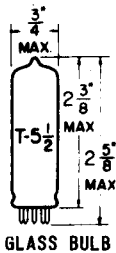


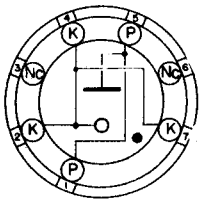
TUNG-SOL

VOLTAGE REGULATOR
MINIATURE TYPE



COLD CATHODE

ANY MOUNTING POSITION



BOTTOM VIEW

SMALL-BUTTON MINIATURE
7 PIN BASE

THE 6627/OB2WA IS A MINIATURE, TWO ELECTRODE, INERT-GAS-FILLED, COLD CATHODE TUBE FOR USE AS A VOLTAGE REGULATOR. IT MAINTAINS PRACTICALLY CONSTANT OPERATING VOLTAGE OVER A CURRENT RANGE OF 5 TO 30 MILLIAMPERES. IT HAS BEEN DESIGNED TO GIVE EXTREMELY SMALL VOLTAGE DRIFT THROUGHOUT LIFE BY CONTROLLED MANUFACTURING PROCESSES. THIS TUBE HAS BEEN SPECIALLY DESIGNED TO MAINTAIN STABLE OPERATING VOLTAGES THROUGH LIFE, EVEN IN APPLICATIONS WHICH REQUIRE TUBES TO OPERATE CONTINUOUSLY UNDER ENVIRONMENTAL CONDITIONS WHICH RAISE THE BULB TEMPERATURE TO A MAXIMUM OF 150°C

OVER THE RANGE OF 6 TO 10 MILLIAMPERES, THIS TUBE EXHIBITS REFERENCE TUBE CHARACTERISTICS. THE 6627/OB2WA ALSO HAS IMPROVED CHARACTERISTICS FOR SHOCK, VIBRATION, AND DARK BREAKDOWN VOLTAGE.

ELECTRICAL DATA

CATHODE

COLD

MECHANICAL DATA

MOUNTING POSITION	ANY	
MAXIMUM OVERALL LENGTH	2 5/8	INCHES
MAXIMUM SEATED LENGTH	2 3/8	INCHES
MAXIMUM DIAMETER	3/4	INCHES
WEIGHT (APPROX.)	0.3	OUNCES
BULB	T-5 1/2	
BASE	SMALL-BUTTON MINIATURE 7 PIN (JEDEC E2-1)	

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RATINGS

ABSOLUTE VALUES

MAXIMUM DC CATHODE CURRENT	30	MA.
MINIMUM DC CATHODE CURRENT	5	MA.
MAXIMUM BULB TEMPERATURE	150	°C
MINIMUM AMBIENT TEMPERATURE	-55	°C
MAXIMUM ALTITUDE	120 000	FEET
MAXIMUM INVERSE VOLTAGE	-50.	VOLTS
SHOCK IMPACT	450	G/ms
VIBRATION FATIGUE	2.5	G

CIRCUIT VALUES

MAXIMUM SHUNT CAPACITOR	0.1	μ f
SERIES RESISTOR	SEE OPERATION NOTES	

ADDITIONAL TESTS TO INSURE RELIABILITY

RANDOMLY SELECTED SAMPLES ARE SUBJECTED TO THE FOLLOWING TESTS

SHOCK: 30° HAMMER ANGLE IN NAVY, FLYWEIGHT, HIGH IMPACT
MACHINE (450 G/msc).

FATIGUE: 25 CPS, 0.08" TOTAL DISPLACEMENT, FOR 32 HOURS IN
OF 3 MUTUALLY PERPENDICULAR PLANES (2.5 G).

POST SHOCK AND FATIGUE LIMITS:

IONIZATION VOLTAGE (MAX.)	130	VDC
TUBE VOLTAGE DROP (5. & 30. MA.)	105 TO 111	VDC
REGULATION (5. TO 30. MA.) (MAX.)	2.5	VDC

SURVIVAL RATE LIFE TEST (100 HOURS): END POINT:

CHANGE IN TUBE VOLTAGE DROP FROM INITIAL VALVE	5	PERCENT
VOLTAGE REPEATABILITY (MAX.)	0.4	VDC

INTERMITTENT LIFE TEST: END POINTS (500 HOURS):

CHANGE IN TUBE VOLTAGE DROP FROM INITIAL VALUE (MAX.)	3	PERCENT
TUBE VOLTAGE DROP	103 TO 113	VDC.
REGULATION (MAX.)	3.0	VDC.
IONIZATION VOLTAGE (MAX.)	130	VDC

END POINTS (1000 HOURS):

CHANGE IN TUBE VOLTAGE DROP FROM INITIAL VALUE (MAX.)	4	PERCENT
TUBE VOLTAGE DROP	103 TO 116	VDC
REGULATION (MAX.)	3.0	VDC
IONIZATION VOLTAGE (MAX.)	130	VDC
VOLTAGE REPEATABILITY (MAX.)	0.4	VDC

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EQUIPMENT DESIGN AND RANGE VALUES

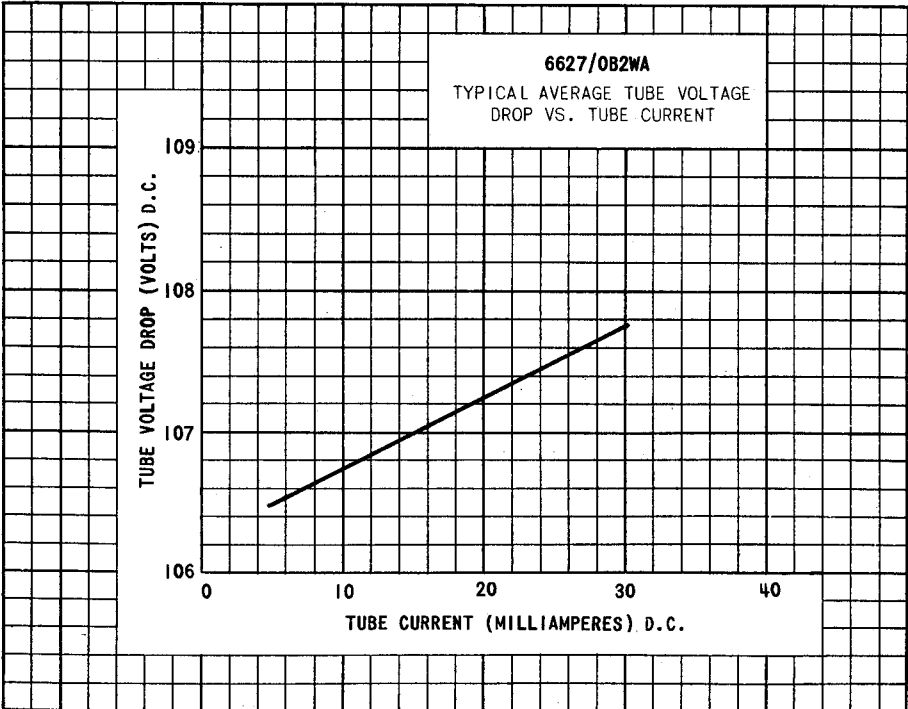
	MIN.	AVG.	MAX.	
DC ANODE SUPPLY VOLTAGE IN DARKNESS	130 ^A	---	---	VOLTS
DC ANODE SUPPLY VOLTAGE IN LIGHT	130 ^A	---	---	VOLTS
ANODE BREAKDOWN VOLTAGE	---	118	130	VOLTS
TUBE VOLTAGE DROP (1) AT 5.MA.	103	107	---	VOLTS
TUBE VOLTAGE DROP (2) AT 30. MA.	---	108	116	VOLTS
REGULATION	---	1.1	2.5	VOLTS
VOLTAGE JUMP ^B	---	0	100	MVOLTS
VOLTAGE REPEATABILITY ^C	---	0.1	0.4	VOLTS
OSCILLATION (AURAL CHECK)	---	---	---	
NOISE	---	0	5.0	MVOLTS
LEAKAGE CURRENT ($E_b = 50V$, $R_p = 3000\Omega$)	---	0	5.0	μ AMPS
MAXIMUM SHUNT CAPACITOR	---	---	0.1	μ f
SERIES RESISTOR	0	---	---	
MAXIMUM CURRENT THROUGH INTERCONNECTED LEADS	---	---	1.0	AMP.

^A TO ASSURE STARTING THROUGHOUT TUBE LIFE, THE SUPPLY VOLTAGE SHOULD NOT BE LESS THAN THIS VALUE.

^B THE MAXIMUM VOLTAGE FLUCTUATION AT ANY CURRENT LEVEL WITHIN THE CURRENT RANGE OF 6 TO 10 MA.

^C TUBE IS CYCLED ONE MINUTE ON AND ONE MINUTE OFF FOR FIVE CYCLES. READINGS ARE TAKEN INITIALLY AND AT THE END OF EACH "ON" PERIOD.

^D SUFFICIENT SERIES RESISTANCE MUST BE USED TO LIMIT THE CURRENT TO A MAXIMUM OF 30. MA. AT THE HIGHEST ANODE SUPPLY VOLTAGE AND TO LIMIT THE CURRENT TO A MINIMUM OF 5. MA. AT THE LOWEST ANODE SUPPLY VOLTAGE.



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OPERATING NOTES

IN THE OPERATION OF A GLOW TUBE THERE ARE SEVERAL REQUIREMENTS WHICH MUST ALWAYS BE MET. THE FIRST IS THAT THE SUPPLY VOLTAGE MUST ALWAYS BE GREATER THAN THE ANODE BREAKDOWN VOLTAGE AND THE SECOND IS THAT SUFFICIENT RESISTANCE MUST ALWAYS BE PUT IN SERIES WITH THE TUBE IN ORDER TO LIMIT THE CURRENT TO THE MINIMUM AND MAXIMUM VALUES GIVEN IN THE RATINGS.

IN ORDER TO ILLUSTRATE HOW TO CALCULATE THE VALUE OF THE SERIES RESISTANCE A TYPICAL REGULATOR CIRCUIT IS SHOWN IN FIGURE 1.

FROM FIGURE 1 WE SEE THAT V_1 IS THE UNREGULATED SUPPLY VOLTAGE, V_2 IS THE TUBE VOLTAGE DROP OR THE REGULATED VOLTAGE SUPPLIED TO THE LOAD, R_1 IS THE SERIES LIMITING RESISTOR, R_2 IS THE VARIABLE LOAD, I_T IS THE TUBE CURRENT AND I_L IS THE LOAD CURRENT.

WE SEE THAT THE TUBE CURRENT WILL BE A MAXIMUM WHEN THE SUPPLY VOLTAGE IS A MAXIMUM (V_1 MAX.); WHEN THE LOAD CURRENT IS A MINIMUM (I_L MIN.); AND WHEN THE TUBE VOLTAGE DROP IS A MINIMUM (V_2 MIN.). THEREFORE THE CONDITIONS WHICH DETERMINE THE LOWER LIMIT FOR THE SERIES RESISTANCE R_1 ARE THAT

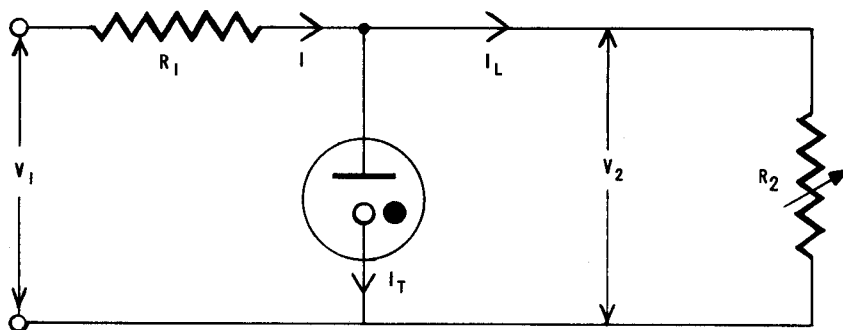
$$R_1 > \frac{V_1 \text{ MAX.} - V_2 \text{ MIN.}}{I_T \text{ MAX.} + I_L \text{ MIN.}}$$

IN A LIKE MANNER IT CAN BE SHOWN THAT THE VALUE OF R_1 IN ORDER TO LIMIT THE CURRENT TO THE MINIMUM VALUE REQUIRES THAT

$$R_1 < \frac{V_1 \text{ MIN.} - V_2 \text{ MAX.}}{I_T \text{ MIN.} + I_L \text{ MAX.}}$$

WHEN THESE VALUES HAVE BEEN COMPUTED, ONE SHOULD CHECK TO SEE IF THERE IS SUFFICIENT STARTING VOLTAGE BY THE FOLLOWING RELATION

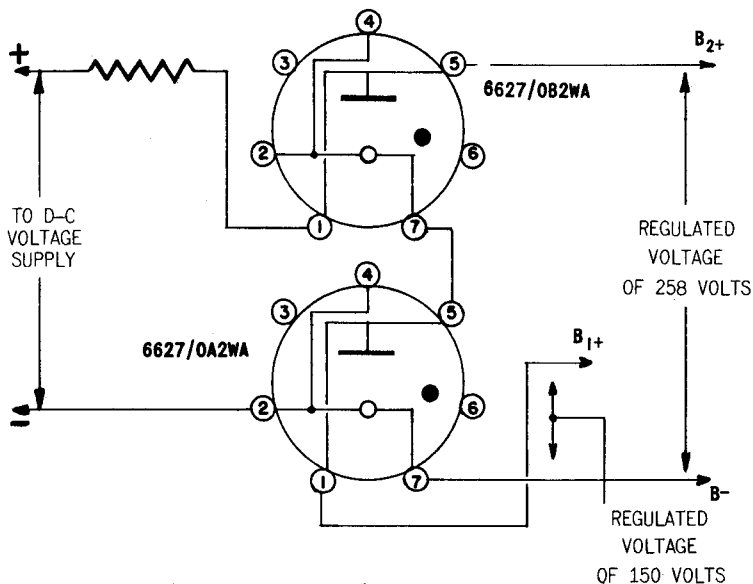
$$V_1 \text{ MIN.} \cdot \frac{R_2}{R_1 + R_2} > V \text{ STARTING}$$

**FIGURE 1**

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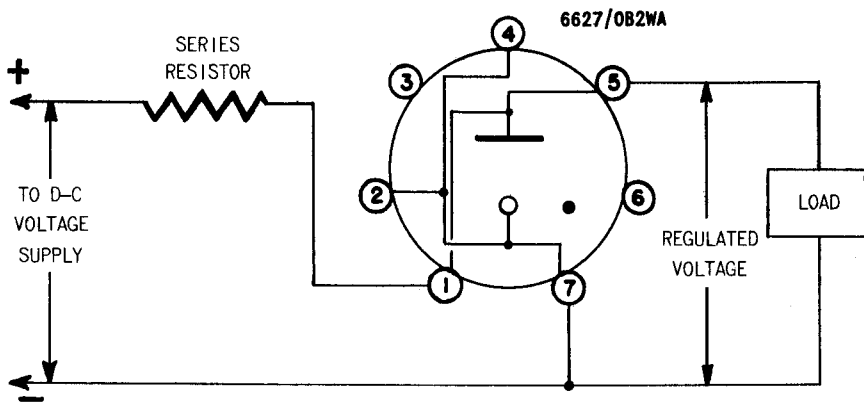
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OPERATION OF REGULATOR TUBES IN SERIES

FIGURE 2



TYPICAL CIRCUIT FOR VOLTAGE REGULATOR
FIGURE 3

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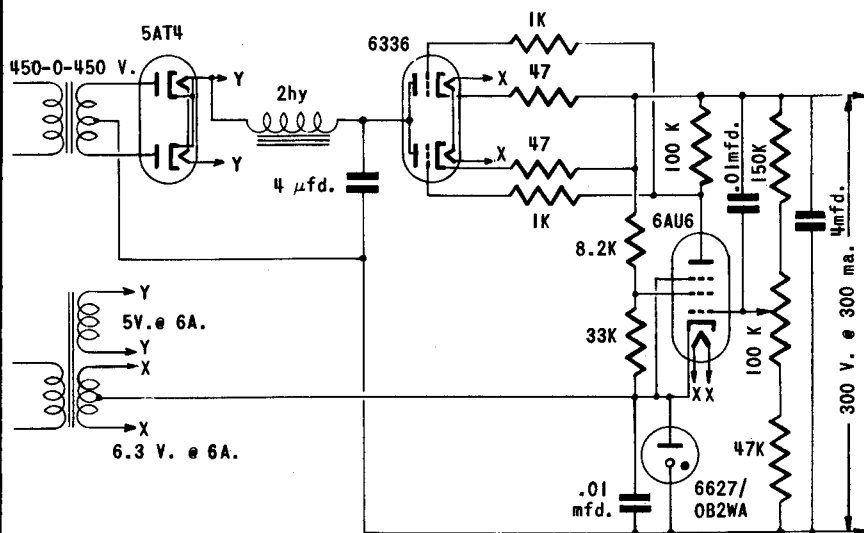
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WHEN THESE CALCULATIONS HAVE BEEN MADE AND THERE IS INSUFFICIENT STARTING VOLTAGE, A NEW LOAD CURRENT OF LOWER VALUE MUST BE USED AND THE CALCULATIONS REPEATED.

CIRCUITS WHICH HAVE A CAPACITOR IN SHUNT WITH THE 6627/OB2WA SHOULD BE LIMITED IN VALUE TO $0.1 \mu\text{fd}$; LARGER VALUES MAY CAUSE THE TUBE TO OSCILLATE.

OPERATION OF THE 6627/OB2WA IN PARALLEL IS NOT RECOMMENDED UNLESS A RESISTANCE OF APPROXIMATELY 100 OHMS IS USED IN SERIES WITH EACH 6627/OB2WA TO EQUALIZE DIVISION OF THE CURRENT. HOWEVER, IT SHOULD BE NOTED THAT WHILE THIS TYPE OF OPERATION ENABLES ONE TO HANDLE MORE LOAD CURRENT, IT REDUCES THE REGULATION THAT CAN BE OBTAINED.

IF IT IS DESIRED TO OBTAIN HIGHER REGULATING VOLTAGES, TUBES MAY BE OPERATED IN SERIES AS INDICATED IN FIGURE 2. HOWEVER, CARE SHOULD BE TAKEN TO SEE THAT SUFFICIENT SUPPLY VOLTAGE IS AVAILABLE TO START BOTH TUBES.



TYPICAL APPLICATION OF 6627/OB2WA
USED IN VOLTAGE REGULATED POWER SUPPLY
FIGURE 4