engineering data for CBS®

BULLETIN T-1017

SHARP CUTOFF PENTODE

7732

CBS Type 7732 is a miniature sharp cutoff pentode which is especially designed and tested for high input impedance applications in measurement test equipment, instrumentation, and other applications where extreme reliability, stable characteristics, and long life are required. The 7732 is a replacement for type 6CB6 and superior performance is assured because of its improved construction, special tests, and tight minimum-maximum limits.

This electron tube has a continuous-wound coil heater which is superior to ordinary heaters both electrically and mechanically. Burn-outs are virtually eliminated, heater-cathode leakage is lower, and hum is lower. Further insurance of quality is provided by heater cycle testing.

Stable characteristics throughout life is a result of meticulous processing and selection of cathode sleeve material. Also each tube is subjected to a 48 hour burn-in period to obtain a more uniform level of performance when they are put into operational service.

An elaborate testing procedure is carried out on these tubes for confidence in their ultimate operation. There is a 100-hour early life assurance test, a special 1000-hour life test, and a 5000-hour informational life test.

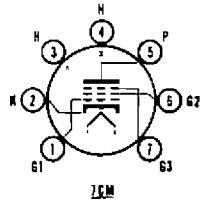
Additional mechanical features offered by CBS type 7732 include: gold plated base pins which prevent oxidation and improve base pin contact, precisely made and fitted parts in stronger structures for lower noise and microphonism. Electrical features include: grid current test, low heater voltage transconductance test, and life tested transconductance.

MECHANICAL DATA

Cathode, coated unipotential	
Bulb	T-5 1/2
Outline	JEDEC 5-2
Base	Miniature button 7-pin(JEDEC E7-1)
Basing	7CM
Mounting position	Any

PIN CONNECTIONS

Pin 1: Grid 1
Pin 2: Cathode
Pin 3: Heater
Pin 4: Heater
Pin 5: Plate
Pin 6: Grid 2
Pin 7: Grid 3, I.S.



7CM

ELECTRICAL DATA

HEATER CHARACTERISTICS

Voltage, a-c or d-c	6.3±10%	volts
Current	300	ma
Peak heater-cathode voltage, max		
Heater negative to cathode	200	volts
Heater positive to cathode*	200	volts

*D-c component must not exceed 100 volts

DIRECT INTERELECTRODE CAPACITANCES

	No Shield	Shield ♦	
Grid to plate: g1 to p, max	0.025	0.15	uuf
Input: g1 to k+h+g2+g3+i.s.	6.5	6.5	uuf
Output: p to k+h+g2+g3+i.s.	2.0	3.0	uuf

♦ JEDEC shield 316 connected to cathode

MAXIMUM RATINGS (Design maximum values)

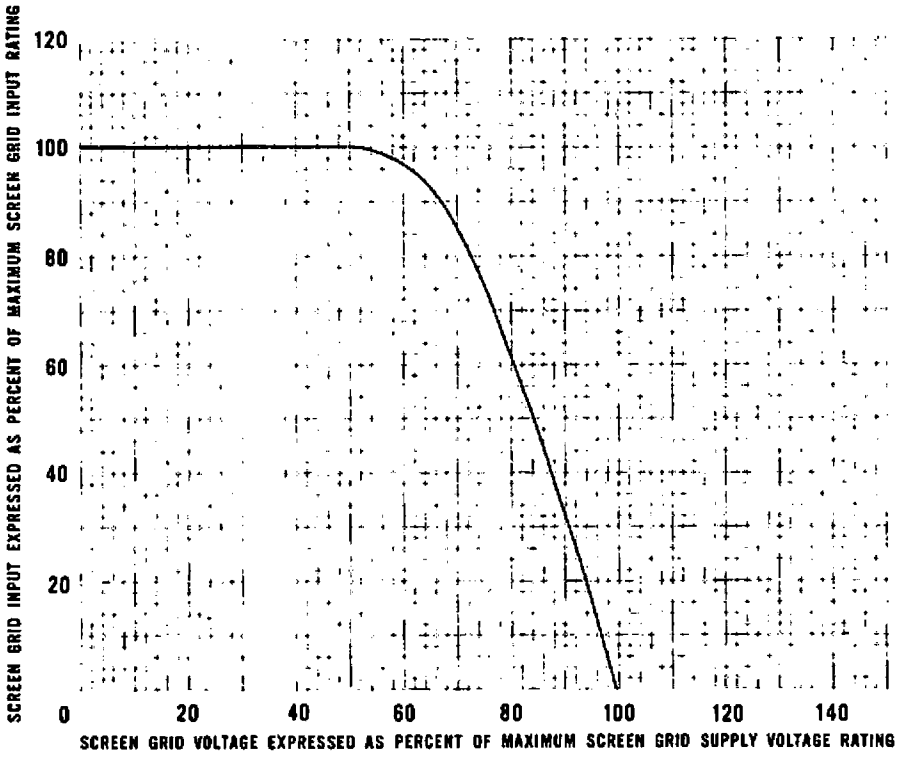
Plate voltage	330	volts
Grid 2 voltage	Rating Chart	
Grid 2 supply voltage	330	volts
Grid 1 voltage, positive d-c	0	volts
Plate dissipation	2.3	watts
Grid 2 dissipation	.55	watts
Bulb temperature	165	°C

CHARACTERISTICS AND TYPICAL OPERATION

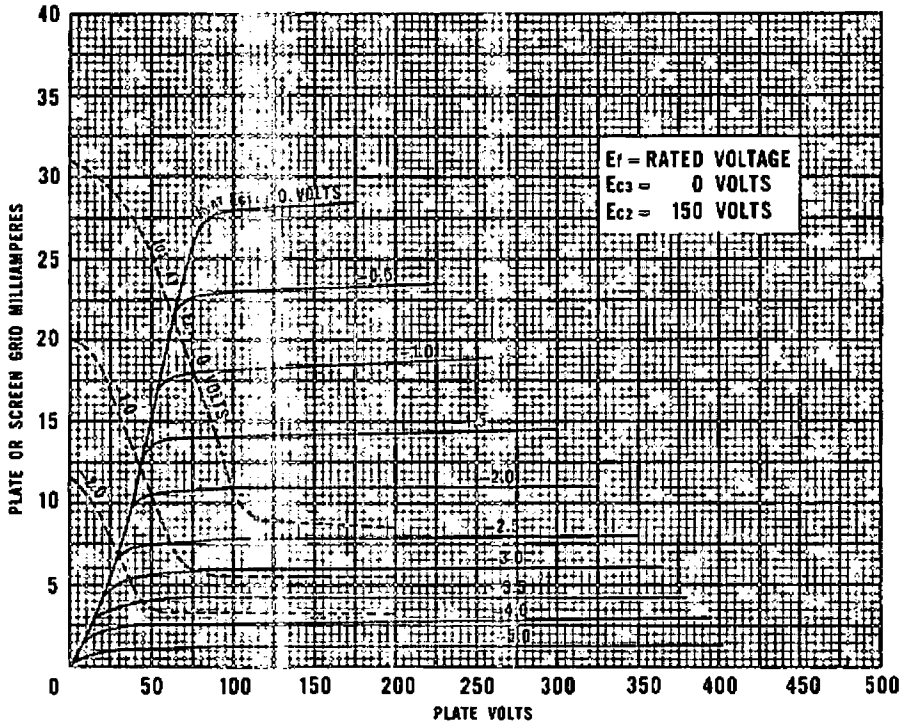
Plate voltage	250	volts
Grid 3 (suppressor) connected to cathode at socket		
Grid 2 (screen) voltage	150	volts
Cathode bias resistor	200	ohms
Plate resistance (approx.)	0.6	meg
Transconductance	6000	umhos
Plate current	8.5	ma
Grid 2 current	2.5	ma
Grid 1 voltage (approx) for Ib=20ua	-8.0	volts

from JEDEC release #2870, July 4, 1960

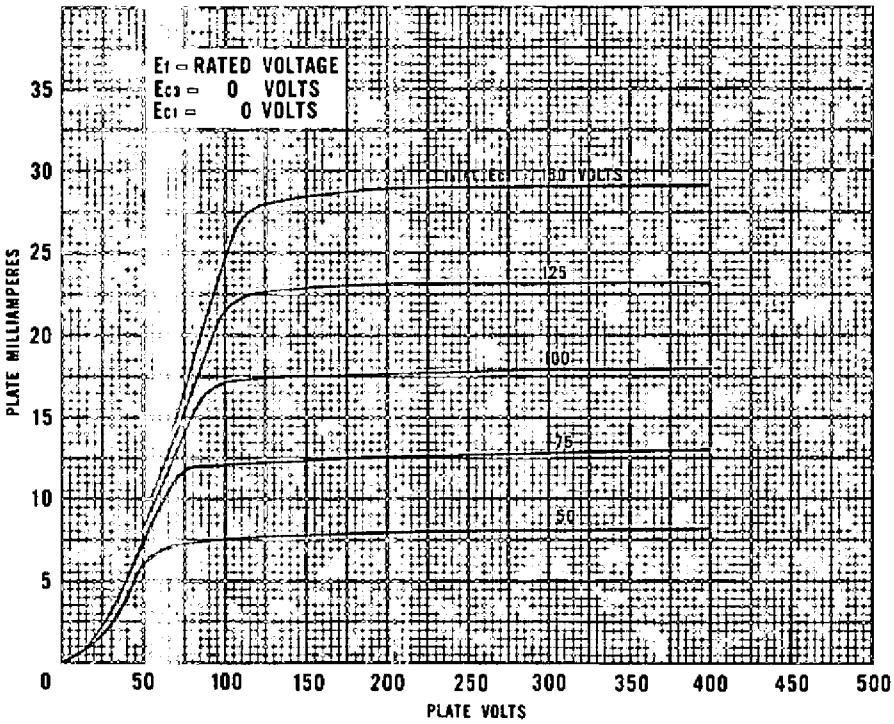
SCREEN GRID RATING



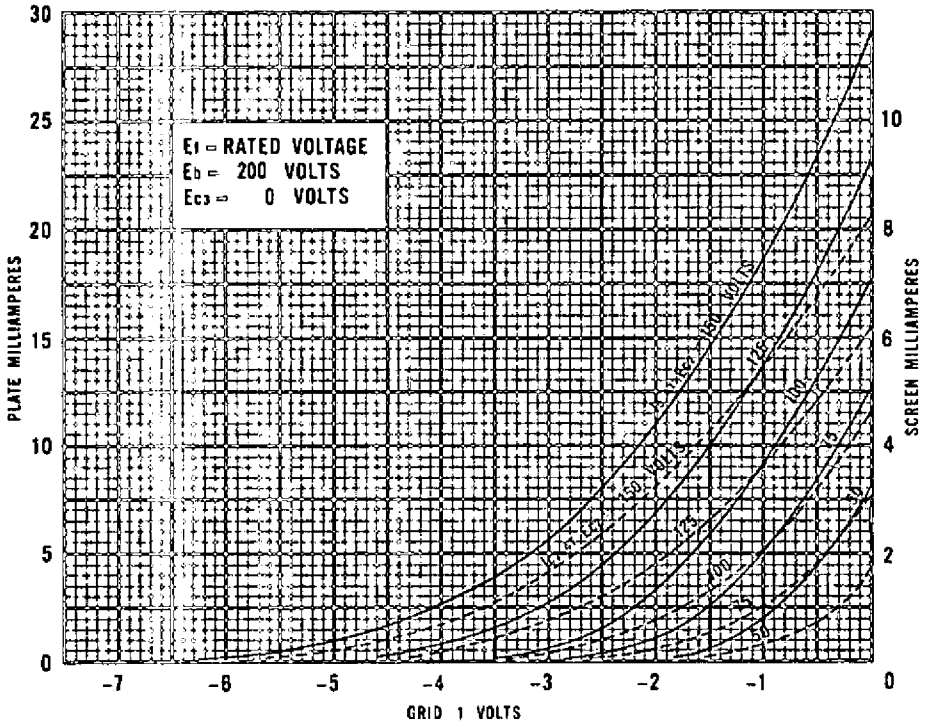
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



Test Conditions

Ef=6.3V; Eb=250Vdc
Ec1=0Vdc; Ec2=150Vdc; Rk=200ohms

Reference Note 2	AQL Note 1	Test	Conditions	Sym.	Min.	Max.	Unit
4.7.5	0.4	Continuity & Short		---	---	---	---
4.10.8	2.5*	Heater Current		If	275	325	mA
4.10.15	1.0	Heater Cathode Leakage	Ehk = +200Vdc Ehk = -200Vdc	Ihk Ihk	--- ---	10 10	uAdc uAdc
4.10.6 1	1 0	Grid Current (1)		Ic(1)	0	-0.3	uAdc
4.10.4.1	[redacted] 2.5	Plate Current (1)		Ib(1)	6.0	12.0	mAdc
4 10.4.3	[redacted] 2.5	Screen Grid Current		Ic(2)	1.5	3.5	mAdc
4.10.9	1.0	Transconductance(1)		Sm(1)	5000	7400	umhos
4.8	2.5	Insulation of Electrodes	E(g1-all)=100Vdc, g1 Negative E(p-all)=300Vdc, p Negative	R(g1-all) R(p-all)	500 5000	--- ---	Meg Meg
4.10.4.1	2.5	Plate Current (2)	Rk=0; Ec1= -12Vdc	Ib(2)	---	100	uAdc
4.10.9	2.5	Transconductance (2)	Ef=5.7V	Δ Sm	---	15	%
4.10.6 1	2.5	Grid Current (2)	Ef=7.0V; Rg1=0.1Meg, Note 3	Ic(2)	0	-0.4	uAdc
4.10.3.1	2.5	RF Noise	Ec1= -2Vdc; Ecal=15.0 mVac; Note 4	---	---		
4.10.3.4	2.5	Noise and Microphonics	Ef=6.3Vac; Ehk=0; Ebb=300Vdc Ecc=150Vdc; Rp=0.01Meg Rk=200 ohms; Rg1=50,000 ohms Ecal=50mVac; Notes 5, 8	M	---	---	---
4.9.19.1	2.5*	Vibration	Rp=2000 ohms	Ep	---	100	mVac
4.10.14	2.5*	Capacitance	No Shield No Shield No Shield	Cgp Cin Cout	--- 5.2 1.3	.025 7.8 2.3	uuf uuf uuf
LIFE TESTS							
---	1.0 Code K	Early Life Assurance Test	Ef=6.3V; Eb=250Vdc; Ec2=150Vdc Rk=200 ohms; Ehk= +200Vdc Rg1 = 1.0Meg; Note 6	---	---	---	---
---	---	Early Life Assurance Test End Points	Shorts and Continuity	---	---	---	---
			Change in transconductance of individual tubes	Δ Sm / t	---	10	%
4.11.5	---	Intermittent Life Test 1000 Hours	Early Life Assurance Test Conditions, Note 7	---	---	---	---

Reference	AQL	Test	Conditions	Sym.	Min.	Max.	Unit
4.11.4	---	Intermittent Life Test	Inoperatives Grid Current (1)	---	---	---	---
		End Points - 1000 hours	Change in Transconductance(1)	Ic(1)	0	-0.5	uAdc
			of individual tubes	$\frac{\Delta Sm}{t}$	0	20	%
			Transconductance(2)	Δ Sm	0	20	%
			Heater Cathode Leakage				
			Ehk= +200Vdc	Ihk	0	25	uAdc
			Ehk= -200Vdc	Ihk	0	25	uAdc
			Insulation of Electrodes				
			E(g1-all)	R(g1-all)	50	---	Meg
			E(p1-all)	R(p-all)	500	---	Meg
4.11.7	---	Heater Cycling Life Test	Ef=7.5V Ehk= -200Vdc Cycle 1.0 min. on 4.0 min. off	---	---	48	hours
4.11.4	---	Heater Cycling Life Test	Shorts & Opens	---	---	---	---
		End Points	Heater Cathode Leakage				
			Ehk= +200Vdc	Ihk	---	15	uAdc
			Ehk= -200Vdc	Ihk	---	15	uAdc

TEST NOTES

Note 1: Lots of CBS Electronics tubes may be sampled using MIL-STD-105A sampling tables for the specified AQL. All characteristics, having similar AQL's shall be combined for sampling purposes with the exception of control test. Control test is indicated by an asterisk (*). The term AQL, as used on the specification, is defined in MIL-STD-105A, paragraph 4.1.

Note 2: References are paragraphs in MIL-E-1D specification, dated 31 March 1958.

Note 3: Prior to this test, tubes to be preheated five (5) minutes at conditions indicated below. Test immediately after preheating:

Ef	Ec1	Rk	Rg1	Eb	Ec2
V	Vdc	ohms	Meg	Vdc	Vdc
7.0	0	200	0.25	250	150

Note 4: The output indicator shall be a "VU" meter. The three (3) milliwatt point shall be determined as a meter deflection of 25 percent of the calibration point.

Note 5: The cathode resistor shall be shunted with capacitive reactance not exceeding three (3) ohms 60 cycles.

Note 6: Early Life Assurance Test

a. Life test samples shall be selected from a lot at random in such a manner as to be representative of the lot. If such selection results in a sample containing tubes which are outside the initial specification limits for the relevent life test endpoint characteristics, such tubes shall be replaced by randomly selected acceptable tubes.

b. Serially mark all tubes of the sample.

c. Record reference characteristic measurements on the entire sample after a maximum operation of 15 minutes under specified voltage and current conditions.

d. The Early Life Assurance Test sample shall be operated at specified conditions or equivalent for 100 hours ($\pm$ 4 hours) with the intermediate down period reading point at 20 hours ($\pm$ 4 hours) and 2 hours $\pm$ 30 minutes. Intermittent or continuous operation may be employed.

e. A defective shall be defined as a tube having failed the shorts and continuity test or a tube having a change in referenced characteristic greater than that specified.

Note 7: 1000 Hour Intermittent Life Test

a. The sample size shall be 10 tubes and shall be selected from the first 10 lowest number tubes which have successfully passed the Early Life Assurance Test and meet the initial test endpoint characteristic.

b. Record the reference characteristic.

c. Place the sample on life test with the specified operating conditions for 1000 hours with the intermediate down period reading points at 250 ± 24 hours, 500 ± 24 hours and 750 ± 24 hours. The 100 hours of Early Life Assurance Test shall be part of the 1000 hours.

d. Acceptance criteria - The sample is acceptable if it has earned a total of 9000 tube hours. The total number of tube hours is the sum of the successful operating hours of each tube.

e. Quarterly, the life test sample shall be continued to 5000 hours with interim reading points at each 1000 hours. This test will be run to determine long life capabilities.

Note 8: The rejection label shall be set at the VU meter reading obtained during calibration.

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Printed in U.S.A.