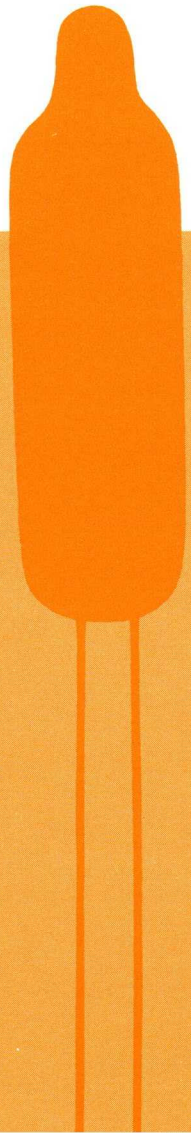
Signalite

NEON GLOW LAMPS

- CIRCUIT COMPONENTS
- VOLTAGE REGULATORS
- INDICATORS



Signalite

Glow Lamps Have Solved Problems In These Areas:

- Counters • Voltage Regulation • Voltage References
- Voltage Dividers • Digital Readouts • Oscillators
- Coupling Devices • Switches • Memory • Surge Protectors
- Limiters • Logic Circuits • Timing • SCR Triggering
- Pulse Generators • Photo-Cell Drivers • Flip-Flops • Gating
- Relays • Time Delays • Photo Choppers • Amplifiers

Signalite Division of General Instrument
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Evaluating And Applying Neon Glow Lamps

The neon lamp known to industry for many years is basically a negative glow discharge device. It consists of two closely spaced electrodes housed in a glass envelope filled with rare gas. When a sufficient amount of voltage is applied across the terminals of a neon lamp, it exhibits what is called breakdown characteristics; that is, the voltage across the lamp drops very quickly to a reduced level which is called its maintaining voltage. When this condition occurs, there is the appearance of a glow surrounding the negative electrode. As can be seen, the glow lamp exhibits characteristics making it useful as a circuit component as well as an indicator.

IONIZATION TIME

The amount of time it takes for the lamp to start conducting after application of the breakdown voltage is known as the ionization time. If the applied voltage is just equal to the lamp's specified breakdown voltage, this time may be hundreds of milliseconds. However, if the applied voltage is 30% or greater than the breakdown voltage, the ionization time may be as low as 10 microseconds. Fig. 1 illustrates ionization time vs. percent over voltage for typical lamp operating in 5 to 50 ft. candles of light.

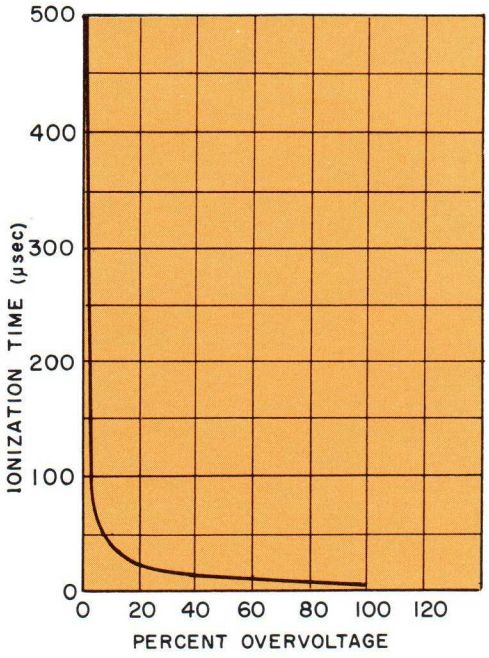


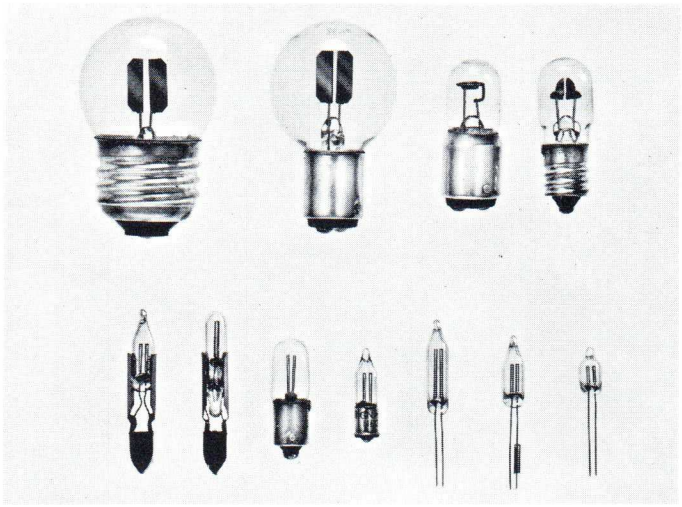
FIG. 1

BALLASTING

All neon glow lamps require ballasting in the form of a resistor in series with the lamp. The value of the resistor depends on the applied voltage, current, and desired lamp characteristics.

ELECTROSTATIC AND RF EFFECTS

There are also external conditions which affect the operation of neon glow lamps. For example, the existence of an electrostatic field in the vicinity of the glow lamp will noticeably affect its performance. Such a field may decrease the rated breakdown voltage, and cause the lamp to ignite at levels significantly below normal. Electrostatic fields have no effect on maintaining voltage characteristics. High intensity radio frequency can cause the neon lamp to ignite with no applied voltage. These characteristics in themselves suggest other possible applications.



Typical Signalite Neon Glow Lamp Configurations

OTHER EXTERNAL EFFECTS

Temperature

Neon lamps exhibit a negative temperature characteristic, normally about 40 to 50 millivolts per degree Centigrade. In a voltage regulator, this temperature coefficient may be as low as 1.5 millivolts per degree C. This change is small compared to zener diodes. The normal operating temperature specifications for electronic circuitry of −60°F to +165°F are perfectly acceptable to neons.

Dark Effect

When glow lamps are subjected to a darkened environment, their breakdown voltage rises and their ionization time increases. Signalite manufactures glow lamps which are dark compensated which substantially reduces this undesirable effect.

LIGHT OUTPUT

Light output of neon lamps in circuit applications is usually not a matter of prime importance, except when being used with photocells. However, the fact that the lamp does glow when it is operating can be used as an indicator of circuit operation. Also, since the glow in a direct current application is confined to the cathode (or negative electrode), this characteristic can be used to determine polarity.

Light emitted by standard brightness neon lamps averages .06 lumens per milliamp while high brightness lamps average .15 lumens per milliamp. However, high brightness lamps have higher current ratings giving typically 8 times more brightness for equivalent life. The light itself is confined mainly to the yellow and red regions of the spectrum, between 5200 and 7500 Angstroms. A band in the infrared region between 8200 and 8800 Angstroms is also emitted.

RATED LIFE EXPECTANCY

In most circuit applications, neon glow lamps are not on all of the time. In such applications, only the time during which the lamp has current passing through it determines the useful life. If this period is a short duration, as in pulsing applications, the rated life will have to reflect the fact that the lamp's useful life is not being consumed while it is inoperative. In many applications, the actual rated life, i.e. calculated operation time of the lamp, will exceed by many times the estimated lifetime of the equipment or circuit in which the lamp is installed.

The life expectancy of a neon glow lamp, of course, depends on the operating conditions of the lamp. Operating at above design current results in shorter life, while operating below design current results in an increase in life. Generally, the current for neon lamps may vary from .1 milliamp to 10 milliamp. If the lamp is installed in a circuit where it will be subject to pulsing, the peak current, pulse wave shape and pulse duration all will have their effect on lamp lifetimes. Lifetimes predominantly range from 1,000 to 50,000 hours of continuous operation.

Definition Of Terms

BREAKDOWN VOLTAGE sometimes called starting or igniting voltage, is the minimum voltage across the lamp at which an abrupt increase in current occurs. (This voltage is read at V_2 — See Circuit Diagram.)

MAINTAINING VOLTAGE sometimes called operating voltage, is the voltage measured across the lamp when it is conducting. (This voltage is read as V_2 — See Circuit Diagram.)

EXTINGUISHING VOLTAGE is that voltage appearing across the lamp and resistor at the instant the lamp turns off. (This voltage is read at V_1.) This voltage is dependent upon the value of the series resistor.

DESIGN CURRENT is that current at which rated life values are based.

RATED LIFE is the number of hours which produces specified changes in characteristics. In lamps for indicator use, the end of useful life is considered to be when light output reaches 50% of its initial value for standard brightness glow lamps, or when the lamp becomes inoperative at line voltage for high brightness glow lamps. In lamps used as circuit components, the characteristic is usually a specified change in breakdown voltage or maintaining voltage.

STANDARD BRIGHTNESS LAMPS

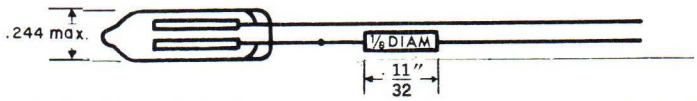
SIGNALITE TYPE	ASA #	BREAKDOWN VOLTAGE (MAX.) A.C.	BREAKDOWN VOLTAGE (MAX.) D.C.	RATED LIFE HOURS (AVG.)	SERIES RESISTANCE (OHMS)	CIRCUIT VOLTS	WATTS NOM.	GLASS DIMENSIONS OUTSIDE LENGTH (MAX.)	WIRE TERMINAL LENGTH
A1B	A1B	65	90	25,000	220,000	105-125	1/25	1/2″	1″
T2-20-1	—	65	90	25,000	100,000	105-125	1/15	5/8″	1″
**NE2V	A2B	65	90	25,000	100,000	105-125	1/15	3/4″	2″
T2-24-1	A7A	65	90	25,000	100,000	105-125	1/15	3/4″	1″
T2-24-2 (NE 2E)	A9A	65	90	25,000	100,000	105-125	1/15	3/4″	2″
T2-27-1	A5A	65	90	25,000	100,000	105-125	1/15	27/32″	1″
T2-27-2 (NE 2A)	A3A/A2A	65	90	25,000	100,000	105-125	1/15	27/32″	2″
*T2-32-1	A6A	65	90	25,000	75,000	105-125	1/10	1″	1″
NE-2	A1A	65	90	25,000	150,000	105-125	1/17	1″	1″

NOTES: *Electrodes are 12mm long for longer illuminated length.
**NE2V has a small amount of radio active additive to reduce dark effect.
Useful life of all standard brightness lamps is considered to be when light output reaches 50% of initial.

HIGH BRIGHTNESS LAMPS

A1C	A1C	95	135	25,000	47,000	105-125	1/7	1/2″	1″
LT2-20-1	—	95	135	25,000	30,000	105-125	1/4	5/8″	1″
LT2-24-1	C3A	95	135	25,000	30,000	105-125	1/4	3/4″	1″
LT2-24-2 (NE 2H)	C2A	95	135	25,000	30,000	105-125	1/4	3/4″	2″
**NE2U	A3C	95	135	25,000	30,000	105-125	1/4	3/4″	2″
LT2-27-1	C4A	95	135	25,000	30,000	105-125	1/4	27/32″	1″
LT2-27-2	C5A	95	135	25,000	30,000	105-125	1/4	27/32″	2″
*LT2-32-1	C6A	95	135	25,000	22,000	105-125	1/3	15/16″	1″

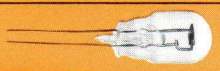
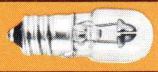
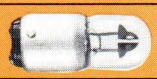
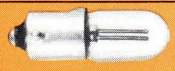
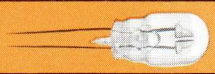
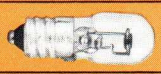
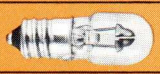
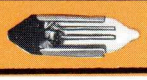
NOTES: * Electrodes are 12mm long for longer illuminated length.
** NE2U has a higher amount of radio active additive than the C2A.
All high brightness lamps have a small amount of radio active additive to reduce dark effect.



All above lamps are available with attached resistor as typically shown in above diagram, as well as to exact customer specifications.

The following notes are common to all standard brightness lamps and high brightness lamps.
Available with different resistor values to meet customer requirements for life and brightness.
May be used on higher voltages in series with proper value resistor.
D.C. life is 60% of A.C. values.
Lamps supplied with cleaned copper finish. May be furnished tinned.

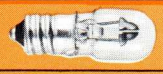
BASED NEON GLOW LAMPS

SIGNALITE TYPE	ASA #	BREAKDOWN VOLTAGE (MAX.)		SERIES RESISTANCE (OHMS)	RATED LIFE HOURS (AVG.)	CIRCUIT VOLTS	WATTS (NOM.)	BASE	BULB	NOTES	MAX. OVERALL LENGTH
		A.C.	D.C.								
NE2J 	C9A	95	135	30,000	25,000	105-125	1/4	S.C. Midget Flange	T2	(1) (2) (3) (5)	15/16
NE2D 	C7A	65	90	100,000	25,000	105-125	1/15	S.C. Midget Flange	T2	(1) (3) (5) (6)	15/16
NE3 	—	65	90	200,000	15,000	105-125	1/25	Telephone Slide	T2 Rounded End	(1) (3) (5) (7)	1-11/16
NE4 	—	65	90	100,000	15,000	105-125	1/15	Telephone Slide	T2	(1) (3) (5) (7)	1-3/4
NE7 	B4A	55	75	30,000	7,500	105-125	1/4	Wire Terminal	T4-1/2	(1) (3) (5) (8)	1-1/4
NE17 	B5A	55	75	30,000	7,500	105-125	1/4	D.C. Bayonet	T4-1/2	(1) (3) (5)	1-1/2
NE21 	B6A	55	75	30,000	7,500	105-125	1/4	S.C. Bayonet	T4-1/2	(1) (3) (5)	1-1/2
NE30 	J6A / J5A	60	85	4,800	10,000	105-125	1	Medium Screw	S11	(3) (4)	2-3/16
NE32 	L6A / L5A	60	85	4,800	10,000	105-125	1	D.C. Bayonet	G10	(1) (3) (5)	2-1/8
NE45 	B7A	65	90	30,000	7,500	105-125	1/4	Cand. Screw	T4-1/2	(3) (4)	1-17/32
NE47 	B8A	65	90	30,000	7,500	105-125	1/4	S.C. Bayonet	T4-1/2	(1) (3) (5)	1-1/2
NE48 	B9A	65	90	30,000	7,500	105-125	1/4	D.C. Bayonet	T4-1/2	(1) (2) (3) (5)	1-1/2
NE51 	B1A	65	90	200,000	15,000	105-125	1/25	Min. Bayonet	T3-1/4	(1) (3) (5)	1-3/16
NE51H 	B2A	95	135	47,000	25,000	105-125	1/7	Min. Bayonet	T3-1/4	(2) (3) (5)	1-3/16
NE54 	F2A	65	90	30,000	7,500	105-125	1/4	Wire Terminal	T4-1/2	(1) (3) (5)	1-1/4
NE56 	L1A	60	85	30,000	10,000	210-250	1	Medium Screw	S11	(3) (4)	2-3/16
NE57 	F3A	55	75	30,000	7,500	105-125	1/4	Cand. Screw	T4-1/2	(3) (4)	1-17/32
NE58 	F4A	55	75	100,000	7,500	210-250	1/2	Cand. Screw	T4-1/2	(3) (4)	1-17/32
NE84 	K1A	95	135	30,000	25,000	105-115	1/4	Min. Telephone Slide	T2	(1) (2) (3) (5)	1-1/32

NOTES:

1. May be used on circuits of higher voltage provided proper external resistor is used.
2. High brightness lamps with a small amount of radio active additive to reduce dark effect.
3. D.C. life approximately 60% of A.C. values.
4. Resistor included in base.
5. External resistor, not included.
6. Meets Mil. Spec. MS25252.
7. Lamp must fall free through a .310″ dia. cylinder ½″ long.
8. For D.C. operation, center electrode is negative.

ARGON GLOW LAMPS

AR3 	J2A	80	115	15,000	150	105-125	1/4	Cand. Screw	T4-1/2	(1)	1-17/32
AR4 	J3A	80	115	15,000	150	105-125	1/4	D.C. Bayonet	T4-1/2	(1) (2)	1-1/2
AR9 	K4A	80	115	200,000	50	105-125	1/25	Wire	T2	(1)	1

NOTES:

1. Ultraviolet output drops to 50% at above rated hours.
2. External resistor, not included.

A261 NEON DISPLAY LAMP

- Signalite A261 is designed to replace digital readout tubes as numeral 1, + and — readouts.
- Specific uses for over-range, plus and minus positions in digital voltmeters and other digital readout equipment.
- Features excellent light output, long life, low cost and offers space savings.

BREAK-DOWN VOLTAGE	MAINTAIN-ING VOLTAGE	DESIGN CURRENT	CIRCUIT VOLTAGE	LIFE	CORONA LENGTH	DIMENSIONS		
						ENVELOPE MOL	ENVELOPE MAX. DIA.	LEAD LENGTH
90 vdc max.	75 vdc max.	1.5 ma	150 vdc min.	2000 hours (continuous)	.55" (approx.) 14 mm	1.3125"	.244"	1.0" ± .0625

NOTES:

- Tinned Leads
- Pre-Aged
- Dark Effect Reduced
- 90% Corona Coverage
- Anoda (+) Indentified by Green Dot

V SERIES VOLTAGE REGULATOR AND REFERENCE TUBES

- temp. coef. less than 15 mv/°C
- life greater than 20,000 hours
- stacking capability for higher voltage regulation

SIGNALITE TYPE	BREAKDOWN VOLTAGE vdc max.	REFERENCE VOLTAGE MEAS. AT		CURRENT RANGE* FOR REGULATOR	OPERATING CURRENT ma		
		vdc	ma	ma	MAX.[3]	MIN. AS SHUNT REG.	MIN. IN PARALLEL WITH A CAPACITOR
V83R4	115	83±2	1.5	0.25 — 4.0	6.0	0.25	0.4
V84R2	115	84±2	1.0	0.15 — 2.0	3.0	0.15	0.35
V91R2	125	91±2	1.0	0.1 — 2.0	3.0	0.1	0.3
V103R2	135	103±2	0.8	0.2 — 2.0	3.0	0.2	0.25
V110R4	170	110±2	1.5	0.5 — 4.0	6.0	0.5	0.95
V115R4	155	115±2	0.8	0.15 — 4.0	6.0	0.15	0.3
V116R2	150	116±2	0.6	0.12 — 2.0	3.0	0.15	0.3
V139R1.9	190	139±4	0.5	0.3 — 1.9	3.0	0.3	0.6
V143R1.9	225	143±4	0.5	0.3 — 1.9	3.0	0.3	0.6

Z SERIES VOLTAGE REGULATOR AND REFERENCE TUBES

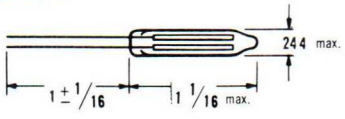
SIGNALITE TYPE	BREAKDOWN VOLTAGE vdc		REFERENCE MEAS. VOLTAGE AT		CURRENT RANGE[2] FOR REGULATOR	TEMP. COEFF.	OPERATING CURRENT ma			LIFE EXPECTANCY	TYPICAL VARIATION AT 250 HOURS
	MAX.	TYPICAL	vdc	ma	ma	mv/°C	MAX.[3]	MIN. AS SHUNT REG.	MIN. IN PARALLEL WITH A CAPACITOR	HOURS	%
Z82R7	110	102	82±1	2.0	0.25 - 7.0	—2	10.0	0.25	0.45	30,000	< 0.2
Z82R10	115	105	82±1	2.0	0.3 - 10.0	—2	14.0	0.3	0.7	30,000	< 0.3
Z82R15	118	107	82±1	2.0	0.5 - 15	—2	17.0	0.5	0.9	30,000	< 0.5
Z83R4	110	100	83±1	1.5	0.25 - 4.0	—2	6.0	0.25	0.4	30,000	< 0.2
Z84R2	110	100	84±1	1.0	0.15 - 2.0	—2	3.0	0.15	0.35	30,000	< 0.2
Z91R2	118	110	91±1	1.0	0.1 - 2.0	—3.5	3.0	0.1	0.3	30,000	< 0.3
Z91R4	120	111	91±1	1.5	0.2 - 4.0	—3.5	6.0	0.15	0.35	30,000	< 0.3
Z91R7	130	120	91±1	1.5	0.25 - 7.0	—3.5	10.0	0.25	0.4	30,000	< 0.3
Z91R10	135	122	91±1	1.5	0.25 - 10	—3.5	12.0	0.25	0.5	25,000	< 0.3
Z100R12	150	140	100±1	3.0	0.6 - 12.0	—9	14.0	0.7	1.8	30,000	< 0.6
Z103R2	130	115	103±1	0.8	0.2 - 2.0	—4.5	3.0	0.2	0.25	20,000	< 0.4
Z103R4	130	120	103±1	1.0	0.2 - 4.0	—4.5	5.0	0.2	0.25	20,000	< 0.6
Z110R4	165	155	110±1	1.5	0.5 - 4.0	—9	6.0	0.5	0.95	30,000	< 0.4
Z115R4	150	140	115±1	0.8	0.15 - 4.0	15	6.0	0.15	0.3	20,000	< 0.3
Z115R6	155	145	115±1	1.5	0.5 - 6.0	15	9.0	0.5	2.0	20,000	< 0.3
Z116R2	145	138	116±1	0.6	0.12 - 2.0	15	3.0	0.15	0.3	20,000	< 0.3
Z139R1.9	185	175	139±3	0.5	0.3 - 1.9	—10	3.0	0.3	0.6	20,000	< 0.35
Z143R1.9	220	195	143±3	0.5	0.3 - 1.9	—10	3.0	0.3	0.6	20,000	< 0.2

NOTES:

- Stacking capability for higher voltage regulation.

1 Limits for less than two volt variation.
2 Limits for less than one volt variation.
3 Maximum continuous current without permanent damage to tube.

Equilibrium condition reached within 2 minutes after ignition is common to all Voltage Regulators and Reference Tubes.



Red dot denotes anode or + terminal.
Leads are hot tin dipped.

2 ELEMENT CIRCUIT COMPONENT NEON LAMPS

SIGNALITE TYPE	BREAKDOWN VOLTAGE VDC	MAINTAINING VOLTAGE VDC	DESIGN CURRENT ma (AVG)	EXTINGUISHING VOLTAGE VDC	AVERAGE LIFE HOURS	NOTES	DIMENSIONS See Fig. 1 Table A
A016	65-77	50-60	0.3	—	—	1, 3, 8	G
A321	65-74	52-62	0.5	50	—	1, 3, 5	G
A059	64-80	50-60	0.3	—	—	1, 3, 8	G
A079	70 max.	58 max.	0.3	47	7,500	1, 3, 4, 12	G
A194	73 max.	53 min.	3.0	49	—	1, 15	—
A308	74 max.	—	—	—	—	——	—
A211	75 max.	60 max.	1.0	—	7,500	1, 2, 12	G
A211B	75 max.	60 max.	1.0	—	—	——	E
A229	75 max.	60 max.	0.5	—	—	1, 4	G
A149	70-82	50-65	6.0	50	—	1, 3, 1B	U
A173	70-90	60 max.	0.3	—	5,000	1, 2, 3, 4, 12	G
A073D	75-90	—	—	—	—	7	G
A066	80 max.	—	—	—	—	1, 16	—
A230	80 max.	62 max.	5.0	45	5,000	1, 2, 3, 4, 11	K
A245	80 max.	—	—	—	—	——	M
A173A	80-100	—	—	—	—	1, 4	G
A091	90 max.	57-61	0.3	—	—	1, 3, 6	G
A092	90 max.	53-57	0.3	—	—	1, 3, 4	G
A093	90 max.	61-65	0.3	—	—	1, 3, 7	G
A203	90 max.	—	—	—	—	7	Q
A315	90 max.	—	—	—	—	20	B
A322	90 max.	—	—	—	—	20	M
A151	92 max.	—	—	—	—	——	R
A167	92 max.	—	—	—	—	20	E
A233A	55-90	44-54	3.5	—	—	1	P
A287	58-80	60 max.	0.3	—	5,000	1, 2, 20	G
A304	64 max.	—	—	—	—	1, 2, 3, 4	M
A089	60-70-80	—	—	—	—	3, 9	B
A090	60-70-80	—	—	—	—	1, 3, 9	G
A230D	60-75	62 max.	5.0	—	—	1, 3	K
A215	60-80	45-58	0.3	—	5,000	1, 4, 12	A
A290	63-67	—	—	—	—	1	C
A223	63-72	48-56	0.5	—	—	1, 2, 3, 4	B
A204	63-76	60 max.	1.5	—	2,000	1, 3, 4, 11	K
A096	64-70	53 min.	0.1	—	—	1, 3, 4	G
A286	65 max.	44-60	1.5	—	—	1	M
A321	65-74	52-62	0.5	50 min.	—	1, 5, 14	G
A159	65-75	50-60	0.3	—	—	1, 3, 8	G
A039A	66-72	50-60	0.3	—	5,000	1, 2, 3, 4, 14, 20	G
A309	66-72	58 max.	0.3	—	—	1, 2, 4, 20	F
A291	67.1-76	—	—	—	—	1	C
A243	68-76	—	—	—	—	1, 2, 3, 6, 14, 20	K

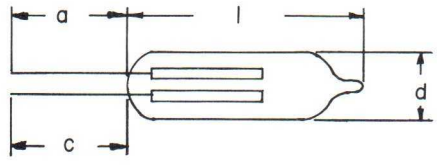


FIG. 1

TABLE A DIMENSIONS FOR CIRCUIT COMPONENTS

	l (MAX)	a	c	d (MAX)
A	1/2	1 ± 1/16	1 ± 1/16	.244
B	3/4			
C				.236
D		1 3/4 ± 1/32	2 ± 1/16	.244
E		2 ± 1/16		
F	27/32	3/8 ± 1/32	3/8 ± 1/32	
G		1 ± 1/16	1 ± 1/16	
H		1 1/8 ± 1/32	2 ± 1/16	
J		1 1/2 ± 1/32	1 1/2 ± 1/32	
K	15/16	1 ± 1/16	1 ± 1/16	
L	1	7/8 ± 1/32		
M		1 ± 1/16		
N		2 1/4 ± 1/16	2 1/4 ± 1/16	
P		3 ± 1/16	3 ± 1/16	
Q	1 1/16	1 ± 1/16	1 ± 1/16	
R		2 ± 1/16	2 ± 1/16	
S	1 3/16	1 ± 1/16	1 ± 1/16	
T	27/32	9/16 ± 1/32	1 1/8 ± 1/32 W- RES.	
U	1	1 3/8 ± 1/32 W-RES.	3/8 ± 1/32	

2 ELEMENT CIRCUIT COMPONENT NEON LAMPS

SIGNALITE TYPE 	BREAKDOWN VOLTAGE VDC	MAINTAINING VOLTAGE VDC	DESIGN CURRENT ma (AVG)	EXTINGUISHING VOLTAGE VDC	AVERAGE LIFE HOURS	NOTES	DIMENSIONS See Fig. 1 Table A
A038	68-85	50-60	0.6	50	15,000	1, 4	G
A050	70 max.	—	—	—	—	1, 4	B
A331	85-105	60-73	2.0	—	—	1, 3, 5, 14	J
A332	94-115	75 max.	2.0	—	—	1, 3, 5, 14	G
A219	98 max.	—	—	—	—	1	E
A072C	90-110	60-70	2.0	—	—	1	E
A328	90-110	60-75	2.0	—	—	1, 3	E
A278	90-130	59-80	2.0	55	—	1, 2, 4	E
A032A	95-130	61-70	32.0	—	—	2, 10, 18	T
A009	100 max.	—	—	—	—	1, 3, 4	Q
A244	100 max.	—	—	—	—	2, 4, 14	B
A066B	105 max.	75 max.	2.0	—	—	1, 3, 15	—
A072	105 max.	—	—	—	—	1, 4	E
A296	100-125	—	—	—	—	1	E
A158D	100-135	55-80	2.0	—	—	1, 3, 4	R
A221C	100-120	65-72	2.0	—	—	1, 3, 4	G
A305	104-112	—	—	52 min.	—	4, 14	G
A333	112 max.	—	—	—	—	1, 3, 5, 14	G
A201	113-135	—	—	—	—	1, 2, 3, 4	G
A329	115 max.	60-75	2.0	—	—	1, 3, 5, 14	G
A330	115 max.	60-70	2.0	—	—	1, 3, 5, 14	B
A226	115-140	60-70	6.0	55	—	1, 5, 14	E
A104	120-145	—	—	—	—	1, 3, 5	G
A081A	120-150	60-80	3.0	—	3,000	1	G
A257	125-145	65-80	2.0	—	—	1, 3, 4	E
A012A	126-146	60-70	6.0	—	10,000	4	B
A142A	135 max.	—	—	—	—	1, 2, 3, 10	D
A165	135 max.	—	—	—	—	1	E
A158E	135 max.	—	—	—	—	1, 4	R
A319	135 max.	—	—	—	—	1, 7, 17	—
A090A	130-170	—	—	—	—	1, 4	Q
A170	150 max.	80 max.	2.0	—	—	1, 4	R
A224	150 max.	80 max.	2.0	—	—	1, 3, 4	M
A327	170-200	—	—	—	—	3, 10	H
A009A	200 max.	130 min.	2.0	—	—	1, 2	Q
A053	205 min.	90 max.	6.0	—	—	——	G
A280	205	—	—	—	—	2, 8	M
A258	200-230	—	—	—	—	2, 10, 14	L
A258C	200-230	—	—	—	—	2, 10, 14, 21	L
A297	200-240	125-150	2.0	—	—	1, 3	G
A051	205-240	80 max.	6.0	—	7,500	——	G
A316	225-300	80 max.	6.0	—	—	1, 7, 14	G
A208	225-300	180 min.	6.0	—	500	1, 2, 13	G

TABLE B	
LAMP	LEAKAGE RESISTANCE (OHMS)
A009A	5×10^9
A039A	2×10^{10}
A167	1×10^9
A243	1×10^{10}
A287	1×10^{12}
A309	1×10^9
A315	1×10^{10}
A322	1×10^8

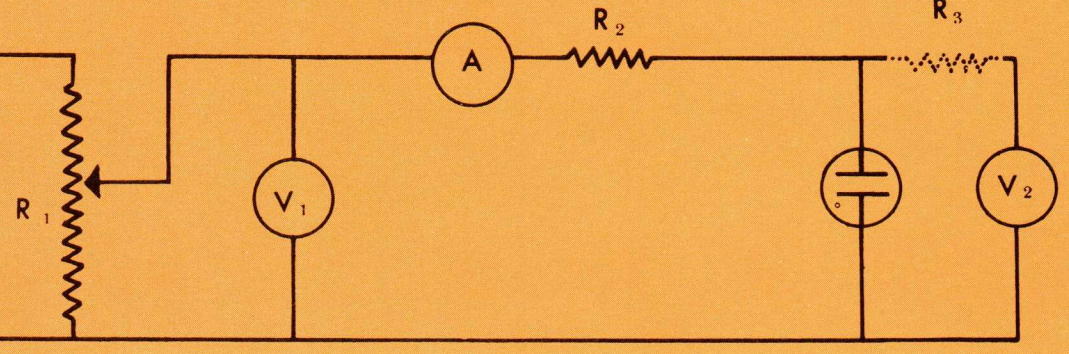
NOTES:

1. Dark Effect Reduced
2. Tinned Leads
3. Pre-Aged
4. Anode Identified by Green Dot
5. Anode Identified by Blue Dot
7. Anode Identified by Red Dot
8. Anode Identified by Orange Dot
9. Split Into Two Ranges With Anode Identified With:
   Orange Dot For VB 60-70 and
   Brown Dot For VB 70-80
10. Anode Identified by Shorter Lead
11. End of Life Is A 5V Increase In Max. Breakdown or Maintaining Voltage
12. End of Life Is A 6V Increase In Max. Breakdown or Maintaining Voltage
13. End of Life Is A 10V Increase In Max. Breakdown or Maintaining Voltage
14. Breakdown in Total Darkness
15. Based — Telephone Slide Type (Dimensions, see NE-4)
16. Based — Telephone Slide Type (Dimensions, see NE-3)
17. Based — Midget Flange Type
18. Resistor Welded To Lead
19. Regulator
20. Leakage Resistance Is Measured, See Table B
21. Potted In RTV-Silastic

CIRCUIT FOR MEASUREMENT OF BREAKDOWN, MAINTAINING, EXTINGUISHING VOLTAGE AND LAMP CURRENT

A-C test voltage shall be 60 cycles per second sine wave having a root-mean-square (rms) summation of the harmonic components that does not exceed three percent of the fundamental.

D-C test voltage shall have a ripple of less than 0.1 percent.



R_1 — Resistance Divider.

V_1 — Voltmeter.

A — Ammeter (impedance less than 1.0% of series impedance R_2). For A. C. measurement use thermocouple meter.

R_2 — Series Resistor (magnitude suitable for lamp under test).

R_3 — Resistor (10 to 30 megohms) to be used to suppress tendency of lamp to oscillate only when using electrostatic voltmeter.

V_2 — Voltmeter (VTVM or electrostatic, 10 megohms or more input resistance).

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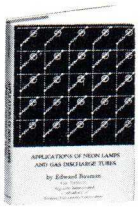

"Applications of Neon Lamps and Gas Discharge Tubes" by Edward Bauman — has been published by Carlton Press. This book contains 160 pages, liberally illustrated with circuit drawings, design information and many practical down-to-earth applications for neon glow lamps. Copies of this hard cover edition may be obtained by writing directly to Signalite Incorporated, 1933 Heck Avenue, Neptune, New Jersey 07753. Enclose check, money order or P.O. for $2.95 plus 25¢ for shipping and handling.

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