

## Voltage-Regulator

GLOW-DISCHARGE TYPE

75 VOLTS

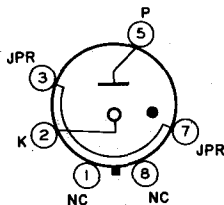
For Applications Requiring a Relatively  
Constant DC Output Voltage, Independent  
of Load and Supply-Voltage Variations

### Mechanical:

Operating Position . . . . .	Any
Type of Cathode . . . . .	Cold
Maximum Overall Length . . . . .	3-1/16"
Maximum Seated Length . . . . .	2-1/2"
Maximum Diameter . . . . .	1-9/32"
Dimensional Outline . . . . .	See <i>General Section</i>
Bulb . . . . .	T9
Base . . . . .	Intermediate-Shell Octal 6-Pin, Arrangement 1 (JEDEC Group 1, No. B6-8)

Basing Designation for BOTTOM VIEW. . . . . 4AJ

- Pin 1 - No Internal Connection
- Pin 2 - Cathode
- Pin 3 - Jumper<sup>a</sup>
- Pin 5 - Anode
- Pin 7 - Jumper<sup>a</sup>
- Pin 8 - No Internal Connection



### VOLTAGE REGULATOR

#### Maximum and Minimum Ratings, Absolute-Maximum Values:

Average Cathode Starting Current <sup>b</sup> . . . . .	100 max.	ma
DC Cathode Current . . . . .	{ 40 max.	ma
	{ .5 min.	ma
DC or AC Jumper Current . . . . .	2 max.	amp
Ambient-Temperature Range . . . . .	-55 to +90	°C

#### Circuit Values:

Shunt Capacitor . . . . .	0.1 max.	μf
Series Resistor . . . . .	See <i>Operating Considerations</i>	

<sup>a</sup> With suitable socket connections, the jumper within the tube base (between pins 3 and 7) provides for opening the power-supply circuit to protect circuit components when the voltage-regulator tube is removed from its socket.

<sup>b</sup> Averaged over starting period not exceeding 10 seconds. When starting currents greatly in excess of the maximum dc-cathode-current rating of 40 milliamperes are encountered, it may be necessary to operate these tubes as much as 20 minutes under steady-state conditions to assure stable operation.



## CHARACTERISTICS RANGE VALUES

Values are initial unless otherwise specified

	Note	Min.	Av.	Max.	
DC Anode Supply Voltage. . . . .	See Note 1				
DC Anode Starting Voltage in:					
Total darkness . . . . .	-	-	-	160	volts
Normal ambient light (5 to 50 footcandles). . . . .	-	-	100	105	volts
Anode Voltage Drop					
for dc cathode current of:					
5 ma. . . . .	-	70	-	-	volts
30 ma. . . . .	-	70	76	79	volts
40 ma. . . . .	-	70	78	81	volts
Regulation for dc-cathode- current range of:					
5 to 30 ma. . . . .	2	-	3	4.5	volts
5 to 40 ma. . . . .	2	-	5	6.5	volts
Tube Noise for dc cathode current of					
40 ma. . . . .	-	-	-	5	rms mv
DC Leakage Current					
for dc anode supply voltage of 50 volts and anode resistor of 3000 ohms . . . . .	-	-	-	10	$\mu$ a

Note 1: The minimum value to insure starting throughout useful tube life must be equal to the dc anode starting voltage plus the voltage drop across the series resistor at the maximum value of the load current.

Note 2: The maximum values for the specified regulation range apply throughout useful tube life.

## OPERATING CONSIDERATIONS

In any given application, the following two considerations must be met to assure safe and reliable operation:

1. The dc cathode current must be kept within the minimum ( $I_{kmin}$ ) and maximum ( $I_{km}$ ) ratings.
2. The dc anode starting voltage,  $E_b$  (stg), must be available under the worst probable conditions.

Instantaneous cathode starting currents in excess of the maximum dc-cathode-current rating (40 milliamperes) are permissible as indicated under *Maximum and Minimum Ratings*. When the tubes are subjected to such high starting currents, as much as 20 minutes may be required for the regulated dc voltage to reach its normal operating value. The regulated dc voltage may also change after long idle periods. To assure a constant regulated voltage a single value of operating current should be maintained.

Another effect associated with VR tubes is "spot jump", sometimes referred to as "jitter". This phenomenon is an instantaneous shift of the glow on the surface of the cathode and is responsible for small instantaneous changes in anode voltage drop. These changes can be minimized by operating the voltage-regulator tubes at dc cathode currents sufficiently above the minimum dc-cathode-current rating (5 milliamperes)



to assure that the glow covers a substantial portion of the cathode surface.

The level of ambient radiation directly affects the dc anode starting voltage of VR tubes. The maximum values required to start any tube under normal ambient-light conditions and in total darkness are given under *Characteristics Range Values*. Shielding should be considered when VR tubes are operated in the presence of strong, varying, magnetic, or nuclear-radiation fields to assure proper performance.

Ambient temperature should be kept relatively constant to minimize voltage drift.

Coupling effects can be minimized by shunting the VR tube with a capacitor not larger than 0.1  $\mu$ f.

*Series connection of VR tubes* may be employed to obtain dc regulated voltages greater than those obtainable from a single tube. Different types may be used provided the series current is kept within the maximum dc-cathode-current rating of the lowest-rated tube.

*Parallel connection of VR tubes* may be employed where it is necessary to obtain dc load currents greater than those obtainable from a single tube but at a loss in regulation. This loss in regulation results from the requirement that a resistor be used in series with each VR tube when in parallel operation.

Combinations of regulated dc voltages may also be obtained by series connection of VR tubes with tapped output as shown in *Typical Circuit 1*.

To determine the value of the series resistor for small load currents in a circuit of this type, disconnect the loads and adjust the series resistor for a tube current of not more than 40 milliamperes.

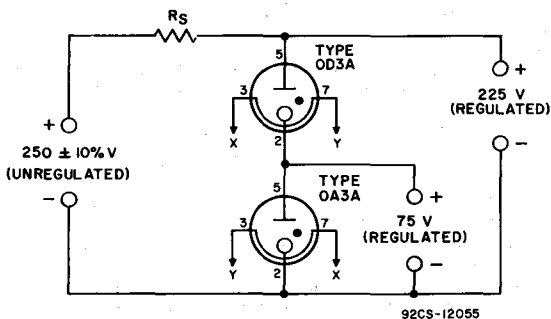
*Regulated bias voltages* may also be obtained as shown in *Typical Circuit 2*. In this circuit, a single 0A3A can supply a regulated dc voltage of -75 volts.

The *jumper* between pins 3 and 7 inside the base makes it possible with suitable socket connections, to open power-supply circuits to protect circuit components when one of the VR tubes is removed from its socket.

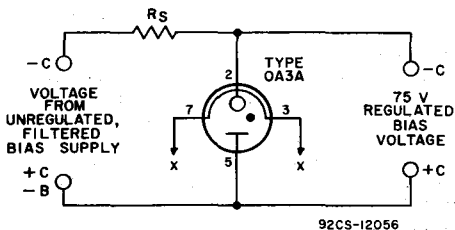


# 0A3A

## TYPICAL CIRCUIT 1



## TYPICAL CIRCUIT 2



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