



931-A

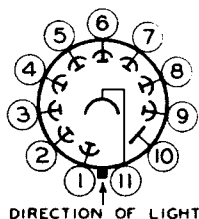
931-A MULTIPLIER PHOTOTUBE

9-STAGE TYPE with S-4 RESPONSE

DATA**General:**

Spectral Response.	S-4
Wavelength of Maximum Response	4000 $\pm$ 500 angstroms
Cathode:	
Minimum Projected Length*.	15/16"
Minimum Projected Width*.	5/16"
Direct Interelectrode Capacitances:	
Anode to Dynode No.9	4 μ mf
Anode to All Other Electrodes.	6.5 μ mf
Maximum Overall Length	3-11/16"
Maximum Seated Length.	3-1/8"
Seated Length to Center of Cathode	1-15/16" $\pm$ 3/32"
Maximum Diameter	1-5/16"
Bulb	T-9
Mounting Position.	Any
Base	Small-Shell Submagnal 11-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW	11K

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 - Anode
Pin 11 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) [□] . . .	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.9 and ANODE (DC or Peak AC). . .	250 max.	volts
PEAK ANODE CURRENT	10 max.	ma
AVERAGE ANODE CURRENT [○]	1 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

*With 100 volts per dynode stage and
100 volts between dynode No.9 and anode**

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>	
Anode Dark Current [●] . . .	-	-	0.25	μ amp
Sensitivity:				
At 4000 Angstroms . . .	-	9300	-	μ amp/ μ watt
Luminous [▲]	4.5	10	300	amp/lumen
Current Amplification [■] . . .	-	1000000	-	
Luminous Detectivity [★] . . .	1 $\times$ 10 ⁻¹¹	-	-	lumen

* On plane perpendicular to indicated direction of incident light.

□ Referred to cathode.

○ Averaged over any interval of 30 seconds maximum.

●, ▲, ■, □, ★: See next page.

← Indicates a change.

MAR. 15, 1948

TUBE DEPARTMENT

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MULTIPLIER PHOTOTUBE

→ Characteristics:

*With 75 volts per dynode stage
and 50 volts between dynode No.9 and anode*

Sensitivity:	<u>Av.</u>	
At 4000 Angstroms.	1400	$\mu\text{amp}/\mu\text{watt}$
Luminous [▲]	1.5	amp/lumen
Current Amplification [■]	150000	

* Dark current due to thermionic emission and ion feedback may be reduced by the use of refrigerants.

● For maximum signal-to-noise ratio, operation below 1000 volts is recommended.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS" at the front of this Section.

■ Ratio of anode sensitivity to cathode sensitivity.

* Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: 100 volts per stage, 25°C tube temperature, bandwidth of 1 cycle per second, tungsten light source at 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. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

● The successive stages of a multiplier phototube are operated at voltages increasing in equal steps from the photocathode to the 9th dynode, and are generally chosen as 75 to 100 volts per stage. The voltage between dynode No.9 and the anode should be kept as low as will permit of operation at a point just giving anode-current saturation. This point on the anode characteristic curves corresponds to a voltage of about 50 volts. Low operating voltage between dynode No.9 and anode reduces the dark current due to leakage paths and also reduces the ion bombardment of the dynodes. As a result, the operating stability of a multiplier phototube is greatly improved without sacrifice in sensitivity. It is to be noted that the supply voltage required to give an operating voltage of 50 volts between dynode No.9 and anode will, of course, be contingent on the load impedance used and the desired signal output voltage.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the front of this Section

→ Indicates a change.

MAR. 15, 1948

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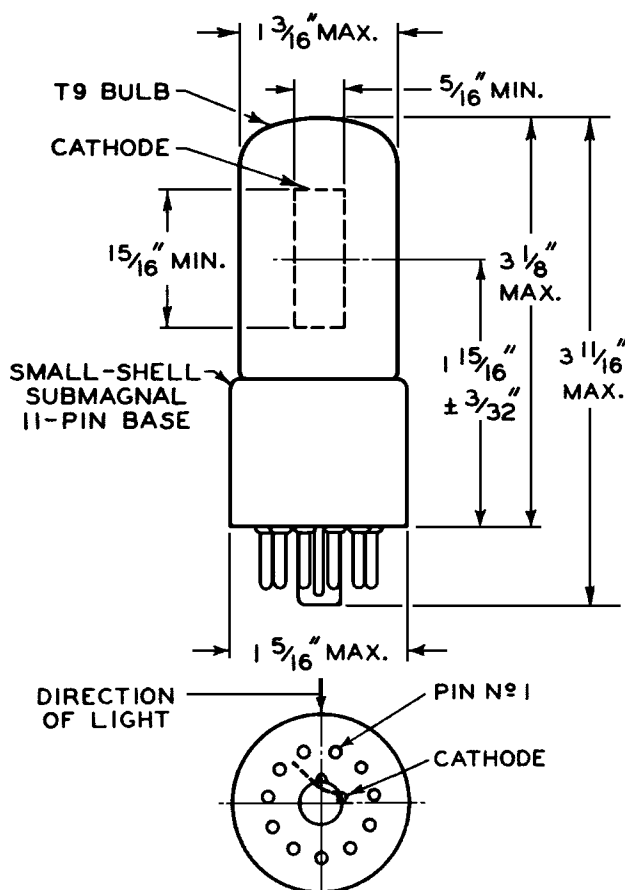
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DATA



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931-A MULTIPLIER PHOTOTUBE



BOTTOM VIEW 92CM-6264R2

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

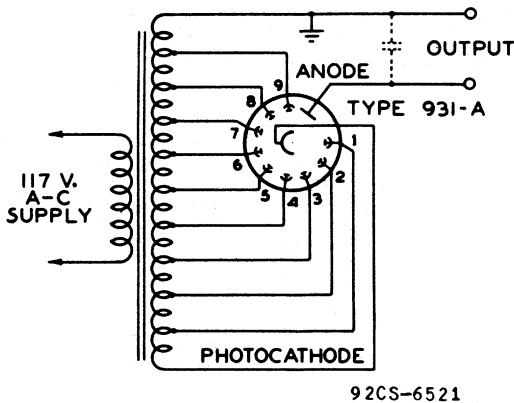


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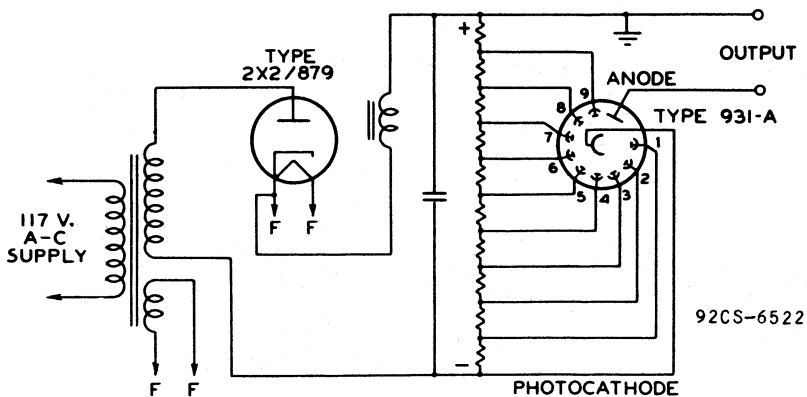
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TYPICAL CIRCUITS

A-C POWER-SUPPLY CIRCUIT with uniformly tapped transformer



HALF-WAVE POWER-SUPPLY CIRCUIT with bleeder for supplying d-c voltages



The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

DEC. 1, 1943

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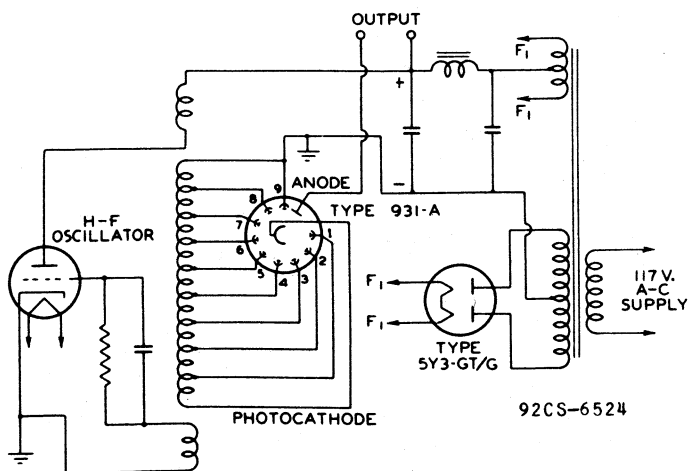
CIRCUITS



TYPICAL CIRCUITS

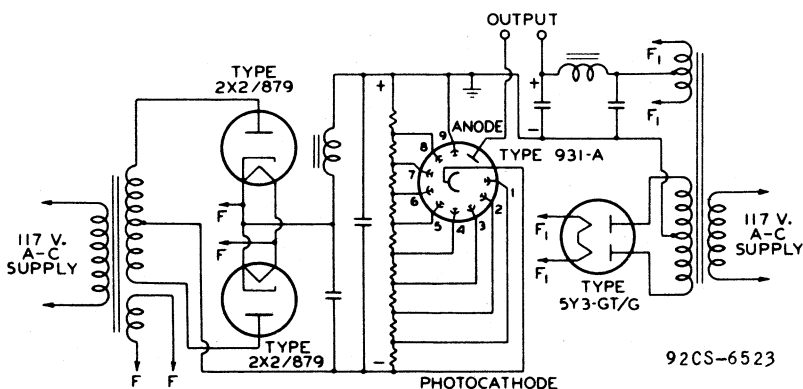
CIRCUIT USING H-F OSCILLATOR

for supplying a-c voltages to dynodes No.1 to No.9
and separate d-c voltage supply for the anode stage



FULL-WAVE POWER-SUPPLY CIRCUIT

with bleeder for supplying d-c voltages to dynodes No.1 to
No.9 and separate d-c voltage supply for the anode stage

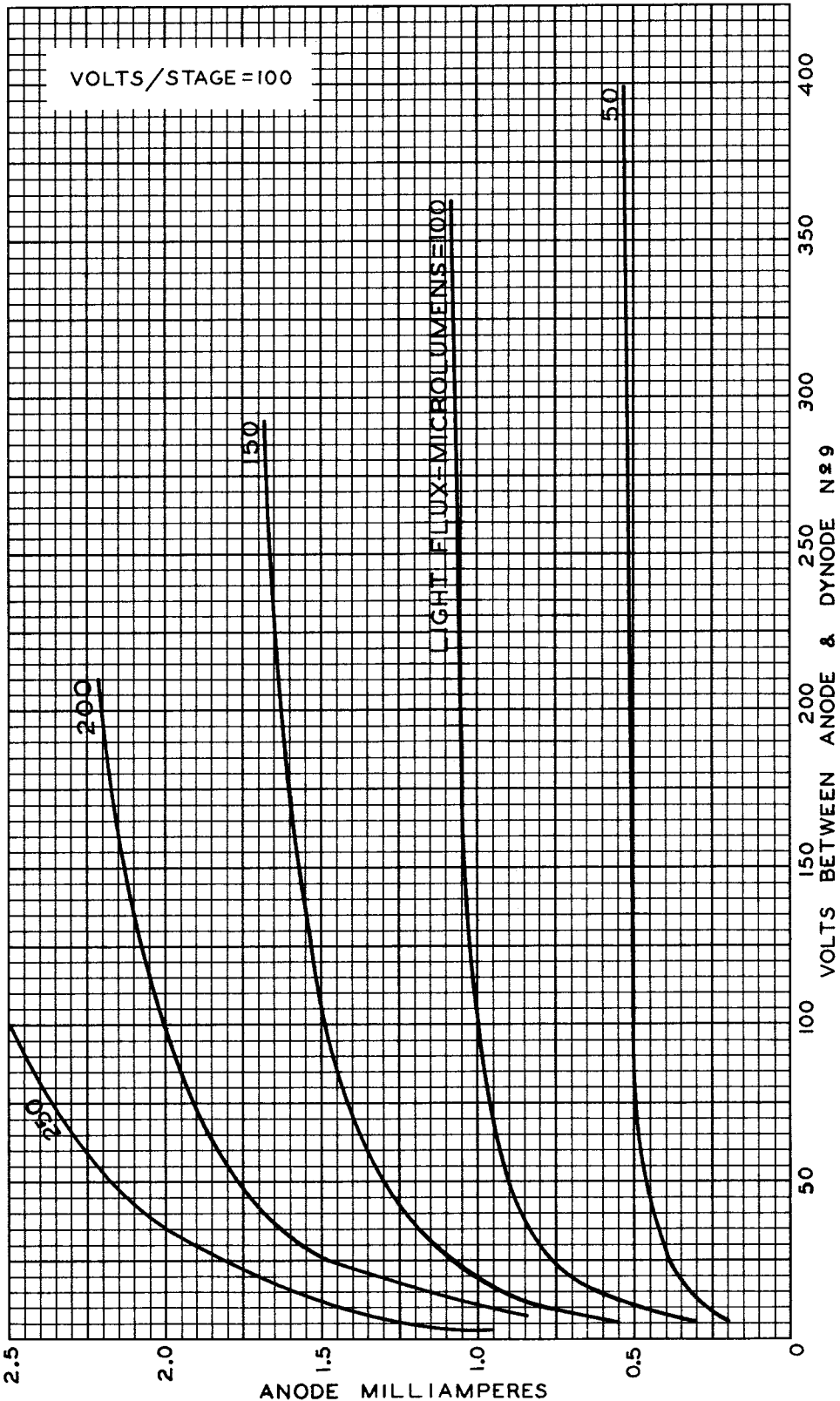




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AVERAGE ANODE CHARACTERISTICS



NOV. 19, 1945

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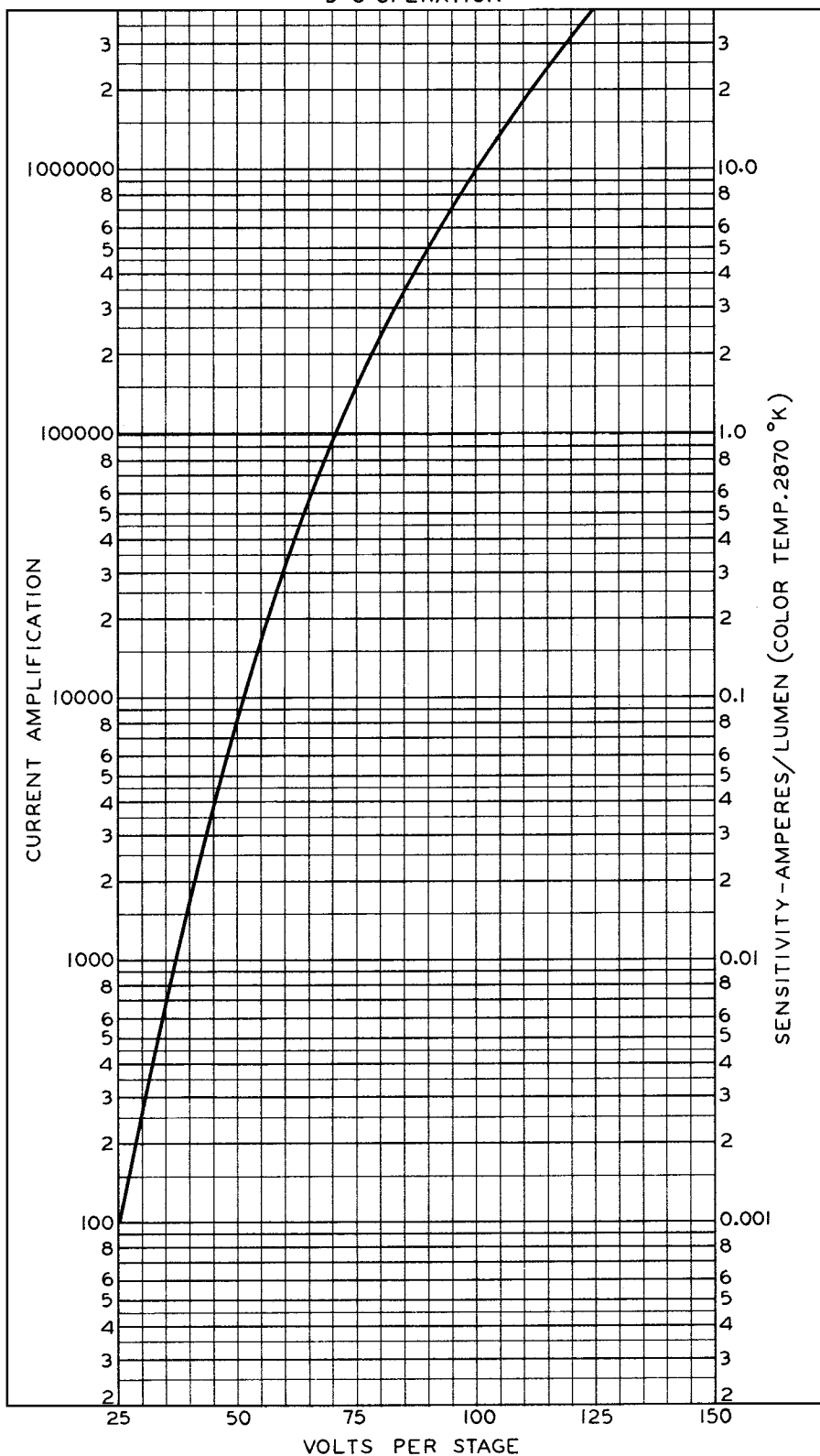
92CM-6268R3

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AVERAGE CHARACTERISTIC
D-C OPERATION

NOV. 16, 1945

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92CL-6459R1