.00	2,000.00	.00	.00		YES	YES	CAN	5656	1452
0801605	A	7,000.00	10	100	25.00	30	.00	60.00	4,180.00	.00	.00			YES	CAN	3250	2078
0524669	C	7,500.00	10	100	25.00	40	.00	.00	4,330.00	.00	.00			YES	CAN	4250	2078
5214420	A	8,200.00	10	75	25.00	30	.00	120.00	3,000.00	.00	3.90	65	YES	YES	CAN	4250	1453
5796426	A	8,200.00	10	75	25.00	30	.00	120.00	6,000.00	.00	3.90	65	YES	YES	CAN	4250	1453
5214969	A	9,600.00	10	75	25.00	30	.00	.00	.00	.00	4.40	65	YES	YES	CAN	5062	1468
0501544	C	10,000.00	10	100	25.00	40	.00	75.00	.00	.00	3.10	65	YES	YES	CAN	4562	2093
0801604	A	10,000.00	10	100	25.00	30	.00	160.00	5,000.00	.00	.00		YES	YES	CAN	4250	2078
0801607	C	12,000.00	10	100	25.00	30	.00	140.00	5,480.00	.00	.00			YES	CAN	4750	2078
2572706	A	12,000.00	10	100	25.00	30	.00	140.00	5,470.00	.00	4.32	65	YES	YES	CAN	4250	2078
0801624	C	14,000.00	10	100	25.00	30	.00	103.00	5,920.00	.00	.00			YES	CAN	5250	2078
1143248	A	15,000.00	10	150	25.00	40	.00	.00	6,120.00	.00	4.00		YES	YES	CAN	4250	2578

PG. 4 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23645 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
5214372	A	18,000.00	10	75	25.00	30	.00	54.00	4,000.00	.00	7.30	65	YES	YES	CAN	4250	2078
5214373	A	21,000.00	10	75	25.00	30	.00	54.00	4,000.00	.00	8.20	65	YES	YES	CAN	3250	2578
5214965	A	22,000.00	10	75	25.00	30	.00	35.00	6,000.00	.00	8.30	65	YES	YES	CAN	4750	2078
5214952	A	55,000.00	10	100	25.00	30	.00	30.00	6,000.00	.00	12.00	65	YES	YES	CAN	5250	3078
2524764	C	71,000.00	10	75	25.00	30	.00	22.00	6,000.00	.00	16.80	65	YES	YES	CAN	6062	3093
2524792	C	100,000.00	10	75	25.00	30	.00	26.00	6,000.00	.00	17.20	65	YES	YES	CAN	5312	3109
5476430	C	2,600.00	10	100	30.00	40	.00	.00	1,600.00	.00	5.00	25	YES	YES	CAN	2250	1444
0322356	C	3,000.00			30.00		.00	.00	.00	.00	.00		YES	YES	CAN	4375	2062
0208237	C	4,000.00	10	150	30.00	45	.00	.00	.00	.00	.00			YES	CAN	4750	1468
8493246	C	4,500.00	10	75	30.00	45	.00	91.00	3,670.00	.00	3.70	65	YES	YES	CAN	3250	1453
5921776	A	8,000.00	10	75	30.00	40	.00	100.00	2,900.00	.00	3.20	65	YES	YES	CAN	4240	1460
5252715	C	8,400.00	10	75	30.00	40	.00	100.00	5,000.00	.00	6.00	65	YES	YES	CAN	3249	1406
5261077	C	8,900.00	10	100	30.00	40	.00	.00	5,170.00	.00	3.76	65	YES	YES	CAN	4250	2078
4481152	C	10,000.00	10	75	30.00	40	.00	82.00	5,500.00	.00	4.90	65	YES	YES	CAN	3250	1453
5214171	A	10,000.00	10	75	30.00	45	.00	50.00	1,550.00	.00	6.20	85	YES	YES	CAN	4250	2077
5252878	C	12,000.00	10	75	30.00	40	.00	67.00	3,600.00	.00	6.60	65	YES	YES	CAN	4187	1437
5616840	C	12,000.00	10	75	30.00	40	.08	.00	6,000.00	.00	5.50	65	YES	YES	CAN	4250	1453
1655382	C	16,000.00	10	75	30.00	40	.00	48.00	4,150.00	.00	8.10	65	YES	YES	CAN	4749	2063
5213837	C	16,000.00	10	75	30.00	40	.00	48.00	415.00	.00	8.10	65	YES	YES	CAN	4750	2078
5617167	C	16,000.00	10	75	30.00	40	.00	70.00	6,000.00	.00	5.00	65	YES	YES	CAN	5750	1828
8493325	C	22,000.00	10	75	30.00	40	.00	22.30	6,000.00	.00	9.80	65	YES	YES	CAN	4250	2078
4406545	C	24,000.00	10	75	30.00	40	.00	40.00	5,000.00	.00	7.10	65	YES	YES	CAN	4249	1812
5214366	A	24,000.00	10	75	30.00	40	.00	33.00	5,000.00	.00	9.10	65	YES	YES	CAN	4250	2578
4481346	C	25,000.00	10	75	30.00	40	.00	30.00	6,000.00	.00	9.80	65	YES	YES	CAN	3750	1828
5214174	A	34,000.00	10	75	30.00	45	.00	22.00	3,100.00	.00	12.60	85	YES	YES	CAN	5405	3077
5796427	A	54,000.00	10	75	30.00	40	.00	22.00	6,000.00	.00	16.70	65	YES	YES	CAN	5750	3078
8493378	C	54,000.00	10	75	30.00	40	.00	22.00	6,000.00	.00	16.70	65	YES	YES	CAN	6062	3093
5617001	C	69,000.00	10	75	30.00	40	.00	18.00	6,000.00	.00	14.00	65	YES	YES	CAN	4250	3078
6814385	C	69,000.00	10	75	30.00	40	.00	16.30	6,000.00	.00	13.00	65	YES	YES	CAN	5750	2590
1582841	A	77,000.00	10	75	30.00	40	.00	27.00	8.00	.00	16.00	65	YES	YES	CAN	5249	3077
4481559	C	78,000.00	10	75	30.00	40	.00	18.00	6,000.00	.00	14.40	65	YES	YES	CAN	4250	3078
5252740	C	100,000.00	10	75	30.00	40	.00	19.00	5,000.00	.00	19.00	65	YES	YES	CAN	5749	3062
5617056	C	110,000.00	10	75	30.00	40	.00	15.00	6,000.00	.00	19.00	65	YES	YES	CAN	5750	3078
4429898	C	150,000.00	10	75	30.00	40	.00	12.00	6,000.00	.00	25.60		YES	YES	CAN	5749	3078
1582581	C	2,200.00		100	32.00	45	.00	69.00	3,000.00	.00	8.00	65	YES	YES	CAN	4250	1453
0208238	C	10,000.00	10	100	33.00		.00	.00	.00	.00	3.10	65	YES	YES	CAN	4562	2093
0598340	C	5,000.00	10	150	36.00	40	.00	20.00	4,240.00	.00	.00			YES	CAN	4250	2078
5261129	A	1,800.00	10	100	40.00	50	.00	.00	2,680.00	.00	1.50	65	YES	YES	CAN	3250	1453
1589050	A	4,000.00	10	75	40.00	50	.13	.00	2,680.00	.00	3.90	65	YES	YES	CAN	3250	1453
0518152	C	4,500.00	10	100	40.00	60	.00	150.00	4,240.00	.00	1.70		YES	YES	CAN	4250	2078
5213458	C	7,200.00	10	50	40.00	50	.00	50.00	9,999.99	.00	8.00	65	YES	YES	CAN	5250	2078
5712125	C	7,200.00	10	50	40.00	50	.00	155.00	9,999.00	.00	4.24	65	YES	YES	CAN	4250	2578
6833780	C	8,700.00	10	75	40.00	50	.10	100.00	6,000.00	.00	4.30	65	YES	YES	CAN	3250	1453
5214167	C	9,800.00	10	75	40.00	55	.00	40.00	2,000.00	.00	7.60	85	YES	YES	CAN	5374	2078
5214168	C	14,000.00	10	75	40.00	55	.00	30.00	2,250.00	.00	9.70	85	YES	YES	CAN	4750	2578
5214073	C	32,000.00	10	75	40.00	50	.00	32.00	2,000.00	.00	13.20	65	YES	YES	CAN	6062	2593
4481690	C	40,000.00	10	75	40.00	50	.00	38.00	6,000.00	.00	8.50	65	YES	YES	CAN	4250	2578
5252993	C	48,000.00	10	75	40.00	50	.00	20.00	6,000.00	.00	16.00	65	YES	YES	CAN	6062	3031

Component Data Bank - P/N Catalog
Chassis, Can Aluminum Capacitors

PG. 5 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23645 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLE EVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
5617163	C	75,000.00	10	75	40.00	50	.00	15.00	6,000.00	.00	18.00	65	YES	YES	CAN	6750	3078
4430064	C	130,000.00	10	75	40.00	55	.00	10.00	6,000.00	.00	19.50	65	YES	YES	CAN	6000	3078
0208227	C	1,000.00	10	100	45.00	70	1.00	.00	.00	150.00	.00	65		YES	CAN	4562	1468
0208245	C	2,500.00	10	100	45.00	50	.00	.00	.00	.00	1.30	65		YES	CAN	4562	1471
0208235	C	5,500.00	10	100	45.00	50	.00	.00	4,970.00	.00	.00	65	YES	YES	CAN	4250	2078
0801645	C	5,500.00	10	100	45.00	50	.00	.00	4,970.00	.00	.00			YES	CAN	4250	2078
0526332	C	450.00	10	100	50.00	75	.00	.00	1,500.00	.00	.50			YES	CAN	3562	1468
0226417	C	1,000.00			50.00		.00	.00	.00	.00	.00			YES	CAN	3750	2063
5213798	A	1,300.00	10	75	50.00	65	.00	400.00	3,000.00	.00	1.60	65	YES	YES	CAN	2250	1453
2181753	A	1,500.00	10	100	50.00	65	.00	500.00	3,800.00	.00	2.70		YES	YES	CAN	3250	1453
0134954	A	2,000.00			50.00	60	.00	.00	.00	.00	.00			YES	CAN	5015	2015
0228626	C	2,000.00	10	150	50.00	75	.00	.00	.00	.00	3.00			YES	CAN	5000	1843
0252545	A	2,000.00			50.00		.00	.00	.00	.00	.00		YES	YES	CAN	4375	1812
0316138	A	2,000.00		100	50.00		.00	.00	3,160.00	.00	.00			YES	CAN	4250	2078
5214162	A	3,000.00	10	75	50.00	75	.00	96.00	1,200.00	.00	3.50	85	YES	YES	CAN	4750	1453
8493170	C	4,900.00	10	75	50.00	65	.00	185.00	4,900.00	.00	3.10	65	YES	YES	CAN	2750	1453
5214163	A	5,800.00	10	75	50.00	75	.00	560.00	2,100.00	.00	5.80	85	YES	YES	CAN	4250	2077
5615359	C	7,200.00	10	75	50.00	65	.00	87.00	3,600.00	.00	5.30	65	YES	YES	CAN	4250	1453
5214374	A	15,000.00	10	75	50.00	65	.00	40.00	.00	.00	.00	65	YES	YES	CAN	4250	2578
5214371	A	18,000.00	10	75	50.00	65	.00	34.00	6,000.00	.00	10.90	65	YES	YES	CAN	4750	2578
2361035	C	30,000.00	10	75	50.00	67	.00	34.00	6,000.00	.00	12.50	65	YES	YES	CAN	4750	2578
6814397	C	69,000.00	10	75	50.00	65	.00	15.20	6,000.00	.00	14.20	65	YES		CAN	4687	3091
8519126	C	69,000.00	10	75	50.00	65	.00	15.20	6,000.00	.00	14.20	65	YES	YES	CAN	4750	3047
5261287	A	2,000.00	10	50	55.00	65	.00	.00	3,320.00	.00	.00		YES	YES	CAN	4250	3443
5261477	C	3,000.00	10	50	55.00	65	.00	.00	4,060.00	.00	8.00	65	YES	YES	CAN	4250	2078
0501546	C	3,500.00	10	100	55.00	80	.00	160.00	4,390.00	.00	.00			YES	CAN	4250	2078
0563898	C	3,500.00	10	50	55.00	80	.00	160.00	4,390.00	.00	.00			YES	CAN	4250	2078
0441068	C	4,500.00	10	100	55.00	75	.00	.00	.00	.00	4.00			YES	CAN	4562	2093
5214967	A	4,600.00	10	75	55.00	65	.00	95.00	5,030.00	.00	4.20	65	YES	YES	CAN	4750	1453
0208222	A	5,000.00	10	100	55.00	61	.00	.00	.00	.00	.00			YES	CAN	4562	2093
0526161	C	5,000.00	10	100	55.00	61	.00	.00	5,240.00	.00	.00		YES	YES	CAN	4250	2078
0608179	C	5,000.00	10	100	55.00	60	.00	160.00	5,240.00	.00	.00		YES	YES	CAN	4250	2078
2158757	C	6,000.00	10	150	55.00	61	.00	.00	2,750.00	.00	2.20	65	NO	YES	CAN	4562	2093
2572798	C	6,000.00	10	50	55.00	65	.00	38.00	5,740.00	.00	.00	65	YES	YES	CAN	4250	2078
5266095	C	6,000.00	10	50	55.00	65	.00	38.00	5,740.00	.00	.00		YES	YES	CAN	4750	2078
0122622	A	8,000.00			55.00	65	.00	.00	.00	.00	.00			YES	CAN	5266	3093
0140470	C	8,000.00	10	75	55.00	65	.00	.00	.00	.00	.00			YES	CAN	5266	3093
5214962	A	10,000.00	10	75	55.00	65	.00	45.00	6,000.00	.00	7.80	65	YES	YES	CAN	4750	2078
5266023	C	10,000.00	10	50	55.00	65	.00	.00	7,420.00	.00	.00		YES	YES	CAN	4750	2578
5708947	C	15,000.00	10	75	55.00	80	.00	40.00	6,000.00	.00	9.80	65	YES	YES	CAN	4562	3093
5239119	C	18,000.00	10	75	55.00	65	.00	34.00	6,000.00	.00	.00		YES	YES	CAN	4750	2578
0316997	C	20,000.00	10	150	55.00	65	.00	.00	6,000.00	.00	.00		YES	YES	CAN	5750	3078
2281069	C	34,000.00	10	75	55.00	70	.00	.00	6,000.00	.00	17.60	65	YES	YES	CAN	6062	3093
4429633	C	69,000.00	10	75	55.00	65	.00	13.00	6,000.00	.00	17.00	65	YES	YES	CAN	5749	3078
0218704	C	2,500.00			70.00		.00	.00	.00	.00	.00			YES	CAN	4625	2563
0595251	C	3,600.00	10	150	70.00	80	.00	160.00	5,020.00	.00	.00			YES	CAN	4250	2078
0483108	A	900.00	10	75	75.00	95	1.10	.00	.00	.00	1.44	65		YES	CAN	3562	1468
4481040	C	950.00	10	75	75.00	90	.00	180.00	1,600.00	.00	2.80	65	YES	YES	CAN	2250	1453

PG. 6 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23645 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
5214406	A	950.00	10	75	75.00	90	.00	180.00	1,600.00	.00	2.80	65	YES	YES	CAN	2562	1468
0336788	C	1,000.00	10	100	75.00	100	.00	.00	.00	.00	.00			YES	CAN	4500	2063
5214317	A	1,100.00	10	50	75.00	100	.00	210.00	1,000.00	.00	2.40	65	YES	YES	CAN	4250	1453
5252708	C	1,600.00	10	75	75.00	95	.00	200.00	2,000.00	.00	2.00	65	YES	YES	CAN	2249	1437
5261368	A	1,600.00	10	50	75.00	90	.00	.00	3,460.00	.00	.00		YES	YES	CAN	4750	1453
5214159	A	2,500.00	10	75	75.00	100	.00	94.00	1,300.00	.00	4.50	85	YES	YES	CAN	4250	2078
5709383	A	2,500.00	10	50	75.00	95	.00	150.00	.00	.00	3.50	65	YES	YES	CAN	4562	1468
5252748	C	3,000.00	10	75	75.00	95	.00	134.00	2,800.00	.00	4.50	65	YES	YES	CAN	3249	1438
0801606	C	3,100.00	10	75	75.00	95	.00	.00	4,820.00	.00	.00			YES	CAN	4250	2078
5261087	A	3,100.00	10	75	75.00	95	.00	.00	3,970.00	.00	3.60	65	YES	YES	CAN	4250	2078
0208232	A	3,500.00	10	100	75.00	100	.00	.00	5,120.00	.00	.00	65	YES	YES	CAN	4250	2078
0801608	A	3,600.00	10	75	75.00	95	.00	300.00	5,200.00	.00	4.08		YES	YES	CAN	4750	2078
0480749	A	3,750.00	10	100	75.00	83	.00	.00	5,300.00	.00	4.25	65		YES	CAN	4250	2078
2572809	C	5,000.00	10	50	75.00	95	.00	.00	6,120.00	.00	13.00	65	YES	YES	CAN	4250	2078
5214160	A	5,000.00	10	50	75.00	100	.00	50.00	2,000.00	.00	7.40	85	YES	YES	CAN	4750	2578
5261369	A	5,000.00	10	50	75.00		.00	.00	6,120.00	.00	13.00	65	YES	YES	CAN	4750	2078
0598881	C	6,000.00	10	150	75.00	85	.00	30.00	6,710.00	.00	.00			YES	CAN	5750	2078
5214365	A	6,700.00	10	75	75.00	95	.00	65.00	4,000.00	.00	7.00	65	YES	YES	CAN	3250	2578
6833781	C	9,500.00	10	75	75.00	95	.07	70.00	6,000.00	.00	7.50	65	YES	YES	CAN	4250	2093
4430074	C	11,000.00	10	75	75.00	95	.00	25.00	6,000.00	.00	9.10	65	YES	YES	CAN	4251	2079
5214233	C	20,000.00	10	100	75.00	95	.00	30.00	6,000.00	.00	14.00	65	YES	YES	CAN	5562	3093
1590111	A	37,000.00	10	75	75.00	95	.00	26.00	6,000.00	.00	18.20	65	YES	YES	CAN	5749	3077
0520846	C	1,000.00	10	150	80.00	100	.00	.00	2,830.00	.00	.00			YES	CAN	4250	1453
0334810	C	1,500.00	10	150	80.00	105	.00	.00	3,460.00	.00	2.00		YES	YES	CAN	4250	2078
0515385	C	2,500.00	10	150	80.00	100	.00	.00	4,470.00	.00	.00			YES	CAN	4250	2078
0254835	C	1,500.00	10	150	100.00	135	.00	600.00	3,870.00	.00	1.10	65		YES	CAN	4562	2093
5253786	A	6,000.00	10	75	100.00	125	.00	25.00	6,000.00	.00	8.90	65	YES	YES	CAN	4750	2578
0476359	C	1,800.00	10	150	125.00	160	.00	.00	.00	.00	.00		YES	YES	CAN	5000	2063
0316136	C	250.00	10	100	150.00		.00	.00	1,940.00	.00	.00			YES	CAN	4250	1453
0252600	C	1,000.00	10	100	150.00	200	.00	.00	.00	.00	.00		YES	YES	CAN	4750	2092
0316135	C	1,500.00	10	150	150.00		.00	.00	4,740.00	.00	.00			YES	CAN	4250	2078
6833782	C	10,000.00	7	75	150.00	175	.40	400.00	6,000.00	.00	9.00		YES	YES	CAN	5250	3078
0515386	C	1,250.00	10	150	180.00	200	.00	.00	.00	.00	.00			YES	CAN	4250	2078
0236675	C	15.00	10	50	200.00		.00	.00	.00	.00	.00			YES	CAN	2063	844
0167726	C	200.00	10	150	200.00	250	.00	.00	.00	.00	.00			YES	CAN	4000	1500
1589047	A	300.00	10	75	200.00	250	.52	.00	1,470.00	.00	1.50	65	YES	YES	CAN	2217	1406
8493930	C	440.00	10	50	200.00	250	.00	400.00	3,000.00	.00	3.00	65	YES	YES	CAN	2750	1453
0301870	C	500.00	10	150	200.00	250	.00	.00	.00	.00	.00		YES	YES	CAN	4250	2078
2102147	C	500.00	10	150	200.00		.00	.00	.00	800.00	.00		YES	YES	CAN	5000	2063
2572754	C	500.00	10	50	200.00	250	.00	.00	3,160.00	.00	.00	65	YES	YES	CAN	4750	2078
5261375	C	500.00	10	50	200.00	400	.00	.00	3,160.00	.00	.00		YES	YES	CAN	4750	3078
8493247	C	500.00	10	75	200.00	250	.00	240.00	3,600.00	.00	1.80	65	YES	YES	CAN	3250	1453
1589177	A	590.00	10	50	200.00	250	.26	.00	2,100.00	.00	2.50	65	YES	YES	CAN	3250	1453
5252926	C	1,100.00	10	75	200.00	250	.00	210.00	3,000.00	.00	3.80	65	YES	YES	CAN	3217	2062
8493192	C	1,400.00	10	75	200.00	250	.00	120.00	5,300.00	.00	4.00	65	YES	YES	CAN	3250	2078
1582628	C	2,000.00	10	50	200.00	250	.00	120.00	3,800.00	.00	5.10	65	YES	YES	CAN	4249	2077
8519607	C	2,000.00	10	50	200.00	250	.00	120.00	3,800.00	.00	5.10	65	YES	YES	CAN	4249	2077
6832313	C	2,500.00	10	75	200.00	250	.00	150.00	6,000.00	.00	5.00	65	YES	YES	CAN	3750	2578

PG. 7 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23645 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	TUC	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLEEVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
1582627	A	2,900.00	10	50	200.00	250	.00	80.00	4,300.00	.00	7.30	65	YES	YES	CAN	5749	2077
5252722	C	2,900.00	10	50	200.00	250	.00	82.00	5,000.00	.00	8.20	65	YES	YES	CAN	4749	2562
8493169	C	2,900.00	10	75	200.00	250	.00	120.00	7,600.00	.00	6.30	65	YES	YES	CAN	4750	2078
5261442	C	3,200.00	10	50	200.00		.00	89.00	6,000.00	.00	5.10	65	YES	YES	CAN	4250	3078
5252678	C	4,400.00	10	75	200.00	250	.00	55.00	6,000.00	.00	10.80	65	YES	YES	CAN	5250	3078
5252611	E	6,400.00	10	100	200.00	250	.00	35.00	6,000.00	.00	6.00	65	YES	YES	CAN	8656	2515
5213348	C	240.00	10	75	300.00	350	.00	.00	.00	960.00	.00	65	YES	YES	CAN	3220	1440
2361408	C	3,100.00	10	75	300.00	350	.00	80.00	6,000.00	.00	10.00	65	YES	YES	CAN	5750	3078
0515387	C	500.00	10	150	310.00	360	.00	.00	3,940.00	.00	1.25		YES	YES	CAN	4250	2078
1589046	A	130.00	10	75	400.00	475	1.20	.00	1,450.00	.00	1.00	65	YES	YES	CAN	2187	1781
1589176	A	200.00	10	50	400.00	475	.90	.00	1,700.00	.00	1.40	65	YES	YES	CAN	3250	1453
8493931	C	200.00	10	50	400.00	475	.00	780.00	2,800.00	.00	2.10	65	YES	YES	CAN	2750	1453
8493245	C	250.00	10	75	400.00	475	.00	428.00	3,160.00	.00	1.50	65	YES	YES	CAN	3750	1453
5252925	C	440.00	10	75	400.00	475	.00	520.00	2,500.00	.00	2.20	65	YES	YES	CAN	3217	2062
1582630	A	680.00	10	50	400.00	475	.00	460.00	3,100.00	.00	2.80	65	YES	YES	CAN	4249	2077
5252724	C	910.00	10	50	400.00	475	.00	260.00	4,000.00	.00	4.60	65	YES	YES	CAN	4687	2562
1582629	A	1,000.00	10	50	400.00	475	.00	270.00	3,800.00	.00	3.90	65	YES	YES	CAN	5749	2077
5261374	C	1,000.00	10	50	400.00	475	.00	150.00	6,000.00	.00	.00		YES	YES	CAN	4750	3078
5261462	C	1,000.00	10	50	400.00	475	.00	193.00	6,320.00	.00	3.40	65	YES	YES	CAN	4250	3078
5252671	C	2,200.00	10	75	400.00	475	.00	90.00	6,000.00	.00	8.00	65	YES	YES	CAN	5562	3093
0435232	C	50.00	10	50	450.00	525	.00	.00	1,500.00	.00	.34		YES	YES	CAN	3250	1453
0255911	C	100.00	10	100	450.00	525	5.00	.00	2,120.00	300.00	.00	65	YES	YES	CAN	4875	2090
1582639	A	100.00	10	50	450.00	525	1.70	.00	1,300.00	.00	1.10	65	YES	YES	CAN	3562	1468

TOTAL RECORDS 311

ALUMINUM CAPACITORS

COMPONENT DATA BANK - P/N CATALOG

DCS CODES

23646 - AC
23649 - Specials

PG. 1 06/30/82 23:30 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23646 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLE EVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
0804816	A	.00			.00		.00	.00	.00	.00	.00				NODATA		
0736326	C	130.00			.00		.00	.00	.00	.00	.00		NO	NO	CAN AC	5000	2093
0311536	N	193.00			.00		.00	.00	.00	.00	.00			NO	ACMTRS		
0847160	C	300.00	10	10	.00		.00	.00	.00	.00	.00		NO	NO	CAN AC	3440	2080
0847162	C	337.00	10	10	.00		.00	.00	.00	.00	.00		NO	NO	CAN AC	4875	2064
0249382	C	378.00			.00		.00	.00	.00	.00	.00		YES	NO	CAN AC	4500	2062
0847161	C	649.00	10	10	.00		.00	.00	.00	.00	.00		NO	NO	CAN AC	3440	2080
0755450	C	98.00	10	10	125.00	156	.00	.00	.00	.00	.00		NO	NO	ACMTR	3562	2093

TOTAL RECORDS 8

PG. 1 06/30/82 23:31 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/AC DCS#N EQ 23649 PN TECH AC/PAR1 SEQ/LH AC/WORK/V,AC/CAP/MFD NO/LIMIT.

PART NUMBER	T U C	CAPACITANCE MFD	TOL - %	TOL + %	DC W VOLTAGE VOLTS	SURGE VOLTAGE VOLTS	ESR MAX 120HZ 25C OHMS	ESR MAX 120HZ 25C MILOHMS	DCL @25C MICAMPS	RMS MAX @120HZ MILAMPS	RMS MAX @120HZ AMPS	RMS TEMP	SLE EVE	POLARITY	TYPE	MAX LGTH MILS	MAX DIAM MILS
5214700	C	.00			.00		.00	.00	.00	.00	.00		NO	YES	SPECAL	3560	1470
8519185	B	57,000.00	20	20	5.00	6	.00	7.80	3,200.00	.00	.00	65	YES	YES	CANDMF	2249	2078
4481975	C	240,000.00	10	75	7.50	9	.00	13.00	9,999.99	.00	15.00	65	YES	YES	CAN	3750	3078
4481968	C	300,000.00	10	75	7.50	9	.00	14.00	6,000.00	.00	15.00	65	YES	YES	CAN	4718	3078
4481974	C	48,000.00	10	75	10.00	12	.00	37.00	4,100.00	.00	8.60	65	YES	YES	CAN	3250	2578
4481970	C	54,000.00	10	75	10.00	12	.00	44.00	4,400.00	.00	6.80	65	YES	YES	CAN	4718	1812
4481971	C	97,000.00	10	75	10.00	12	.00	30.00	5,900.00	.00	14.40	65	YES	YES	CAN	5750	2078
4481967	C	14,000.00	10	75	13.00	15	.00	.00	4,300.00	.00	3.85	65	YES	YES	CAN	4249	2078
2706647	C	18,000.00	10	75	15.00	20	.00	40.00	.00	.00	3.90	85	YES	YES	CAN	4460	1410
4481973	C	36,000.00	10	75	15.00	18	.00	39.00	4,000.00	.00	8.30	65	YES	YES	CAN	3230	2578
2706648	C	19,000.00	10	75	30.00	45	.00	30.00	.00	.00	6.00	85	YES	YES	CAN	3460	2520
4481972	C	24,000.00	10	75	30.00	40	.00	40.00	5,000.00	.00	7.10	65	YES	YES	CAN	4249	1812
2706649	C	5,800.00	10	75	40.00	50	.00	95.00	.00	.00	2.00	85	YES	YES	CAN	3460	1410
4481969	C	48,000.00	10	75	40.00	50	.00	20.00	6,000.00	.00	15.00	65	YES	YES	CAN	5750	3078
2245094	C	100.00	10	150	50.00	70	.00	.00	.00	.00	.00		YES	YES	RADDMF	1375	625
0752235	A	250.00	10	100	50.00	75	2.40	.00	112.00	350.00	.00	65	YES	YES	CAN	2562	1500
0602746	C	11,000.00	10	100	55.00	65	.00	.00	.00	.00	.00			YES	CAN	4500	3000
2245093	C	750.00	10	100	75.00	100	.00	.00	.00	.00	.00		YES	YES	CAN	3560	1030
5214865	C	340.00	10	100	150.00	200	.00	.00	.00	.00	.00			YES	CAN	3593	1078
2396454	A	400.00	10	100	200.00	250	.00	500.00	.00	.00	2.00		YES	YES	RADDMF	3112	1485
5213983	C	750.00	10	100	200.00	250	.00	.00	.00	.00	.00			YES	CAN	4063	1501
5214864	C	750.00	10	100	200.00	250	.00	.00	.00	.00	.00			YES	CAN	4062	1375
0450955	N	20.00			450.00		.00	.00	.00	.00	.00		YES	YES	CAN	3000	1375

TOTAL RECORDS 23