INTRODUCTION TO POTENTIOMETER COMPONENTS

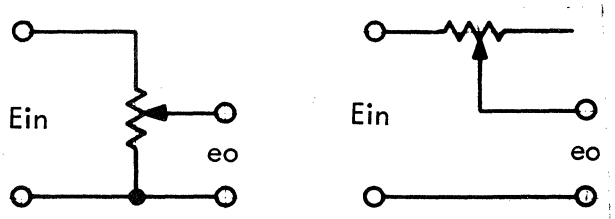
GENERAL

"Potentiometer" is the most common of a number of terms which have evolved over the years for variable resistor devices. Among the more common generic names are:

adjustable resistor
control
adjustable potentiometer
pot
rheostat
trimmer
volume control
tweaker
variable resistor

A list of the number of potentiometer (or "pot") applications would be endless. Basically, however, they can all be categorized into one of two operational modes: the variable voltage divider mode, or the variable current (rheostat) mode.

Potentiometers may be divided into two groups: card (PR board) mounted and panel (bushing) mounted, both of which have wide usage within IBM. The card mounted "trimmers" are used in applications where very few adjustments are required. In these applications, the potentiometers are used to compensate for the various unpredictable errors which may occur in a circuit design. Panel mounted pots are generally used in control type functions. In these applications, frequent and convenient adjustments are generally required. Both potentiometer types are classified as either wirewound or non-wirewound and utilize the following five types of resistive elements:



TYPE I (CARBON COMPOSITION) - The resistor element is made by molding carbon granules and an organic binder together. The TCR varies greatly with ohmic value for a type I potentiometer.

Ohmic Value Range	Maximum TCR
<10,000 Ω	±0.05%/°C
10k Ω to 100K Ω	±0.06%/°C
100k Ω to 1 MΩ	±0.08%/°C
>1 MΩ	±0.09%/°C

TYPE II (CARBON FILM) - The resistor element is made by depositing a film of carbon on a ceramic substrate. The maximum TCR is typically ±0.06%/°C.

TYPE III (METAL GLAZE OR CERMET) - The resistor element is made by screening a thick film composition of precious metals on a ceramic substrate. The maximum TCR range is typically ±0.025%/°C.

TYPE IV (METAL FILM) - The resistor element is made by vapor deposition or bonding a metal film on a ceramic substrate. The maximum TCR range is typically ±0.020%/°C.

TYPE V (WIRE) - The resistor element is made by winding many turns of fine wire around a bobbin or substrate. The maximum TCR range is typically ±0.007%/°C.

Potentiometers are available in ohmic values of 10 Ω to several megohms, and in power ratings up to 1 watt.

DEFINITIONS

Some of the more commonly referred to terms are:

TOTAL RESISTANCE (RT) - The dc resistance between the input terminals with the wiper positioned to either end stop, or in dead band for continuous rotation potentiometers.

ABSOLUTE MINIMUM RESISTANCE (RM) - The resistance measured between the wiper terminal and each end terminal with the wiper positioned to give a minimum value.

END RESISTANCE (RE) - The resistance measured between the wiper terminal and an end terminal when the wiper is positioned at the corresponding end of mechanical travel. Absolute minimum resistance and end resistance are synonymous for continuous rotation trimmers.

TEMPERATURE COEFFICIENT OF RESISTANCE (TCR) - The unit change in resistance per degree Celsius change from a reference temperature, expressed in parts per million per degree Celsius as follows:

$$TCR = \frac{R_2 - R_1}{R_1 (T_2 - T_1)} \times 10^6$$

where:

R_1 = resistance at reference temperature in ohms.

R_2 = resistance at test temperature in ohms.

T_1 = reference temperature in degrees Celsius.

T_2 = test temperature in degrees Celsius.

RESISTANCE - TEMPERATURE CHARACTERISTIC (RTC) - The difference between the total resistance values measured at a reference temperature of 25°C and the specified test temperature expressed as a percent of the total resistance.

$$RTC = \frac{R_2 - R_1}{R_1} \times 100$$

where:

R_1 = resistance at reference temperature (25°C) in ohms.

R_2 = resistance at the test temperature in ohms.

CONTACT RESISTANCE VARIATION (CRV) - The apparent resistance seen between the wiper and the resistance element when the wiper is energized with a specified current and moved over the adjustment travel in either direction at a constant speed. The output variations are measured over a specified frequency bandwidth, exclusive of the effects due to roll-on or roll-off of the terminations and is expressed on ohms or % of R_t.

EQUIVALENT NOISE RESISTANCE (ENR) - Wirewound only. Any spurious variation in the electrical output not present in the input, defined quantitatively in terms of an equivalent parasitic, transient resistance in ohms, appearing between the contact and the resistive element when the shaft is rotated or translated. The equivalent noise resistance is defined independently of the resolution, functional characteristics and the total travel. The magnitude of the equivalent noise resistance is the maximum departure from a specific reference line. The wiper of the potentiometer is required to be excited by a specific current and moved at a specific speed.

CONTINUITY - Continuity is the maintenance of continuous electrical contact between the wiper and both end terminals of the resistive element.

SETTING STABILITY - The amount of change in the output voltage, without readjustment, expressed as a percentage of the total applied voltage.

DIELECTRIC STRENGTH - The ability to withstand the application of a specified potential of a given characteristic, between the terminals and all other external conducting members such as shaft, housing and mounting hardware without exceeding a specified leakage current value.

INSULATION RESISTANCE - The resistance to a specified dc voltage impressed between the terminals and all other external conducting members such as shaft, housing and mounting hardware.

POWER RATING - The maximum power that a trimming potentiometer can dissipate across the total resistive element under specified conditions while meeting specified performance requirements.

ROTATIONAL LIFE - The number of cycles obtainable under specific operating conditions while remaining within specified allowable degradation. A cycle is defined as one complete traversal of the wiper over the resistive element in both directions.

CARD MOUNTED TRIMMER POTENTIOMETERS

DESCRIPTION

Trimmers are available with both single turn and multi-turn wiper mechanisms. The multi-turn are more expensive than the single turn but provide an improvement to setability.

Figures 3-1 through 3-4 present the standard body styles used at IBM. Performance characteristics, design characteristics, and specifications are detailed in Section 3-3.

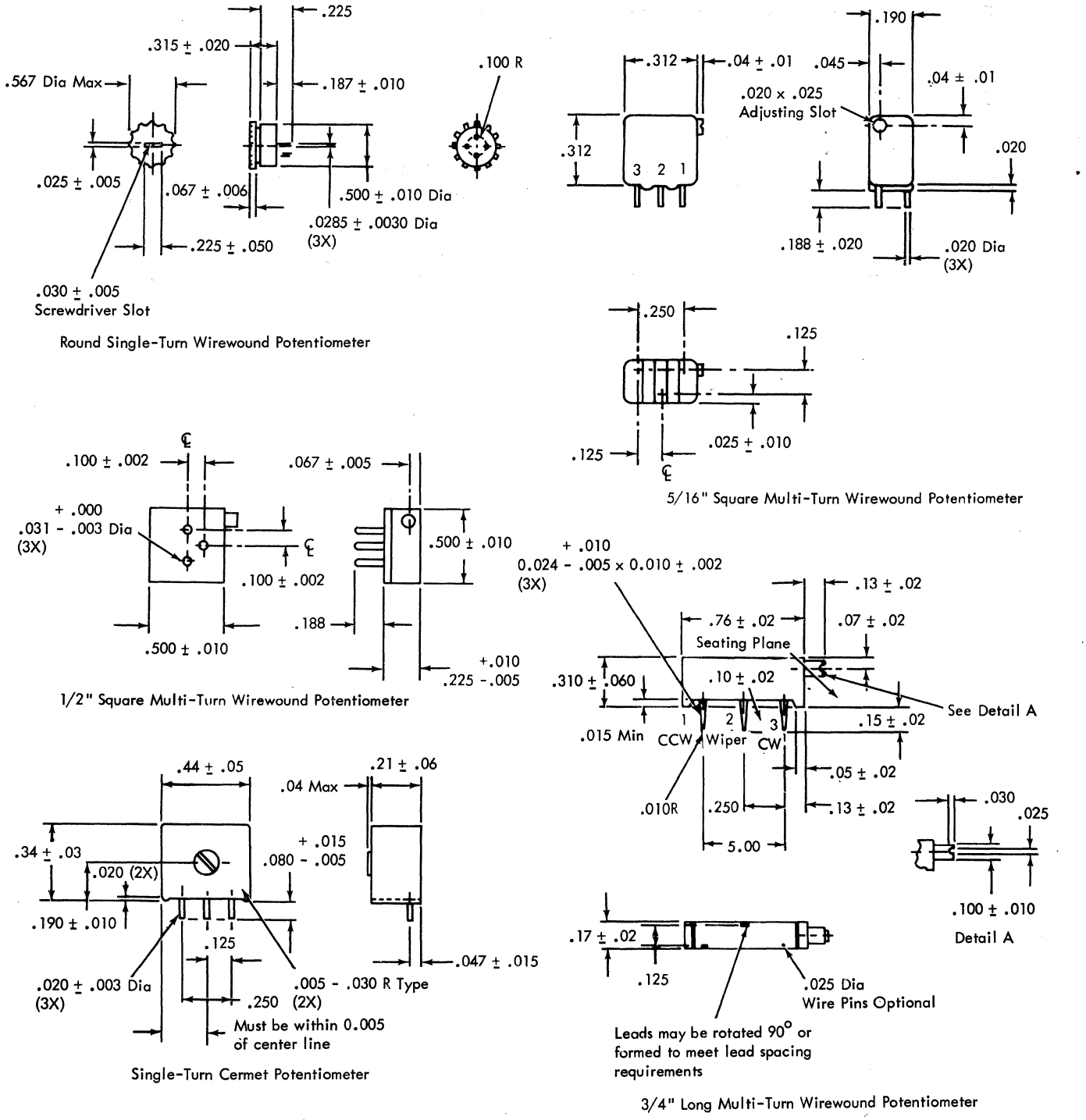


Figure 3-1. Card Mounted Potentiometers

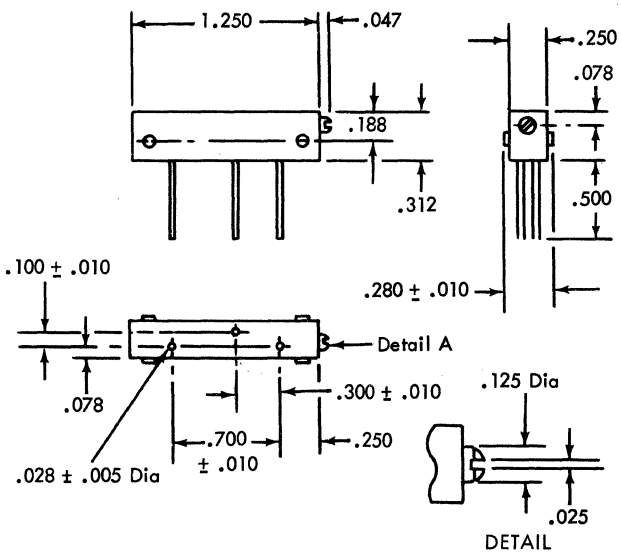


Figure 3-2. 1/1-4" Long Multi-Turn Film Potentiometer

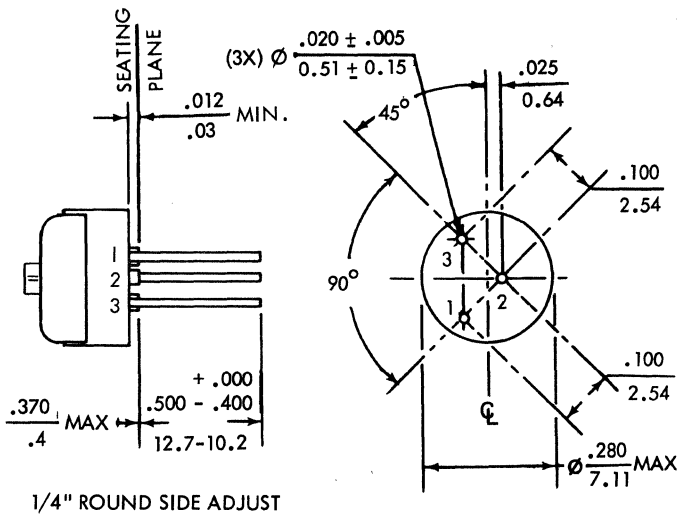


Figure 3-3. Single-Turn Cermet Potentiometer

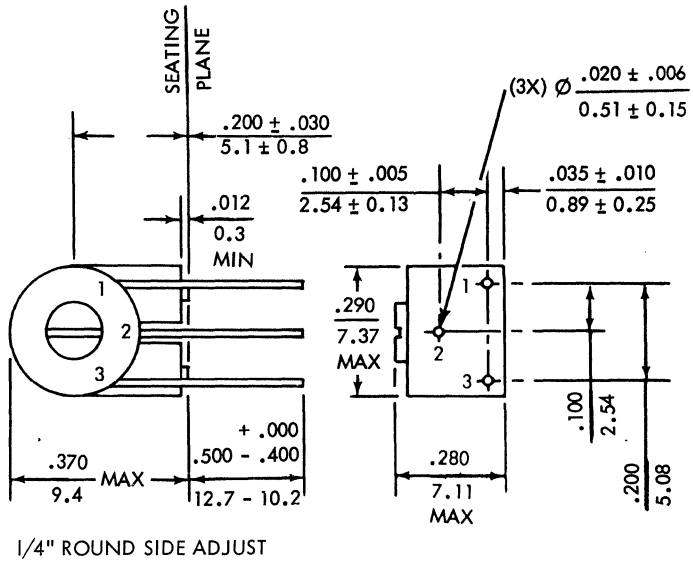
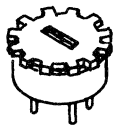
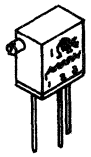


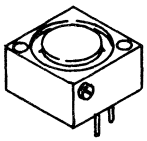
Figure 3-4. Single-Turn Cermet Potentiometer



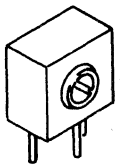
1/2" ROUND
WIREWOUND



5/16 SQUARE
WIREWOUND

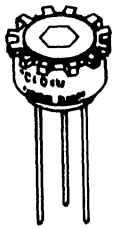


1/2" SQUARE
WIREWOUND

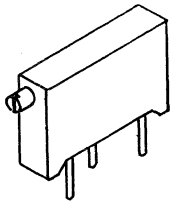


1/2 x 1/4"
CERMET

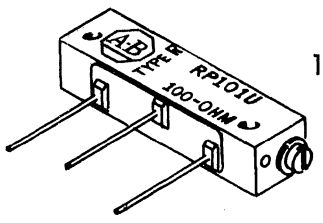
1/4" ROUND
CERMET



1/2" CARBON



3/4" RECTANGULAR
CERMET OR
WIREWOUND



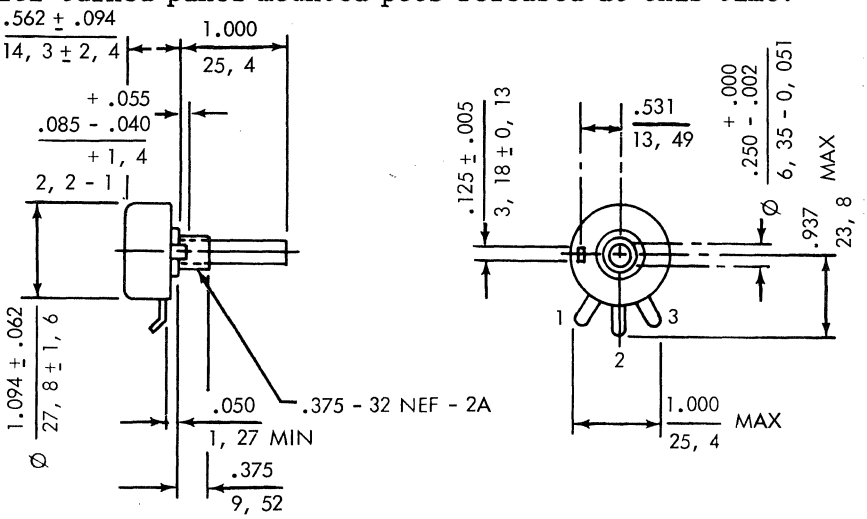
1 1/4" CARBON

Figure 3-5. Typical Trimmer Pot Configurations

PANEL MOUNTED POTENTIOMETERS

GENERAL

Panel mounted potentiometers are available with both single turn and multi-turn wiper mechanisms. The multi-turns are more expensive than the single turns and are generally found only in control applications requiring extreme accuracy. The outlines shown in Figure 3-6 are all single turn units, because there are no multi-turned panel mounted pots released at this time.



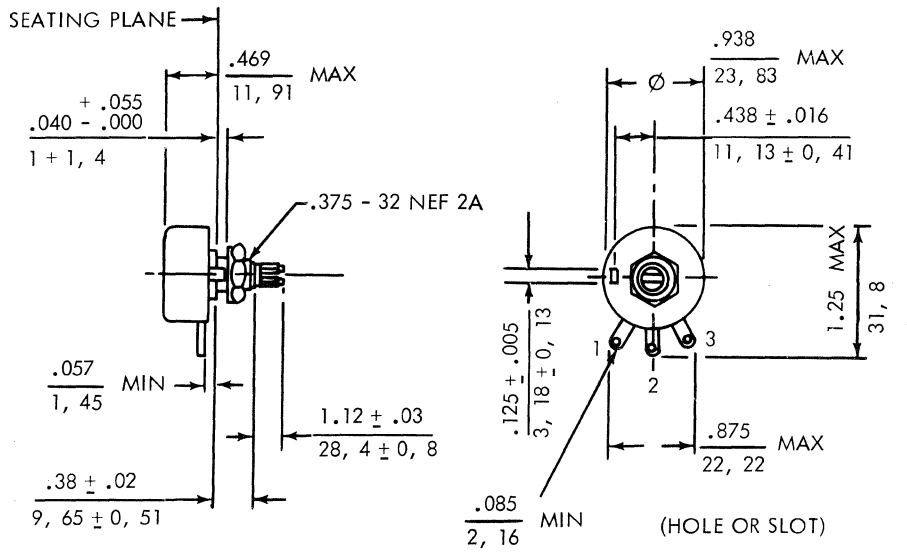
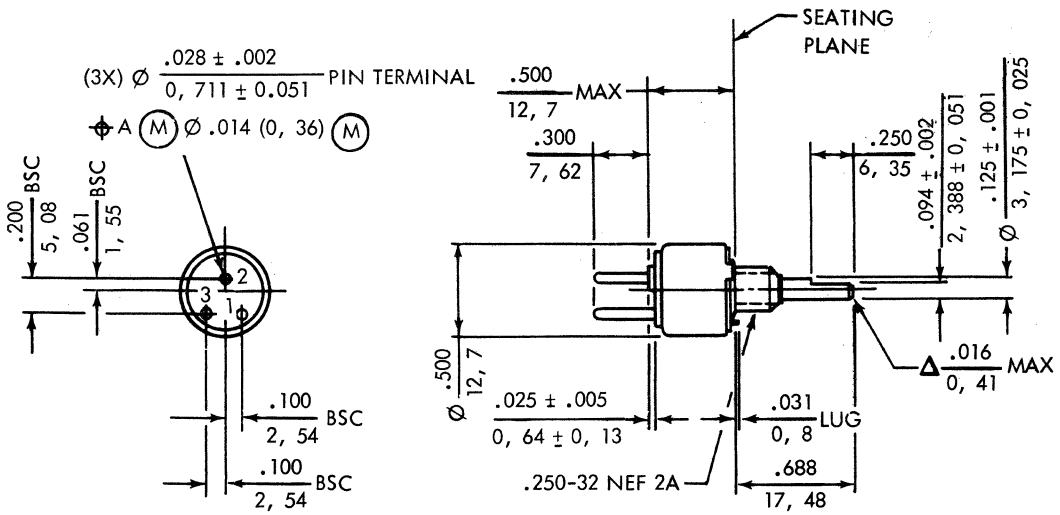


Figure 3-6. Panel Mounted Potentiometers (Part 1 of 2)



ALL DIMENSIONS (INCHES)

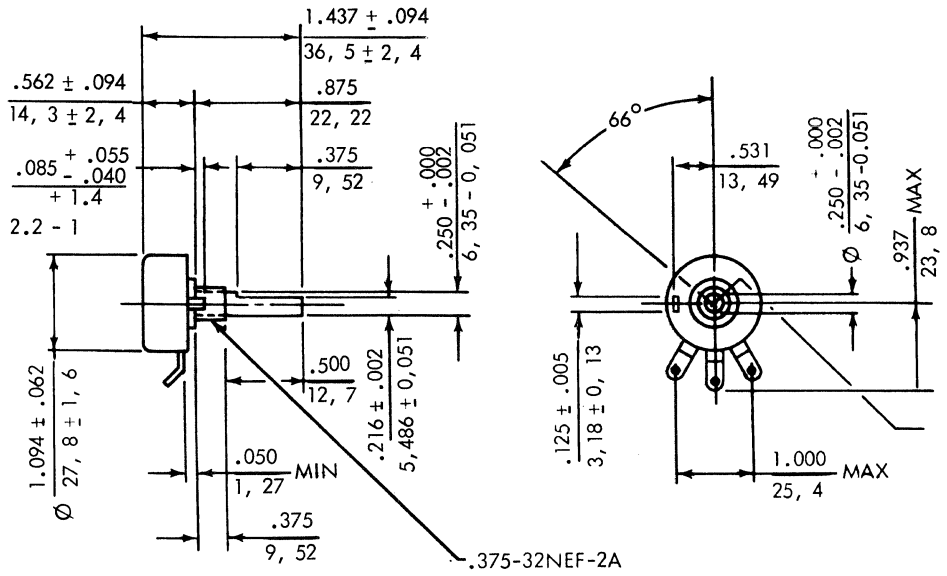


Figure 3-6. Panel Mounted Potentiometers (Part 2 of 2)

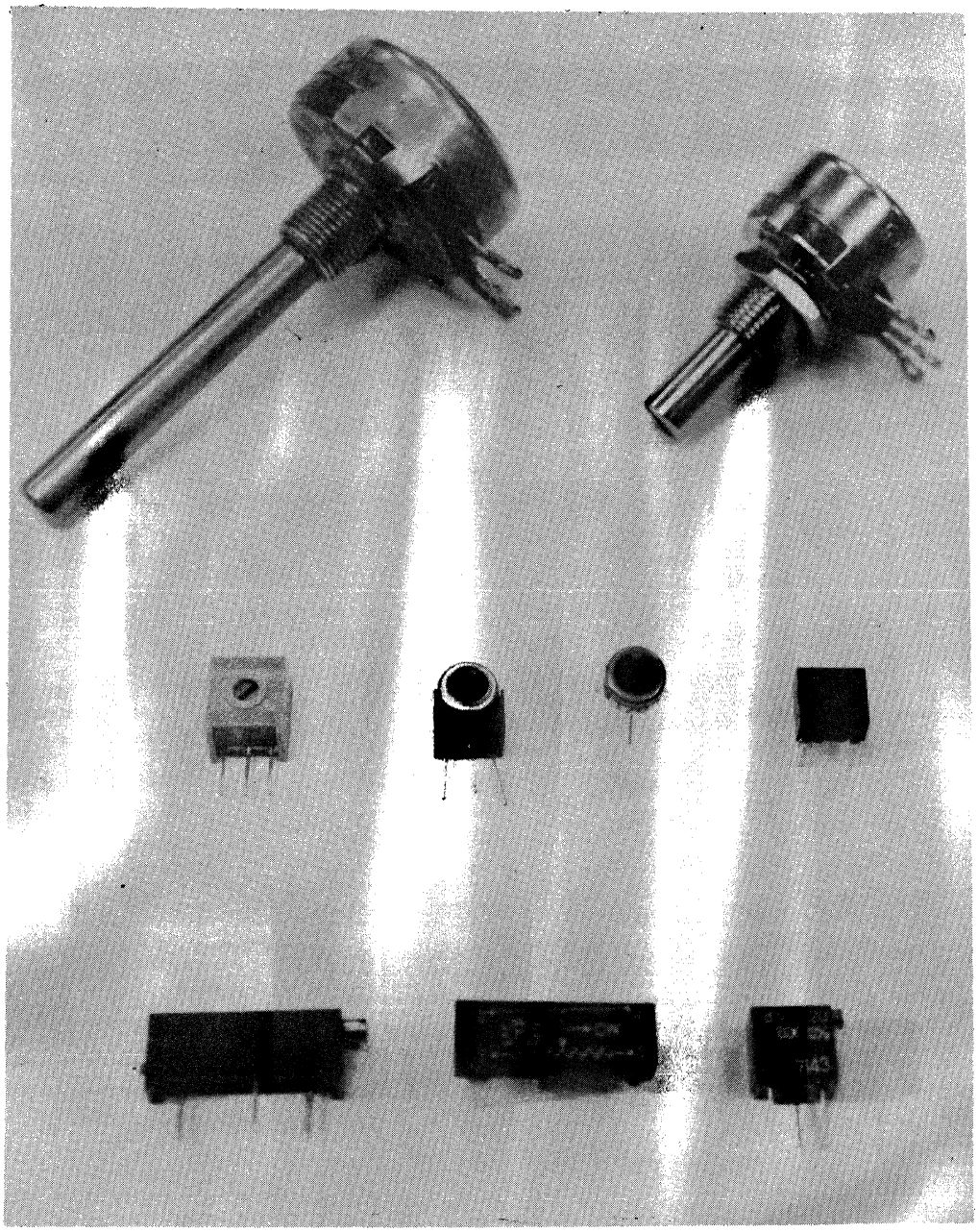


Figure 3-7. Panel Mounted and Trimmer Potentiometers

CARD AND PANEL MOUNTED POTENTIOMETERS

PERFORMANCE CHARACTERISTICS

Resolution

Wirewound potentiometers have relatively poor resolution since the resistance transition is actually a step function resulting from the wiper contact moving from one turn of wire to the next. The higher resistance values have better resolution than lower values due to the turns of wire being closer together. Non-wirewound potentiometers have excellent resolution since they provide a continuous wiper path. However, resolution is affected by resistor element surface uniformity, and the mechanical capabilities of the wiper element. The Metal Film potentiometer has the most uniform resistor surface and gives the best resolution of any of the potentiometer types.

Setability

Potentiometer setability is affected by many physical parameters such as:

1. The length of resistor element - the longer the resistor element the better the setting resolution.
2. The surface uniformity of the resistor element.
3. The number of turns the pot is capable of - Multi-turn pots have better setability than single turn pots.
4. Equivalent noise resistance (ENR).
5. Contact resistance variation (CRV).

The initial adjustment of a potentiometer can not be expected to remain constant throughout the life of the application. Setting stability is affected by time, temperature and mechanical stresses. The more severe the thermal and mechanical environment the greater the variation in resistance value from initial "hit".

Wiper Contact Resistance

EQUIVALENT NOISE RESISTANCE (WIREWOUND) - Pots with wirewound resistance elements use the parameter equivalent noise resistance (ENR) to specify variations in resistance between the wiper and the element. The ENR is a theoretical (lumped parameter) resistance, in series with the wiper output termi-

nal. This resistance will produce an equivalent loss in an ideal potentiometer. The most common specification for ENR is 100 Ω, maximum.

CONTACT RESISTANCE VARIATION (NON-WIREWOUND) - Pots having non-wirewound resistance elements use the parameter contact resistance variation (CRV) to specify changes in resistance between the wiper and the resistance element; as with wirewound potentiometers, it is a theoretical (lumped parameter) resistance, in series with the wiper terminal. The CRV is typically expressed either in ohms, or as a percentage of the unit's total resistance. The most common specification for the maximum allowed CRV value is 1% of the total resistance, or 3 Ω, whichever is greater.

Linearity (Panel Mounted Pots)

Panel mounted pots are made with a number of difference rates of change of resistance with angular shaft rotation. This characteristic is called the potentiometer's "taper". Potentiometers with a linear taper, for example, have a constant rate of change of resistance with angular shaft rotation. Many tapers have been developed to suit particular applications, that is, audio volume control. Of the many tapers available, a few have become standard, and are made by almost every supplier. Figures 3-8 and 3-9 show the standard tapers for composition and wirewound pots.

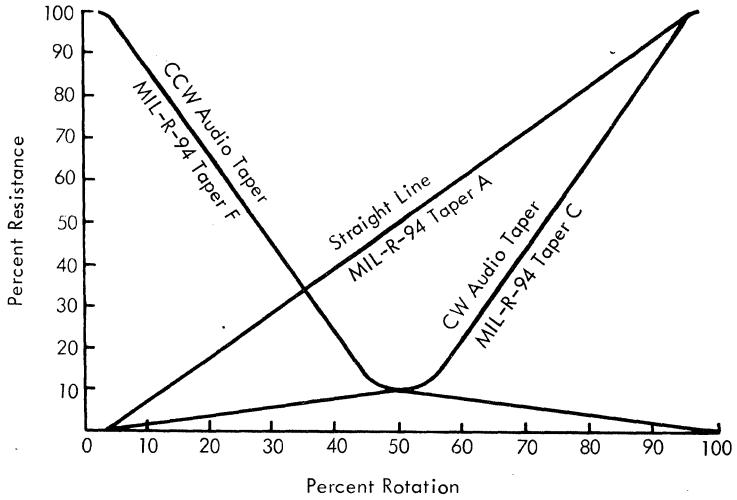
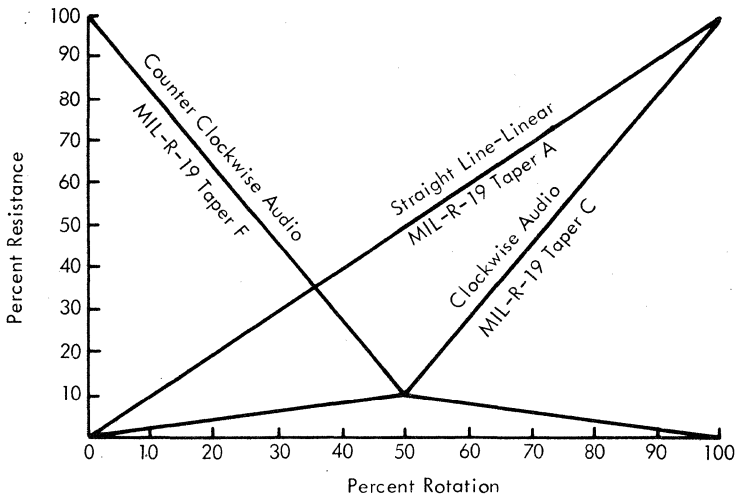


Figure 3-8. Standard Tapers (Composition Pots)



*Note all wirewound tapers are composed of straight line sections as shown. Other two-section tapers similar to MIL-R-19 tapers C and F are also available.

Figure 3-9. Standard Tapers (Wirewound Pots)

Operating Temperature

Each type of potentiometer has a maximum operating temperature which should not be exceeded if adequate performance is to be expected.

Figure 3-10 indicates the maximum percent rated power which can be applied to each potentiometer type, for a given still air ambient, without exceeding its maximum operating temperature. Figure 3-10 can be used in conjunction with Figure 2-9, to determine the actual operating temperatures for specific power levels and ambient conditions.

Table 3-1 presents some of the pertinent performance data by potentiometer type.

The typical range of absolute worst case EOL tolerances are:

Purchase Tolerances:	±5.0% to ±20%
TCR:	±0.3% to ±9%
Short Term Effects:	±2.0% to ±4%
EOL Drift:	±1.0% to ±10%
Absolute W.C. EOL Tolerance:	±8.3% to ±43%

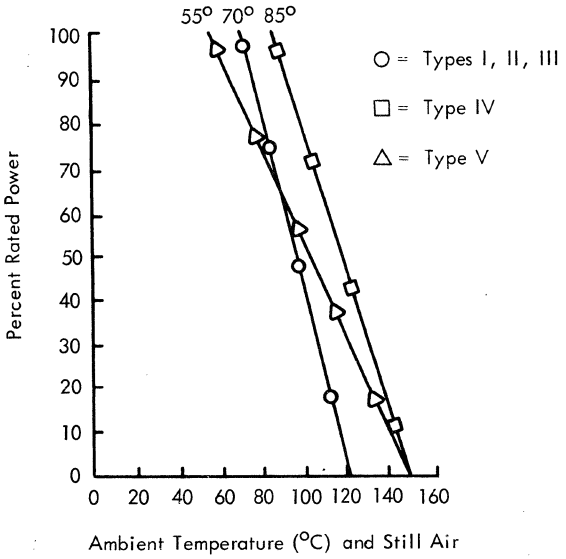


Figure 3-10. Operating Temperature versus Percent Rated Power

When selecting a particular potentiometer the reactive characteristics should be considered. Wirewound potentiometers have a limited operational frequency range.

Frequency Characteristics

Because of the inherent distributed inductance and capacitance of the wirewound element, it is not possible to accurately specify the ac performance beyond 10 kHz. However, good ac performance can be expected for the non-wirewound type potentiometers up to the 50 to 100 MHz range. This makes film type potentiometers ideally suited for use in high frequency and pulse applications.

End of Life Tolerance

As defined in the introduction to this section, the EOL tolerance is the estimated total change in resistance from the nominal valve, assuming a normal Gaussian distribution around zero, of each of the elements of change, that is, Purchase Tolerance, TCR, Aging, etc. The values for the various technologies are given in Table 3-1.

Table 3-1. Potentiometer Characteristic Summary

Parameter	I	II	III	IV	V
Setting Stability	±2%	±2%	±1%	±1%	**
End Resistance	±1% or 5 Ω	±1% or 2 Ω	±1% or 5 Ω	±25% or 5 Ω	±1% or 2 Ω
ENR	2% or 10 Ω	2% or 10 Ω	3% or 20 Ω	2% or 10 Ω	100 Ω
Rotational Life*	5%	5%	2%	2%	2%
EOL Drift	±10%	±10%	±3%	±1%	±2%

NOTE: Limits specified for each parameter are maximum allowable changes.

*100 cycles - 1 cycle equals a rotation of the wiper from end to end and back.

**Setting Stability is a function of resistance value for wirewound elements, as follows:

Ohmic Value	Allowable Change
<20 Ω	±1.6%
20 to 100 Ω	±1.22%
100 to 500 Ω	±1.05%
500 to 2,000 Ω	±0.84%
2,000 to 10,000 Ω	±0.70%
>10,000 Ω	±0.64

End Resistance/Minimum Resistance

End resistance (ER) is the resistance measured between the wiper and a reference end terminal when the contact is positioned against the adjacent end stop. The minimum resistance (MR) is the lowest value of resistance obtainable between the wiper and either end terminal. The end resistance and minimum resistance are identical values in many potentiometers, being obtained with the moveable contact in the same position. The only reason for having two parameters relates to the construction technique, which may cause an absolute minimum resistance separate and distinct from the end resistance. Both ER and MR are expressed either as a maximum ohmic valve or a maximum percentage of the total resistance value.

DESIGN CONSIDERATIONS

When selecting a potentiometer one should attempt to match and optimize the design factors which satisfy each of the basic requirements of the application. The principal application requirements which should be considered when specifying a potentiometer are:

1. Parametric Requirements - total resistance, initial resistance tolerance, power rating.
2. Performance Requirements - TCR, resolution, noise and setting stability, drift, rotational life.
3. Packaging Constraints - size, configuration (for example, top or side adjust), lead spacing.
4. Cost Constraints - cost of component, assembly and adjustment.
5. Application Conditions - assembly process, operating environment, circuit characteristics.

The major design factors to be considered in the selection of a suitable potentiometer are:

1. Resistor Technology - wirewound, composition, film.
2. Adjustment Style - single turn (and mechanical rotation), multiturn (and number of turns).
3. Package Design - shape (round, square, rectangular), size, top or side adjust, slot size, seal.

ECONOMIC CONSIDERATIONS

The cost of both card and panel mounted potentiometers is particularly sensitive to: type of element used; the electrical parameters specified, the mechanical package, and the P/N's yearly volume. For card mounted pots the "to user" cost can range from $0.75 to $5.00 each, but typically is in the $0.90 to $2.00 range. Panel mounted carbon and wirewound pots are typically available at prices ranging from $0.75 to $1.50. When considering card mounted pots, card assembly cost should also be considered because these pots, in many cases, are not suited for automatic assembly and therefore must be hand inserted.

Potentiometers should only be used when a fixed resistor will not adequately perform the function. Also, multiturn potentiometers should not be used if single turn or film type potentiometers will fulfill the application requirements.

The failure rate for potentiometers can be obtained from F/R Specification 866451, or the component data bank.

Potentiometer Wetability

Card mounted trimmer potentiometers, although not hermetically sealed, are able to withstand standard IBM card line assembly and cleaning processes without damage. Standard cleaning processes are defined as those employing only DI water in the cleaning process.

SPECIFICATIONS

The following specifications pertain to potentiometers:

Engineering Specifications

Subminiature Trimmer Pot	897501
Panel Mounted Pot	873745

Quality Specifications

General Quality Requirements 873704

DCS Codes
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Panel Mounted - 23501
Rheostat - 23502
Carbon Single Turn - 23503
Carbon Multi-Turn - 23504
Wirewound Single Turn - 23505
Wirewound Multi-Turn - 23506
Film Single Turn - 23507
Film Multi-Turn - 23508
Specials - 23509

PANEL MOUNTED

Component Data Bank - P/N Catalog

DCS CODE
--- ----

23501

PG. 1 06/30/82 23:16 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/DP DCS EQ 23501 PN TECH DP/PAR1 SEQ/LH DP/RES/O NO/LIMIT.

PART NUMBER	T U C	RESIS TANCE OHMS	TOL. %	POWER MIL-W	TCR PPM/C +	TCR PPM/C -	# OF TURNS MIN.	ELEMENT TYPE	RESOL MAX. %	MAX TORQUE IN/OZ	PIN SPACE MILS	CARD MOUNT	MAX LGTH MILS	MAX WDTH MILS	MAX HGTH MILS	MAX DIAM MILS	TAB DRAW NUM.	DCS CODE
2397022	C	100	10	1000			1	CARCOMP	000	6.0		NO	1906		1531	1156	0000000	23501
2397025	C	100	10	1000			1	CARCOMP	000	6.0		NO	1656		1531	1156	0000000	23501
4429607	C	100	10	500			1	CARCOMP		6.0		NO	1188	500		500	0000000	23501
5616818	C	100	20	3000			1	WIRE WOUND		8.0		NO	1059			906	0000000	23501
0252520	A	250	20	2000			1	CARCOMP	0000			NO	1250			1156	0000000	23501
8272288	C	350	10	500			1	CARCOMP		6.0		NO	1188	500	1188	500	0000000	23501
0349910	A	500	10	2000			1	CARCOMP	0000			NO	1250			1156	0000000	23501
1582957	C	500	10	1000			1	CARCOMP	0000	6.0		NO				1094	0000000	23501
1589131	C	500	10	500			1	CARCOMP	0000	6.0		YES	1188		1188	500	0000000	23501
2397023	C	1000	10	1000			1	CARCOMP	000	6.0		NO	1906		1531	1156	0000000	23501
5617152	C	1000	10	1000			1	CARCOMP		6.0		NO	3656			1156	0000000	23501
5617153	C	1000	10	1000			1	CARCOMP		6.0		NO	1656			1156	0000000	23501
6832320	C	1000	10	1000			1	CARCOMP X		6.0		NO	1916	1156	1156	1156	0000000	23501
6832323	A	1000	20	2000			1	CARCOMP XK		6.0		NO	1250	1156	1156	1156	0000000	23501
2397024	C	1500	10	1000			1	CARCOMP	000	6.0		NO	1906		1531	1156	0000000	23501
5615732	C	1500	10	1000			1	CARCOMP	0000	6.0		NO	1750			1156	0000000	23501
5617154	C	1500	10	1000			1	CARCOMP		6.0		NO	1656			1156	0000000	23501
8272230	A	2000	10	1000			1	CARCOMP 1		6.0		NO	1812			1156	0000000	23501
0207369	A	2500	10	2000			1	CARCOMP	0000			NO	1250			1156	0000000	23501
4430053	C	2500	10	2250			1	CARCOMP		6.0		NO	1531	1156	1156	1156	0000000	23501
2410099	C	5000	10	1000		250	1	CERMET		6.0		NO	1456		1456	781	0000000	23501
0317150	C	10000	10	2000			1	CARCOMP	0000	6.0		NO	1500			1156	0000000	23501
0322532	C	10000	10	2000			1	CARCOMP	0000	6.0		NO	1078			1156	0000000	23501
1582835	A	10000	10	1000			1	CARCOMP		6.0		NO	1812			1062	0000000	23501
4429723	C	10000	10	1000			1	FILM	0.00	2.5		NO	2296	655	755		0000000	23501
0320512	C	25000	10	2000			1	CARCOMP	0000	6.0		NO	1453			1156	0000000	23501
1582530	C	25000	10	1000			1	CARCOMP		6.0		NO	1546			1156	0000000	23501
1582590	C	25000	10	1000	250	100	1	FILM	0000	6.0		NO	1475			1106	0000000	23501
2397021	C	25000	10	1000			1	CARCOMP		6.0		NO	1531		1531	1156	0000000	23501
0721074	A	100000	10	2000		600	1	DUAL CC	0000			NO	259			110	0000000	23501
4429724	C	100000	10	1000			1	FILM	0.00	2.5		NO	2296	655	755		0000000	23501
4481169	C	100000	10	1000			1	FILM	0.00	2.5		NO	1392	655	755		0000000	23501
8272231	A	100000	10	1000			1	CARCOMP 1		6.0		NO	1812			1156	0000000	23501
0197274	A	200000	10	500	200	200	1	CARCOMP	0.00	6.0		NO	1249	1156	1156	1156	0000000	23501
0501957	A	250000	10	1000			1	CARCOMP	0000	6.0		NO	1328			1156	0000000	23501
1589725	C	250000	10	1000			1	CARCOMP	0000	6.0		NO	2290			1156	0000000	23501
5615731	C	250000	10	1000			1	CARCOMP		6.0		NO	2190			1156	0000000	23501
0317422	C	500000	10	2000			1	CARCOMP	0.32	6.0		NO	1531			1156	0000000	23501
8493914	A	1000000	10	500	200	200	1	FILM	0.00	6.0		PANEL	1188	500	500	500	0000000	23501

TOTAL RECORDS 39

RHEOSTATS

1 Turn Carbon
Multi-Turn Carbon
Wirewound 1 Turn

Component Data Bank - P/N Catalog

DCS CODES
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23502
23503
23504
23505

PG. 1 06/30/82 23:17 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/DP DCS EQ 23502 PN TECH DP/PAR1 SEQ/LH DP/RES/O NO/LIMIT.

PART NUMBER	T U C	RESISTANCE OHMS	TOL. %	POWER MIL-W	TCR PPM/C +	TCR PPM/C -	# OF TURNS MIN.	ELEMENT TYPE	RESOL MAX. %	MAX TORQUE IN/OZ	PIN SPACE MILS	CARD MOUNT	MAX LGTH MILS	MAX WDTH MILS	MAX HGTH MILS	MAX DIAM MILS	TAB DRAW NUM.	DCS CODE
0736686	A	4	10	4000			1	WIREWOUND	0000			NO	1210			1123	0000000	23502
0834343	A	5	10	2000		70		WIREWOUND	0000			NO	850			1165	0000000	23502
2129503	C	25	10	2000				WIREWOUND				NO	1290			1250	0000000	23502
5213507	A	50	10	4000			1	WIREWOUND		6.0		NO			778	1310	0000000	23502
5214662	A	50	10	4000				WIREWOUND		6.0		NO				938	0000000	23502
5214668	A	50	10	4000				WIREWOUND		6.0		NO				938	0000000	23502
8493368	C	100	10	2000	150	150	1	CERMET	0.00	6.0		PCBT	1185	750	750		0000000	23502
5214684	A	150	10	4000			1	WIREWOUND		6.0		NO	1179			938	0000000	23502
0208300	C	250	10	2000			1	WIREWOUND				NO	1234			1328	0000000	23502
5214661	A	400	10	4000				WIREWOUND		6.0		NO				938	0000000	23502
5214670	A	400	10	4000				WIREWOUND		6.0		NO				938	0000000	23502
5214671	A	500	10	4000				WIREWOUND		6.0		NO				938	0000000	23502
0169639	A	2000	10	4000			1	WIREWOUND	0000			NO	1094			1625	0000000	23502
0303627	A	2000	10	2000			1	WIREWOUND	0000			NO	1475			1255	0000000	23502
0503985	N	10000	5	2000			1	CARCOMP	0000			NO	1250			1344	0000000	23502
TOTAL RECORDS		15																
5214449	A	250	20	250		500	1	CARCOMP	00 0	3.5	100	YES			390	567	0000000	23503
5214582	A	1000	20	250		500	1	CARCOMP	00 0	3.5	100	YES			390	567	0000000	23503
TOTAL RECORDS		2																
0483380	A	1000	10	250		500	20	CARCOMP	00 0	8.0	100	YES	1266	250	359		0000000	23504
0721088	A	2000	10	250		500	20	CARCOMP		8.0	100	YES	1266	266	375		0000000	23504
0483379	A	5000	10	250		500	20	CARCOMP	00 0	8.0	100	YES	1266	250	359		0000000	23504
0483368	A	50000	10	250		500	20	CARCOMP	00 0	8.0	100	YES	1266	250	359		0000000	23504
0721089	A	250000	10	250		600	2	CARCOMP	00 0	8.0	100	YES	1266	266	375		0000000	23504
TOTAL RECORDS		5																
0483352	A	100	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
0483353	A	200	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
0483115	A	250	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0000000	23505
0483114	A	500	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
0483354	A	1000	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
0483355	A	2000	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
1582589	A	2000	5	1000	70	70	1	WIREWOUND		6.0	100	YES		525	610		0000000	23505
0483342	A	5000	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
0483351	A	10000	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
5214114	A	10000	5	500	70	70	1	WIREWOUND	.28	5.0	125	YES	328	328	370		0000000	23505
0483356	A	15000	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
0483357	A	20000	5	1000		70	1	WIREWOUND	00 0	3.5	100	YES			335	567	0483114	23505
TOTAL RECORDS		12																

WIREWOUND MULTI-TURN

Component Data Bank - P/N Catalog

DCS CODE
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23506

PG. 1 06/30/82 23:19 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/DP DCS EQ 23506 PN TECH DP/PAR1 SEQ/LH DP/RES/O NO/LIMIT.

PART NUMBER	T U C	RESIS TANCE OHMS	TOL. %	POWER MIL-W	TCR PPM/C +	TCR PPM/C -	# OF TURNS MIN.	ELEMENT TYPE	RESOL MAX. %	MAX TORQUE IN/OZ	PIN SPACE MILS	CARD MOUNT	MAX LGTH MILS	MAX WDTH MILS	MAX HGTH MILS	MAX DIAM MILS	TAB DRAW NUM.	DCS CODE
2196242	C										100						0000000	23506
2196244	C										100						0000000	23506
2144410	A	10	10	750	70	70	19	WIREWOUND	191	4.0	100	YES	930	190	340		2144410	23506
2199300	C	10	10	750		70	19	WIREWOUND	1.91	4.0	125	YES	935	234	370		2199300	23506
2144411	A	20	10	750	70	70	19	WIREWOUND	141	4.0	100	YES	930	190	340		2144410	23506
2199301	C	20	10	750		70	19	WIREWOUND	1.41	4.0	125	YES	930	190	370		2199300	23506
2391638	A	20	5	600		70	13	WIREWOUND	0.93	3.0	125	YES	317	205	317		0814237	23506
4481161	C	20	5	600	70	70	13	WIREWOUND	0.93	3.0	100	YES	312	190	312		4429926	23506
0483222	A	50	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814237	A	50	5	600		70	13	WIREWOUND	1.17	3.0	125	YES	317	205	317		0814237	23506
2144412	A	50	10	750	70	70	19	WIREWOUND	101	4.0	100	YES	930	190	340		2144410	23506
2199302	C	50	10	750		70	19	WIREWOUND	1.01	4.0	125	YES	930	190	370		2199300	23506
4481162	C	50	5	600	70	70	13	WIREWOUND	1.17	3.0	100	YES	312	190	312		4429926	23506
0492636	A	100	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0529214	E	100	5	1000		70	23	WIREWOUND	0000			NO	515	515	197		0000000	23506
0814238	A	100	5	600		70	13	WIREWOUND	0.90	3.0	125	YES	317	205	317		0814237	23506
2144413	A	100	10	750	70	70	19	WIREWOUND	98	4.0	100	YES	930	190	340		2144410	23506
2199303	C	100	10	750		70	19	WIREWOUND	0.98	4.0	125	YES	930	190	370		2199300	23506
4481163	C	100	5	600	70	70	13	WIREWOUND	0.90	3.0	100	YES	312	190	312		4429926	23506
5130417	C	100	5	750		50	10	WIREWOUND	12	8.0	100	YES	1260	338	460		0000000	23506
5214458	A	100	5	1000		50	25	WIREWOUND	56	5.0	100	YES	385	385	213		0000000	23506
0422558	A	200	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814239	A	200	5	600		70	13	WIREWOUND	0.69	3.0	125	YES	317	205	317		0814237	23506
2144414	A	200	10	750	70	70	19	WIREWOUND	86	4.0	100	YES	930	190	340		2144410	23506
2199304	C	200	10	750		70	19	WIREWOUND	0.86	4.0	125	YES	930	190	370		2199300	23506
4481164	C	200	5	600	70	70	13	WIREWOUND	0.69	3.0	100	YES	312	190	312		4429926	23506
5615312	A	200	5	600	70	70	13	WIREWOUND	0.40	3.0	125	YES	312	312	190		1582927	23506
8493467	A	200	5	600	70	70	13	WIREWOUND	0.69	3.0	100	YES	317	195	317		8493467	23506
0492574	A	500	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814240	A	500	5	600		70	13	WIREWOUND	0.55	3.0	125	YES	317	205	317		0814237	23506
2144415	A	500	10	750	70	70	19	WIREWOUND	80	4.0	100	YES	930	190	340		2144410	23506
2198164	A	500	5	750		50	22	WIREWOUND	39	7.5	100	YES	510	510	270		0000000	23506
2199305	C	500	10	750		70	19	WIREWOUND	0.80	4.0	125	YES	930	190	370		2199300	23506
4481165	C	500	5	600	70	70	13	WIREWOUND	0.55	3.0	100	YES	312	190	312		4429926	23506
5615313	A	500	5	600	70	70	13	WIREWOUND	0.40	3.0	125	YES	312	312	190		1582927	23506
8493468	A	500	5	600	70	70	13	WIREWOUND	0.55	3.0	100	YES	317	195	317		8493467	23506
0483218	A	750	5	1000		70	20	WIREWOUND	00 0	8.0	100	YES			335	567	0000000	23506
0492607	E	1000	5	1000		70	23	WIREWOUND	.32	8.0		YES	500	500	187		0000000	23506
0492678	A	1000	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814219	E	1000	5	1000		25	25	WIREWOUND	00 0	5.0	100	YES	515	515	265		0000000	23506
0814241	A	1000	5	600		70	13	WIREWOUND	0.40	3.0	125	YES	317	205	317		0814237	23506
1582927	A	1000	5	600	70	70	13	WIREWOUND	.40	3.0	125	YES	312	312	190		1582927	23506
2144416	A	1000	10	750	70	70	19	WIREWOUND	58	4.0	100	YES	930	190	340		2144410	23506
2182563	A	1000	5	750		50	22	WIREWOUND	30	7.5	100	YES	510	510	265		0000000	23506
2199306	C	1000	10	750		70	19	WIREWOUND	0.58	4.0	125	YES	930	190	370		2199300	23506
5130461	C	1000	5	750		50	10	WIREWOUND	08		100	YES	1260	338	460		0000000	23506
5615487	C	1000	5	600	70	70	13	WIREWOUND	0.40	3.0	100	YES	312	190	312		4429926	23506
8493469	A	1000	5	600	70	70	13	WIREWOUND	0.40	3.0	100	YES	317	195	317		8493467	23506

Wirewound Multi-Turn

Component Data Bank - P/N Catalog

PG. 2 06/30/82 23:19 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/DP DCS EQ 23506 PN TECH DP/PAR1 SEQ/LH DP/RES/O NO/LIMIT.

PART NUMBER	T U C	RESIS TANCE OHMS	TOL. %	POWER MIL-W	TCR PPM/C +	TCR PPM/C -	# OF TURNS MIN.	ELEMENT TYPE	RESOL MAX. %	MAX TORQUE IN/OZ	PIN SPACE MILS	CARD MOUNT	MAX LGTH MILS	MAX WDTH MILS	MAX HGTH MILS	MAX DIAM MILS	TAB DRAW NUM.	DCS CODE
0483119	A	2000	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0586147	C	2000	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0000000	23506
0814218	E	2000	5	1000		25	25	WIREWOUND	00 0	5.0	100	YES	515	515	265		0000000	23506
0814242	A	2000	5	600		70	13	WIREWOUND	0.38	3.0	125	YES	317	205	317		0814237	23506
2144417	A	2000	10	750	70	70	19	WIREWOUND	0.48	4.0	100	YES	930	190	340		2144410	23506
2199307	C	2000	10	750		70	19	WIREWOUND	0.48	4.0	125	YES	930	190	370		2199300	23506
2219801	A	2000	5	750		50	22	WIREWOUND	0.23	7.5	100	YES	510	510	265		0000000	23506
4429926	C	2000	5	600	70	70	13	WIREWOUND	0.38	3.0	100	YES	312	190	312		4429926	23506
4481157	A	2000	5	600	70	70	13	WIREWOUND	0.38	3.0	100	YES	317	195	317		8493467	23506
0492466	E	5000	5	1000		50	42	WIREWOUND	0.20	8.0	100	NO	515	515	197		0000000	23506
0492573	A	5000	5	1000		50	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814217	E	5000	5	1000	25	25	10	WIREWOUND		5.0	100	YES	515	515	265		0000000	23506
0814243	A	5000	5	600		70	13	WIREWOUND	0.42	3.0	125	YES	317	205	317		0814237	23506
2144418	A	5000	10	750	70	70	19	WIREWOUND	36	4.0	100	YES	930	190	340		2144410	23506
2199308	C	5000	10	750		70	19	WIREWOUND	0.36	4.0	125	YES	930	190	370		2199300	23506
2219781	C	5000	5	750		50	22	WIREWOUND	0.18	7.5	100	YES	510	510	265		0000000	23506
4481166	C	5000	5	600	70	70	13	WIREWOUND	0.42	3.0	100	YES	312	190	312		4429926	23506
5615314	A	5000	5	600	70	70	13	WIREWOUND	0.42	3.0	125	YES	312	312	190		1582927	23506
8493470	A	5000	5	600	70	70	13	WIREWOUND	0.42	3.0	100	YES	317	195	317		8493467	23506
0491232	E	10000	5	1000		70	23	WIREWOUND	0.20	8.0	100	NO	515	515	197		0000000	23506
0492637	A	10000	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814216	E	10000	5	1000		25	25	WIREWOUND	00 0	5.0	100	YES	515	515	265		0000000	23506
0814244	A	10000	5	600		70	13	WIREWOUND	0.33	3.0	125	YES	317	205	317		0814237	23506
2144419	A	10000	10	750	70	70	19	WIREWOUND	28	4.0	100	YES	930	190	340		2144410	23506
2199309	C	10000	10	750	70	70	19	WIREWOUND	0.28	4.0	125	YES	930	190	370		2199300	23506
4429940	A	10000	5	600	70	70	13	WIREWOUND	0.33	3.0	100	YES	312	190	312		4429926	23506
4481167	C	10000	5	600	70	70	13	WIREWOUND	0.33	3.0	100	YES	312	190	312		4429926	23506
0492565	A	15000	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814245	A	15000	5	600		70	13	WIREWOUND	0.28	3.0	125	YES	317	205	317		0814237	23506
4481168	C	15000	5	600	70	70	13	WIREWOUND	0.28	3.0	100	YES	312	190	312		4429926	23506
0492593	A	20000	5	1000		70	23	WIREWOUND	00 0	8.0	100	YES	515	515	265		0422558	23506
0814246	A	20000	5	600		70	13	WIREWOUND	0.25	3.0	125	YES	317	205	317		0814237	23506
2144420	A	20000	10	750	70	70	19	WIREWOUND	0.22	4.0	100	YES	930	190	340		2144410	23506
2199310	C	20000	10	750		70	19	WIREWOUND	0.22	4.0	125	YES	930	190	370		2199300	23506
5052731	A	20000	5	750		50	22	WIREWOUND		7.5	100	YES	510	510	270		0000000	23506
5130435	C	20000	5	750		50	10	WIREWOUND	05		100	YES	1260	338	460		0000000	23506
5615488	C	20000	5	600	70	70	13	WIREWOUND	0.25	3.0	100	YES	312	190	312		4429926	23506
2181918	A	50000	10	750			40	WIREWOUND		7.5	100	YES	510	510	265		0000000	23506
2198157	A	50000	5	750		50	22	WIREWOUND	85	7.5	100	YES	510	510	270		0000000	23506
0492682	C	100000	5	1500		70	23	WIREWOUND	0.06	8.0		NO	760	760	290		0000000	23506
TOTAL RECORDS		88																

FILM 1 TURN

Component Data Bank - P/N Catalog

DCS CODE
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23507

PG. 1 06/30/82 23:19 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/DP DCS EQ 23507 PN TECH DP/PAR1 SEQ/LH DP/RES/O NO/LIMIT.

PART NUMBER	T U C	RESIS TANCE OHMS	TOL. %	POWER MIL-W	TCR PPM/C +	TCR PPM/C -	# OF TURNS MIN.	ELEMENT TYPE	RESOL MAX. %	MAX TORQUE IN/OZ	PIN SPACE MILS	CARD MOUNT	MAX LGTH MILS	MAX WDTH MILS	MAX HGTH MILS	MAX DIAM MILS	TAB DRAW NUM.	DCS CODE
2396723	C	10	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396741	C	10	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2396724	C	20	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396742	C	20	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2391950	C	50	20	500		175	1	CERMET	00 0	5.0	125	YES	496	310	370		2391950	23507
2396725	C	50	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396743	C	50	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2391951	C	100	20	500		175	1	CERMET	00 0	5.0	125	YES	496	310	370		2391950	23507
2396726	C	100	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396744	C	100	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2391952	C	200	20	500		175	1	CERMET	00 0	5.0	125	YES	496	310	370		2391950	23507
2396745	C	200	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2397089	C	200	20	375		150	1	FILM		5.0	100	YES	327	290	370		0000000	23507
2396727	C	250	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2391953	C	500	20	500		175	1	CERMET	00 0	5.0	125	YES	496	310	370		2391950	23507
2396728	C	500	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396746	C	500	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
1582900	C	1000	20	500	150	150	1	CERMET		5.0	150	YES	370	490	310		0000000	23507
2391954	C	1000	20	500		150	1	CERMET	00 0	5.0	125	YES	496	310	370		2391950	23507
2396729	C	1000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396747	C	1000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2391955	C	2000	20	500		150	1	CERMET	00 0	5.0	125	YES	496	310	370		2391950	23507
2396730	C	2000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396748	C	2000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
1582797	C	5000	20	375	150	150	1	FILM		5.0	100	YES	380	380	290		0000000	23507
2391956	C	5000	20	500		150	1	CERMET	00 0	5.0	125	YES	496	310	370		2391950	23507
2396731	C	5000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396749	C	5000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2396732	C	10000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396750	C	10000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2396733	C	20000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396751	C	20000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2396734	C	25000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396752	C	25000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
4430063	C	25000	10	300	100	100	1	CERMET	0.00	5.0	100	YES	270	270	190	270	0000000	23507
2396735	C	50000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396753	C	50000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
0483863	A	100000	10	2000			1	CARCOMP		6.0		NO	1500			1156	0000000	23507
2396736	C	100000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396754	C	100000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
5616548	C	100000	20	500	100	100	1	CERMET		6.0	100	YES	430	380	180	380	0000000	23507
0483509	C	200000	10	750		250	1	FILM	00 0	3.5	100	YES			335	572	0000000	23507
2396737	C	200000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396755	C	200000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2396738	C	250000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396756	C	250000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2396739	C	500000	10	300		100	1	CERMET	00 0	5.0	100	YES	280	280	370	280	2396723	23507
2396757	C	500000	10	300		100	1	CERMET	00 0	5.0	100	YES			370	290	2396741	23507
2395806	C	1000000	20	500		250	1	CERMET	0000	5.0	125	YES	496	310	370		2391950	23507
2396740	C	1000000	10	300		100	1	CERMET	0000	5.0	100	YES	280	280	370	280	2396723	23507
2396758	C	1000000	10	300		100	1	CERMET	0000	5.0	100	YES			370	290	2396741	23507
5615425	C	1000000		375	250	250	1	FILM			100		380	380	290		0000000	23507

TOTAL RECORDS 52

FILM MULTI-TURN

SPECIALS

Component Data Bank - P/N Catalog

DCS CODES
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23508
23509

PG. 1 06/30/82 23:19 UR0206 *** IBM INTERNAL USE *** COMPONENT DATA BANK INTERNAL USE ONLY
CDB/DP DCS EQ 23508 PN TECH DP/PAR1 SEQ/LH DP/RES/O NO/LIMIT.

PART NUMBER	T U C	RESIS TANCE OHMS	TOL. %	POWER MIL-W	TCR PPM/C +	TCR PPM/C -	# OF TURNS MIN.	ELEMENT TYPE		RESOL MAX. %	MAX TORQUE IN/OZ	PIN SPACE MILS	CARD MOUNT	MAX LGTH MILS	MAX WDTH MILS	MAX HGTH MILS	MAX DIAM MILS	TAB DRAW NUM.	DCS CODE
2410141	C	10	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
8279254	C	10	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410142	C	20	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
8279255	C	20	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410143	C	50	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
4481862	A	50	10	750	100	100	10	FILM		0.00	4.0	100	YES	780	234	340		5617024	23508
8279256	C	50	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410144	C	100	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
8279257	C	100	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
8493229	A	100	10	750	100	100	10	FILM			4.0	100	YES	780	190	340		5617024	23508
2410145	C	200	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
2410154	C	200	10	750	100	100	10	CERMET			6.0	125	YES	780	370	234		2410141	23508
8279258	C	200	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410146	C	500	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
5617024	A	500	10	750	100	100	10	CERMET			4.0	100	YES	780	234	340		5617024	23508
8279259	C	500	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2392044	C	1000	10	750		100	10	CERMET		0000	5.0	100	YES	1266	290	330		0000000	23508
2410147	C	1000	10	750	100	100	10	FILM		0000	4.0	125	YES	780	234	370		2410141	23508
8279260	C	1000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
8519709	A	1000	10	750	100	100	10	CERMET			4.0	100	YES	780	234	340		5617024	23508
2392045	C	2000	10	750		100	10	CERMET		00 0	5.0	100	YES	1266	290	330		0000000	23508
2410148	C	2000	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
5617025	A	2000	10	750	100	100	10	CERMET			4.0	100	YES	780	234	340		5617024	23508
8279261	C	2000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410149	C	5000	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
8279262	C	5000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410150	C	10000	10	750	100	100	10	FILM		0000	4.0	125	YES	780	234	370		2410141	23508
5616817	C	10000	20	500	175	175	1	CERMET		0000	5.0	125	YES	496	310	370		2391950	23508
8272289	C	10000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410151	C	20000	10	750	100	100	10	FILM		0000	4.0	125	YES	780	234	370		2410141	23508
4718603	A	20000	10	750	100	100	10	CERMET		0.00	4.0	100	YES	780	234	340		5617024	23508
8279263	C	20000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
8279264	C	25000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410152	C	50000	10	750	100	100	10	FILM		0000	4.0	125	YES	780	234	370		2410141	23508
8272290	C	50000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
0721082	A	100000	10	250		250	17	FILM			8.0	100	YES	1266	296	330		0000000	23508
2410153	C	100000	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
4481404	A	100000	10	750	100	100	10	CERMET		0.00	4.0	100	YES	780	234	340		5617024	23508
8279265	C	100000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
8279284	A	100000	10	500	100	100	24	CERMET	W		5.0	100	YES	390	390	230		0000000	23508
5397244	A	200000	10	750		250		FILM				100	YES	510	510	270		0000000	23508
8272291	C	200000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
8279266	C	250000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410155	C	500000	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
8279267	C	500000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
2410156	C	1000000	10	750	100	100	10	FILM			4.0	125	YES	780	234	540		2410141	23508
8272292	C	1000000	20	300	100	100	12	CERMET	W		5.0	100	YES	312	190	312		8272289	23508
TOTAL RECORDS		47																	
4429712	C				100	100	1	CERMET	MFT	0.00	5.0	100	YES	480	310	200		0000000	23509
4429713	C				100	100	1	CERMET	MFT	0.00	5.0	100	YES	880	310	200		0000000	23509
1589464	C	100	20	500	100	100	1	CERMET			6.0	100	YES			447	380	0000000	23509
1589465	C	5000	20	500	100	100	1	CERMET			6.0	100	YES			447	380	0000000	23509
5617132	C	37500	10	1000			1	CARCOMP	9		2.5		NO	1796	640	740	740	0000000	23509
TOTAL RECORDS		5																	