

Multiplier Phototube

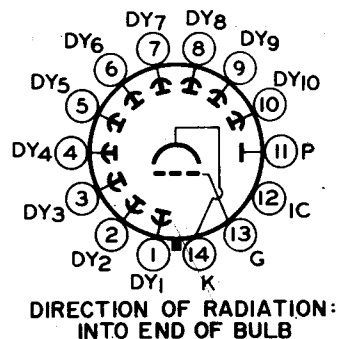
10-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING S-11 RESPONSE

1.5" Minimum Diameter Flat Photocathode With High-Conductivity Grating. For Use as a Scintillation Radiation Detector. Especially Useful in Measuring Transients of Short Duration Involving High Peak Photocathode Currents.

General:

Spectral Response.	S-11
Wavelength of Maximum Response	4400 $\pm$ 500 angstroms
Cathode, Semitransparent	Cesium-Antimony with High-Conductivity Grating
Shape.	Flat, Circular
Minimum area including grating	1.8 sq. in.
Minimum diameter	1.5 in.
Window	Lime Glass ^a
Index of refraction.	1.51
Dynode Material.	Copper-Beryllium
Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.10.	4.4 pf
Anode to all other electrodes.	7.0 pf
Maximum Overall Length	5-13/16"
Seated Length.	4-7/8" $\pm$ 3/16"
Maximum Diameter	2-5/16"
Operating Position	Any
Weight (Approx.)	5.2 oz
Bulb	T16
Socket	Eby ^b No.9709-7, or equivalent
Magnetic Shield.	Perfection Mica Co., ^c No.P-100-2, or equivalent
Base	Medium-Shell Diheptal 14-Pin, (JEDEC Group 5, No.B14-38), Non-hygroscopic
Basing Designation for BOTTOM VIEW	14AA

Pin 1 - Dynode No. 1
Pin 2 - Dynode No. 2
Pin 3 - Dynode No. 3
Pin 4 - Dynode No. 4
Pin 5 - Dynode No. 5
Pin 6 - Dynode No. 6
Pin 7 - Dynode No. 7
Pin 8 - Dynode No. 8
Pin 9 - Dynode No. 9
Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - Do Not Use
Pin 13 - Focusing Electrode
Pin 14 - Photocathode



Maximum Ratings, Absolute-Maximum Values:

Supply Voltage between Anode and Cathode (DC or Peak AC).	1500 max. volts
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← Indicates a change.



Supply Voltage between Dynode No.10 and Anode (DC or Peak AC)	250	max.	volts
Supply Voltage between Dynode No.1 and Cathode (DC or Peak AC)	400	max.	volts
Supply Voltage between Focusing Elec- trode and Cathode (DC or Peak AC) . . .	400	max.	volts
Average Anode Current ^d	2	max.	ma
Cathode Irradiation	0.1 ^e	max.	lm
Ambient Temperature	75	max.	°C

→ Characteristics Range Values:

Under conditions with dc supply voltage (E) across a voltage divider providing 1/6 of E between cathode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode. Focusing-electrode voltage is adjusted to that value between 10 and 60 per cent of dynode No.1 potential (referred to cathode) which provides maximum anode current.

With E = 1500 volts (Except as noted)

	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	
Sensitivity:				
Radiant at 4400 angstroms.	-	2.2x10 ⁴	-	a/w
Cathode radiant, at 4400 angstroms.	-	0.04	-	a/w
Luminous:				
At 0 cps ^f	-	28	-	a/lm
With dynode No.10 as output electrode ^g	-	17	-	a/lm
Cathode luminous:				
With tungsten light source ^h	3x10 ⁻⁵	5x10 ⁻⁵	-	a/lm
With blue light source ^j	3x10 ⁻⁸	-	-	a
Current Amplification.	-	5.6x10 ⁵	-	

With E = 1250 volts (Except as noted)

	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	
Sensitivity:				
Radiant at 4400 angstroms.	-	4.8x10 ³	-	a/w
Cathode radiant, at 4400 angstroms.	-	0.04	-	a/w
Luminous:				
At 0 cps ^f	2.5	6	75	a/lm
With dynode No.10 as output electrode ^g	-	3.6	-	a/lm
Cathode luminous:				
With tungsten light source ^h	3x10 ⁻⁵	5x10 ⁻⁵	-	a/lm
With blue light source ^j	3x10 ⁻⁸	-	-	a

→ Indicates a change.



	Min.	Typ.	Max.	
Current Amplification.	-	1.2×10^5	-	
Equivalent Anode-Dark- Current Input at a luminous sensitivity of 20 a/lm ^{k,m}	-	2.5×10^{-10}	2.25×10^{-9}	lm
Equivalent Noise Input ⁿ	-	7×10^{-12}	1.7×10^{-11}	lm

^a Corning No.0080 made by Corning Glass Works, Corning, New York, or equivalent.

^b Made by Hugh H. Eby Company, 4701 Germantown Avenue, Philadelphia 44, Pennsylvania.

^c Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Illinois.

^d Averaged over any interval of 30 seconds maximum. For best stability, the average anode current value should not exceed 250 microamperes.

^e Above this value of cathode illumination, serious loss in linearity between light input and anode current will be caused by the resistivity of the cathode. For continuous light input of 0.1 lumen from tungsten light source at 2870° K incident on cathode area having diameter of $1\frac{1}{4}'' \pm \frac{1}{8}''$, and with dynode-No.1 voltage of 200 volts, the loss in linearity will not exceed 30 per cent depending on the magnitude of the cathode current. At 0.1 lumen, the corresponding continuous cathode current is approximately 5 microamperes, regardless of the spectral distribution of the exciting illumination.

^f Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 2870° K and a light input of 10 microlumens is used.

^g An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode-No.10 circuit and the anode serves only as collector. The curves shown in *Typical Anode Characteristics* do not apply when dynode No.10 is used as the output electrode.

^h Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 2870° K. The value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.

^j Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning C.S. No.5-58, Glass Code No.5113 polished to 1/2 stock thickness—Manufactured by the Corning Glass Works, Corning, New York) from a tungsten-filament lamp operated at a color temperature of 2870° K. The value of light flux incident on the filter is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.

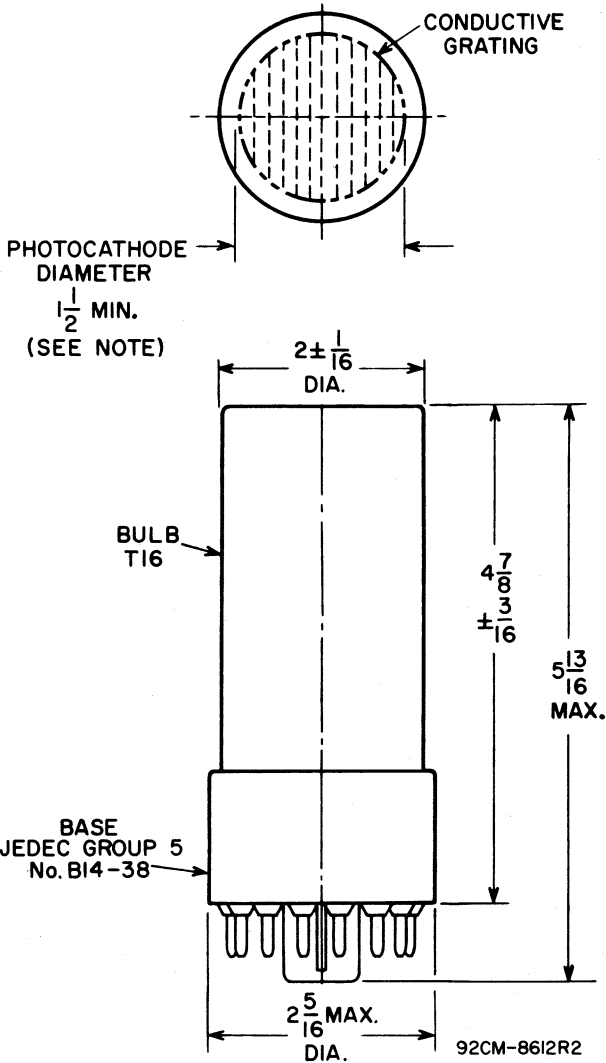
^k At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant.

^m For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.

ⁿ Under the following conditions: Supply voltage (E) is as shown, 25° C tube temperature, external shield connected to cathode, bandwidth 1 cycle per second, tungsten-light source at a color temperature of 2870° K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period.

**SPECTRAL-SENSITIVITY CHARACTERISTIC
OF PHOTSENSITIVE DEVICE HAVING S-II RESPONSE
is shown at front of this Section**





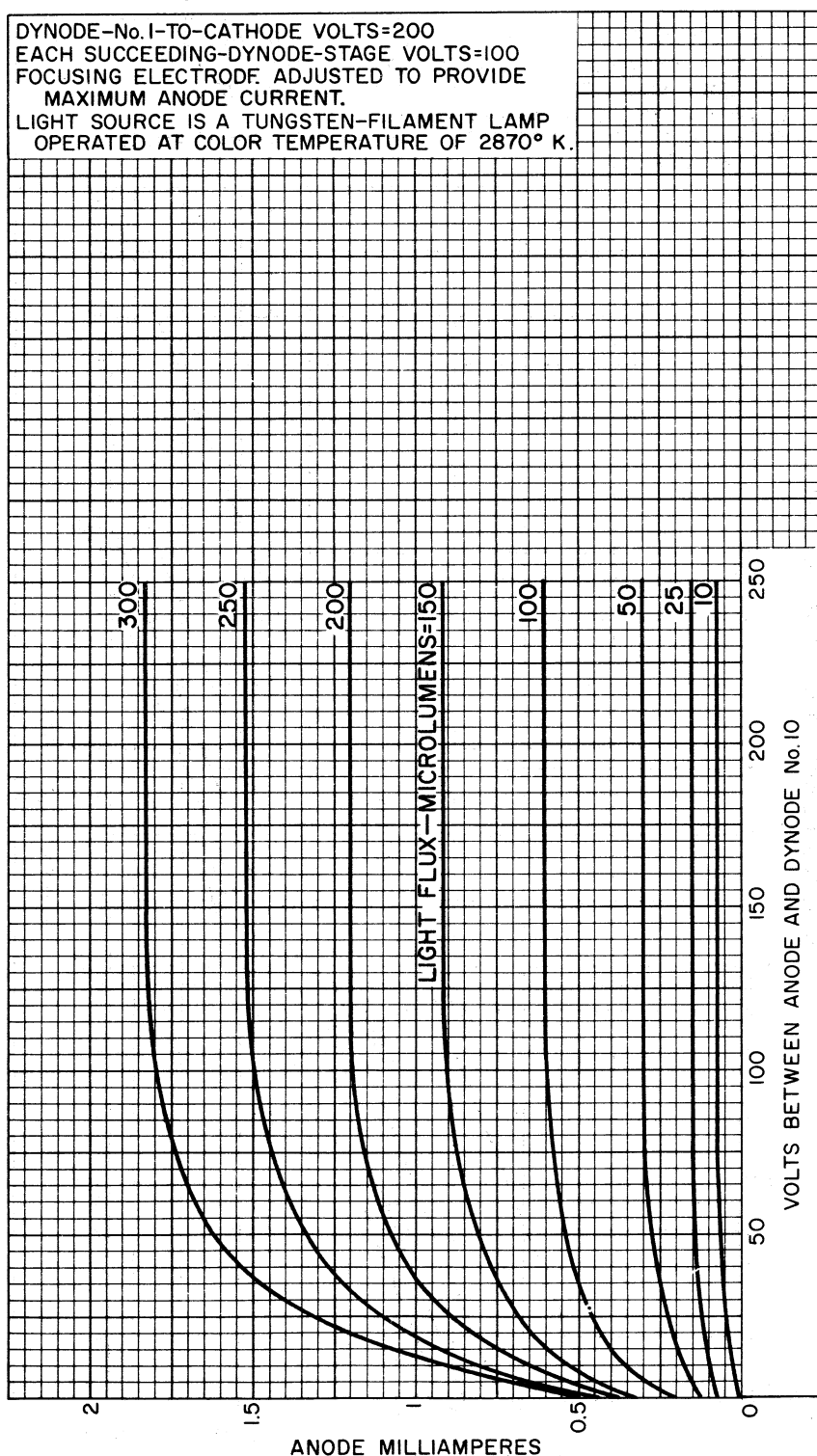
DIMENSIONS IN INCHES

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: WITHIN 1-1/2 INCH DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010 INCH FROM PEAK TO VALLEY.

TYPICAL ANODE CHARACTERISTICS

DYNODE-No.1-TO-CATHODE VOLTS=200
 EACH SUCCEEDING-DYNODE-STAGE VOLTS=100
 FOCUSING ELECTRODE ADJUSTED TO PROVIDE
 MAXIMUM ANODE CURRENT.
 LIGHT SOURCE IS A TUNGSTEN-FILAMENT LAMP
 OPERATED AT COLOR TEMPERATURE OF 2870° K.

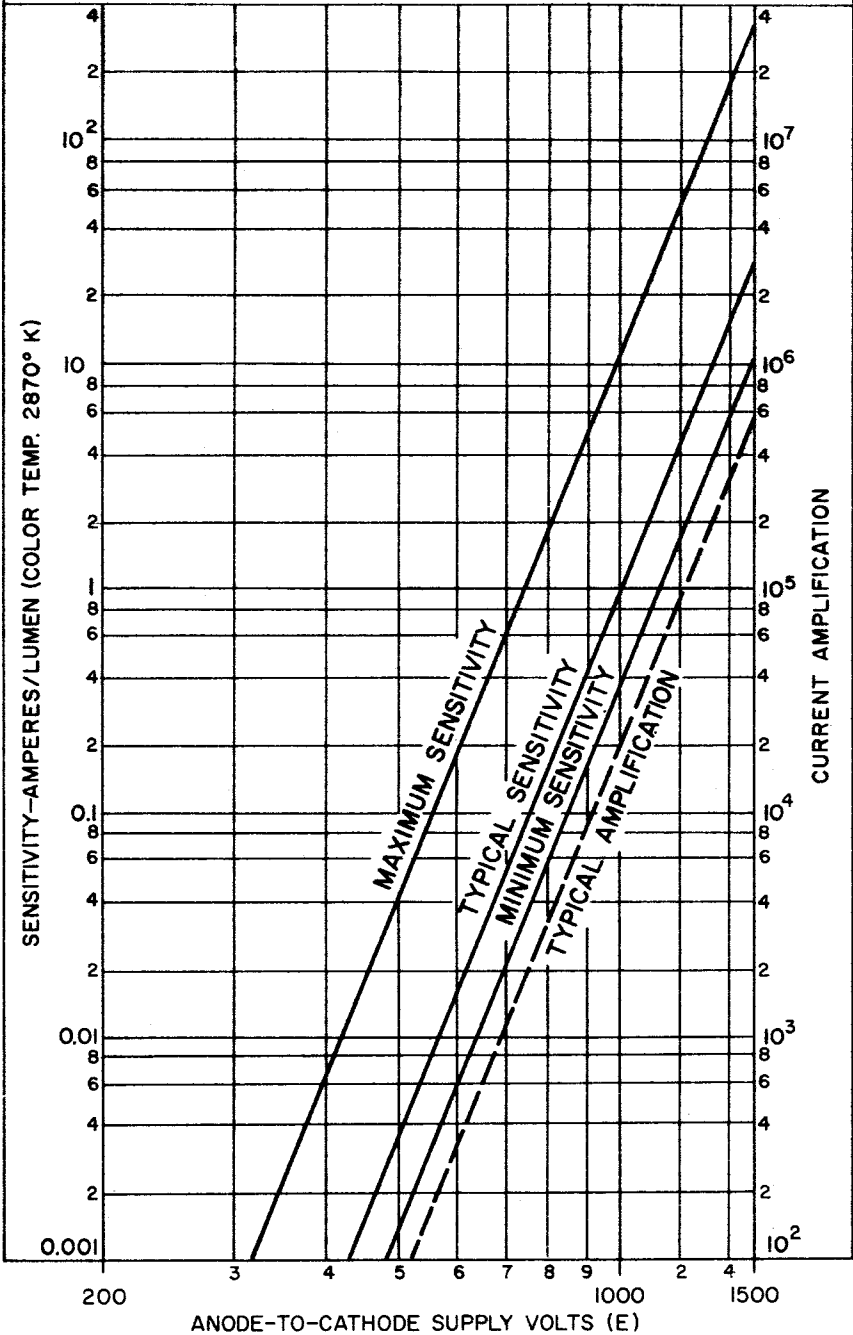


92CM-8641R1



SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS

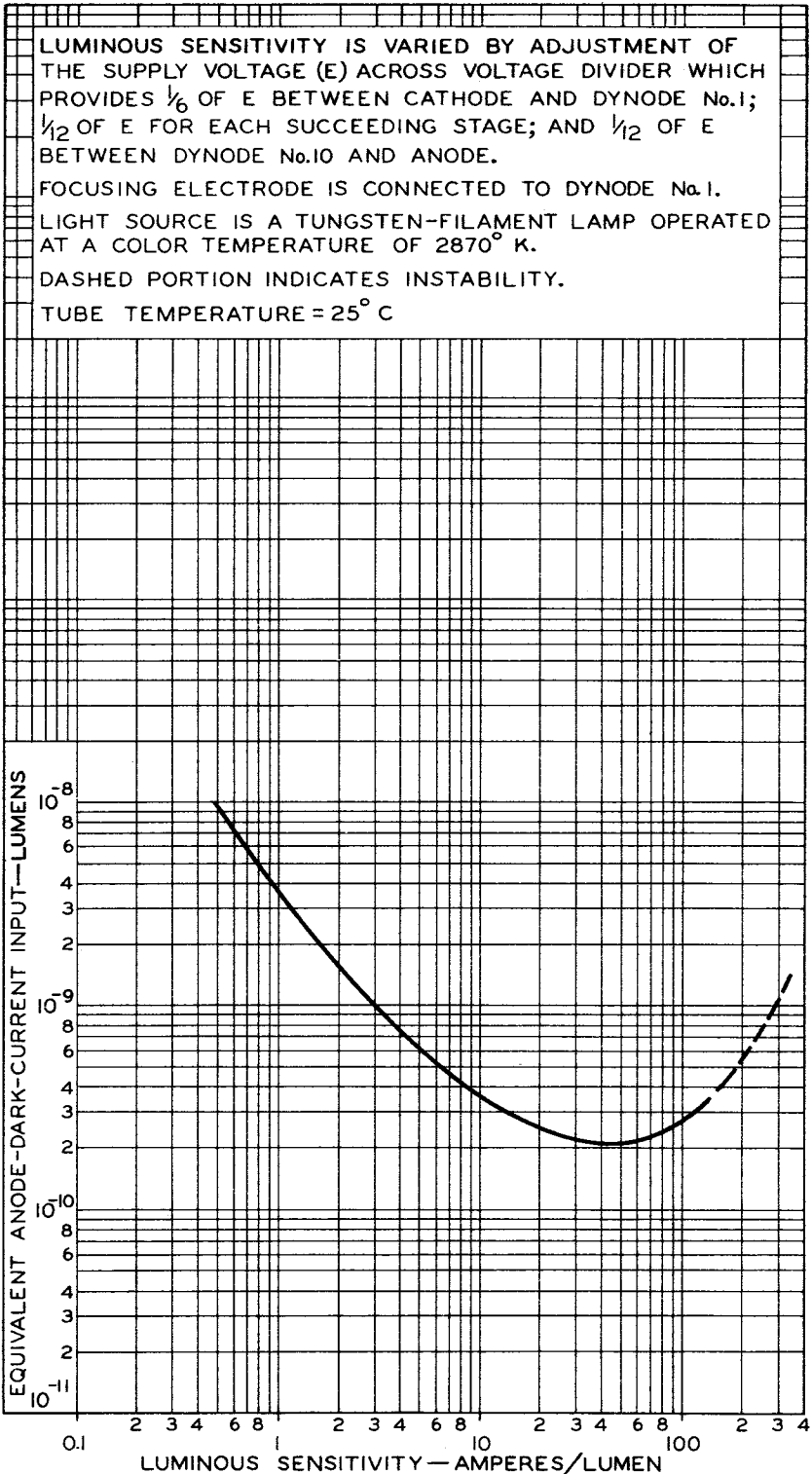
SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING
 1/6 OF E BETWEEN CATHODE AND DYNODE No.1; 1/12 OF E
 FOR EACH SUCCEEDING DYNODE STAGE; AND 1/12 OF E
 BETWEEN DYNODE No.10 AND ANODE.
 FOCUSING ELECTRODE ADJUSTED TO PROVIDE MAXIMUM ANODE
 CURRENT.



92CM-8637R2



TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



92CM-8640



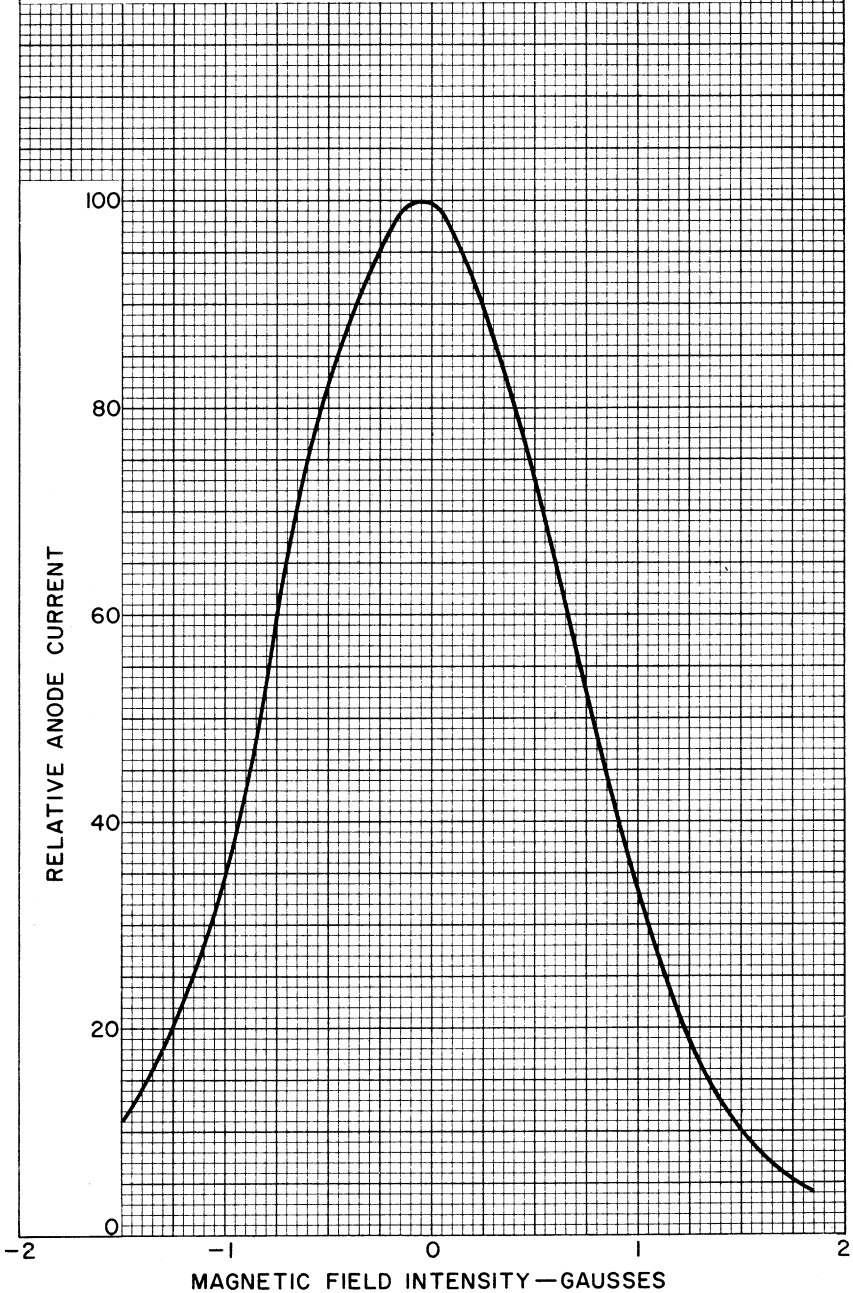
EFFECT OF MAGNETIC FIELD ON ANODE CURRENT

MAGNETIC FIELD IS PARALLEL TO DYNODE - CAGE AXIS.
POSITIVE VALUES ARE FOR LINES OF FORCE FROM LEFT
TO RIGHT WITH BASE DOWN AND BASE KEY TOWARD
OBSERVER.

DYNODE - No. 1 - TO - CATHODE VOLTS = 150

EACH - SUCCEEDING - STAGE VOLTS = 100

FOCUSING-ELECTRODE VOLTAGE ADJUSTED TO GIVE
MAXIMUM ANODE CURRENT.



92CM-8136R2