

JOINT ELECTRON TUBE ENGINEERING COUNCIL

DATA SHEET

Electron Tube Type 5834

The 5834 is a single-ended, mercury-vapor, half-wave rectifier for use in low-voltage rectifier circuits.

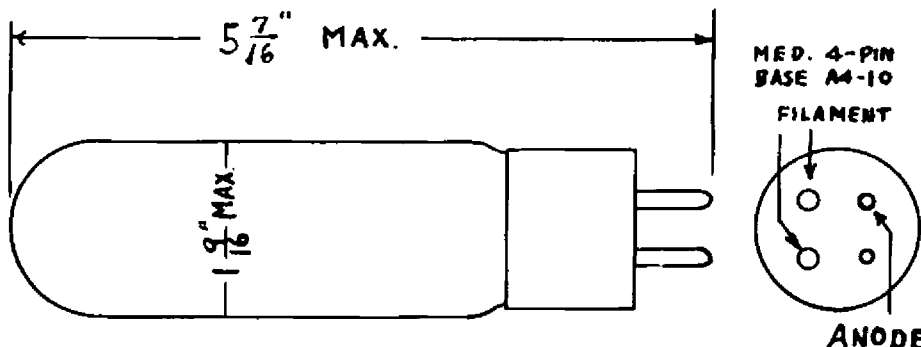
Maximum Ratings, Absolute Values

Maximum Peak Inverse Anode Voltage	900 Volts
Maximum Cathode Current	
Peak	
In-phase Operation	10 Amperes
Quadrature Operation	10 Amperes
Average	
In-phase Operation	2 Amperes
Quadrature Operation	2 Amperes
Surge (Maximum duration 0.1 seconds)	125 Amperes
Maximum Averaging Time	5 Seconds
Maximum Frequency	150 Cycles/sec
Condensed Mercury Temperature Limits	
(mercury or mercury-gas filled tubes only)	+35° to +85° Centigrade

<u>Electrical Data</u>	Min.	Bogey	Max.	
Filament (heater) Voltage	2.38	2.5	2.62	Volts
Filament (heater) Current at 2.5 volts	XX	7	8	Amperes
Cathode heating time, required	20	XX	XX	Seconds
Anode Voltage Drop	XX	9	XX	Volts
Critical Anode Voltage	XX	XX	30	Volts

Mechanical Data

Type of cooling	Convection
Equilibrium Condensed-mercury Temperature Rise	
a. At Full Load, Approximate	25° C
b. At No Load, Approximate	20° C
Mounting position	Vertical, base down
Net Weight, maximum	.3 Pounds



8/10/50

(N.E. type NL-649)

NOTE: Condensed mercury temperature is to be measured within 1/4" band immediately above base.

4/7/49

JOINT ELECTRON TUBE ENGINEERING COUNCIL

DATA SHEET

Electron Tube Type 5835

The 5835 is a single-ended, mercury-vapor, half-wave rectifier for use in low-voltage rectifier circuits.

Maximum Ratings, Absolute Values

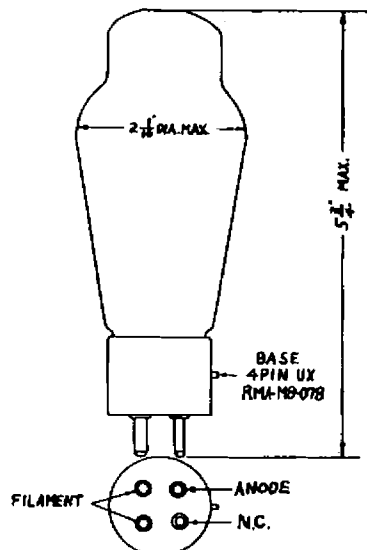
Maximum Peak Inverse Anode Voltage	900	Volts
Maximum Cathode Current		
Peak		
In-phase Operation	12	Amperes
Quadrature Operation	12	Amperes
Average		
In-phase Operation	3	Amperes
Quadrature Operation	3	Amperes
Surge (Maximum duration 0.1 seconds)	200	Amperes
Maximum Averaging Time	5	Seconds
Maximum Frequency	150	Cycles/sec
Condensed Mercury Temperature Limits (mercury or mercury-gas filled tubes only)	+35° to +85° Centigrade	

Electrical Data

	Min.	Bogey	Max.	
Filament (heater) Voltage	2.38	2.5	2.62	Volts
Filament (heater) Current at 2.5 volts	XX	9½	11	Amperes
Cathode heating time, required	40	XX	XX	Seconds
Anode Voltage Drop	XX	11	XX	Volts
Critical Anode Voltage	XX	XX	30	Volts

Mechanical Data

Type of cooling	Convection
Equilibrium Condensed-mercury Temperature Rise	
a. At Full Load, approximate	30° C
b. At No Load, Approximate	23° C
Mounting position	Vertical, base down
Net Weight, maximum	.4# pounds



8/10/50

(N.E. type NL-653)

NOTE: Condensed mercury temperature is to be measured within 1/4" band immediately above base.

4/7/49

7014 (604) FULL WAVE RECTIFIER TUBE

TECHNICAL INFORMATION

Description: An argon-mercury vapor, full wave, rectifier tube designed especially for industrial power rectifier applications up to 250 volts d. c.

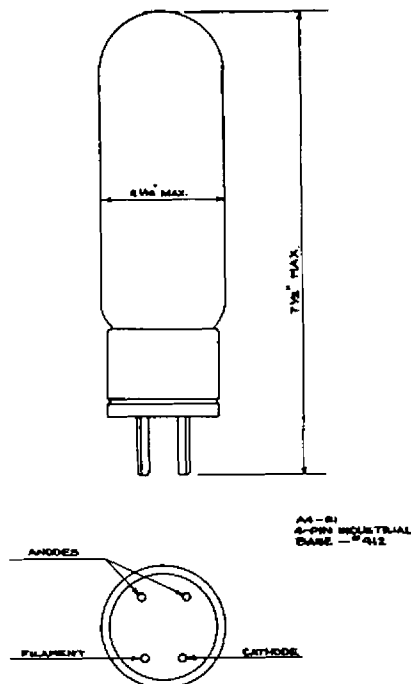
dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	10
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	11.5 ± 1
Filament heating time (seconds)	15
Typical arc drop at 5 amperes peak (volts)	10
Typical Anode starting voltage (volts)	10
Maximum ac short circuit current (amperes)	150
Condensed mercury temperature limits (°C) *	0 to + 90
Approx. temp. rise, cond. merc. above ambient, no load (°C)	18
Approx. temp. rise, cond. merc. above ambient, full load (°C)	28
Mounting position	vertical, base down
Net weight (ounces)	5
Approx. shipping weight (lbs.)	3

*The tube may be started and satisfactory operation will result between 0 and 90°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +90°C which corresponds to approximately +15 to +65°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



from JETEC release
#1984, July 29, 1957

Printed in USA/6-57/GR

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

7015 (604L) FULL WAVE RECTIFIER TUBE

TECHNICAL INFORMATION

Description: An argon-mercury vapor, full wave, rectifier tube designed especially for industrial power rectifier applications up to 250 volts d. c.

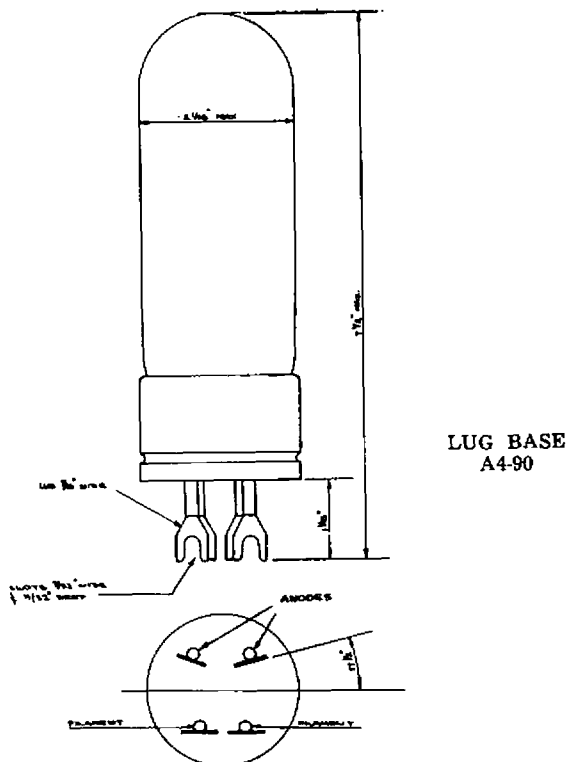
dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	10
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	11.5 ± 1
Filament heating time (seconds)	15
Typical arc drop at 5 amperes peak (volts)	10
Typical Anode starting voltage (volts)	10
Maximum ac short circuit current (amperes)	150
Condensed mercury temperature limits (°C) *	0 to + 90
Approx. temp. rise, cond. merc. above ambient, no load (°C)	18
Approx. temp. rise, cond. merc. above ambient, full load (°C)	28
Mounting position	vertical, base down
Net weight (ounces)	5
Approx. shipping weight (lbs.)	3

*The tube may be started and satisfactory operation will result between 0 and 90°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +90°C which corresponds to approximately +15 to +65°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



from JETEC release
#1984, July 29, 1957

Printed in USA/6-57/GR

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

7016 (606) FULL WAVE RECTIFIER TUBE

TECHNICAL INFORMATION

Description: An argon-mercury vapor, full wave, rectifier tube designed especially for industrial power rectifier applications up to 250 volts d. c.

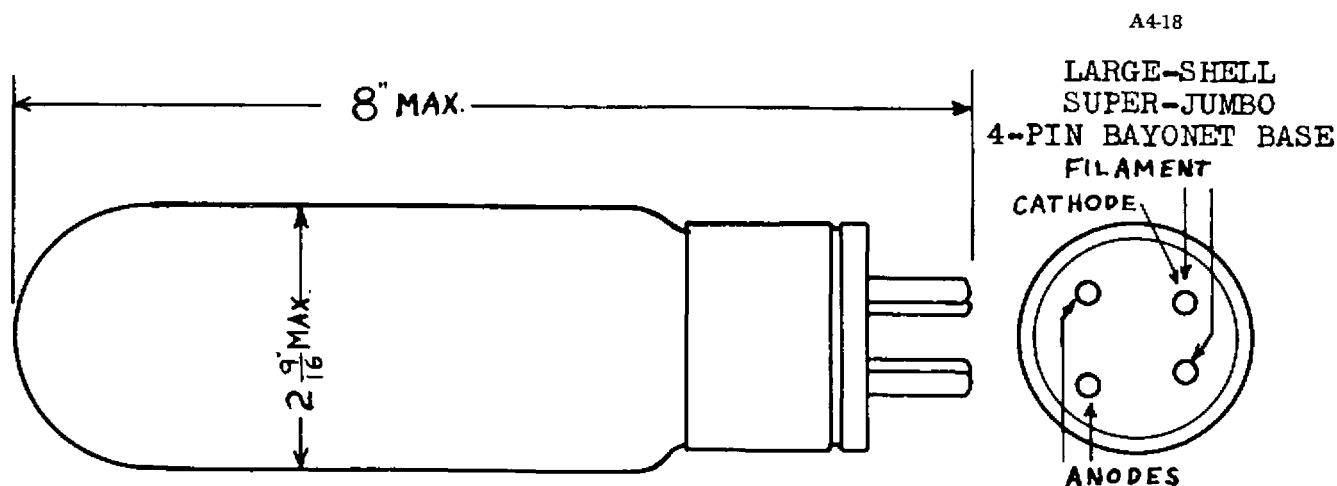
dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	25.6
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	17 $\pm$ 2
Filament heating time (seconds)	40
Typical arc drop at 9 amperes peak (volts)	10
Typical Anode starting voltage (volts)	10
Maximum ac short circuit current (amperes)	360
Condensed mercury temperature limits (°C) *	0 to +90
Approx. temp. rise, cond. merc. above ambient, no load (°C)	30
Approx. temp. rise, cond. merc. above ambient, full load (°C)	40
Mounting position	vertical, base down
Net weight (ounces)	8
Approx. shipping weight (lbs.)	3

*Satisfactory operation will be obtained between 0 and +90°C. For long life the tube should be operated between +40 and +90°C condensed mercury, or approximately 0 to +50°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



from JETEC release #1984, July 29, 1957

Printed in USA/6-57/GR

NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

7017 (606L) FULL WAVE RECTIFIER TUBE

TECHNICAL INFORMATION

Description: An argon-mercury vapor, half-wave, rectifier tube designed especially for industrial power rectifier applications up to 250 volts d. c.

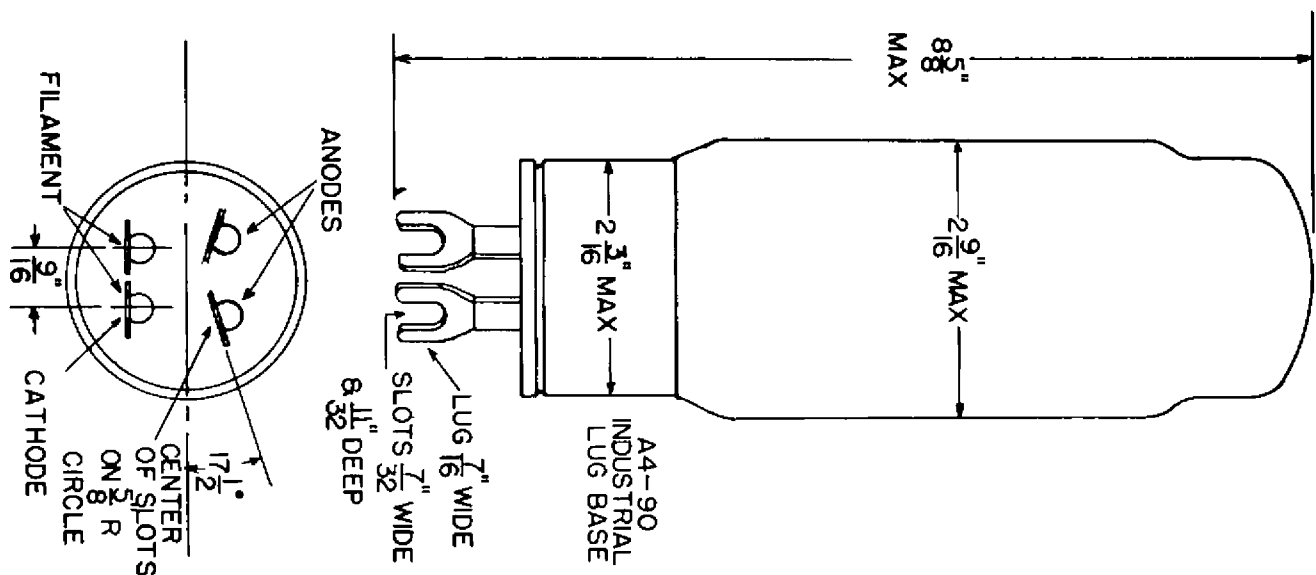
dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	25.6
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	17 ± 2
Filament heating time (seconds)	40
Typical arc drop at 9 amperes peak (volts)	10
Typical Anode starting voltage (volts)	10
Maximum ac short circuit current (amperes)	360
Condensed mercury temperature limits (°C) *	0 to +90
Approx. temp. rise, cond. merc. above ambient, no load (°C)	30
Approx. temp. rise, cond. merc. above ambient, full load (°C)	40
Mounting position	vertical, base down
Net weight (ounces)	8
Approx. shipping weight (lbs.)	3

*Satisfactory operation will be obtained between 0 and +90°C. For long life the tube should be operated between +40 and +90°C condensed mercury, or approximately 0 to +50°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



from JETEC release #1984, July 29, 1957

Printed in USA/6-57/GR

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

7018 (615) HALF WAVE RECTIFIER TUBE

TECHNICAL INFORMATION

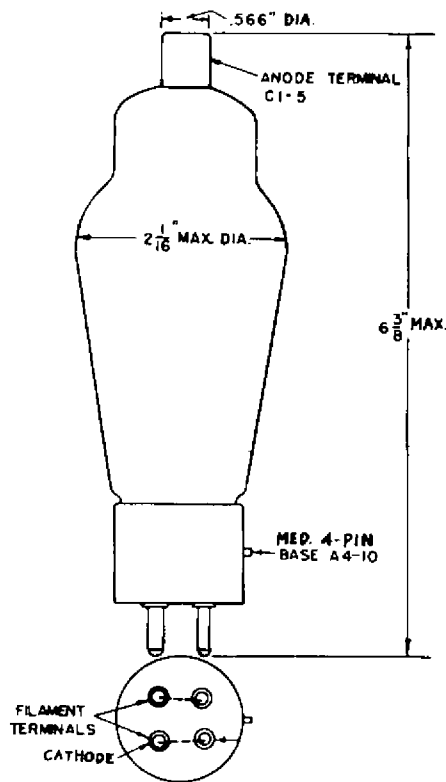
Description: A mercury vapor, half-wave, rectifier tube designed especially for industrial power rectifier applications up to 600 volts d.c.

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	10
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	2000
Filament volts	2.5
Filament amperes	7 ± 1
Filament heating time (seconds)	20
Typical arc drop at 8 amperes peak (volts)	12
Typical Anode starting voltage (volts)	13
Maximum ac short circuit current (amperes)	250
Condensed mercury temperature limits (°C)	+ 35 to + 80
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	4
Approx. shipping weight (lbs.)	3

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



from JETEC release
#1984, July 29, 1957

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NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

7019 (635) HALF WAVE RECTIFIER TUBE

TECHNICAL INFORMATION

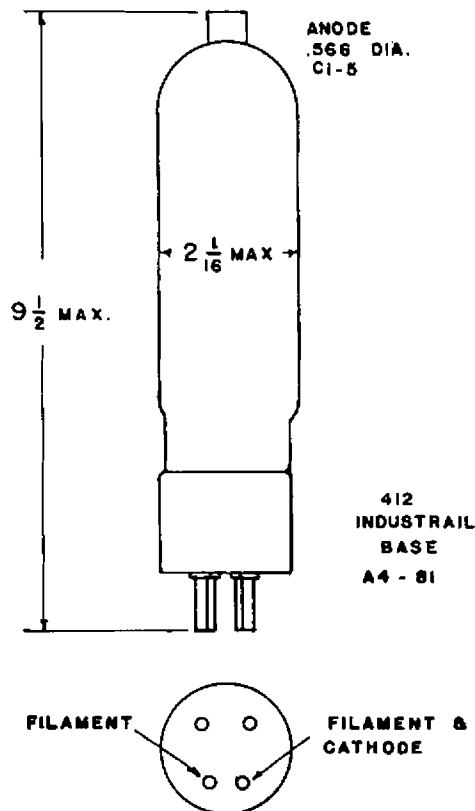
Description: An argon-mercury vapor, half-wave, rectifier tube designed especially for industrial power rectifier applications up to 250 volts d. c.

dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	77
Maximum time of averaging anode current (seconds)	20
Maximum peak inverse volts	1000
Filament volts	2.5
Filament amperes	18 ± 2
Filament heating time (seconds)	60
Typical arc drop at 20 amperes peak (volts)	9
Typical Anode starting voltage (volts)	20
Maximum ac short circuit current (amperes)	770
Condensed mercury temperature limits (°C)	0 to + 100
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	6
Approx. shipping weight (lbs.)	4

LIGHT FILAMENT BEFORE APPLYING LOAD

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

OUTLINE DRAWING



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#1984, July 29, 1957

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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

7020 (635L) HALF WAVE RECTIFIER TUBE

TECHNICAL INFORMATION

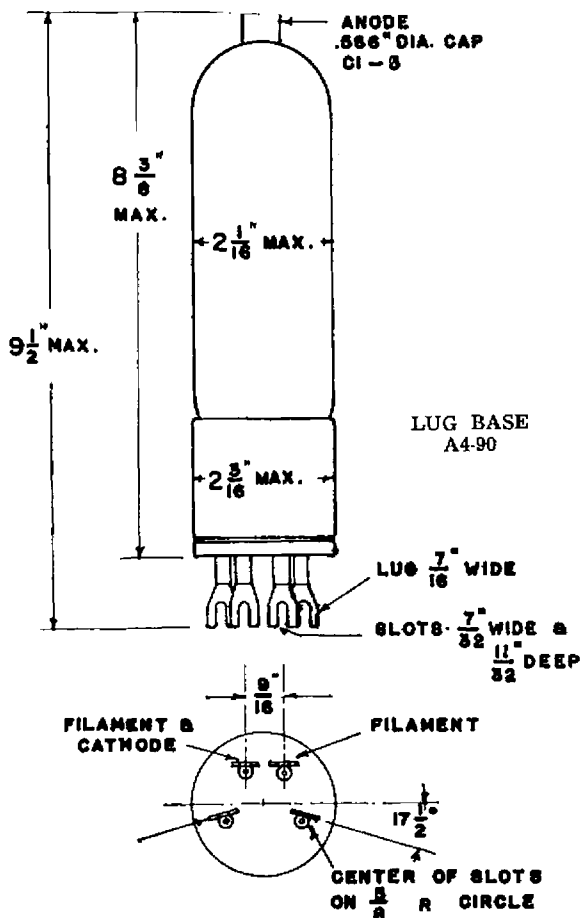
Description: An argon-mercury vapor, half-wave, rectifier tube designed especially for industrial power rectifier applications up to 250 volts d. c.

dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	77
Maximum time of averaging anode current (seconds)	20
Maximum peak inverse volts	1000
Filament volts	2.5
Filament amperes	18 ± 2
Filament heating time (seconds)	60
Typical arc drop at 20 amperes peak (volts)	9
Typical anode starting voltage (volts)	20
Maximum ac short circuit current (amperes)	770
Condensed mercury temperature limits (°C)	0 to +100
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	6
Approx. shipping weight (lbs.)	4

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



from JETEC release
#1984, July 29, 1957

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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

7021 (714) THYRATRON TUBE

TECHNICAL INFORMATION

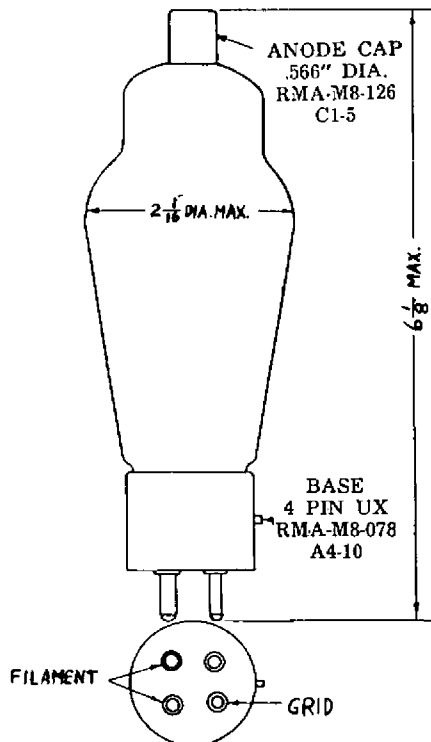
Description: A quick heating, argon and mercury vapor, industrial thyatron designed especially for timing and regulated rectifier applications.

dc amperes output (maximum)	1.0
Instantaneous Amperes output (maximum)	3
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	1250
Maximum peak forward volts	1250
Condensed mercury temperature limits (°C)	-40 to +80
Filament volts	2.5
Filament amperes	5 ± .5
Heating time (seconds)	5
Typical arc drop at 3 amperes peak (volts)	15
Grid control characteristic	See Curve
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Maximum critical grid current (microamps)	5
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	2
Maximum ac short circuit current (amperes)	50
Approx. temp. rise, cond. mercury above ambient (°C)	15
Mounting position	Vertical, base down
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

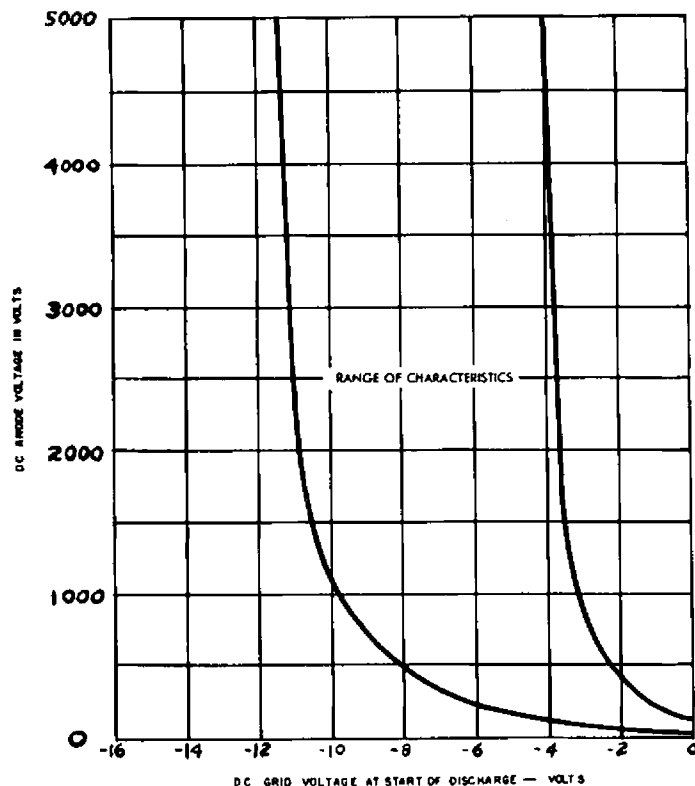
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LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC



from JETEC release #1984, July 29, 1957

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NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

7022 (740L) THYRATRON TUBE

TECHNICAL INFORMATION

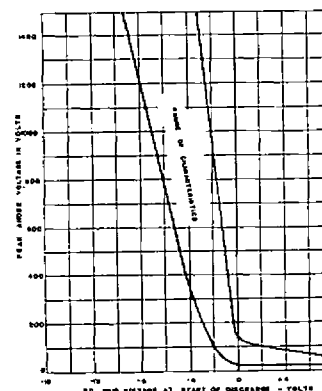
A quick heating, argon and mercury vapor, industrial thyatron designed especially for heavy duty ignitor firing applications, and for use in motor speed control and regulated rectifier applications.

dc Amperes output (maximum)	4
Instantaneous Amperes output (maximum)	30
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	1500
Maximum peak forward volts	1500
Condensed mercury temperature limits (°C)*	-40 to +80
Filament volts	2.5
Filament amperes	16 ± 2
Filament heating time (seconds)	30
Typical arc drop at 12 amperes peak (volts)	12
Grid control characteristic	See Curve
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Maximum critical grid current (microamps)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	3
Maximum ac short circuit current (amperes)	400
Approx. tem. rise, cond. mercury above ambient (°C)	25
Mounting position	Vertical, base down
Net weight (ounces)	7
Approx. shipping weight (lbs.)	4

*The tube may be started and satisfactory operation will result between -40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +15 to +55°C. ambient.

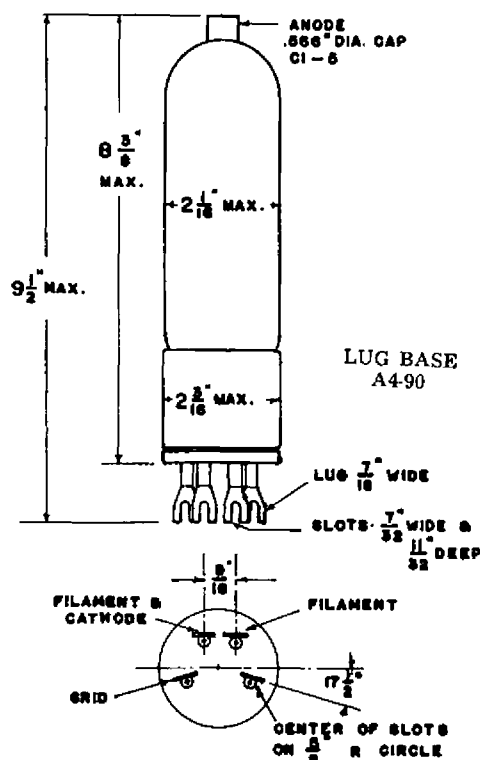
Note: Max. base shell to lead voltage, 1500 v rms.

GRID CHARACTERISTIC



ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

OUTLINE DRAWING



from JETEC release
#1984, July 29, 1957

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GENEVA, ILLINOIS, U. S. A.

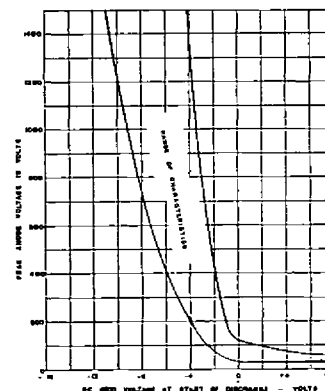
7023 (760L) THYRATRON TUBE

TECHNICAL INFORMATION

Description: A quick heating, argon and mercury vapor, industrial thyatron designed especially for welding control, motor speed control, and regulated rectifier applications.

dc Amperes output (Maximum)	6.4
Instantaneous Amperes output (Maximum)	77
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	1500
Maximum peak forward volts	1500
Condensed mercury temperature limits (°C)	-40 to +80*
Filament volts	2.5
Filament amperes	21 ± 2
Filament heating time (seconds)	60
Typical arc drop at 20 amperes peak (volts)	12
Grid control characteristic	See Curve
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Maximum critical grid current (microamps)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	4
Maximum ac short circuit current (amperes)	770
Approx. temp. rise, cond. mercury above ambient (°C)	30
Mounting position	Vertical, base down
Net weight (ounces)	9
Approx. shipping weight (lbs.)	5

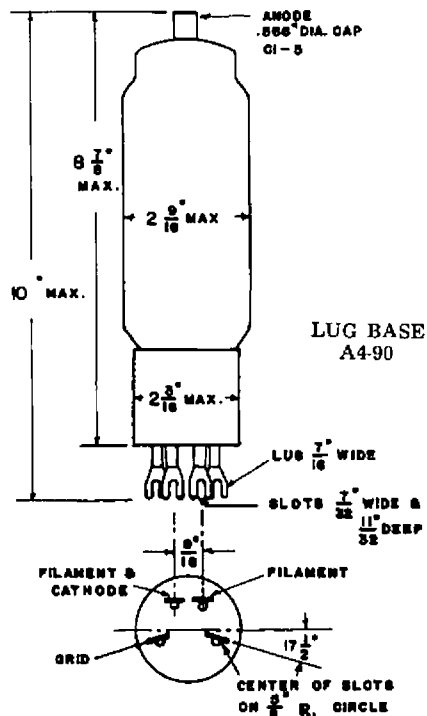
GRID CHARACTERISTIC



*The tube may be started and satisfactory operation will result between -40 and +80°C. For maximum life the condensed mercury temperature after warm up should run between +40 and +80°C which corresponds to approximately +10 to +50°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

OUTLINE DRAWING



from JETEC release
#1984, July 29, 1957

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NATIONAL ELECTRONICS, INC.

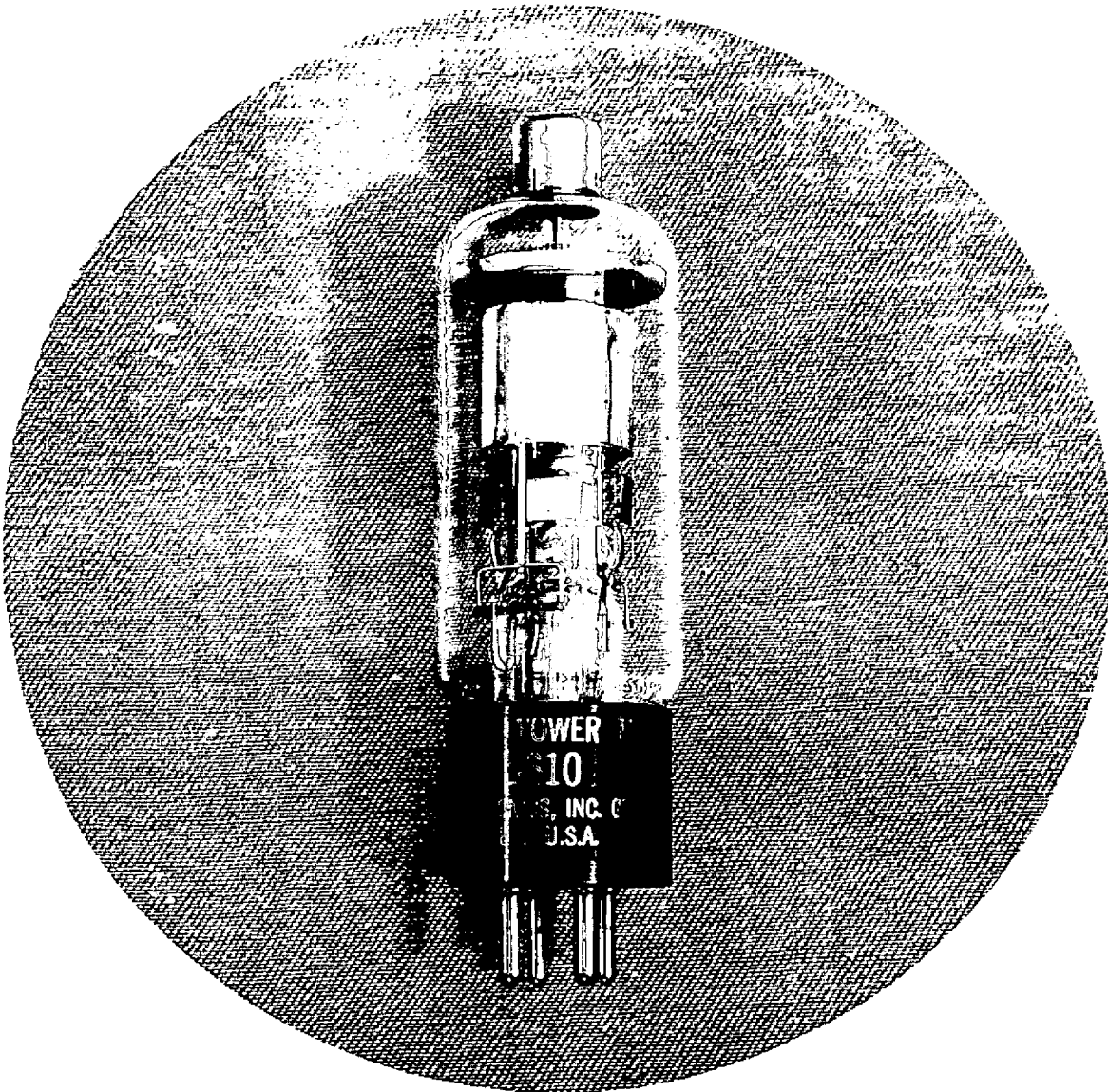
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-610/7723

INERT-GAS-FILLED RECTIFIER TUBE

2.5 Amperes dc



NATIONAL POWER TUBE NL-610 is a sturdy rectifier tube designed especially for industrial power rectifier applications where a high commutation factor tube is required. It is xenon-filled for efficiency, compactness, and the ability to operate within very wide temperature limits.

from JEDEC release #3016, Nov. 7, 1960

NATIONAL ELECTRONICS, INC.

A SUBSIDIARY OF EITEL-McCULLOUGH, INC.

GENEVA, ILLINOIS, U. S. A.

NL-610/7723 RECTIFIER TUBE

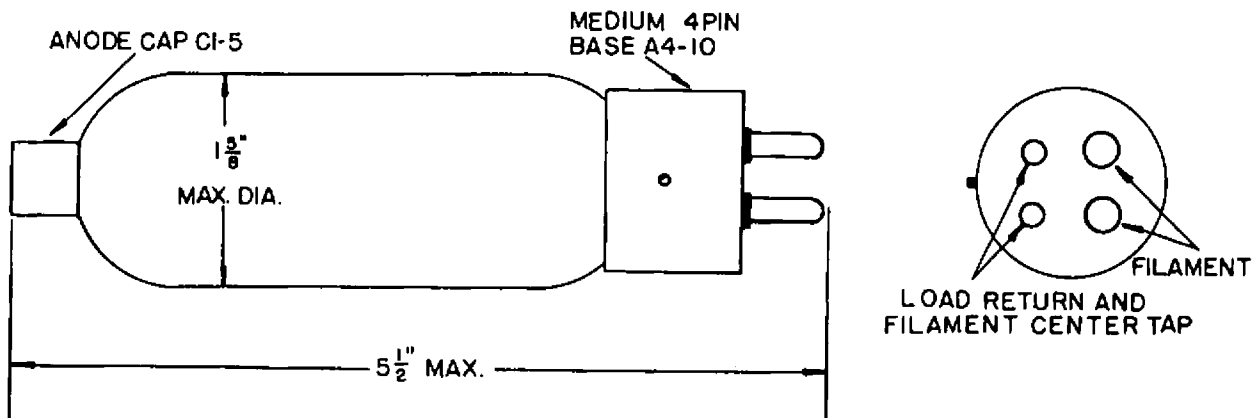
TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	30
Maximum time of averaging anode current (seconds)	7
Maximum peak inverse volts	920
Filament volts	2.5
Filament amperes	7 to 11
Filament heating time (seconds)	30
Typical arc drop at 8 amperes peak (volts)	10
Typical Anode starting voltage (volts)	12
Maximum ac short circuit current (amperes)	300
Maximum Commutation Factor (A/usec x V/usec)	50
Ambient temperature limits (°C)	-55 to +75
Mounting position	any
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3
Type cooling	Unrestricted air convection

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



Printed in USA 10-60

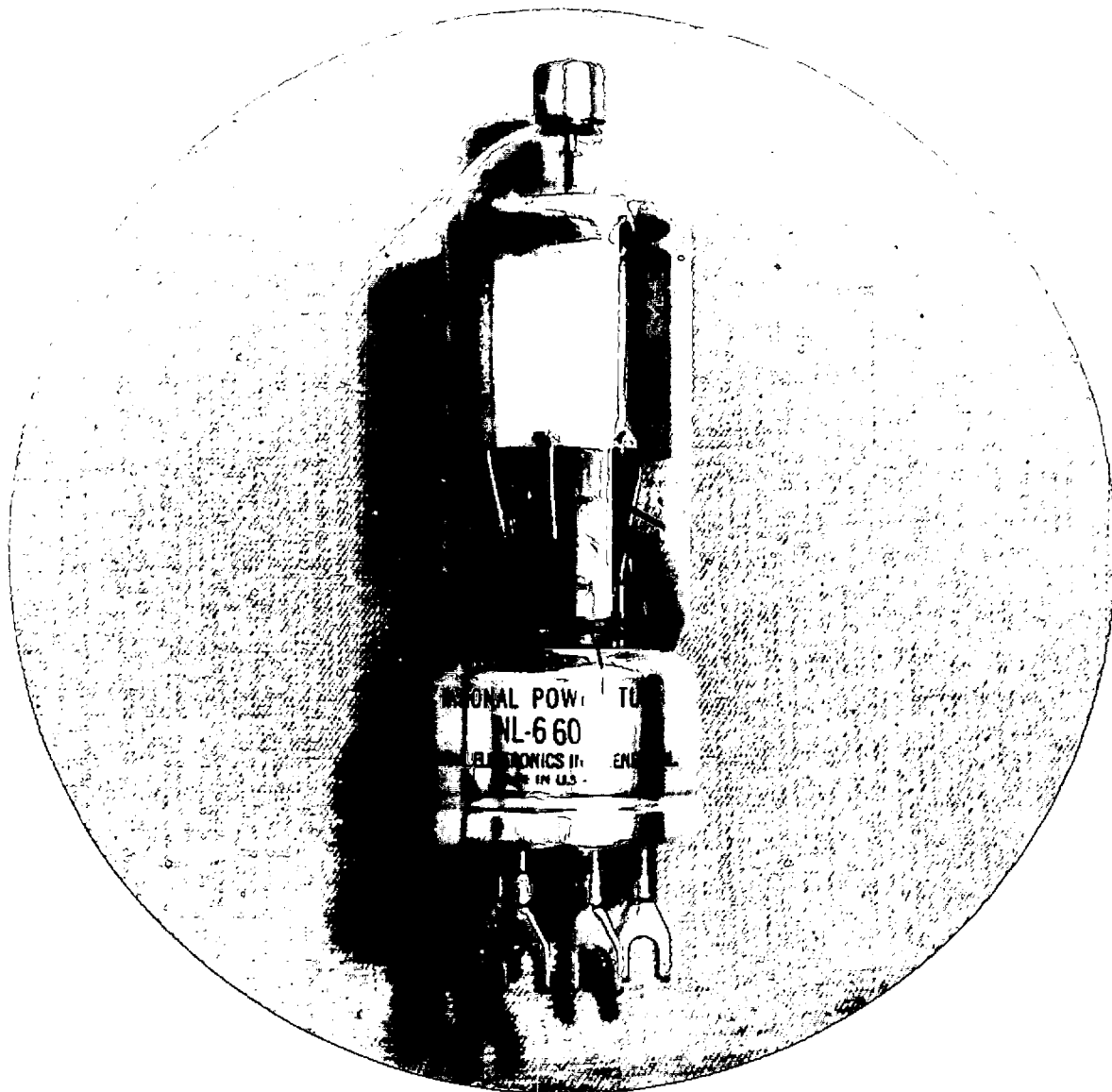
NATIONAL ELECTRONICS, INC.

A SUBSIDIARY OF EITEL-McCULLOUGH, INC.
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

from JEDEC release #3271,
May 15, 1961

NL-660L/7786
RECTIFIER TUBE
6.4 Amperes dc



NATIONAL POWER TUBE NL-660L/7786 is a sturdy rectifier tube designed especially for industrial power rectifier applications up to 250 volts dc. The NL-660L/7786 is particularly useful in those circuits that require a tube with a high commutation factor rating. It is inert gas filled to give quick starting, efficiency, compactness, and the ability to operate within very wide temperature limits. NL-660L/7786 utilizes the NATIONAL lug base as a standard feature. It is also available with the four-pin base and bracket type base for panel mounting under the type numbers NL-660 and NL-660P, respectively.

NATIONAL ELECTRONICS, INC.

A SUBSIDIARY OF EITEL-McCULLOUGH, INC.
GENEVA, ILLINOIS, U. S. A.

NL-660L/7786 TUBE
TECHNICAL INFORMATION
INERT GAS FILLED RECTIFIER

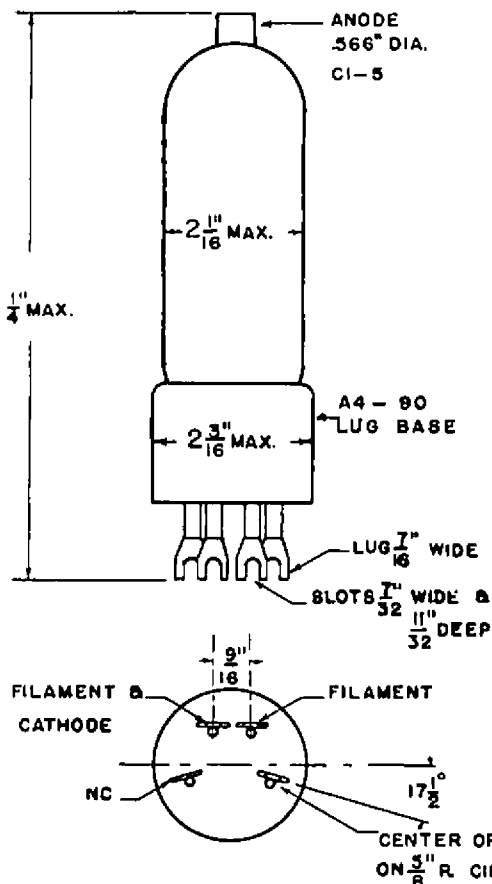
dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	80
Maximum time of averaging anode current (seconds)	7
Maximum peak inverse volts	920
Filament volts	2.5
Filament amperes	21 ± 2
Filament heating time (seconds)	60
Typical arc drop at 20 amperes peak (volts)	10
Typical Anode starting voltage (volts)	20
Maximum ac short circuit current (amperes)	770
Ambient temperature limits (°C)	-55 to +75
Maximum commutation factor (A/u sec. × V/u sec.)	130
Mounting position	Any
Net weight (ounces)	6
Approximate shipping weight (lbs.)	4

LIGHT FILAMENT BEFORE APPLYING LOAD

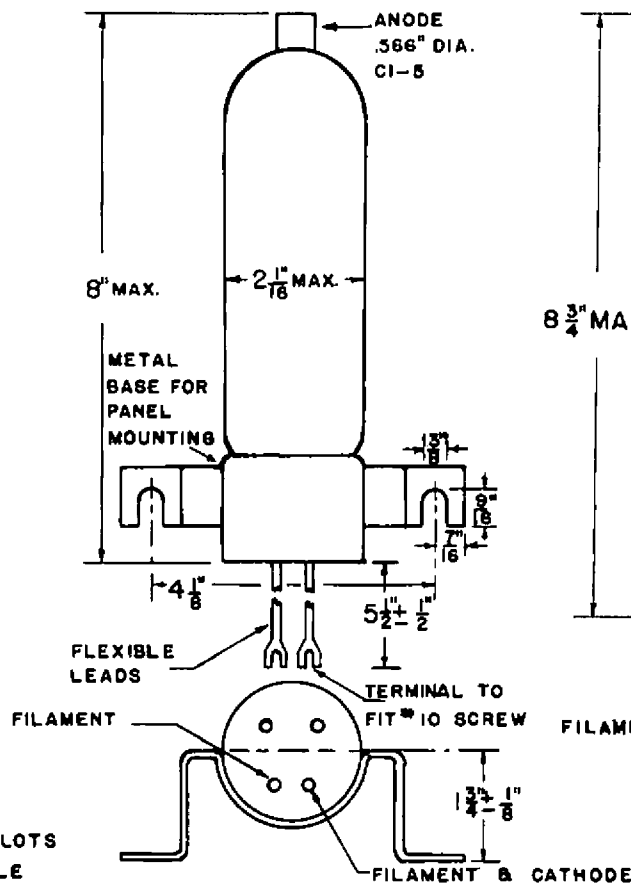
ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

OUTLINE DRAWINGS

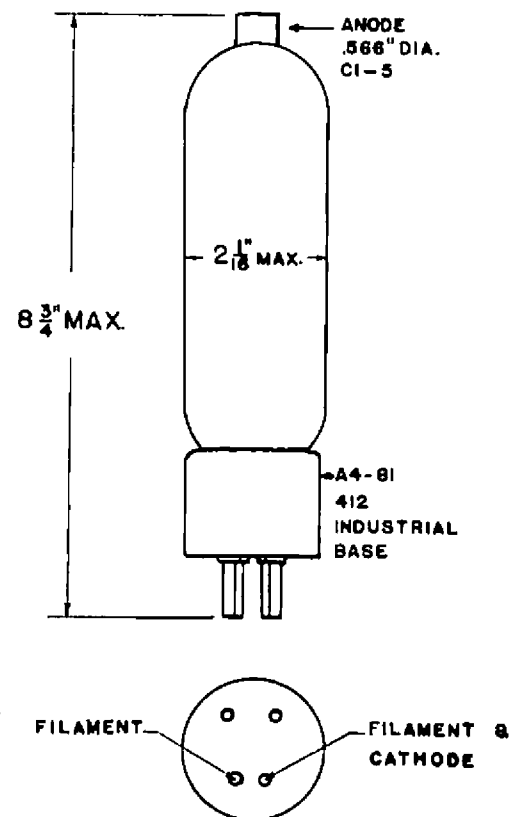
NL-660L/7786



NL-660P



NL-660



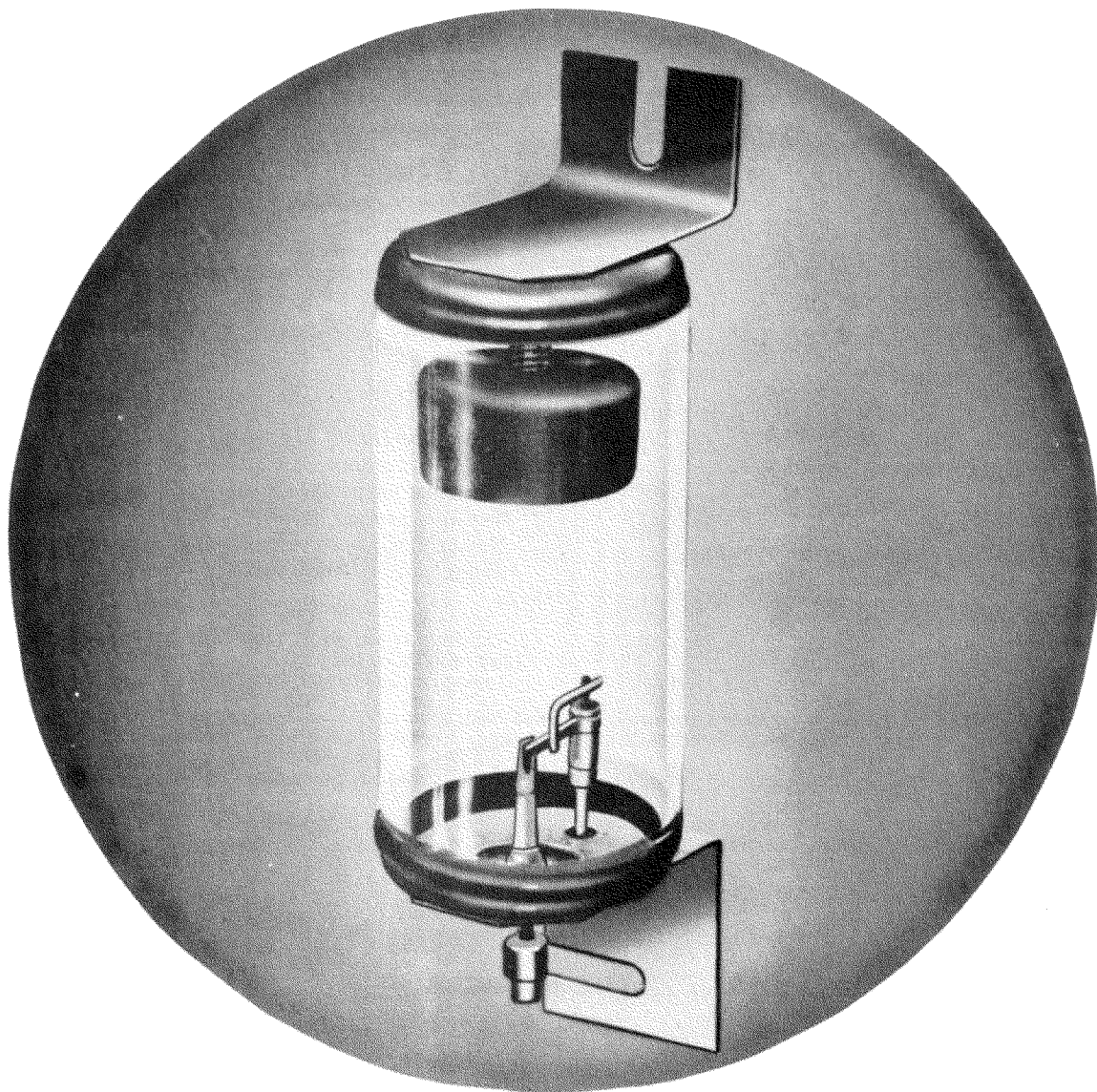
Printed in U S A 12/60

NATIONAL ELECTRONICS, INC.

A SUBSIDIARY OF EITEL-McCULLOUGH, INC.
GENEVA, ILLINOIS, U. S. A.

IGNITRON TUBE

NL-1001
IGNITRON TUBE
9 Amperes dc



NATIONAL IGNITRON NL-1001 is a sturdy, glass, air-cooled mercury pool tube designed especially for welder control and similar AC control applications. It is also useful for demonstrating the operating principles of ignitors and ignitrons. NL-1001 is designed for forced air cooling but may be used with free air cooling at reduced ratings.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

TECHNICAL INFORMATION

AC CONTROL APPLICATIONS — Ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, and on frequencies from 25 to 60 cycles.

tube — amps DC	9.0
----------------------	-----

blent = amps DC	3.3	2.8	2.1
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CAPACITOR DISCHARGE APPLICATIONS

Maximum peak current — amps 500

Maximum averaging time	seconds		172
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⁴RECTIFIER APPLICATIONS — Frequencies from 25 to 60 cycles.

Maximum averaging time—seconds 10

1. *Journal of the American Medical Association*, 1997; 278: 1039-1044.

IGNITION REQUIREMENTS (Same for both applications.)

Ignitor Voltage

Maximum instantaneous allowed, ignitor negative
= volts

Ignitor Current

Ignitor current averaging time — seconds	5
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GENERAL CHARACTERISTICS

Mounting Position Vertical

Approx. shipping weight — lbs. 5

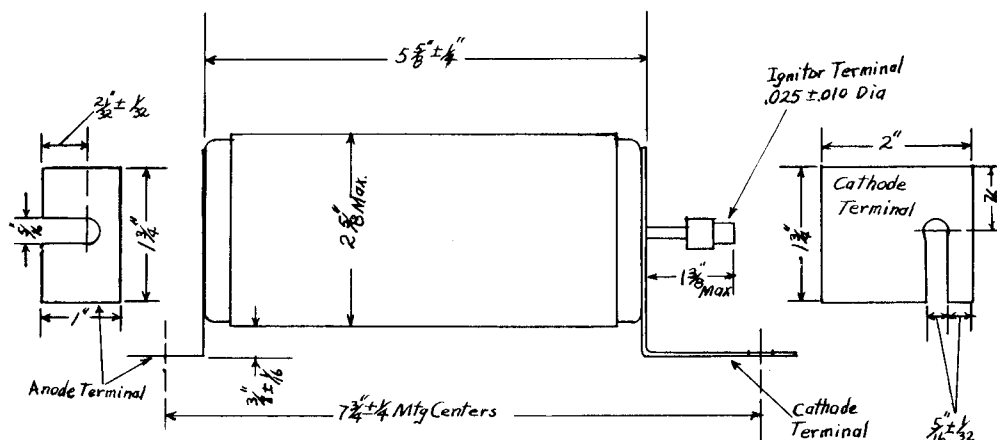
¹The required condensed mercury temperatures are easily obtained with a small fan or blower. Free air cooling may be used but average anode current must be reduced to bring condensed mercury temperature below the maximum rated values.

²Using log-log paper, straight line interpolation of Demand Current vs. Average Anode current may be used to determine intermediate ratings.

³Ignition will occur if either maximum required instantaneous positive potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.

⁴Curves must not be used for rectifier applications.

OUTLINE DRAWING



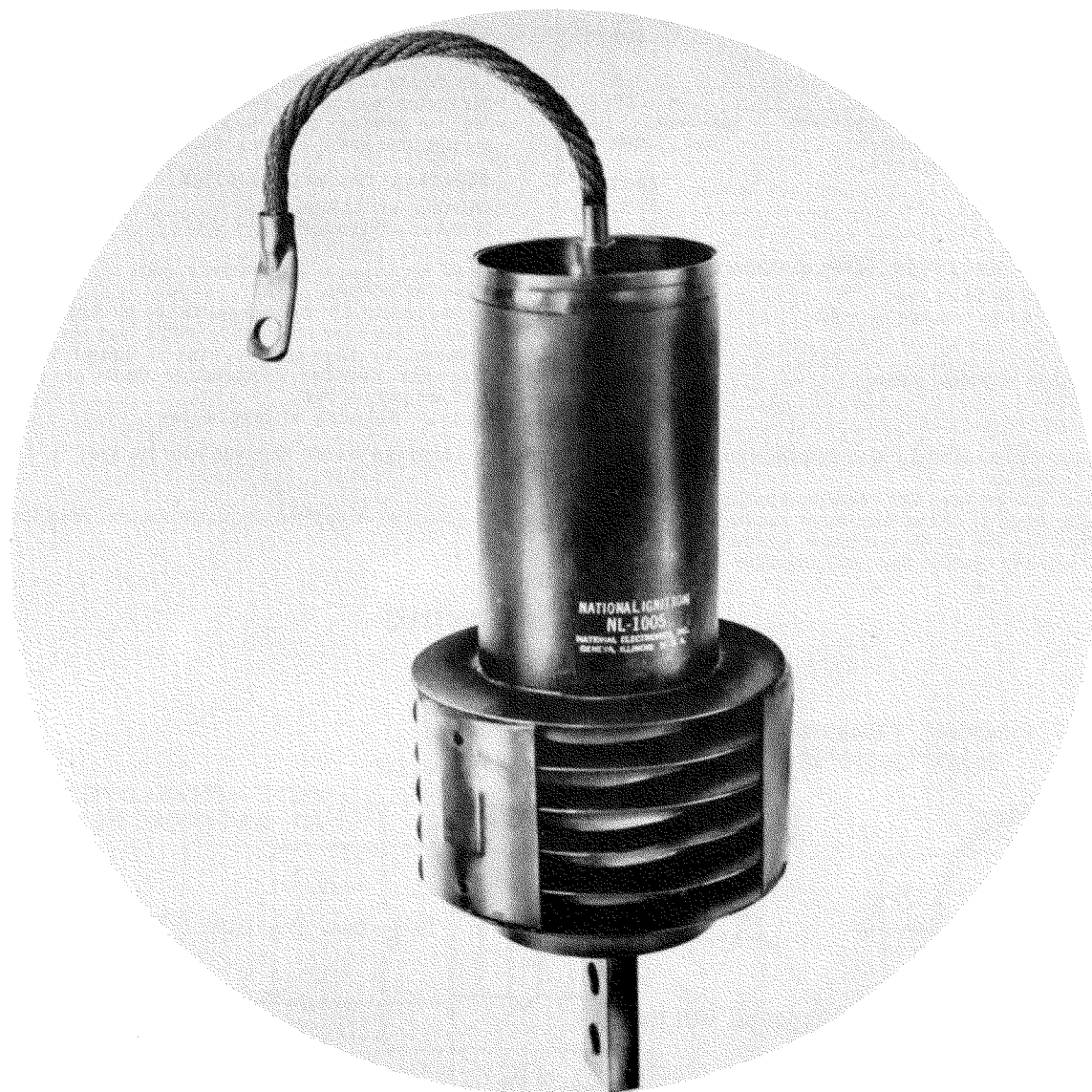
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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

IGNITRON TUBE

**NL-1005
IGNITRON TUBE
56 Amperes dc**



NATIONAL IGNITRON NL-1005 is a sturdy, metal, air-cooled mercury pool tube designed especially for welder control and similar AC control applications. It is also useful in some rectifier applications. NL-1005 is designed for forced air cooling but may be used with free air cooling at reduced ratings.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-1005 IGNITRON TUBE

TECHNICAL INFORMATION

AC CONTROL APPLICATIONS — Ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, on frequencies from 25 to 60 cycles, and any voltage between 250 and 600 volts rms.

¹ Maximum demand — kva	600
¹ Corresponding maximum average anode current per tube — amps dc	30.2
¹ Maximum average anode current per tube—amps dc	56
¹ Corresponding maximum demand — kva	200
¹ Maximum averaging time — seconds	
At 500 volts rms	9
At 250 volts rms.	18
Maximum surge current — peak amps — per cent of max. rms. demand current	250
⁴ Maximum cylinder temperature	
At 600 volts rms	80°C
At 500 volts rms	85°C
At 250 volts rms	90°C

INTERMITTENT RECTIFIER APPLICATIONS — Frequencies from 25 to 60 cycles.

Maximum peak anode voltage — volts	
Inverse	500
Forward	500
Maximum anode current, amps	
Instantaneous	700
Average, per tube	40

¹Using log-log paper, straight line interpolation of Demand Current vs. Average Anode Current may be used to determine intermediate ratings.

²Curves must not be used for rectifier applications.

³Ignition will occur if either maximum required instantaneous positive potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.

⁴Measured between center fins and opposite blower.

Averaging time — seconds	3
Surge, peak amps, averaging time — 0.15 seconds	6000
Maximum cylinder temperature at 500 volts peak	75°C

IGNITION REQUIREMENTS (same for both applications)

Ignitor Voltage

Maximum instantaneous allowed, ignitor positive, volts 900

³Maximum instantaneous required, ignitor positive, volts 200

Maximum instantaneous allowed, ignitor negative, volts 5

Ignitor Current

Maximum instantaneous allowed — amperes 100

³Maximum instantaneous required — amperes 30

Maximum average allowed — amperes 1

³Ignitor ignition time, maximum — microseconds 100

Ignitor current averaging time — seconds 5

GENERAL CHARACTERISTICS

Number of Anodes 1

Number of Ignitors 1

Mounting position Vertical

Peak arc drop — approximate volts 12

Type of cooling forced air

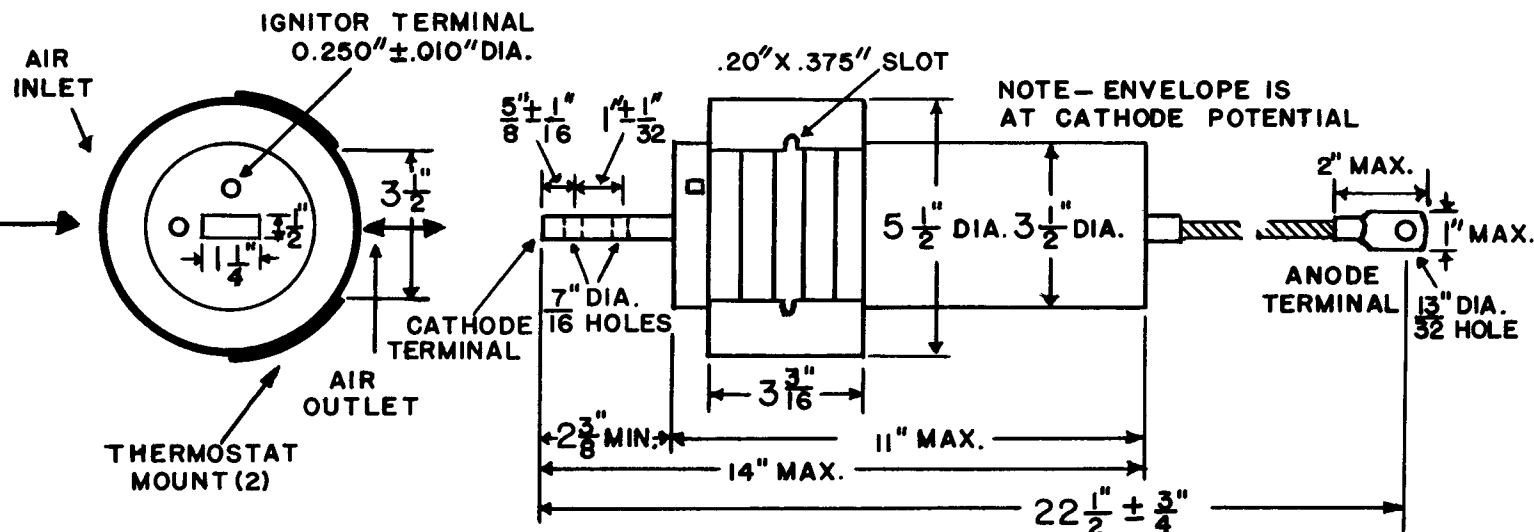
Approximate air flow required at 50 amperes dc for 45°C rise over ambient — cubic feet per minute 140

Reduced air flow may be used at lighter load as long as Maximum Cylinder Temperature limits are not exceeded.

Net weight — lbs. 7

Approx. Shipping Weight — lbs. 15

OUTLINE DRAWING



Printed in U. S. A. 7-57 G

NATIONAL ELECTRONICS, INC.

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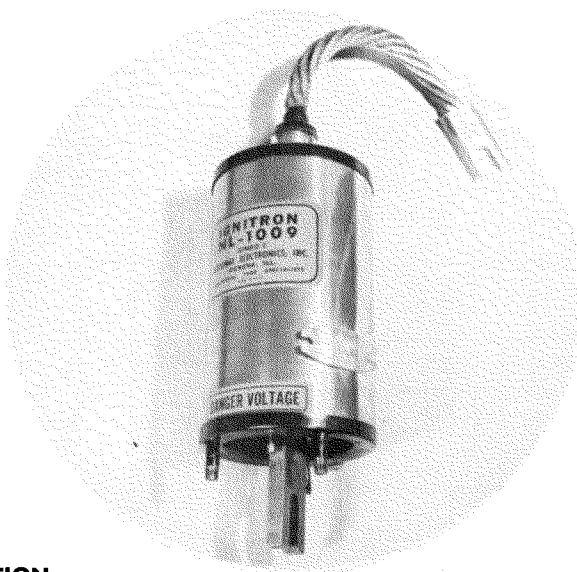
NL-1009 IGNITRON

Jumbo C

220 Amperes dc

National Ignitron NL-1009 is a metal, water-cooled, mercury pool tube designed especially for welder control and similar AC control applications. Its rating is approximately equivalent to a 750 ampere magnetic contactor.

NL-1009 utilizes a thermostat mount brazed to an all-copper cooling system that provides exceptional cooling efficiency. The inner cylinder, copper cooling coil, and thermostat mount being brazed together in a single unit assures a rugged, dependable, and adjustment free temperature control system that operates directly on inner cylinder temperature.



TECHNICAL INFORMATION

AC Control Applications — Ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, on frequencies from 25 to 60 cycles, and any voltage between 250 and 600 volts rms. Ratings are for two tubes in inverse parallel.

¹ Maximum demand — kva	1700*	¹ Maximum averaging time — seconds	
² Corresponding maximum average anode current		at 600 volts rms	8
per tube — amps DC	120	at 250 volts rms	19.1
¹ Maximum average anode current per tube — amps DC	220	Maximum surge current —	
² Corresponding maximum demand — kva	570	peak amps	280%
			of max. rms demand current

Rectifier Applications — Ratings are based on intermittent duty, on no phase delay, and on frequencies from 50 to 60 cycles. When phase control is used, current ratings are reduced as per phase control current rating curve. Values are for one tube.

Maximum peak anode voltage — volts	1200	1500	Maximum averaging time, sec:	6.25	6.25
Maximum peak anode current — amps	2100	1680	Max. ratio of average to peak current,		
Corresponding Average Current—amps DC	28	22.4	maximum averaging time 0.2 seconds	.166	.166
Maximum average anode current — amps DC	98	78.4	Max. ratio of peak fault to peak anode current	12.5	12.5
Corresponding peak current — amps	588	470	Max. duration time of surge current — sec.	.15	.15

Ignition Requirements — (Same for both applications.)

Ignitor Voltage		Ignitor Current	
Maximum instantaneous allowed,		Maximum instantaneous allowed — amperes	100
ignitor positive	anode voltage	² Maximum instantaneous required — amperes	30
² Maximum instantaneous required,		Maximum rms allowed — amperes	10
ignitor positive — volts	200	Maximum average allowed — ampere	1
Maximum instantaneous allowed,		² Ignitor ignition time maximum — microseconds	100
ignitor negative — volts	5	Ignitor current max. averaging time — seconds	5

Cooling Requirements — (Same for both applications.)

Type of cooling	Water
Minimum inlet water temperature, °C	0
Maximum cooling system temperature	
(measured at thermostat mount), °C	45
Rectifier applications	
AC control applications	
At 600 volts rms	45
At 500 volts rms	50
At 250 volts rms	55

Water flow may be reduced at light loads if cooling system temperature (measured at thermostat mount) is maintained within limits.

Typical cooling requirements at 500 volts rms operation for AC control applications, (2 tubes).

Inlet Water Temp. °C	100% Load		50% Load	
	Water Flow Required G.P.M.	Pressure drop per tube lbs. per sq. in.	Water flow required G.P.M.	Pressure drop per tube lbs. per sq. in.
15	1%	1.5	1%	.6
30	1%	5.0	1%	1.5

More water is required at 600 volts to maintain cooling system temperature within limits and less at 250 volts.

Water temperature rise at 2 G.P.M., full load, °C

Approximate temperature rise inlet water to thermostat, (at 2 GPM and full load) °C

GENERAL CHARACTERISTICS

Number of Anodes	1	Peak arc drop at 691 peak amps. — approx. volts	16
Number of Igniters	1	Net weight — lbs.	15½
Mounting Position	Vertical	Approx. shipping weight — lbs.	19
Peak arc drop at 6800 peak amps — approx. volts	35		

¹Using log-log paper, straight line interpolation of RMS Demand Current vs. Average Anode Current and Maximum Averaging Time vs. Anode Voltage may be used to determine intermediate ratings.

²Using log-log paper, straight line interpolation of Peak Anode Current vs. Average Anode Current may be used to determine intermediate ratings. See curves for details.

³Ignition will occur if either maximum required instantaneous potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.

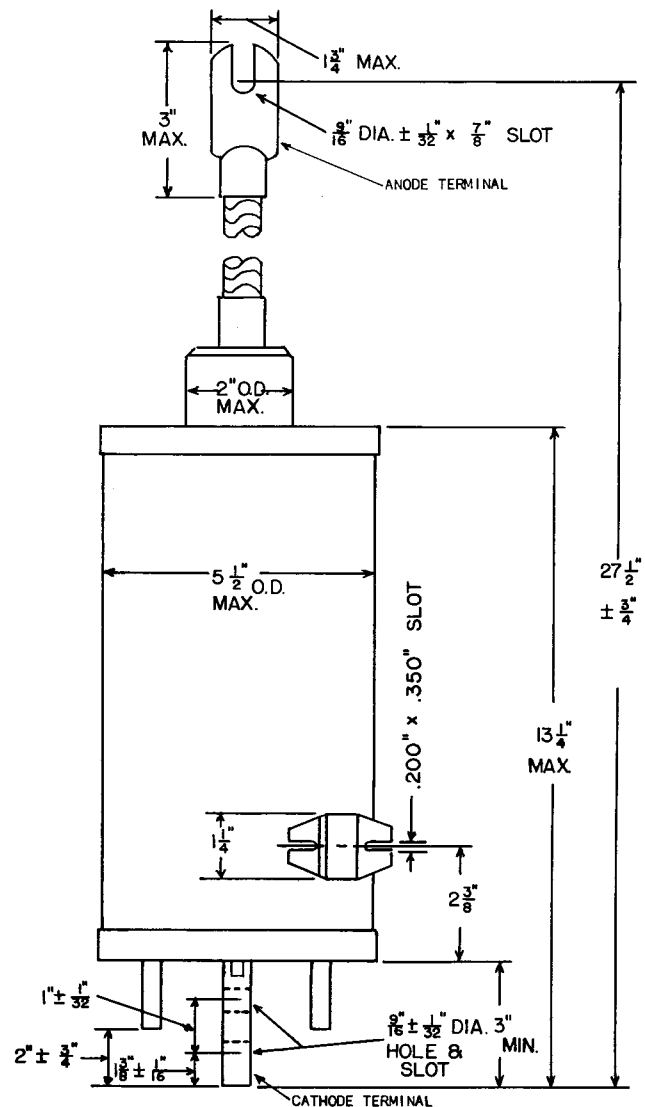
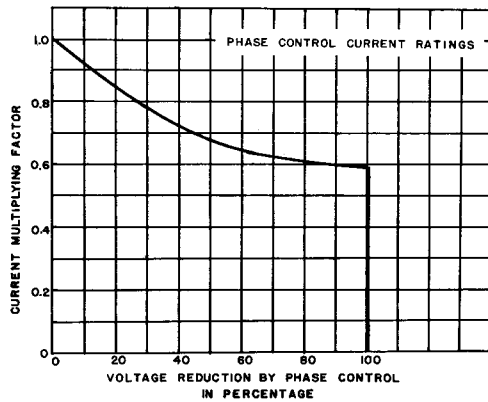
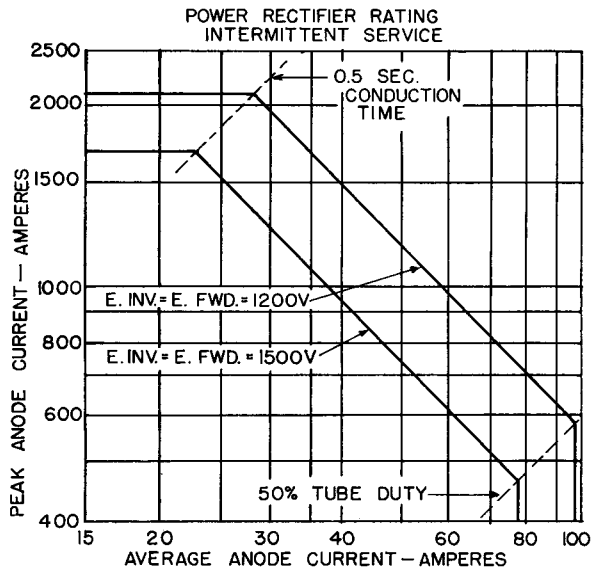
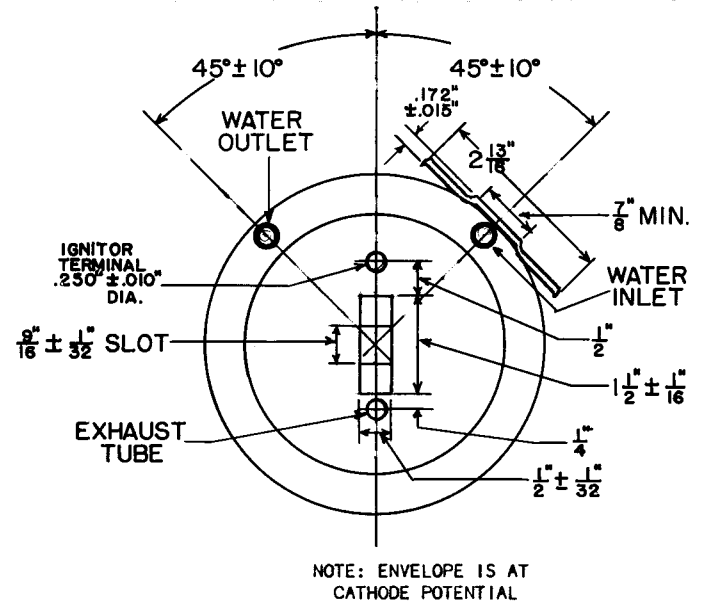
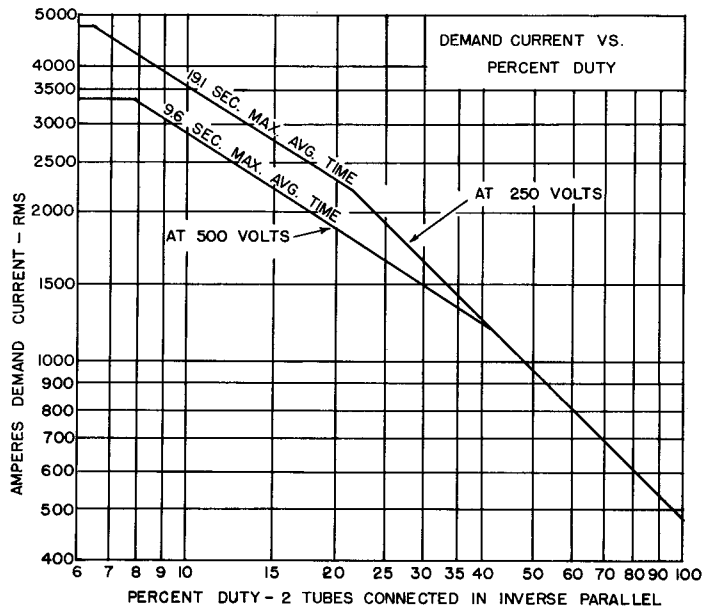
*For 500 to 600 volts rms. Max. demand current for 250 Volts rms is 4800 amperes rms, see curve. For voltages between 250 and 500, use proportional values between 3400 and 4800 amperes rms.

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GENEVA, ILLINOIS, U. S. A.

NL-1009 IGNITRON



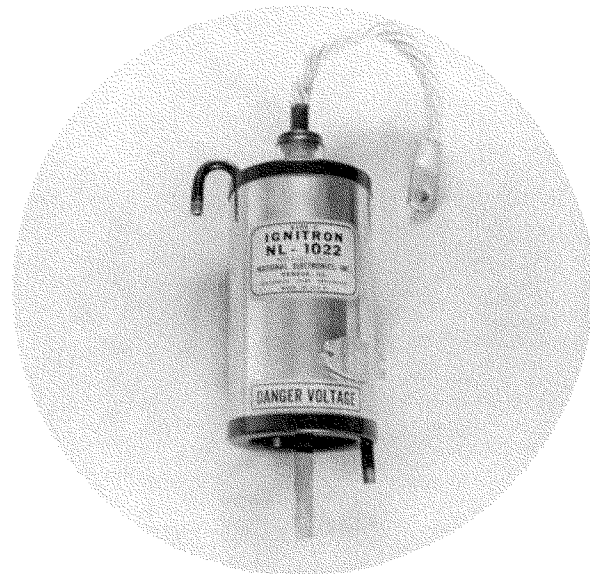
NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

NL-1022 IGNITRON

Size C 70 Amperes dc

National Ignitron NL-1022 is a metal, water cooled, mercury pool tube designed especially for frequency-changer resistance welders. NL-1022 baffle reduces the deionization time so that it will operate satisfactorily in applications involving severe conditions of commutation.

NL-1022 utilizes an all-copper cooling coil construction with thermostat mount that provides exceptional cooling efficiency. The cooling coil is self flushing and prevents sediment deposits. The mercury-pool cathode permits the tube to handle extremely high currents on an intermittent basis.



TECHNICAL INFORMATION

Frequency-Changer Resistance Welding Applications or Intermittent Power-Rectifier Applications

Maximum Ratings: Ratings are based on full cycle conduction (no phase delay) regardless of whether or not phase control is used and frequencies from 50 to 60 cycles. When phase control is used, current ratings are reduced correspondingly. Values are for one tube.

Maximum Peak Anode Voltage – Volts:

Inverse	1200	1500
Forward	1200	1500

*Anode Current – Amps:

Maximum peak	1500	1200
Corresponding maximum average per tube	20	16
Maximum average per tube	70	56
Corresponding maximum peak	420	336
Maximum averaging time, seconds	6.25	6.25
Max. Ratio of average to peak current, maximum averaging time 0.2 sec.	0.166	0.166
Max. Ratio of peak surge to peak current	12.5	12.5
Maximum duration of surge current, sec.	0.15	0.15

Ignition Requirements:

Ignitor Voltage —

Maximum instantaneous allowed, ignitor positive, volts	Anode Voltage
**Maximum instantaneous required, ignitor positive, volts	200
Maximum instantaneous allowed, ignitor negative, volts	5

Ignitor Current —

Maximum instantaneous allowed, amperes	100
**Maximum instantaneous required, amperes	30
Maximum RMS allowed, amperes	10
Maximum average allowed, ampere	1
**Ignitor ignition time, maximum microseconds	100
Ignitor averaging time, seconds	5

Cooling Requirements:

Type of cooling	Water
Minimum inlet water temperature, °C	0
Maximum cooling system temperature (measured at thermostat mount), °C	45
Approximate water flow required at continuous full load, GPM	1/2 to 1
Water flow may be reduced at light loads if cooling system temperature (measured at thermostat mount) is maintained within limits.	
Pressure drop per tube at 1 GPM, lbs. per sq. in.	4
Water temperature rise (at 1 GPM and full load), °C	5
Approx. temperature rise, water at inlet to thermostat mount (at 1 GPM and full load), °C	4

General Characteristics:

Number of anodes	1
Number of ignitors	1
Mounting position	Vertical
Peak arc drop at 1500 amperes peak, approximate volts	25
Net weight — lbs.	10
Approx. shipping weight — lbs.	12

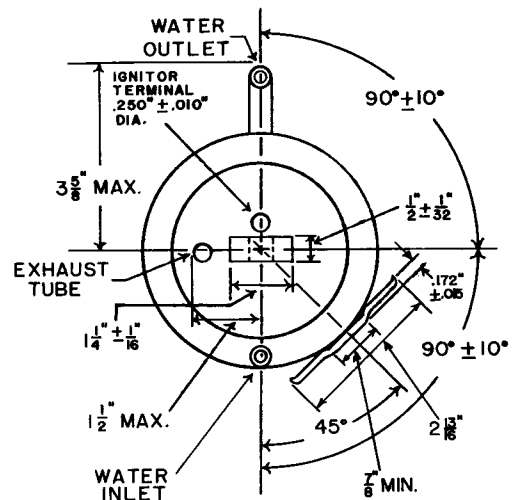
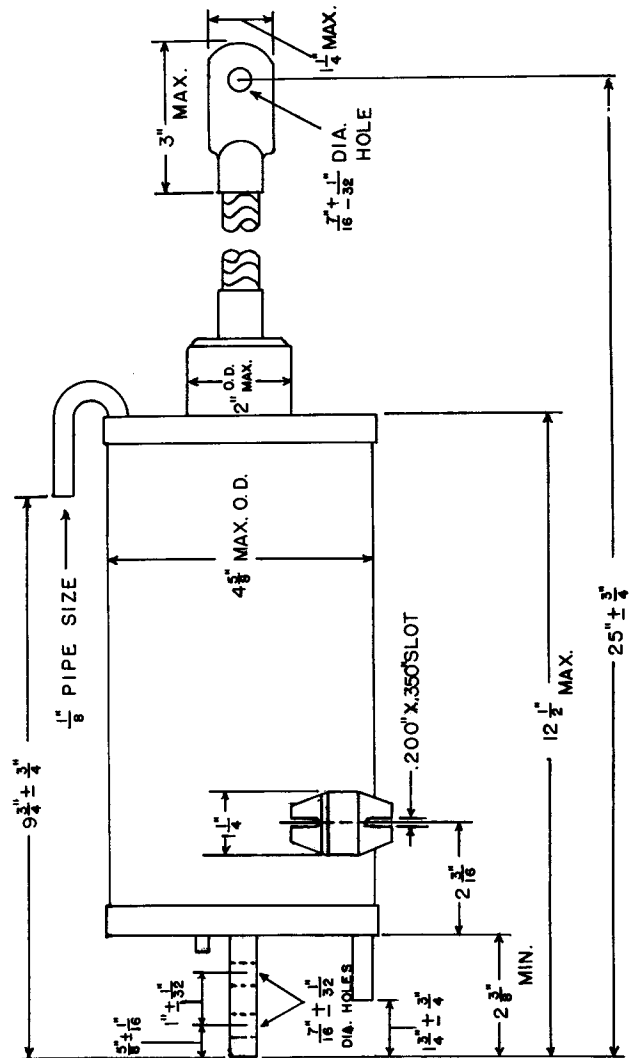
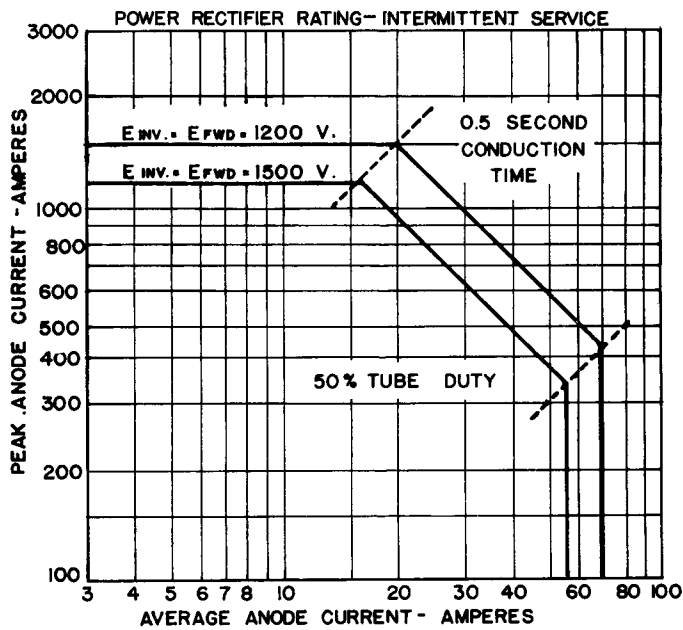
*Using log-log paper, straight line interpolation may be used to determine intermediate ratings. See curve for details.

**Ignition will occur if either maximum required instantaneous positive potential is applied or maximum instantaneous current flows for the rated maximum ignition time.

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NL-1022 IGNITRON

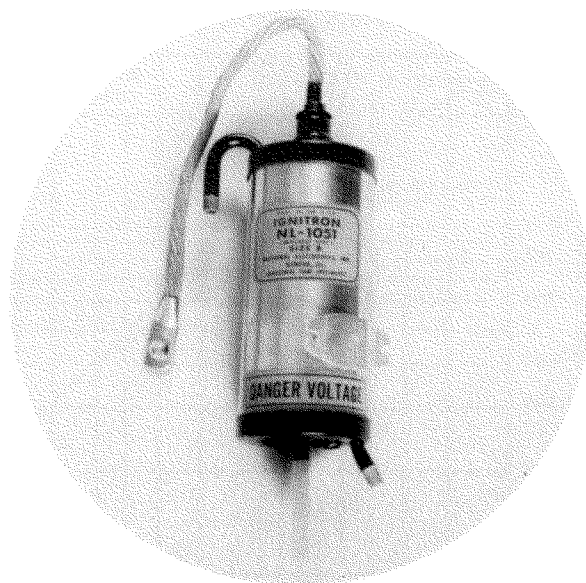


NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

NL-1051 IGNITRON

Size B 56 Amperes dc

National Ignitron NL-1051 is a metal, water-cooled, mercury pool tube designed especially for welder control and similar AC control applications. Its rating is approximately equivalent to a 300 ampere magnetic contactor. **NL-1051** utilizes a thermostat mount brazed to an all-copper cooling system that provides exceptional cooling efficiency. The inner can, copper cooling coil, and thermostat mount being brazed together in a single unit assures a rugged, dependable, and adjustment free temperature control system that operates directly on inner can temperature.



TECHNICAL INFORMATION

AC Control Applications — Ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, on frequencies from 25 to 60 cycles, and any voltage between 250 and 600 volts rms. Ratings are for two tubes in inverse parallel.

¹ Maximum demand — kva	600	¹ Maximum averaging time — seconds	
¹ Corresponding maximum average anode current		at 600 volts rms	11.25
per tube — amps DC	30.2	at 250 volts rms	27
¹ Maximum average anode current per tube — amps DC	56	Maximum surge current —	
¹ Corresponding maximum demand — kva	200	peak amps	280%
			of max. rms. demand current

²Rectifier Applications — Ratings are based on intermittent duty, on no phase delay, and on frequencies from 50 to 60 cycles. When phase control is used, current ratings are reduced as per phase control current rating curve. Values are for one tube.

Maximum peak anode voltage — volts	500	1200	1500	Maximum averaging time, sec.	6	10	10
Maximum peak anode current — amps	700	600	480	Max. ratio of average to peak current,			
Corresponding average current—amps DC	5	4		maximum averaging time 0.2 seconds	—	.166	.166
Maximum average anode current —				Ratio of fault to max. peak current	12.5	12.5	12.5
amps DC	40	22.5	18	Maximum duration time of surge current			
Corresponding peak current — amps	135	108		— sec.	.15	.15	.15

Ignition Requirements — (Same for both applications.)

Ignitor Voltage	
Maximum instantaneous allowed,	
ignitor positive	anode voltage
³ Maximum instantaneous required,	
ignitor positive — volts	200
Maximum instantaneous allowed,	
ignitor negative — volts	5

Ignitor Current	
Maximum instantaneous allowed — amperes	100
³ Maximum instantaneous required — amperes	30
Maximum rms allowed — amperes	10
Maximum average allowed — ampere	1
³ Ignitor ignition time maximum — microseconds	100
Ignitor current max. averaging time — seconds	5

Cooling Requirements — (Same for both applications.)

Type of cooling	Water
Minimum inlet water temperature, °C	0
Maximum cooling system temperature	
(measured at thermostat mount). °C	
Rectifier applications	45
AC control applications	
At 600 volts rms	45
At 500 volts rms	50
At 250 volts rms	55

Water flow may be reduced at light loads if cooling system temperature (measured at thermostat mount) is maintained within limits.

Typical cooling requirements at 500 volts rms operation for AC control applications.

Inlet Water Temp. °C	100% Load		50% Load	
	Water flow required G.P.M.	Pressure drop per tube lbs. per sq. in.	Water flow required G.P.M.	Pressure drop per tube lbs. per sq. in.
15	1/4	.4	1/16	.1
30	1/2	.75	1/8	.2
40	1-1/2	3.0	1/4	.4

More water is required at 600 volts to maintain cooling system temperature within limits and less at 250 volts.

Water temperature rise at 1 G.P.M., full load, °C

Approximate temperature rise inlet water to thermostat, °C 4

GENERAL CHARACTERISTICS

Number of Anodes	1
Number of Ignitors	1
Mounting Position	Vertical
Peak arc drop at 3400 peak amps — approx. volts	26

Peak arc drop at 176 peak amps. — approx. volts	13
Net weight — lbs.	4½
Approx. shipping weight — lbs.	7

¹Using log-log paper, straight line interpolation of RMS Demand Current vs. Average Anode Current and Maximum Averaging Time vs. Anode Voltage may be used to determine intermediate ratings.

²Using log-log paper, straight line interpolation of Peak Anode Current vs. Average Anode Current may be used to determine intermediate ratings. See curves for details.

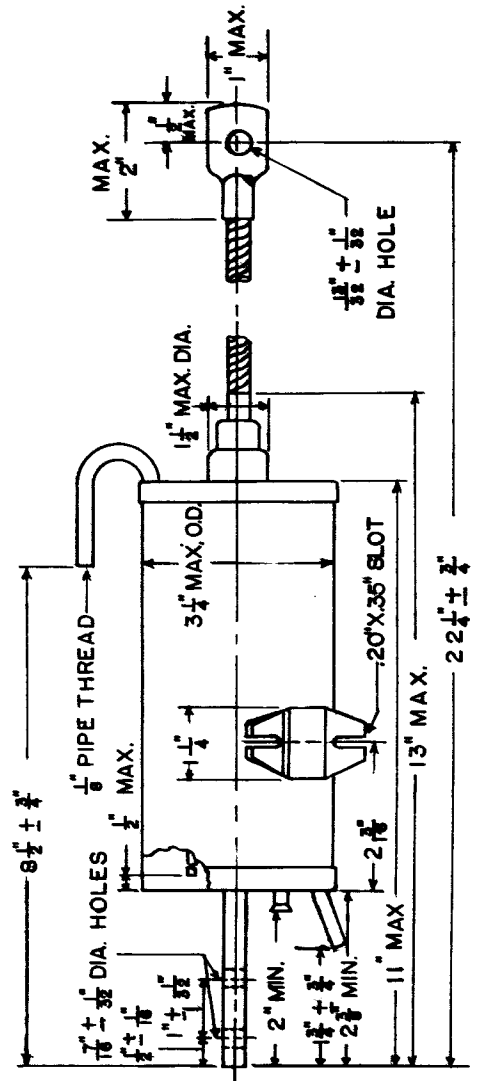
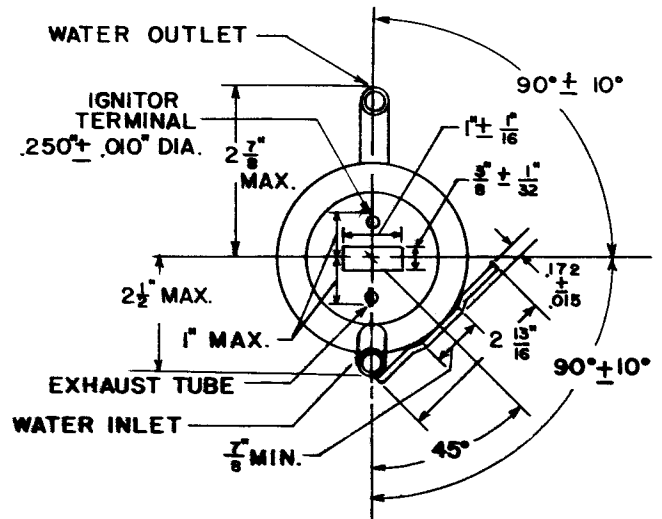
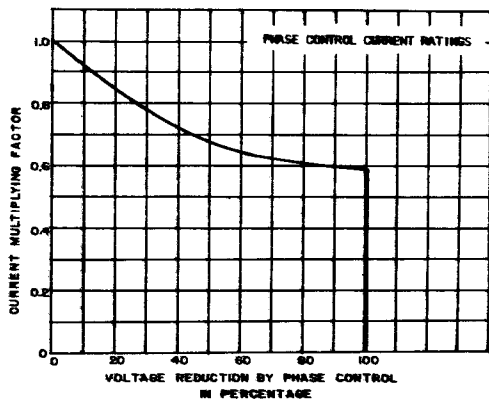
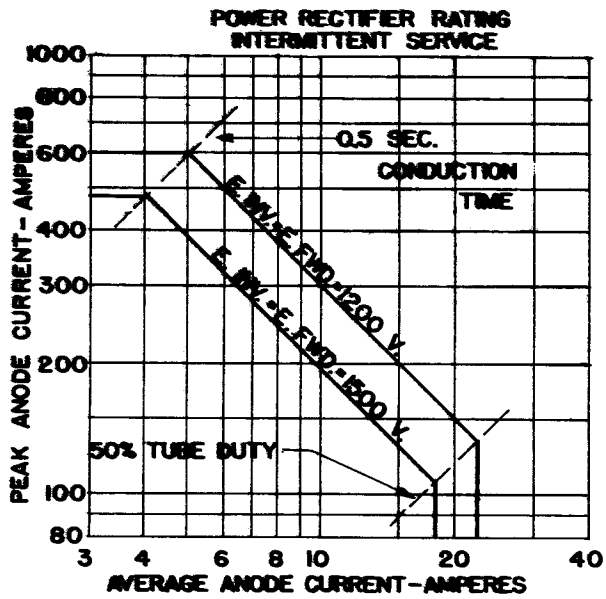
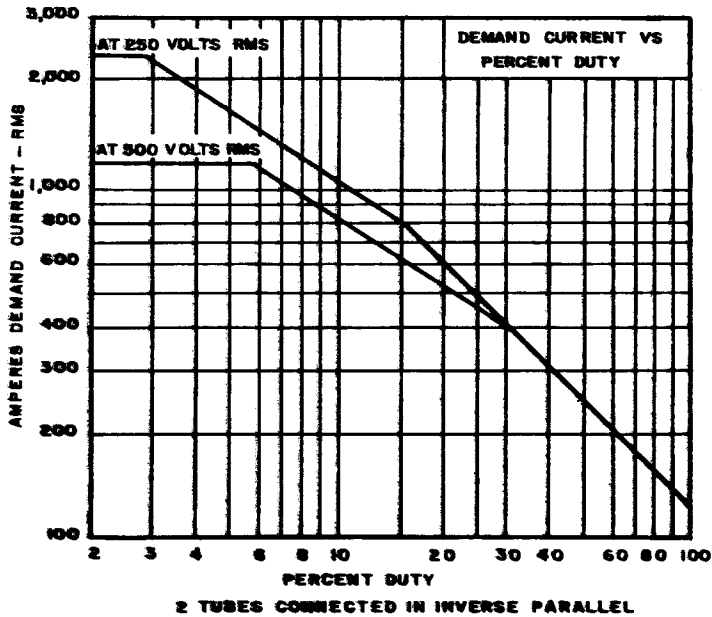
³Ignition will occur if either maximum required instantaneous potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.

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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-1051 IGNITRON



NATIONAL ELECTRONICS, Inc.

GENEVA, ILLINOIS, U. S. A.

NL-1052 IGNITRON

Size C

140 Amperes dc

National Ignitron NL-1052 is a metal, water-cooled, mercury pool tube designed especially for welder control and similar AC control applications. Its rating is approximately equivalent to a 600 ampere magnetic contactor.

NL-1052 utilizes a thermostat mount brazed to an all-copper cooling system that provides exceptional cooling efficiency. The inner can, copper cooling coil, and thermostat mount being brazed together in a single unit assures a rugged, dependable, and adjustment free temperature control system that operates directly on inner can temperature.



TECHNICAL INFORMATION

AC Control Applications — Ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, on frequencies from 25 to 60 cycles, and any voltage between 250 and 600 volts rms. Ratings are for two tubes in inverse parallel.

¹ Maximum demand — kva	1200	¹ Maximum averaging time — seconds	
¹ Corresponding maximum average anode current per tube — amps DC	75.6	at 600 volts rms	8.75
¹ Maximum average anode current per tube — amps DC	140	at 250 volts rms	21.
¹ Corresponding maximum demand — kva	400	Maximum surge current — peak amps	280%
			of max. rms demand current

Rectifier Applications — Ratings are based on intermittent duty, on no phase delay, and on frequencies from 25 to 60 cycles. Values are for one tube.

Maximum peak anode voltage — volts	500	Maximum averaging time, sec.	6
Maximum peak anode current — amps	1600	Maximum peak fault current — amps	6000
Maximum average anode current — amps DC	100	Maximum duration time of fault current — sec.	.15

Ignition Requirements — (Same for both applications.)

Ignitor Voltage

Maximum instantaneous allowed, ignitor positive	anode voltage
³ Maximum instantaneous required, ignitor positive — volts	200
Maximum instantaneous allowed, ignitor negative — volts	5

Ignitor Current

Maximum instantaneous allowed — amperes	100
³ Maximum instantaneous required — amperes	30
Maximum rms allowed — amperes	10
Maximum average allowed — ampere	1
³ Ignitor ignition time maximum — microseconds	100
Ignitor current max. averaging time — seconds	5

Cooling Requirements — (Same for both applications.)

Type of cooling	Water
Minimum inlet water temperature, °C	0
Maximum cooling system temperature (measured at thermostat mount), °C	
Rectifier applications	45
AC control applications	
At 600 volts rms	45
At 500 volts rms	50
At 250 volts rms	55

Water flow may be reduced at light loads if cooling system temperature (measured at thermostat mount) is maintained within limits.

Typical cooling requirements at 500 volts rms operation for AC control applications.

Inlet Temp. °C	100% Load		50% Load	
	Water flow required G.P.M.	Pressure drop per tube lbs. per sq. in.	Water flow required G.P.M.	Pressure drop per tube lbs. per sq. in.
15	¾	.6	¾	.2
30	½	.9	¼	.4
40	1¼	4.0	½	.9

More water is required at 600 volts to maintain cooling system temperature within limits and less at 250 volts.

Water temperature rise at 1 G.P.M., full load, °C

Approximate temperature rise inlet water to thermostat, °C 4

GENERAL CHARACTERISTICS

Number of Anodes	1	Peak arc drop at 440 peak amps. — approx. volts	14
Number of Ignitors	1	Net weight — lbs.	10
Mounting Position	Vertical	Approx. shipping weight — lbs.	12
Peak arc drop at 6800 peak amps — approx. volts	28		

¹Using log-log paper, straight line interpolation of RMS Demand Current vs. Average Anode Current and Maximum Averaging Time vs. Anode Voltage may be used to determine intermediate ratings.

²Curves must not be used for rectifier applications.

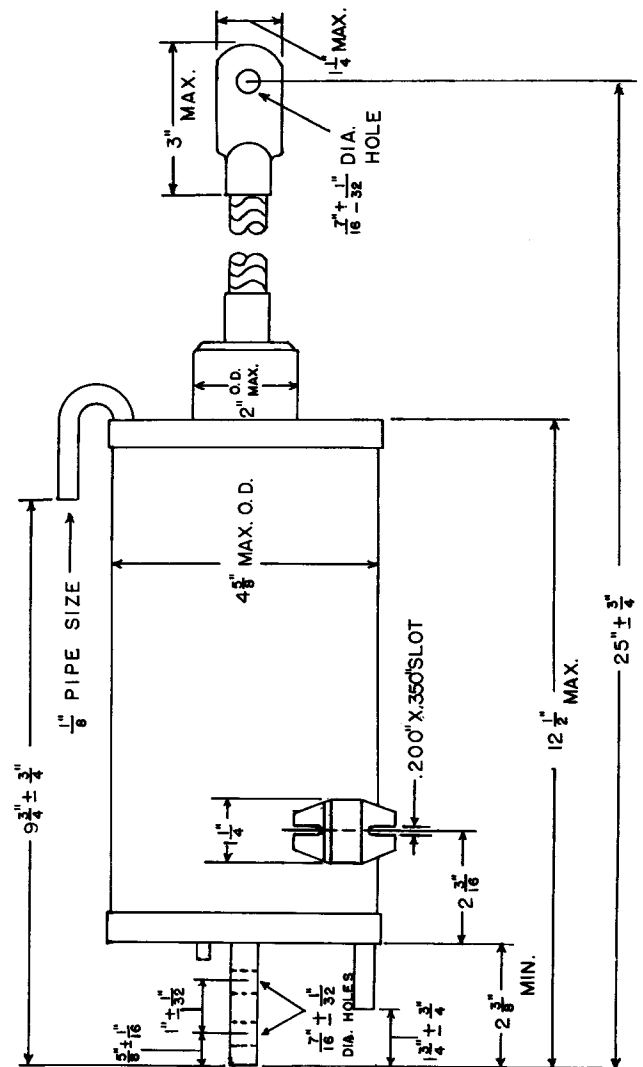
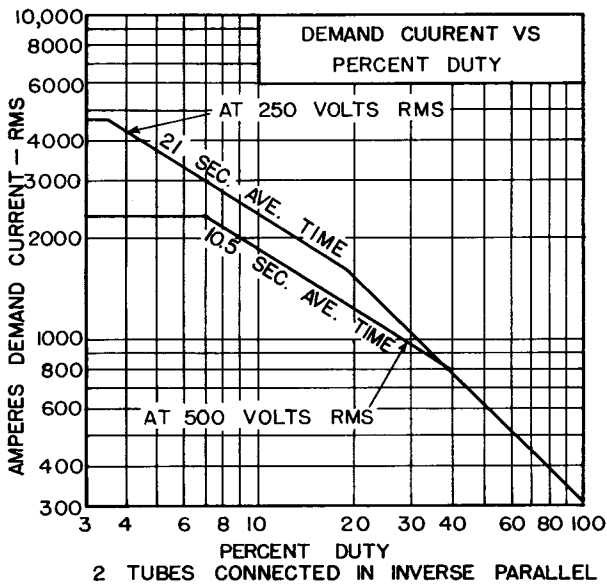
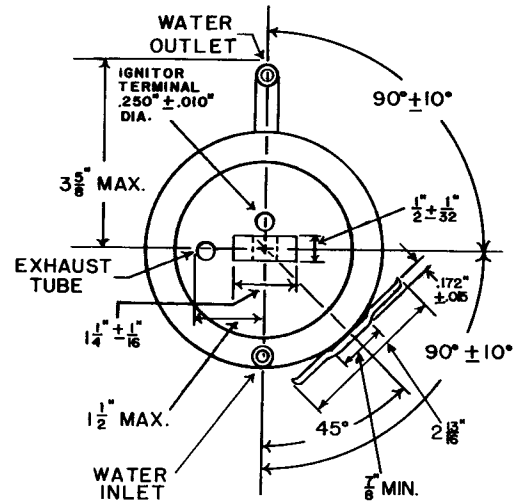
³Ignition will occur if either maximum required instantaneous potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.

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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-1052 IGNITRON



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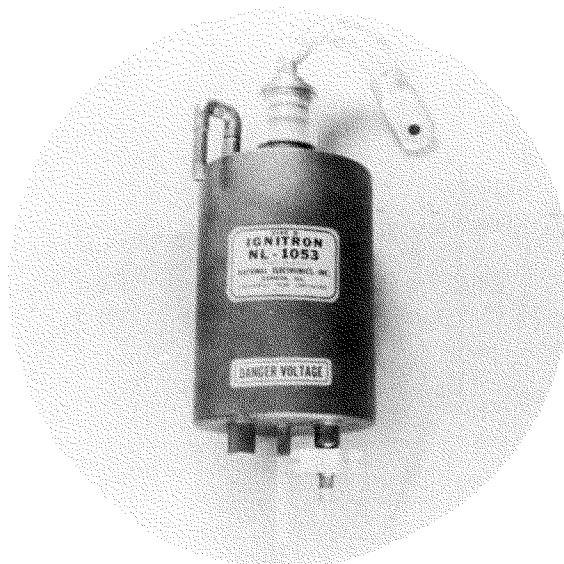
NL-1053 IGNITRON

Size D

355 Amperes dc

National Ignitron NL-1053 is a metal, water-cooled, mercury pool tube designed especially for welder control and similar AC control application. Its rating is approximately equivalent to a 1200 ampere magnetic contactor.

NL-1053 utilizes a thermostat mount brazed solidly to the cathode header and cooling coil to give accurate temperature indication and tube protection. The large stainless steel envelope with internal cooling coil greatly increases the cooling surface for long life and arc-back-free operation.



TECHNICAL INFORMATION

AC Control Applications — Ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, on frequencies from 25 to 60 cycles, and any voltage between 250 and 600 volts rms. Ratings are for two tubes in inverse parallel.

¹ Maximum demand — kva	2400	¹ Maximum averaging time — seconds	
¹ Corresponding maximum average anode current per tube — amps DC	192	at 600 volts rms	9.2
¹ Maximum average anode current per tube — amps DC	355	at 250 volts rms	22.
¹ Corresponding maximum demand — kva	800	Maximum surge current — peak amps	280%
			of max. rms demand current

Rectifier Applications — Ratings are based on intermittent duty, on no phase delay, and on frequencies from 50 to 60 cycles. When phase control is used, current ratings are reduced as per phase control current rating curve. Values are for one tube.

Maximum peak anode voltage — volts	600	1200	1500	Max. ratio of average to peak current, maximum averaging time 0.2 seconds	.166	.166	.166
Maximum peak anode current — amps	4000	3000	2400	Max. ratio of peak fault to peak anode current	12.5	12.5	12.5
Corresponding average current — amps DC	54	40	32	Maximum duration time of fault current — sec.	.15	.15	.15
Maximum average anode current — amps DC	190	140	112				
Corresponding peak current — amps	1140	840	672				
Maximum averaging time, sec.	6.5	6.5	6.5				

Ignition Requirements — (Same for both applications.)

Ignitor Voltage		Ignitor Current	
Maximum instantaneous allowed, ignitor positive	anode voltage	Maximum instantaneous allowed — amperes	100
³ Maximum instantaneous required, ignitor positive — volts	200	³ Maximum instantaneous required — amperes	30
Maximum instantaneous allowed, ignitor negative — volts	5	Maximum rms allowed — amperes	10
		Maximum average allowed — ampere	1
		³ Ignitor ignition time maximum — microseconds	100
		Ignitor current max. averaging time — seconds	5

Cooling Requirements — (Same for both applications.)

Type of cooling	Water	Approximate water flow required at continuous full load GPM	1½ to 3
Minimum inlet water temperature °C	0	Water flow may be reduced if cooling system temperature is maintained within limits.	
Maximum cooling system temperature (measured at thermostat mount) — °C		Pressure drop per tube at 3 GPM — lbs. per sq. in.	3.2
Rectifier Applications	50	Water temperature rise at 3 GPM, full load — °C	8
AC Control Applications		Approx. temperature rise, water at inlet to thermostat mount (at full load and at 3 GPM) — °C	10
At 600 volts rms	50		
At 500 volts rms	55		
At 250 volts rms	60		

GENERAL CHARACTERISTICS

Number of Anodes	1	Peak arc drop at 1115 peak amps — approx. volts	17
Number of Ignitors	1	Net weight — lbs.	35½
Mounting Position	Vertical	Approx. shipping weight — lbs.	40
Peak arc drop at 13,600 peak amps — approx. volts	36		

¹Using log-log paper, straight line interpolation of RMS Demand Current vs. Average Anode Current and Maximum Averaging Time vs. Anode Voltage may be used to determine intermediate ratings.

²Using log-log paper, straight line interpolation of Peak Anode Current vs. Average Anode Current may be used to determine intermediate ratings. See curves for details.

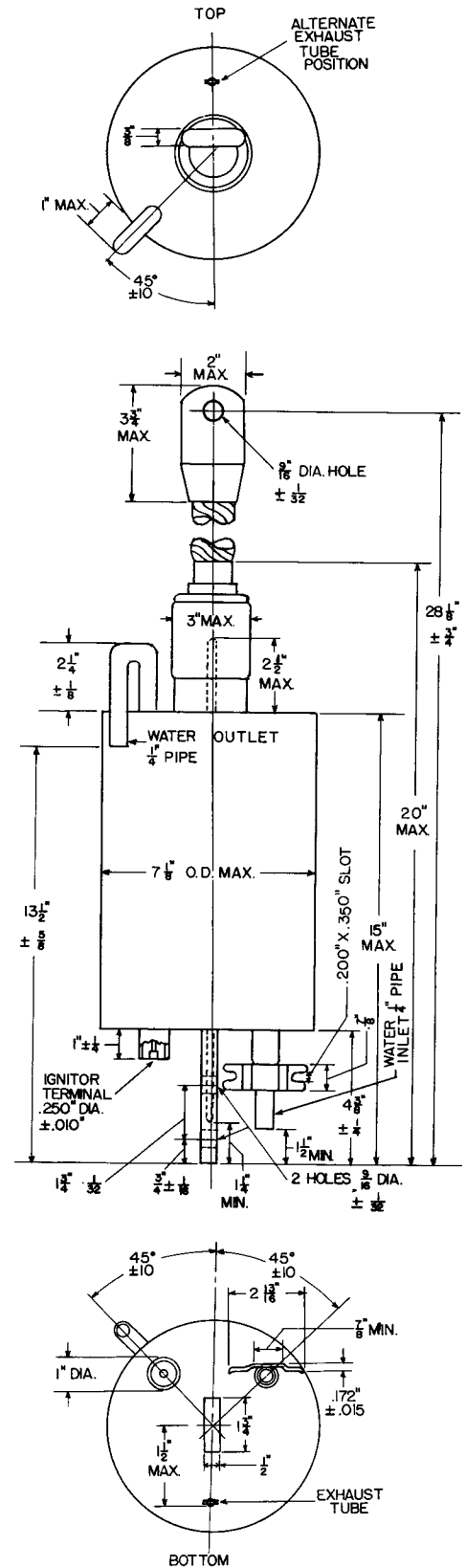
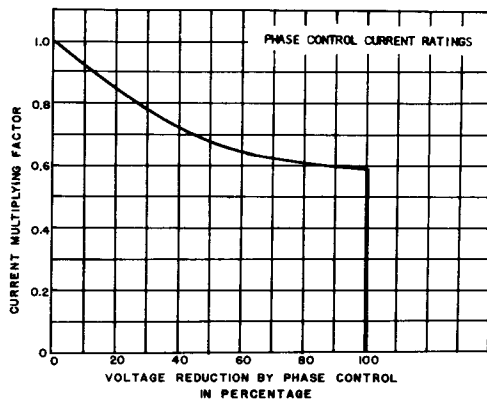
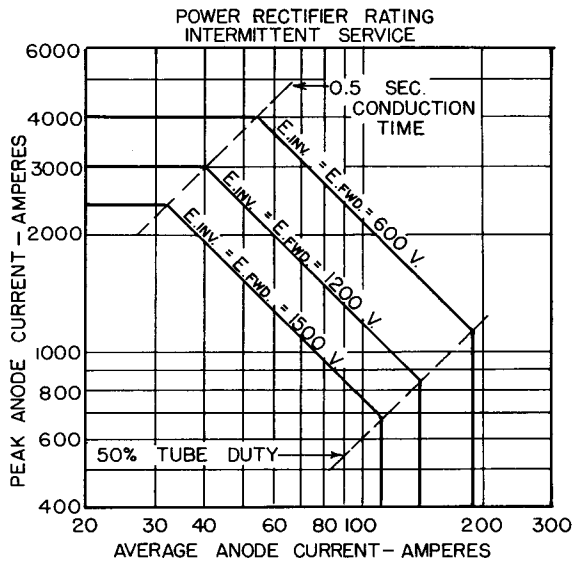
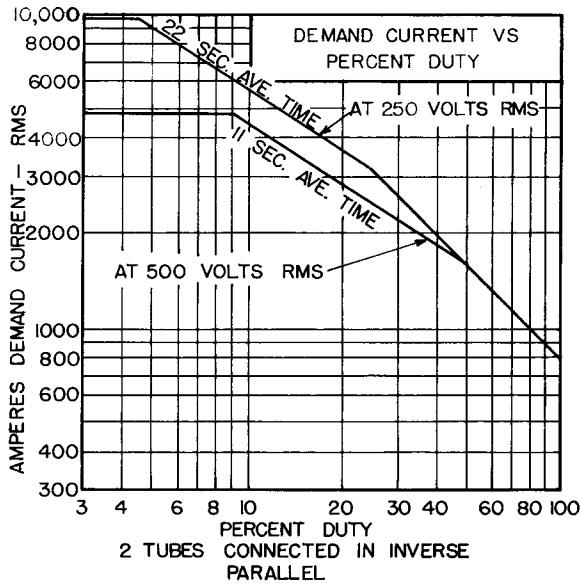
³Ignition will occur if either maximum required instantaneous potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.

Printed in USA 11-57 GR

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-1053 IGNITRON



NATIONAL ELECTRONICS, INC.

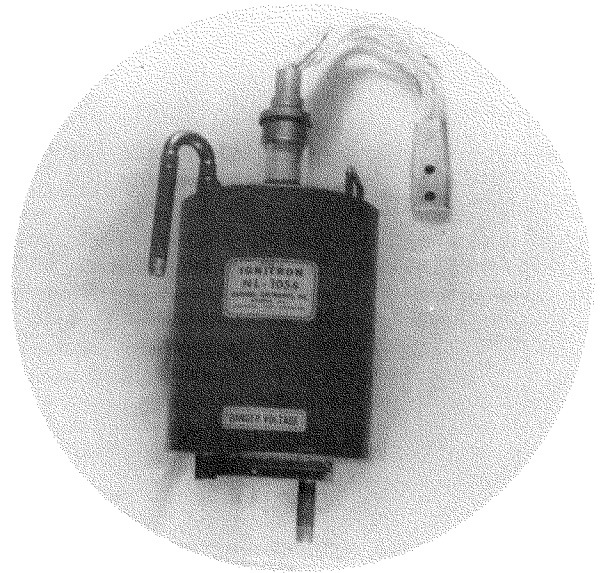
GENEVA, ILLINOIS, U. S. A.

NL-1054 IGNITRON

SIZE E

900 Amperes dc

National Ignitron NL-1054 is a metal, water-cooled, mercury pool tube designed especially for welder and similar AC control applications. Its rating is approximately equivalent to a 2400 ampere magnetic contactor. NL-1054 internal cooling coil greatly increases the cooling surface giving long life and arc-back-free operation.



TECHNICAL INFORMATION

AC Control Applications — Ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, on frequencies from 25 to 60 cycles, and any voltage between 250 and 600 volts rms. Ratings are for two tubes in inverse parallel.

¹ Maximum demand — kva	4800*
¹ Corresponding maximum average anode current per tube, amps DC	486
¹ Maximum average anode current per tube — amps DC	900
¹ Corresponding maximum demand — kva	1600

¹ Maximum averaging time — seconds	
at 500 volts rms.	8.9
at 250 volts rms.	17.8
Maximum surge current — peak amps	280%
of max. rms demand current	

²Rectifier Applications — Ratings are based on intermittent duty, on full-cycle conduction (no phase delay), and on frequencies from 50 to 60 cycles. When phase control is used, current ratings are reduced as per phase control current rating curve. Values are for one tube.

Max. peak anode volts	600	1200	1500
Max. peak anode current, amps.	8000	6000	4800
Corres. max. ave. anode current, amps. DC ..	160	120	96
Max. ave. anode current, amps. DC	453	340	272
Corres. max. peak anode current, amps.	2718	2040	1632

Max. averaging time, sec.	12.5	12.5	12.5
Max. ratio of average to peak current, max. averaging time, 0.6 sec.	0.166	0.166	0.166
Max. ratio of peak surge current to peak anode current	12.5	12.5	12.5
Max. duration of surge current, sec.	0.15	0.15	0.15

Ignition Requirements — (Same for both applications.)

Ignitor Voltage

Maximum instantaneous allowed, ignitor positive .. anode voltage	
³ Maximum instantaneous required, ignitor positive — volts	200
Maximum instantaneous allowed, ignitor negative — volts	5

Ignitor Current

Maximum instantaneous allowed — amperes	100
³ Maximum instantaneous required — amperes	30
Maximum rms allowed — amperes	10
Maximum average allowed — ampere	1
³ Ignitor ignition time maximum — microseconds	100
Ignitor current averaging time — seconds	5

Cooling Requirements — (Same for both applications.)

Type of cooling	Water
Minimum inlet water temperature, °C	0
Maximum outlet water temperature, °C	40
Approximate water flow required at continuous full load, GPM	6

At duty less than maximum % duty for any given demand current, water flow can be reduced in proportion to reduction in duty.

Minimum water flow, at any load, GPM	1.5
Pressure drop per tube at 6 GPM — lbs. per sq. in.	16
Water temperature rise at 6 GPM — full load — °C	9

GENERAL CHARACTERISTICS

Number of anodes	1
Number of ignitors	1
Mounting position	Vertical

Peak arc drop at 6000 amperes peak — approximate volts	30
Net weight — lbs.	85
Approx. shipping weight — lbs.	105

¹Using log-log paper, straight line interpolation of RMS Demand Current vs. Average Anode Current and Maximum Averaging Time vs. Anode Voltage may be used to determine intermediate ratings.

²Using log-log paper, straight line interpolation of Peak Anode Current vs. Average Anode Current may be used to determine intermediate ratings. See curves for details.

³Ignition will occur if either maximum required instantaneous potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.

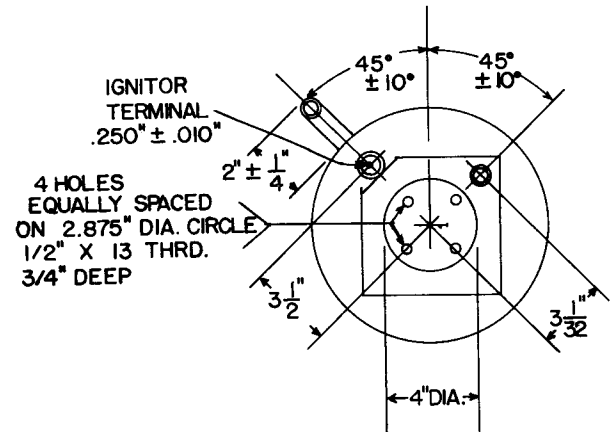
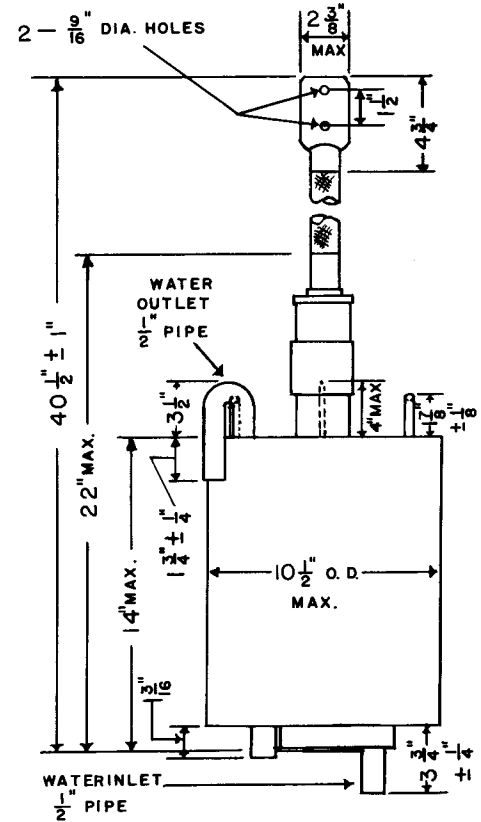
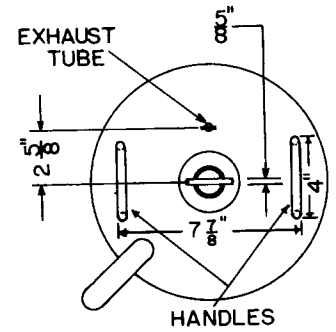
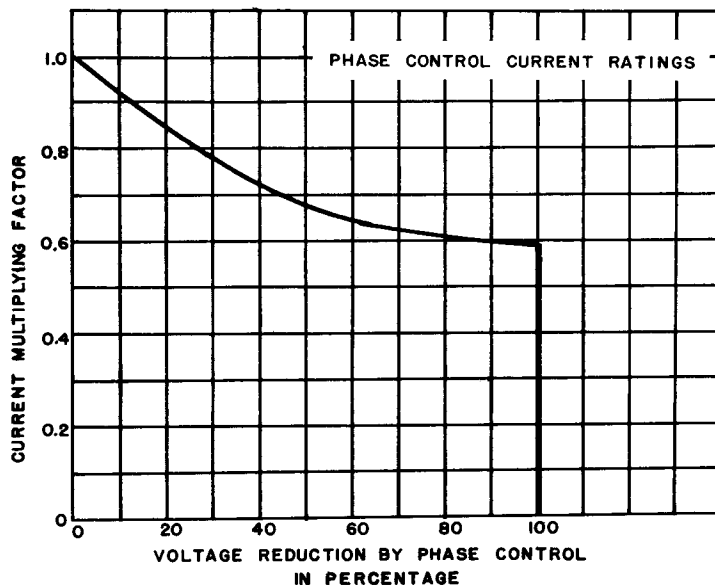
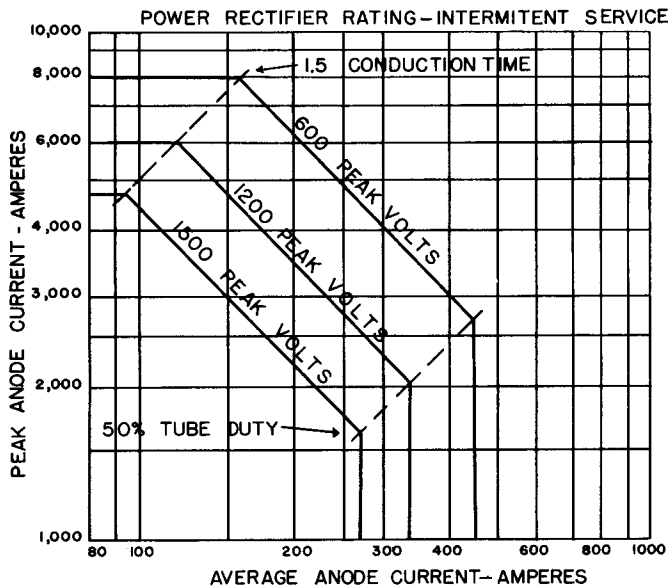
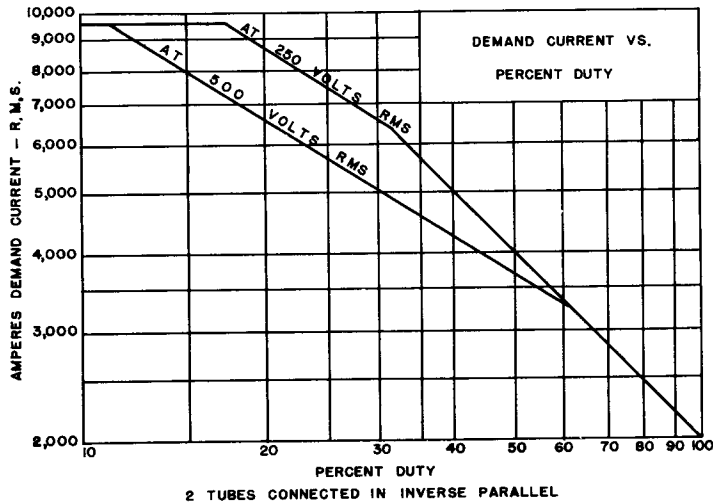
*Maximum demand current at voltages below 500 is 9600 amps rms.

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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-1054 IGNITRON



NATIONAL ELECTRONICS, INC.

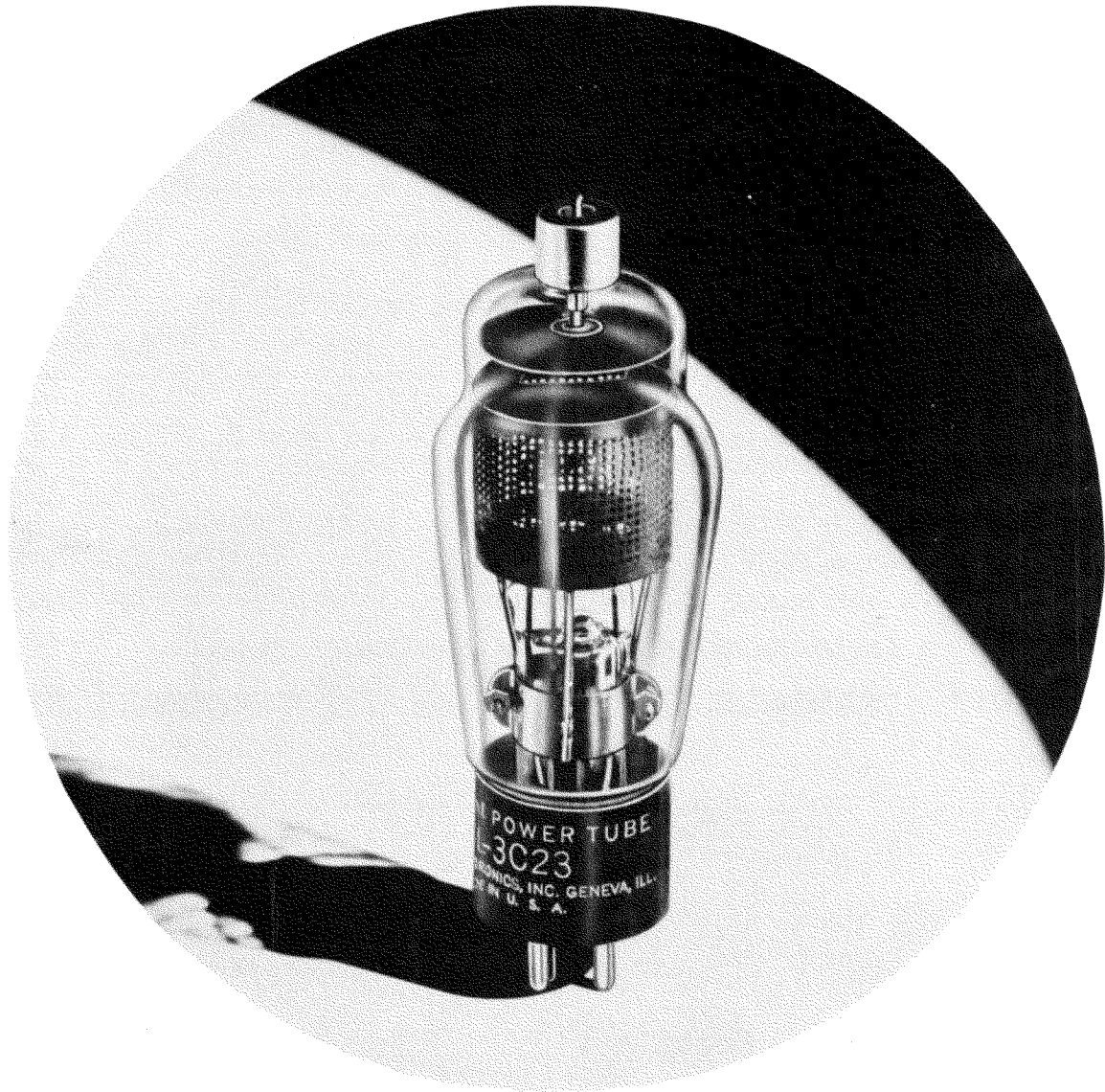
GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBES

NL-3C23, NL-323B and NL-393A

THYRATRON TUBES

1.5 Amperes dc — 6 Amperes Peak



NATIONAL POWER TUBE NL-3C23 is a quick heating thyatron designed especially for industrial grid controlled rectifier applications. It is gas and mercury filled for quick starting and constancy of characteristics within wide temperature limits.

NL-323B and NL-393A are similar thyatron tubes, but use different bases and caps.

NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

NL-3C23, NL-323B and NL-393A THYRATRON TUBES

TECHNICAL INFORMATION

dc Amperes output (maximum)	1.5
Instantaneous Amperes output (maximum)	6
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	1250
Maximum peak forward volts	1250
Filament volts	2.5
Filament amperes	7
Filament heating time (seconds)	15
Typical arc drop at 5 amperes peak (volts)	15
Grid control characteristic	see curve
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	2
Maximum ac short circuit current (amperes)	120
Condensed mercury temperature limits (°C)*	-40 to +80
Approximate temperature rise, cond. mercury above ambient (°C)	20
Mounting position	vertical, base down
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

*The tube may be started and satisfactory operation will result between -40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +20 to +60°C ambient.

All data are for frequencies between 25 and 210 cycles per second.

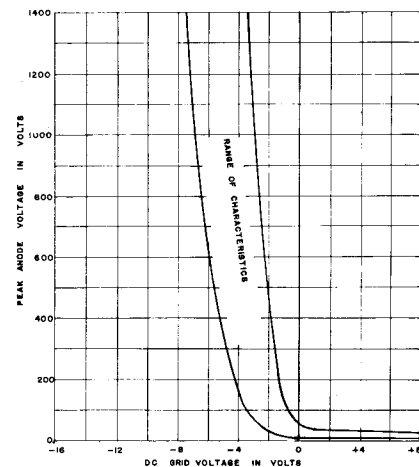
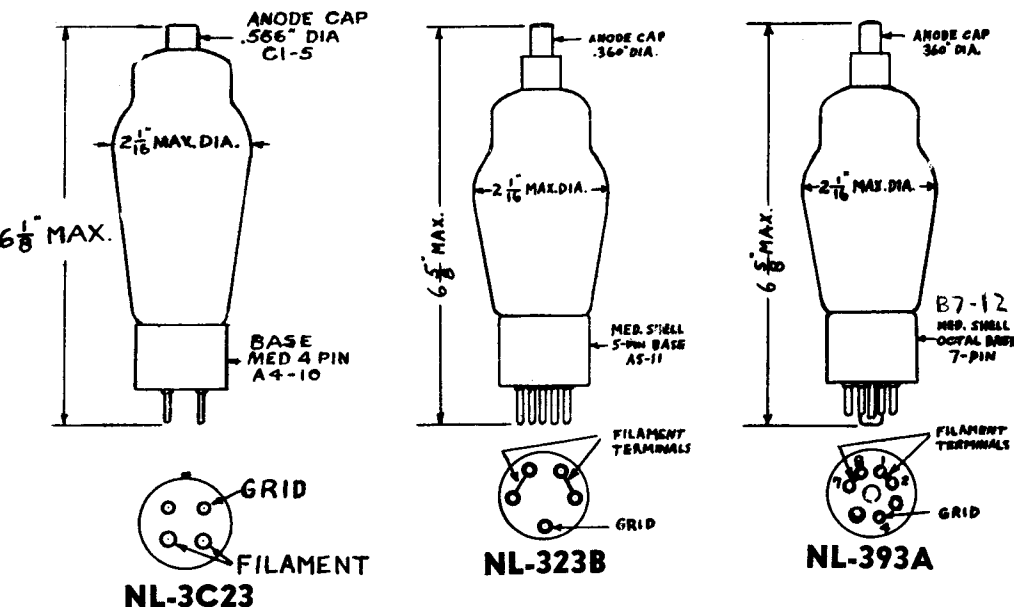
Special ratings apply to other frequencies.

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWINGS

GRID CHARACTERISTIC



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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

IGNITRON TUBE

NL-5550

IGNITRON TUBE

22.4 Amperes dc



NL-5550 is a mercury pool tube designed especially for resistance welding control. Its rating is approximately equivalent to a 150-ampere magnetic contactor.

NL-5550 can be used to control 25-60 cycle AC at voltages of 250 to 600 volts. It can also be used to control stored electrostatic energy for resistance welding.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-5550 IGNITRON TUBE TECHNICAL INFORMATION

AC CONTROL APPLICATIONS — ratings are based on full-cycle conduction (no phase delay) regardless of whether or not phase control is used, on frequencies from 25 to 60 cycles, and any voltage between 250 to 600 volts rms.

Maximum clamp temperature, °C	75	50
¹ Maximum demand — kva	150	300
¹ Corresponding maximum average anode current per tube — amps DC	4.9	12.1
¹ Maximum average anode current per tube — amps DC	9.0	22.4
¹ Corresponding maximum demand — kva	50	100

¹ Maximum averaging time — seconds		
At 600 volts rms.	11.6	9.2
At 250 volts rms.	27.8	22
Maximum surge current —		
Peak amps	280	280
percent of max. rms demand current		

²CAPACITOR DISCHARGE RATINGS

Maximum discharges per sec.	60	60
Peak forward voltage, max.	3000	6000
Peak inverse volts, max.	3000	3000
Peak anode current, max. amps.	500	500

Maximum temp. of cooling clamp, °C	70	40	60	40
Corresponding maximum average current, amps DC	3	15	2.5	8
Maximum averaging time, sec.	3.3	0.66	4.0	1.25

IGNITION REQUIREMENTS (same for both applications)

Ignitor Voltage

Maximum instantaneous allowed, ignitor positive— anode voltage

³Maximum instantaneous required, ignitor positive — volts 200

Maximum instantaneous allowed, ignitor negative—volts 5

Ignitor Current

Maximum instantaneous allowed — amperes 100

³Maximum instantaneous required — amperes 30

Maximum average allowed — ampere 1

³Ignitor ignition time maximum — microseconds 100

Ignitor current averaging time — seconds 5

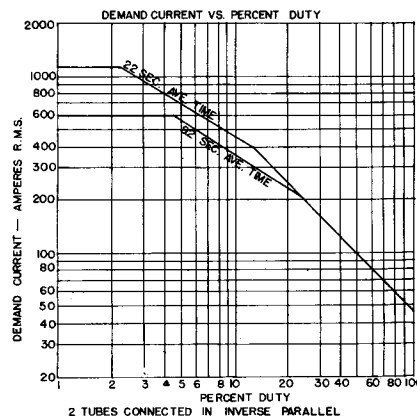
GENERAL CHARACTERISTICS

Number of anodes	1
Number of ignitors	1
Mounting position	Vertical
Peak arc drop — approximate volts	12
Type of cooling	Water cooled clamp
Minimum inlet water temperature — °C	0
Net weight — lbs.	1.5
Approx. shipping weight — lbs.	8

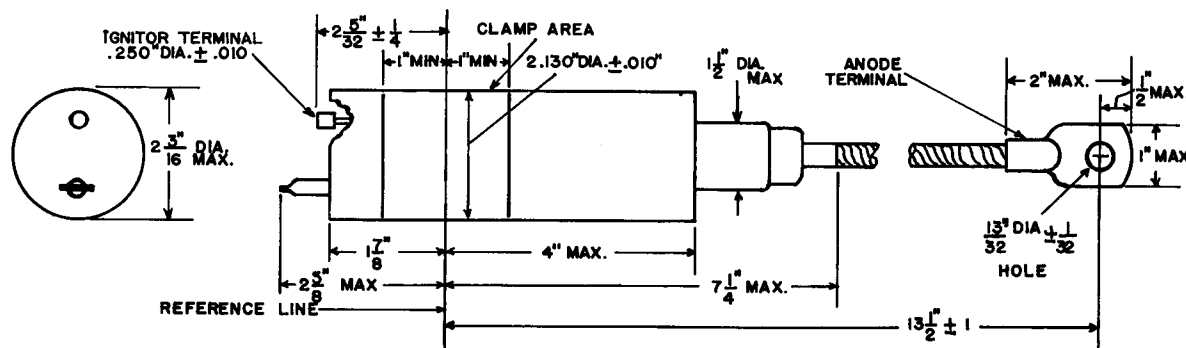
¹Using log-log paper, straight line interpolation of Demand Current vs. Average Anode Current may be used to determine intermediate ratings.

²Using log-log paper, straight line interpolation between listed points may be used to determine intermediate ratings of average anode current and maximum averaging time vs. temperature.

³Ignition will occur if either maximum required instantaneous positive potential is applied or maximum required instantaneous current flows for the rated maximum ignitor ignition time.



OUTLINE DRAWING



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NATIONAL ELECTRONICS, INC.

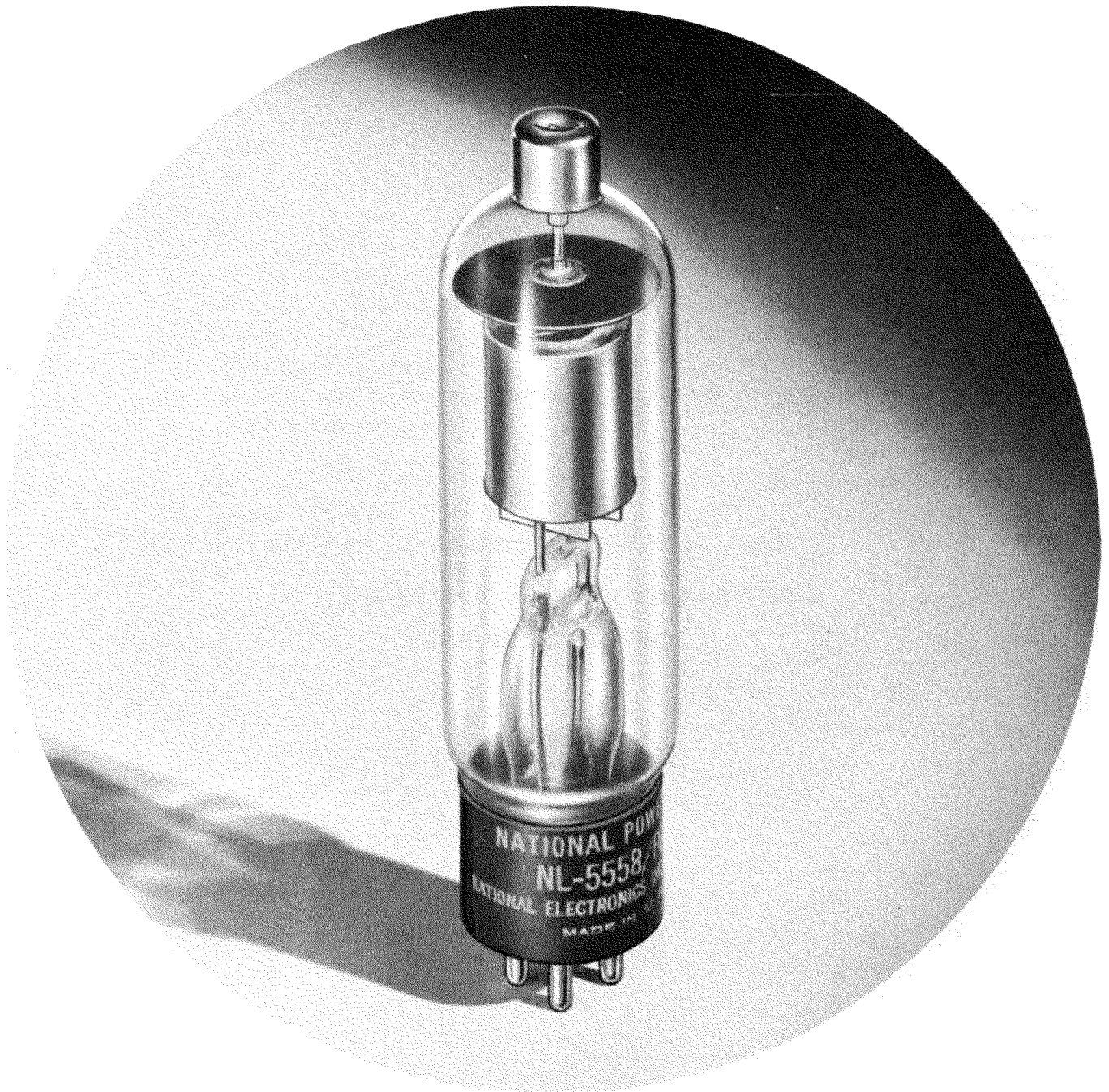
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-5558/FG-32

RECTIFIER TUBE

2.5 Amperes dc



NATIONAL POWER TUBE NL-5558/FG-32 is a sturdy rectifier tube designed especially for Industrial power rectifier applications up to 1500 volts dc. It is mercury filled for efficiency, long life, and the ability to stand high inverse voltage.

NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

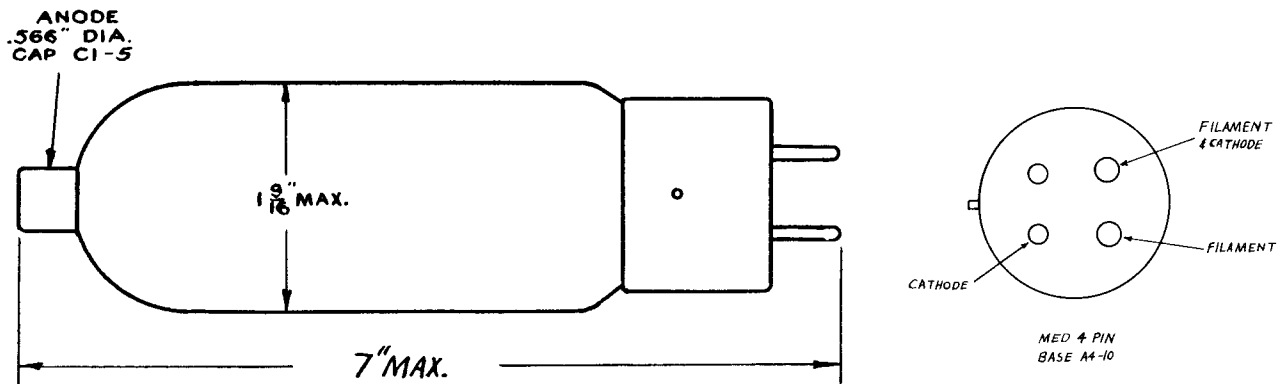
NL-5558/FG-32 RECTIFIER TUBE TECHNICAL INFORMATION

Indirectly heated Cathode

dc Amperes output (maximum).....	2.5	2.5
Instantaneous Amperes output (maximum).....	15	15
Maximum time of averaging anode current (seconds).....	15	15
Maximum peak inverse volts.....	2000	5000
Heater volts	5	5
Heater amperes	4.5 ± .4	4.5 ± .4
Cathode heating time (minutes).....	5	5
Typical arc drop at 10 amperes peak (volts).....	12	12
Typical Anode starting voltage (volts).....	50	50
Maximum ac short circuit current (amperes).....	200	200
Condensed mercury temperature limits (°C).....	+ 35 to + 80	+ 35 to + 60
Approximate temperature rise, cond. mercury above ambient (°C)	28	28
Mounting position	vertical, base down	
Net weight (ounces).....	4	4
Approx. shipping weight (lbs.).....	3	3

ALL DATA ARE BASED ON RETURNS TO CATHODE

LIGHT FILAMENT BEFORE APPLYING LOAD OUTLINE DRAWING



NATIONAL ELECTRONICS, INC.

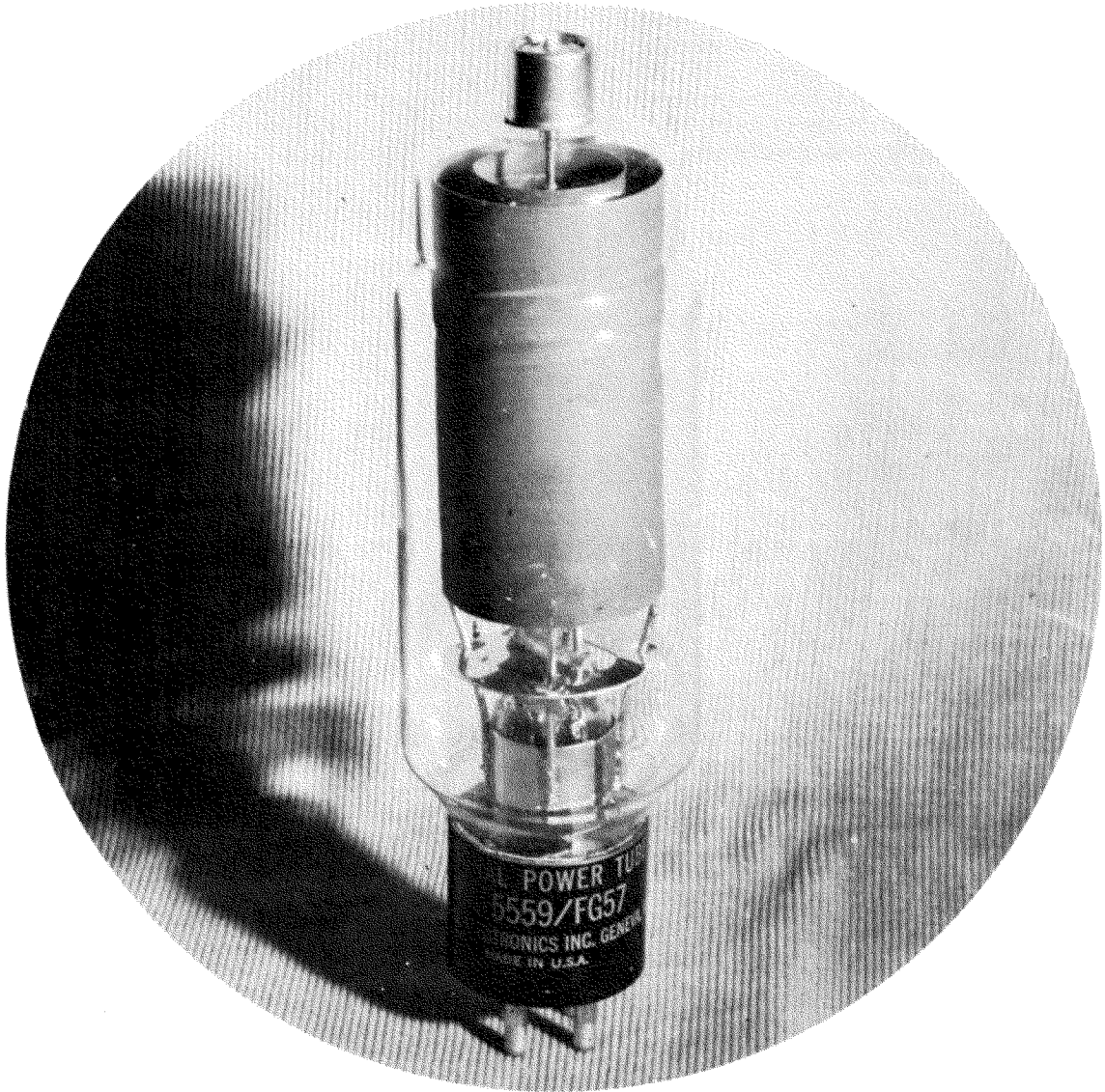
GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBE

NL-5559/FG-57

THYRATRON TUBE

2.5 Amperes dc -- 15 Amperes Peak



NATIONAL POWER TUBE NL-5559/FG57 is an indirectly heated cathode thyatron designed especially for those applications where little grid power is available. The mercury filling and efficient cathode give long and dependable life.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-5559/FG-57 THYRATRON TUBE

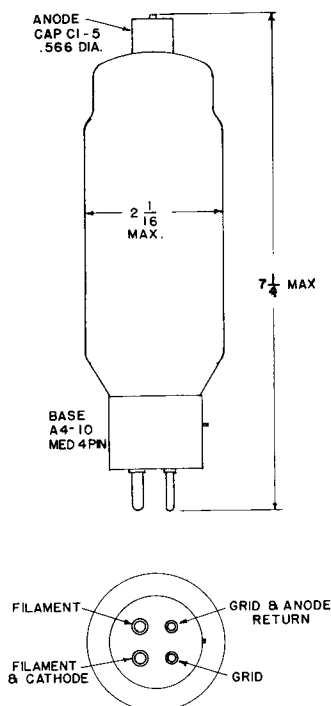
TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	15
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	1000
Maximum peak forward volts	1000
Filament volts	5.0 ± .25
Filament amperes	4.5 ± .4
Cathode heating time (seconds)	300
Typical arc drop at 10 amperes peak (volts)	12
Grid control characteristic	see curve
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Maximum grid current (amperes)	.25
Maximum critical grid current (microamperes)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	2.5
Cathode to grid capacitance (uuf)	10
Maximum ac short circuit current (amperes)	200
Condensed mercury temperature limits (°C)	+ 40 to + 80
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	5
Approx. shipping weight (lbs.)	4

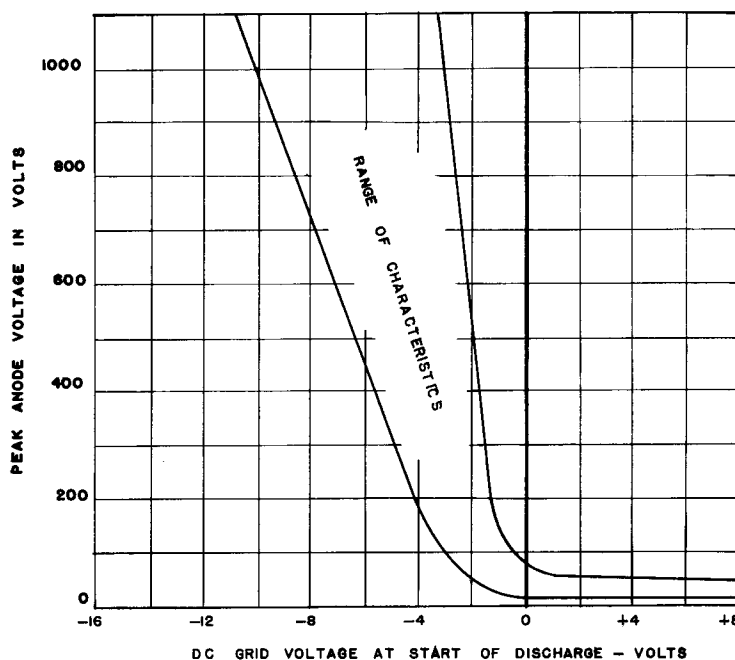
ALL DATA ARE BASED ON RETURNS TO CATHODE

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC



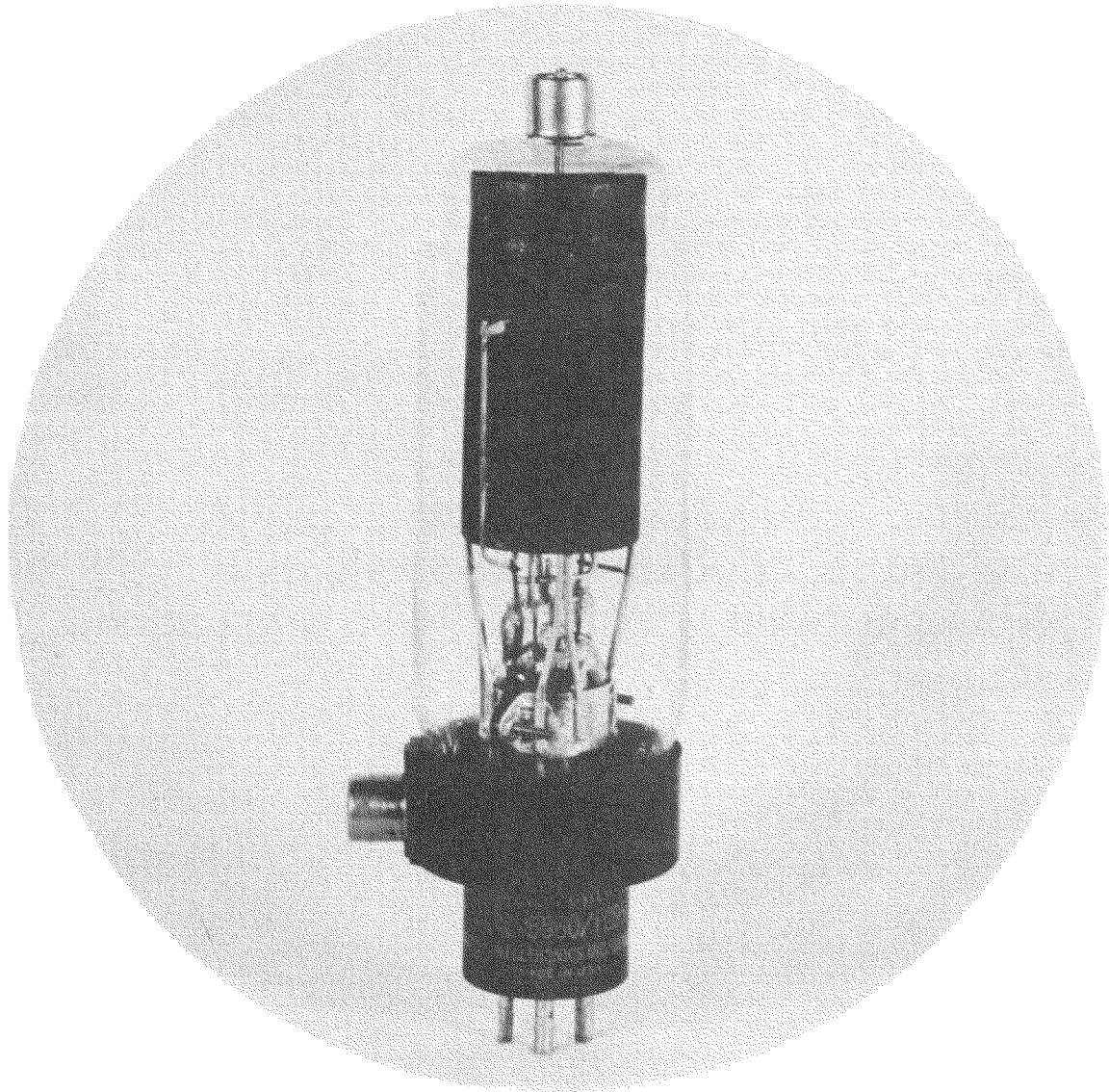
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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBE

**NL-5560/FG95
THYRATRON TUBE
2.5 Amperes dc -- 15 Amperes Peak**



NATIONAL POWER TUBE NL-5560/FG95 is an indirectly heated cathode thyatron designed especially for control, timing, and ignitor firing applications. The shield grid construction and mercury vapor filling give stable operation even with high impedance grid supplies.

NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

NL-5560/FG95 THYRATRON TUBE TECHNICAL INFORMATION

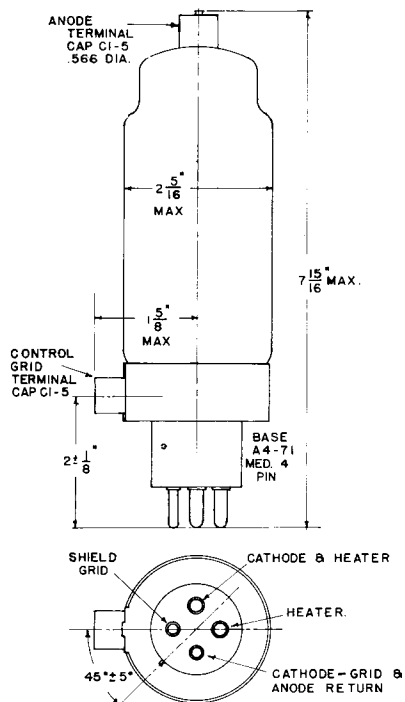
dc Amperes output (maximum)	.5*	2.5
Instantaneous Amperes output (maximum)	30*	15
Maximum time of averaging anode current (seconds)		15
Maximum peak inverse volts		1000
Maximum peak forward volts		1000
Filament volts	5.0 ± .25	
Filament amperes	4.5 ± .4	
Heating time (seconds)		300
Typical arc drop at 10 amperes peak (volts)		12
Grid control characteristic		see curve
Maximum negative control grid voltage before conduction (volts)		1000
Maximum negative control grid voltage during conduction (volts)		10
Maximum negative shield grid voltage before conduction (volts)		300
Maximum negative shield grid voltage during conduction (volts)		5
Maximum control grid current (amperes)		.25
Maximum shield grid current (amperes)		1.0
Maximum critical control grid current (microamperes)		1.0
Ionization time (approx., microseconds)		10
Deionization time (approx., microseconds)		1000
Anode to control grid capacitance (uuf)		0.2
Cathode to control grid capacitance (uuf)		4.4
Maximum ac short circuit current (amperes)		200
Condensed mercury temperature limits (°C)	+40 to +80	
Approximate temperature rise, cond. mercury above ambient (°C)		30
Mounting position		vertical, base down
Net weight (ounces)		8
Approx. shipping weight (lbs.)		4

*These ratings apply with heater voltage 5.5 ± 5% Volts.

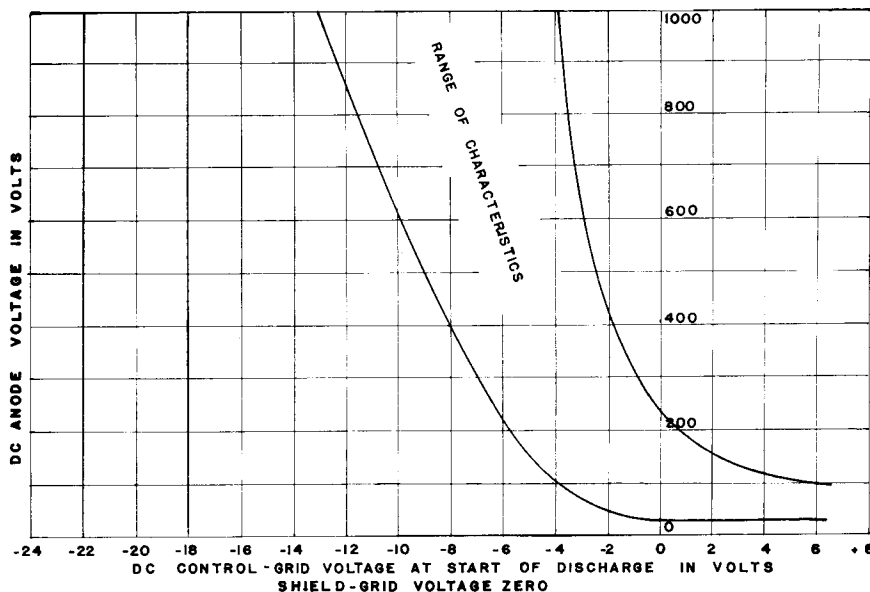
ALL DATA ARE BASED ON RETURNS TO CATHODE

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC



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NATIONAL ELECTRONICS, INC.

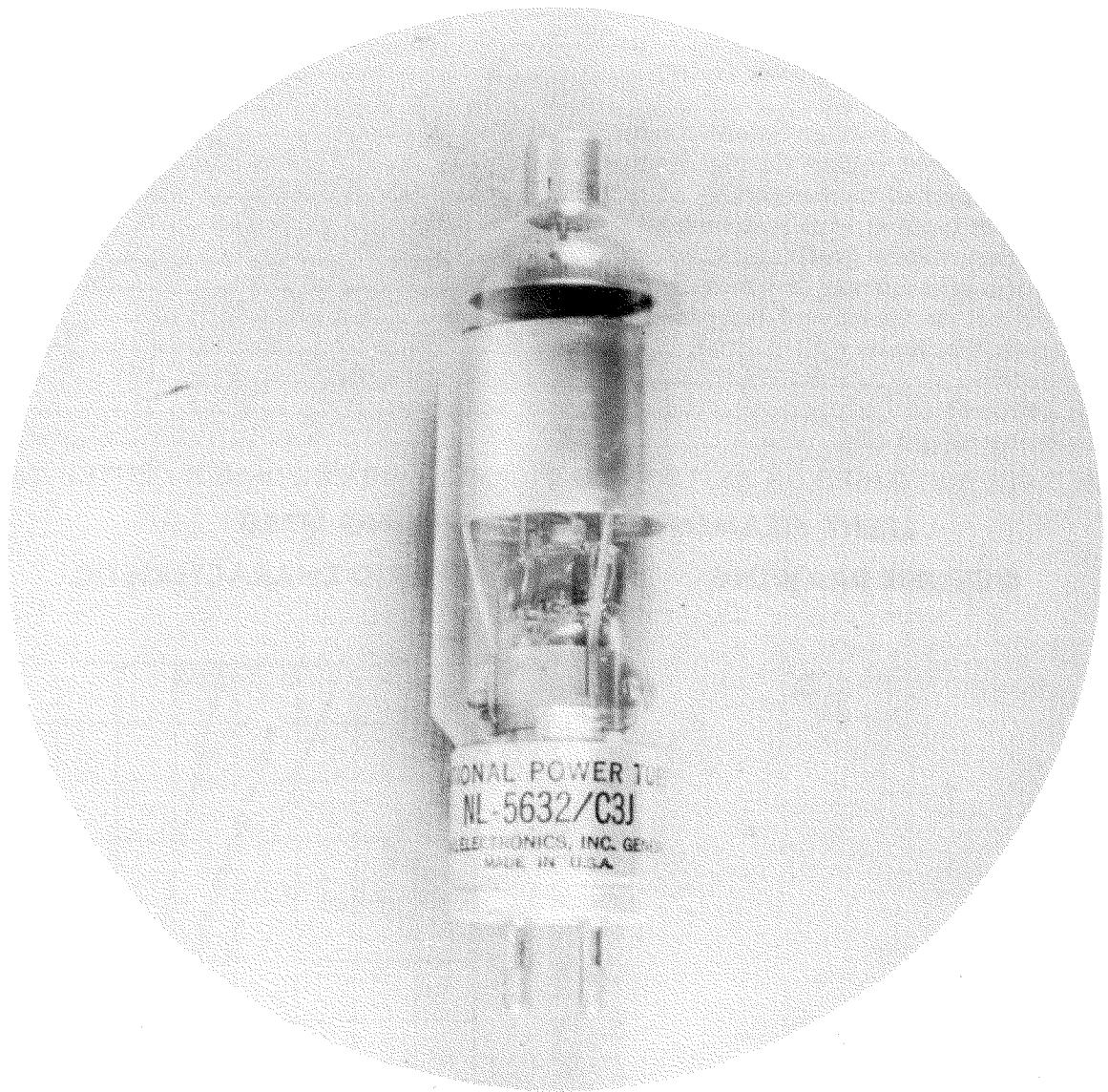
GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBE

NL-5632/C3J

THYRATRON TUBE

2.5 Amperes dc -- 30 Amperes Peak



NATIONAL POWER TUBE NL-5632/C3J is a quick heating thyatron designed for timing and control applications. It is xenon filled for quick starting and the ability to operate within wide ambient temperature limits. It is ruggedly constructed for industrial applications.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-5632/C3J THYRATRON TUBE

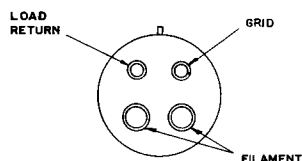
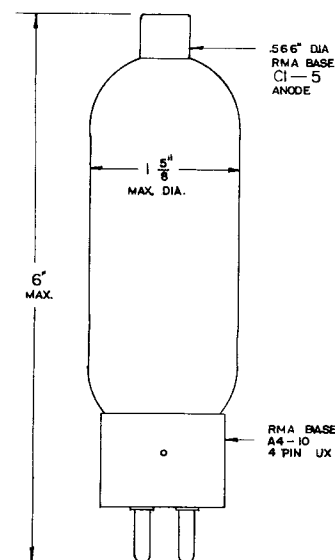
TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	30
Maximum time of averaging anode current (seconds)	4.5
Maximum peak inverse volts	1250
Maximum peak forward volts	900
Max. Commutation Factor (V/usec x V/usec) at a max. initial inverse voltage of 350 volts	0.66
Filament volts	2.5
Filament amperes	9 ± 2
Heating time (seconds)	30
Typical arc drop at 10 amperes peak (volts)	10
Grid control characteristic	see curve
Maximum negative grid voltage before conduction (volts)	100
Maximum negative grid voltage during conduction (volts)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	2
Maximum critical grid current (microamperes)	10
Maximum ac short circuit current (amperes)	300
Ambient temperature limits (°C)	-55 to +75
Mounting position	any
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

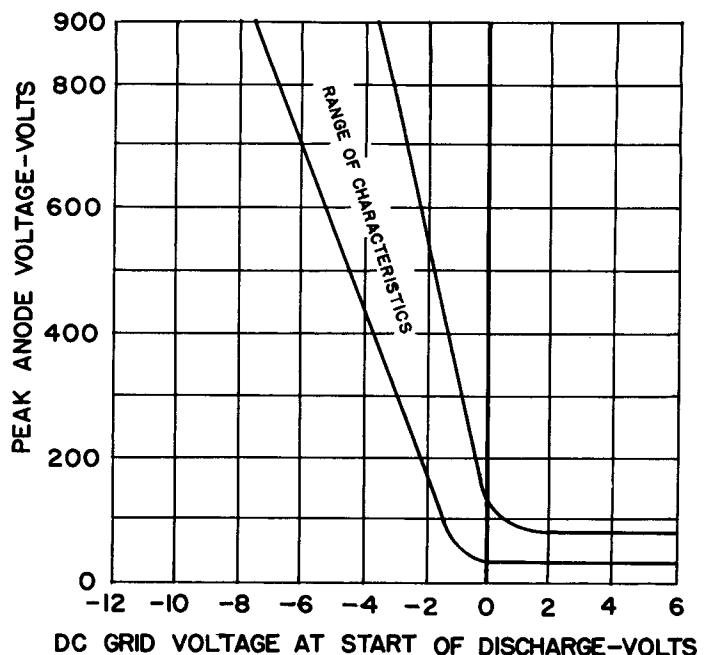
ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC



Printed in USA 8-57 GR

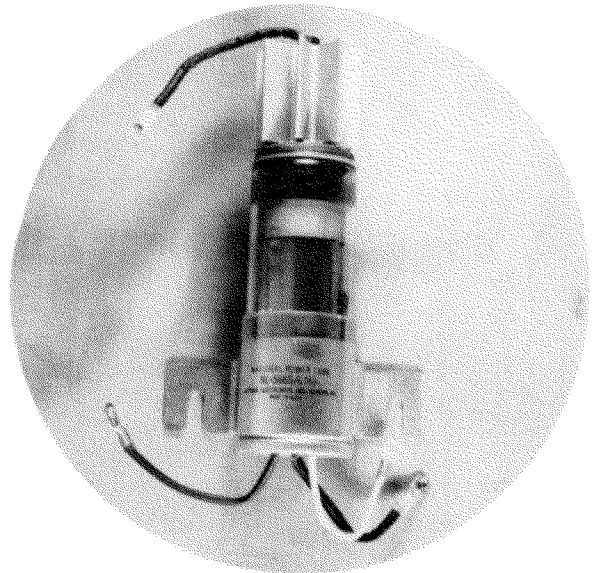
NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-5665/C16J THYRATRON TUBE

**18 Amperes dc -- 160 Ampere peak
1250 Volts peak**

National Power Tube NL-5665/C16J is a compact, quick heating thyatron designed for motor speed control and welding control applications. It is xenon filled for quick starting and the ability to operate within very wide temperature limits.



TECHNICAL INFORMATION

dc Amperes output (Maximum)	18	16
Instantaneous amperes output (Maximum)	100	160
Maximum time of averaging anode current (seconds)	4.5	
Maximum peak inverse volts	1250	
Maximum peak forward volts	1000	
Max. commutation factor (V/usec. x A/usec.) at max. initial inverse voltage of 330 volts	0.66	
Filament volts	2.5	
Filament amperes	31 ± 3	
Filament heating time (seconds)	60	
Typical arc drop at 50 amperes peak (volts)	12	
Grid control characteristic	See Curve	
Maximum negative grid voltage before conduction (volts)	100	
Maximum negative grid voltage during conduction (volts)	10	
Maximum critical grid current (microamps)	10	
Ionization time (approx., microseconds)	10	
Deionization time (approx., microseconds)	1000	
Anode to grid capacitance (uuf) (approx.)	8	
Maximum ac short circuit current (amperes)	1000	
Ambient temperature limits (°C)	-55 to +75	
Mounting position	Vertical	
Net weight (ounces)	32	
Approx. shipping weight (lbs.)	3½	

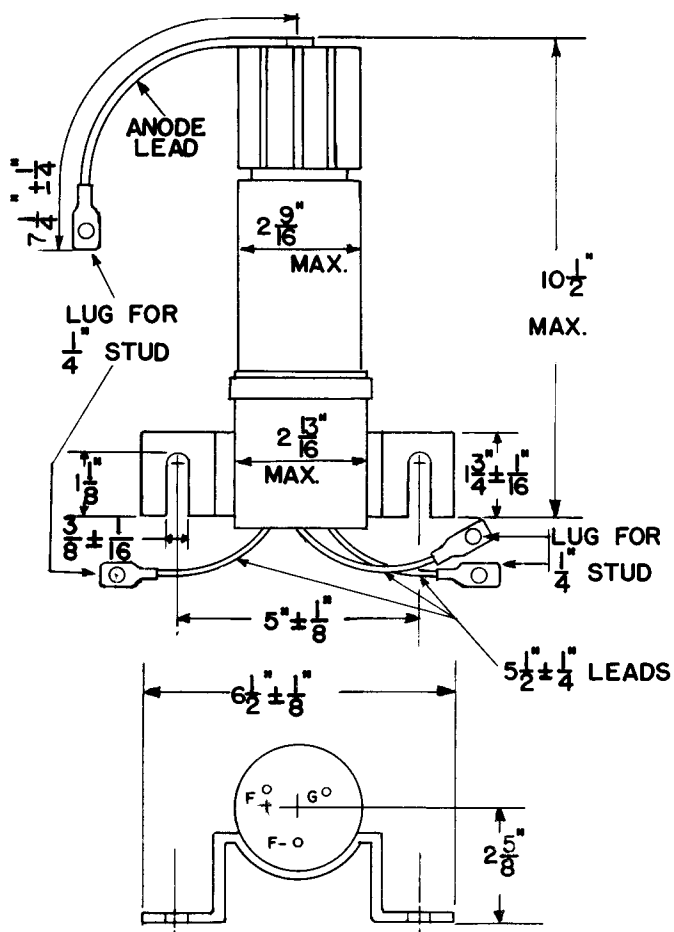
ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP. Filament lead F— should be negative with respect to F+ during conduction period.

LIGHT FILAMENT BEFORE APPLYING LOAD.

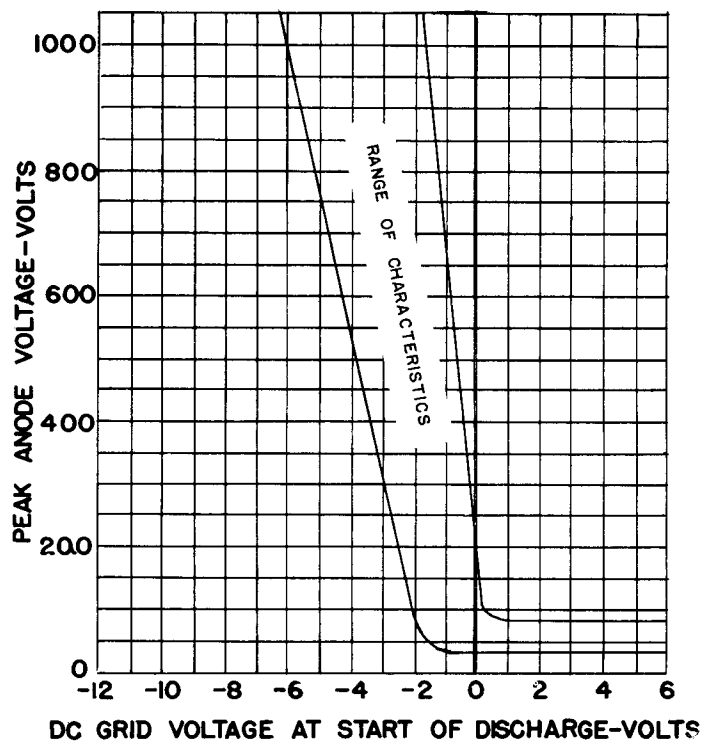
Printed in USA 8-57 GR

NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

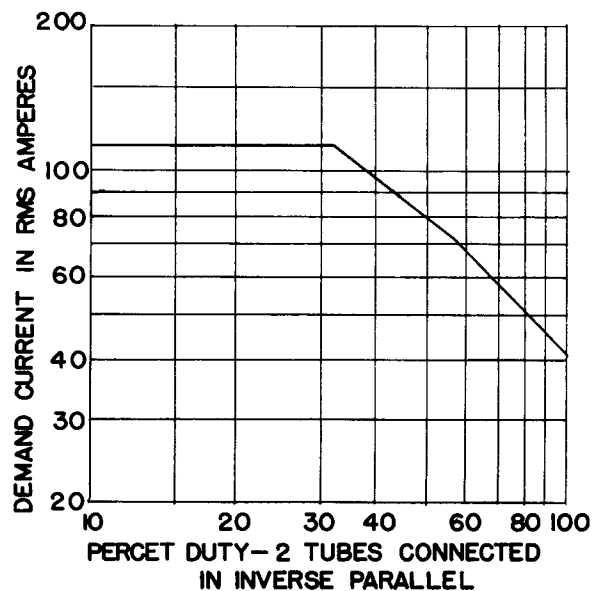
NL-5665/C16J THYRATRON TUBE



GRID CHARACTERISTIC



WELDER RATING



NATIONAL ELECTRONICS, INC.

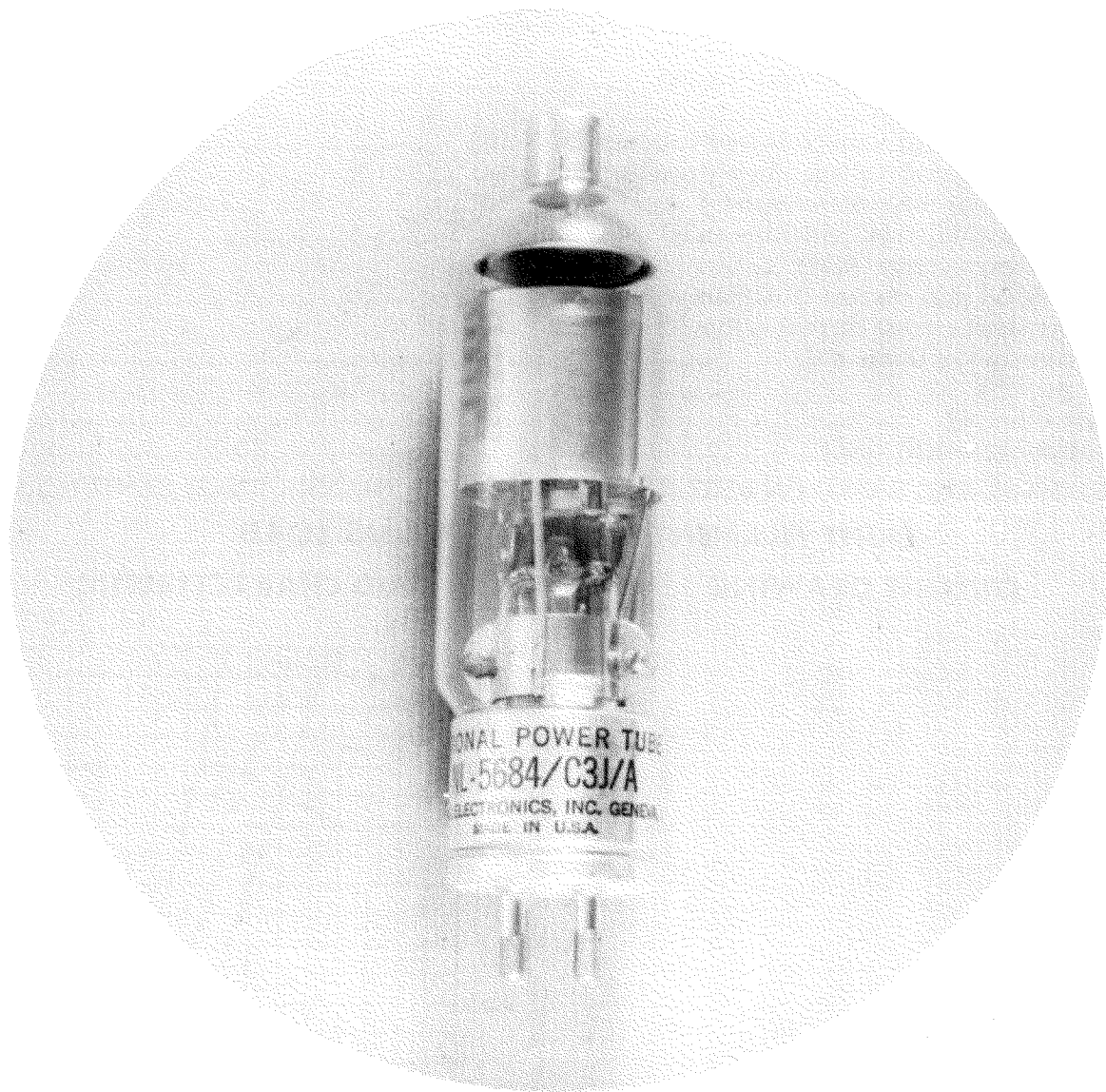
GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBE

NL-5684/C3J/A

THYRATRON TUBE

2.5 Amperes dc -- 30 Amperes Peak



NATIONAL POWER TUBE NL-5684/C3J/A is a quick-heating, ruggedly constructed thyatron designed for timing, control and other industrial applications. It is xenon filled for quick starting characteristics and operation within wide temperature limits.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

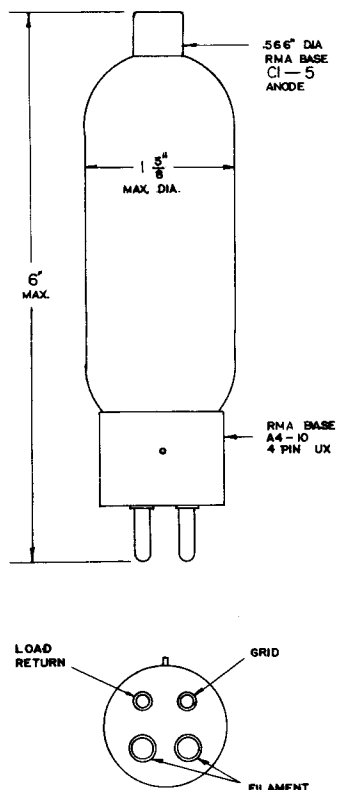
NL-5684/C3J/A THYRATRON TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	30
Maximum time of averaging anode current (seconds)	4.5
Maximum peak inverse volts	1250
Maximum peak forward volts	1000
Max. Commutation Factor (V/usec x V/usec) at a max. initial inverse voltage of 350 volts	0.66
Filament volts	2.5
Filament amperes	9 ± 2
Heating time (seconds)	30
Typical arc drop at 10 amperes peak (volts)	10
Grid control characteristic	see curve
Maximum negative grid voltage before conduction (volts)	100
Maximum negative grid voltage during conduction (volts)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	2
Maximum critical grid current (microamperes)	10
Maximum ac short circuit current (amperes)	300
Ambient temperature limits (°C)	-55 to +75
Mounting position	any
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

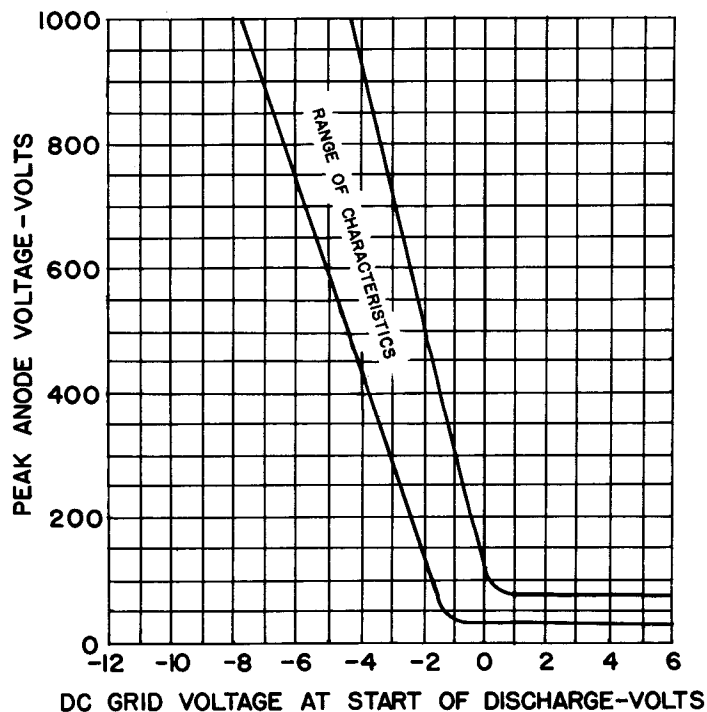
ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC



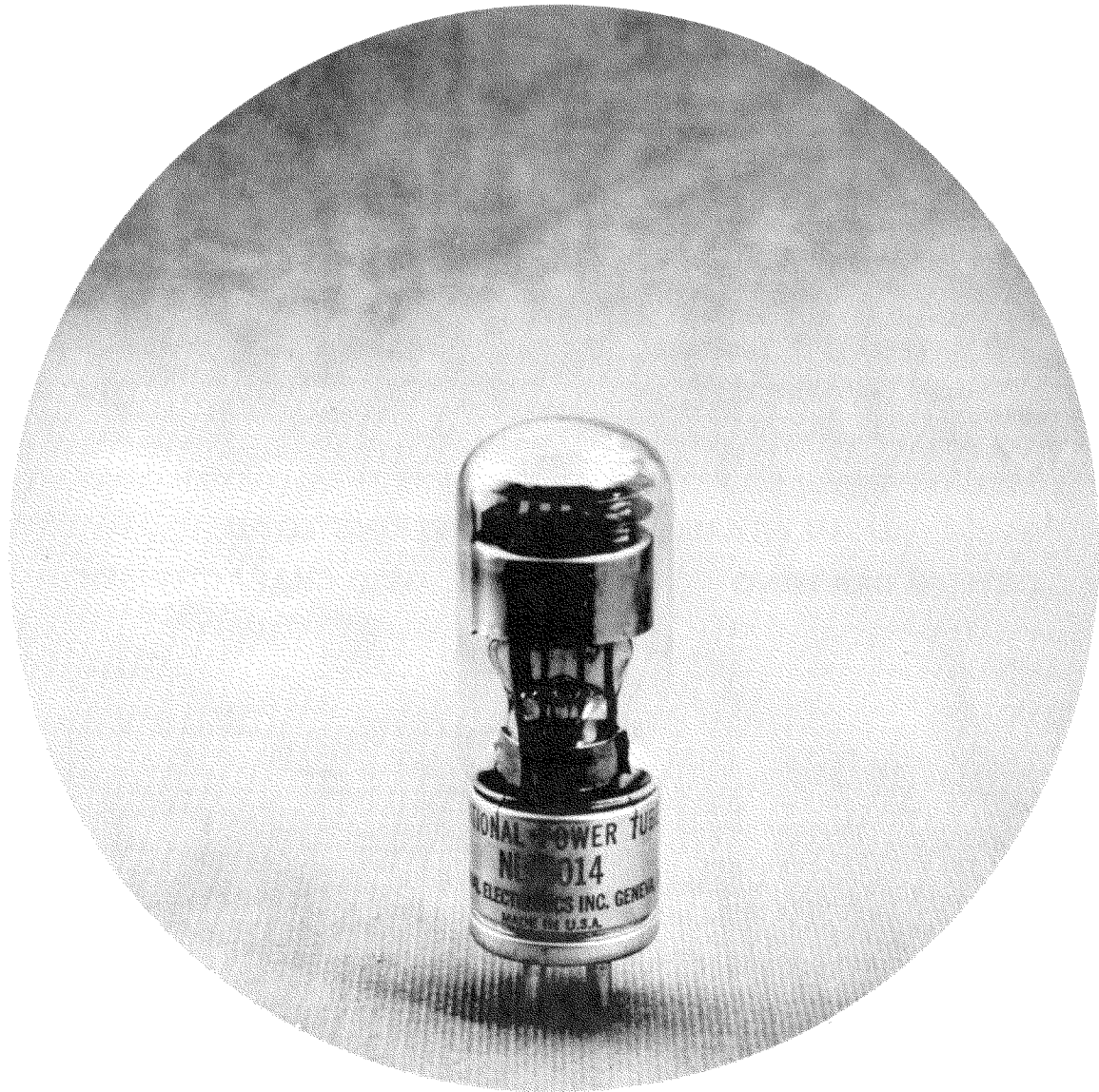
Printed in USA 8-57 G

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBE

NL-6014/CIK
THYRATRON TUBE
1.0 Ampere dc -- 8.0 Amperes Peak



NATIONAL POWER TUBE NL-6014/CIK is a compact, quick heating thyatron designed for timing and control applications. It is xenon filled for quick starting and the ability to operate within very wide temperature limits.

NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

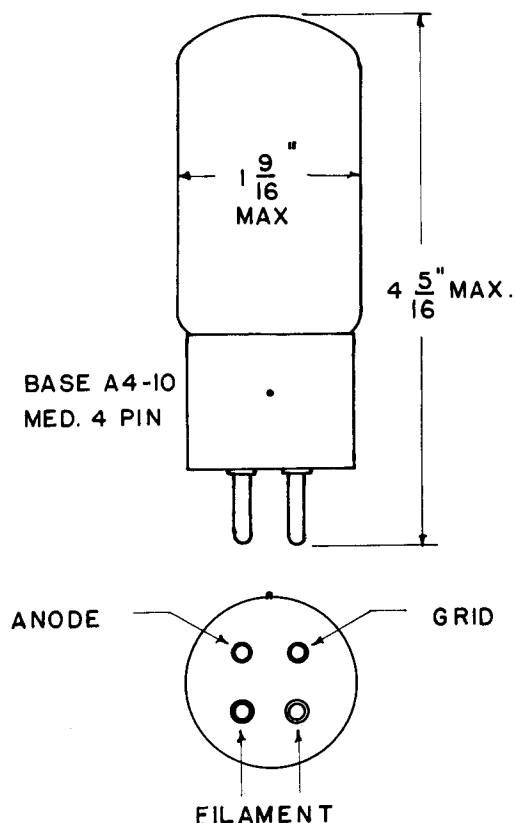
NL-6014/CIK THYRATRON TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	1.0
Instantaneous Amperes output (maximum)	8.0
Maximum time of averaging anode current (seconds)	4.5
Maximum peak inverse volts	1250
Maximum peak forward volts	1000
Filament volts	2.5
Filament amperes	6.3 ± 0.8
Heating time (seconds)	25
Typical arc drop at 5 amperes peak (volts)	8
Grid control characteristic	see curve
Maximum negative grid voltage before conduction (volts)	100
Maximum negative grid voltage during anode conduction (volts)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	500
Anode to grid capacitance (uuf)	1
Maximum critical grid current (microamperes)	5
Maximum ac short circuit current (amperes)	77
Ambient temperature limits (°C)	-55 to +70
Mounting position	any
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

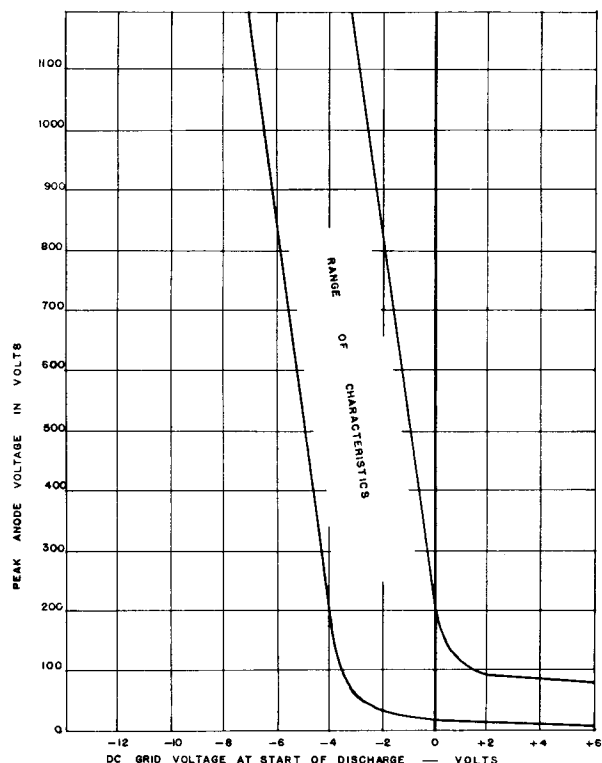
ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC



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NATIONAL ELECTRONICS, INC.

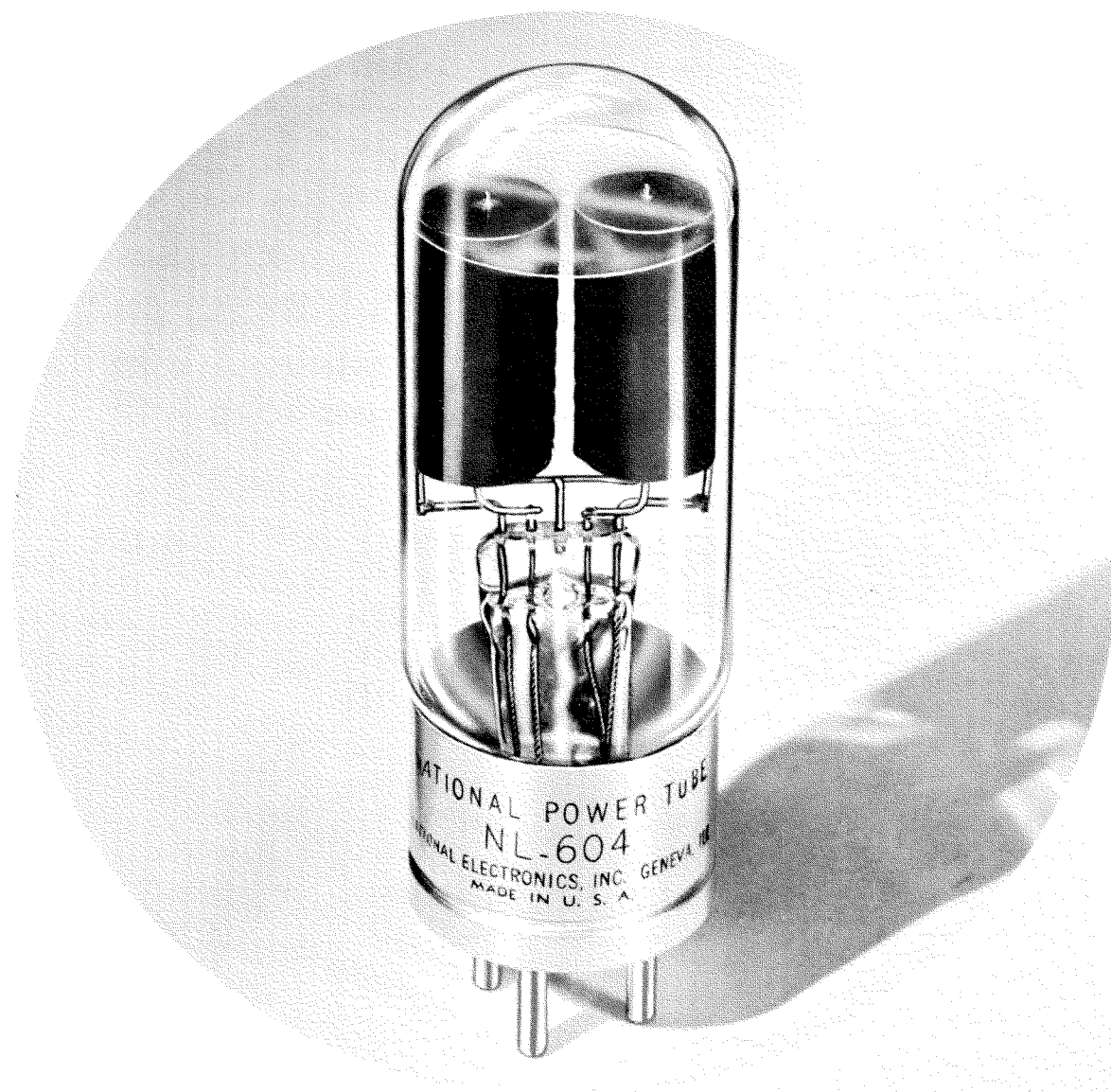
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-604

FULL-WAVE RECTIFIER TUBE

2.5 Amperes dc



NATIONAL POWER TUBE NL-604 is a sturdy full-wave rectifier tube designed especially for industrial power rectifier application up to 250 volts dc. It is gas and mercury filled for quick starting, long life, and constancy of characteristics within wide temperature limits. It is available with a lug base under the type number NL-604L.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-604 RECTIFIER TUBE TECHNICAL INFORMATION

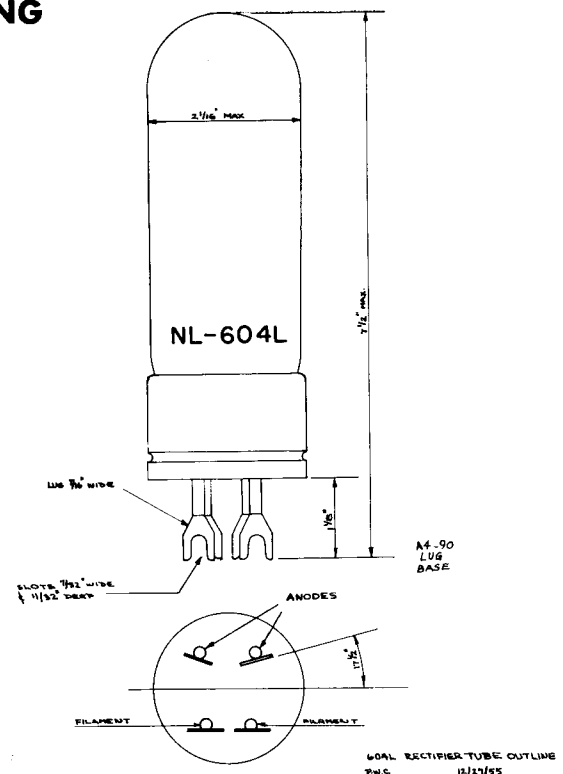
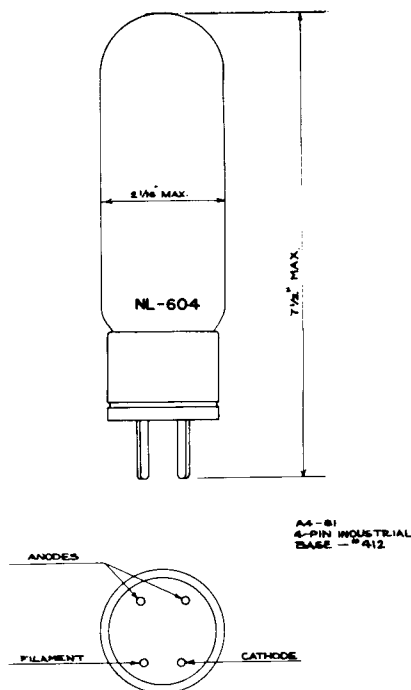
dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	10
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	11.5 ± 1
Filament heating time (seconds)	15
Typical arc drop at 5 amperes peak (volts)	10
Typical Anode starting voltage (volts)	10
Maximum ac short circuit current (amperes)	150
Condensed mercury temperature limits (°C) *	0 to + 90
Approx. temp. rise, cond. merc. above ambient, no load (°C)	18
Approx. temp. rise, cond. merc. above ambient, full load (°C)	28
Mounting position	vertical, base down
Net weight (ounces)	5
Approx. shipping weight (lbs.)	3

*The tube may be started and satisfactory operation will result between 0 and 90°C. For maximum life the condensed mercury temperatures after warm-up should run between +40 and +90°C which corresponds to approximately +15 to +65°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-606

FULL-WAVE RECTIFIER TUBE

6.4 Amperes dc



NATIONAL POWER TUBE NL-606 is a sturdy full-wave rectifier tube designed especially for industrial power rectifier applications up to 250 volts dc. It is gas and mercury filled for quick starting and long life. It is available with a lug base under the type number NL-606L.

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GENEVA, ILLINOIS, U. S. A.

NL-606 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	25.6
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	17 $\pm$ 2
Filament heating time (seconds)	40
Typical arc drop at 9 amperes peak (volts)	10
Typical Anode starting voltage (volts)	10
Maximum ac short circuit current (amperes)	360
Condensed mercury temperature limits ($^{\circ}$ C) *	0 to +90
Approx. temp. rise, cond. merc. above ambient, no load ($^{\circ}$ C)	30
Approx. temp. rise, cond. merc. above ambient, full load ($^{\circ}$ C)	40
Mounting position	vertical, base down
Net weight (ounces)	8
Approx. shipping weight (lbs.)	3

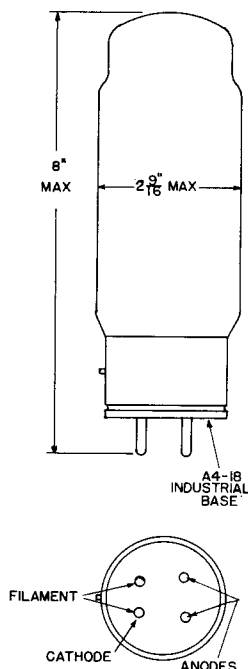
*Satisfactory operation will be obtained between 0 and +90 $^{\circ}$ C. For long life the tube should be operated between +40 and +90 $^{\circ}$ C condensed mercury, or approximately 0 to +50 $^{\circ}$ C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

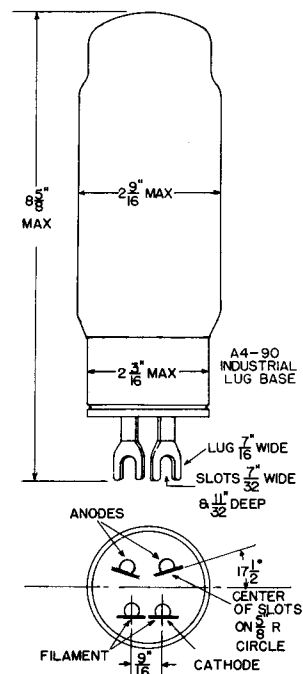
LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWINGS

NL-606



NL-606L

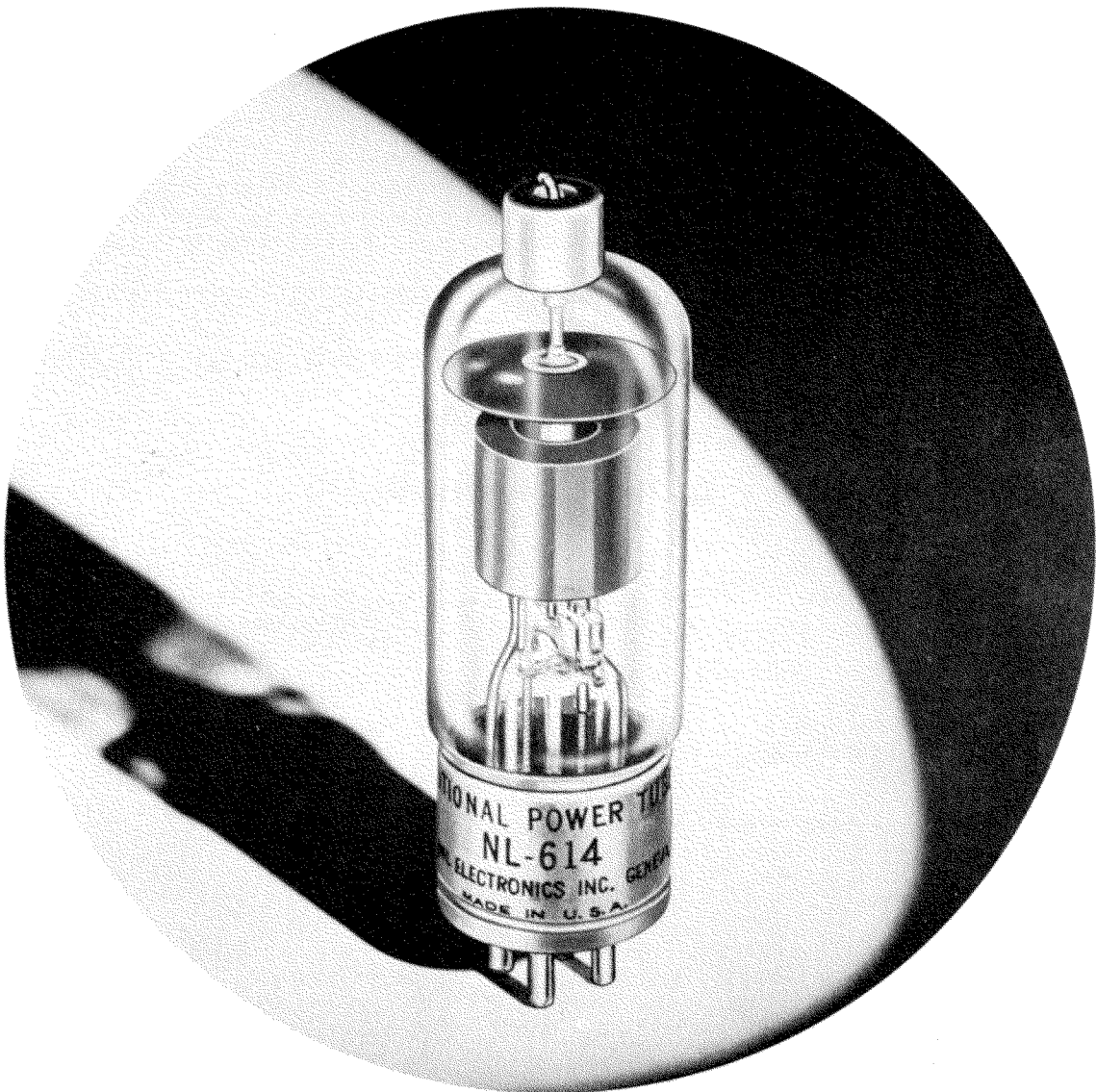


RECTIFIER TUBE

NL-614

INERT-GAS-FILLED RECTIFIER TUBE

2.5 Amperes dc



NATIONAL POWER TUBE NL-614 is a sturdy rectifier tube designed especially for industrial power rectifier applications up to 250 volts dc. It is xenon-filled for efficiency, compactness, and the ability to operate within very wide temperature limits.

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GENEVA, ILLINOIS, U. S. A.

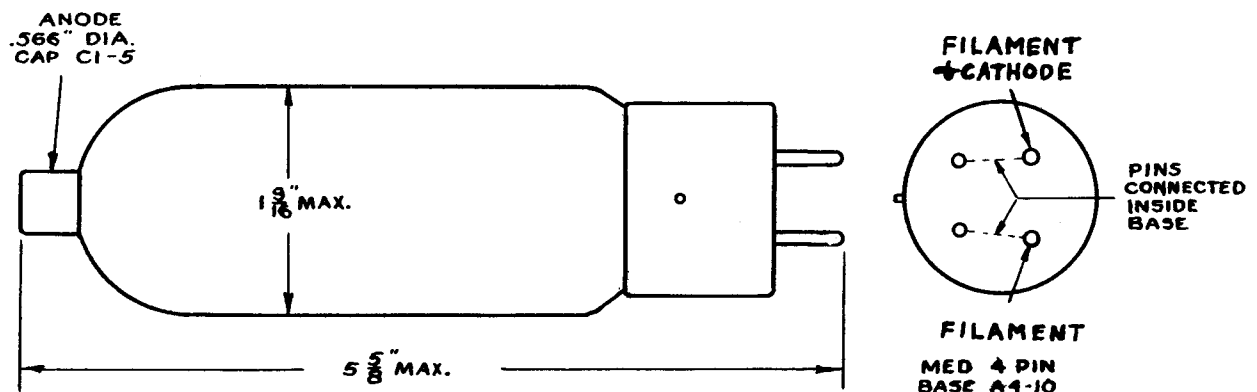
NL-614 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	15
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	7 to 11
Filament heating time (seconds)	20
Typical arc drop at 8 amperes peak (volts)	10
Typical Anode starting voltage (volts)	13
Maximum ac short circuit current (amperes)	250
Maximum Commutation Factor (A/usec x V/usec)	10
Ambient temperature limits (°C)	— 55 to + 70
Mounting position	any
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



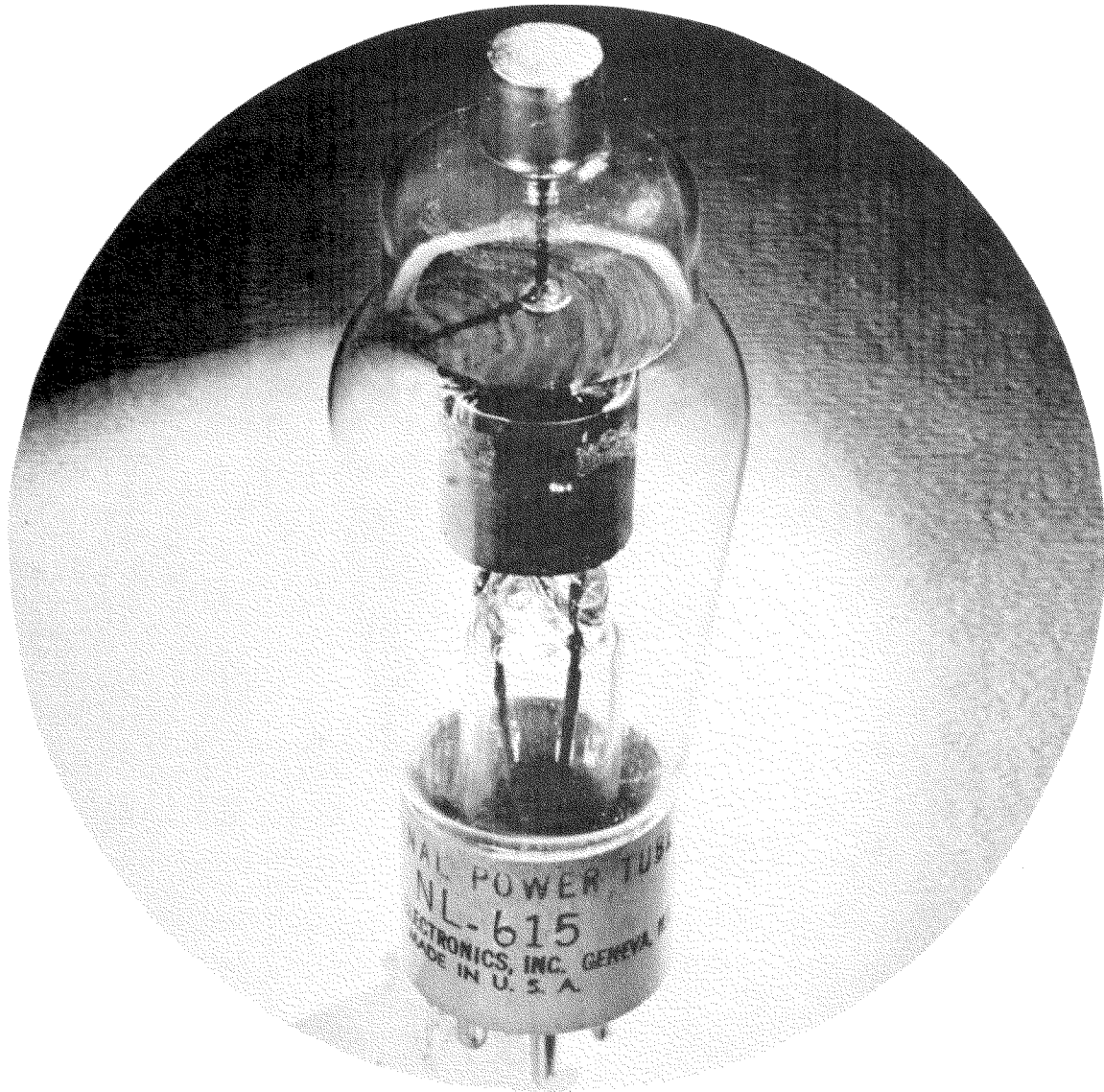
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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-615
RECTIFIER TUBE
2.5 Amperes dc



NATIONAL POWER TUBE NL-615 is a sturdy rectifier tube designed especially for industrial power rectifier applications up to 600 volts dc. It is mercury filled for efficiency, long life, and the ability to stand high inverse voltage.

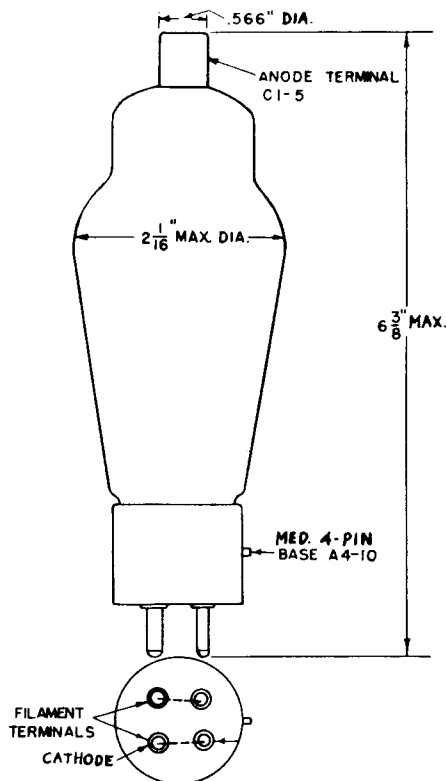
NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

NL-615 RECTIFIER TUBE

TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	10
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	2000
Filament volts	2.5
Filament amperes	7 $\pm$ 1
Filament heating time (seconds)	20
Typical arc drop at 8 amperes peak (volts)	12
Typical Anode starting voltage (volts)	13
Maximum ac short circuit current (amperes)	250
Condensed mercury temperature limits ($^{\circ}$ C)	+ 35 to + 80
Approximate temperature rise, cond. mercury above ambient ($^{\circ}$ C)	30
Mounting position	vertical, base down
Net weight (ounces)	4
Approx. shipping weight (lbs.)	3

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP
LIGHT FILAMENT BEFORE APPLYING LOAD
OUTLINE DRAWING



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NATIONAL ELECTRONICS, INC.

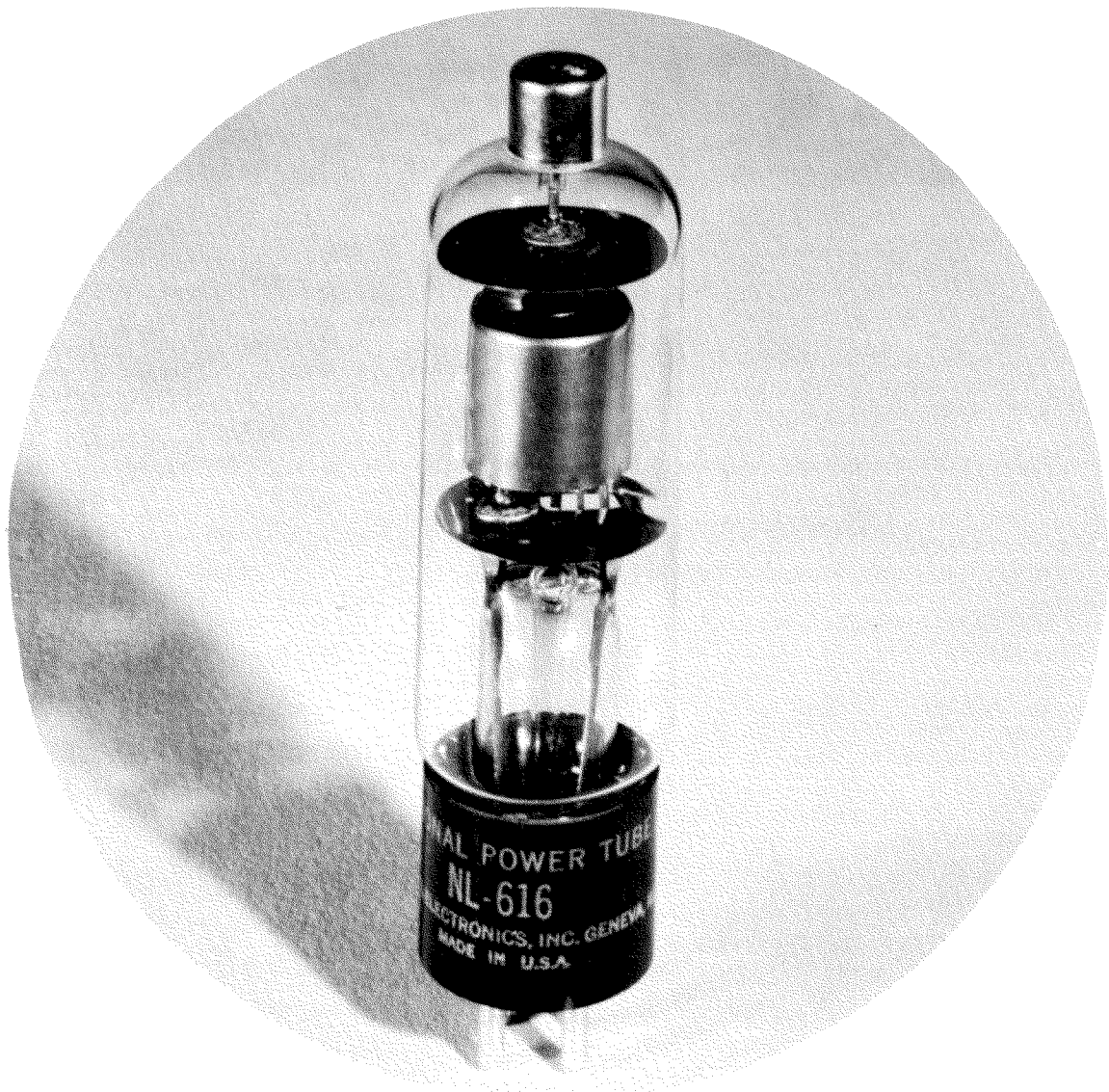
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-616

RECTIFIER TUBE

2.5 Amperes dc — 30 Amperes Peak



NATIONAL POWER TUBE NL-616 is a sturdy rectifier tube designed especially for industrial power rectifier applications up to 600 volts dc. It is mercury and argon filled for efficiency, long life, and quick starting.

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GENEVA, ILLINOIS, U. S. A.

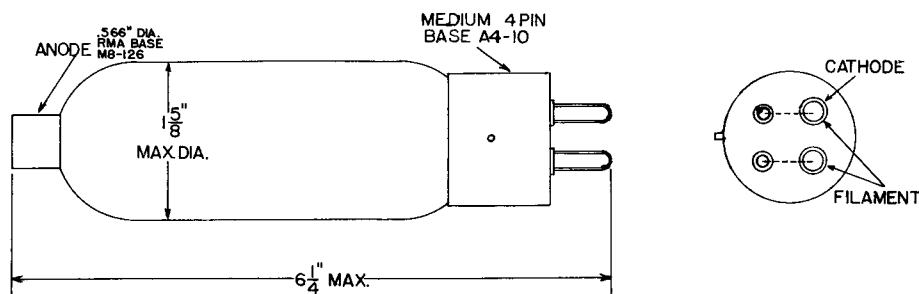
NL-616 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	30
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	1250
Filament volts	2.5
Filament amperes	9 ± 2
Filament heating time (seconds)	20
Typical arc drop at 8 amperes peak (volts)	9
Typical Anode starting voltage (volts)	13
Maximum ac short circuit current (amperes)	300
Condensed mercury temperature limits (°C) *	+40 to +100
Approximate temperature rise, cond. mercury above ambient, full load, (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	4
Approx. shipping weight (lbs.)	3

*The tube may be started and satisfactory operation will result between -40 and $+100^{\circ}\text{C}$. For maximum life the condensed mercury temperature after warm-up should run between $+40$ and $+100^{\circ}\text{C}$ which corresponds to approximately $+10$ to $+70^{\circ}\text{C}$ ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD OUTLINE DRAWING



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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-617
RECTIFIER TUBE
5 Amperes dc



NATIONAL POWER TUBE NL-617 is a sturdy mercury vapor rectifier tube with Mogul screw base. It is designed especially for industrial rectifier applications at 250 and 600 volts dc and is mercury vapor filled for high efficiency, long life, and the ability to withstand high peak inverse voltages.

NATIONAL ELECTRONICS, INC.

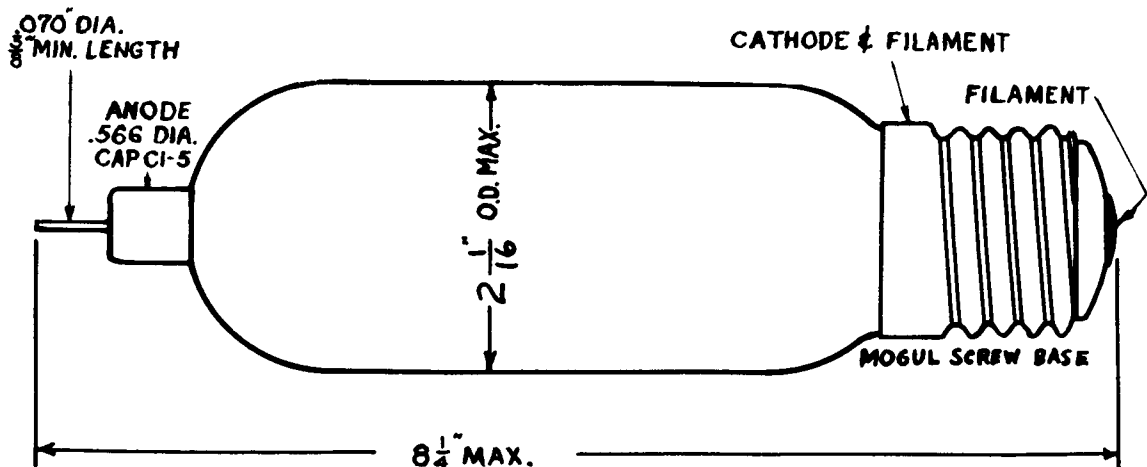
GENEVA, ILLINOIS, U. S. A.

NL-617 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	5
Instantaneous Amperes output (maximum)	20
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	1000
Filament volts	2.0
Filament amperes	10 to 13
Filament heating time (seconds)	60
Typical arc drop at 15 amperes peak, 70 °C (volts)	10
Typical Anode starting voltage (volts)	12
Maximum ac short circuit current (amperes)	250
Condensed mercury temperature limits (°C)	+ 35 to + 90
Approx. temp. rise, cond. merc. above ambient, no load (°C)	25
Approx. temp. rise, cond. merc. above ambient, full load (°C)	40
Mounting position	vertical, base down
Net weight (ounces)	6
Approx. shipping weight (lbs.)	4

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP
LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



Printed in USA 5-56 GR

NATIONAL ELECTRONICS, INC.

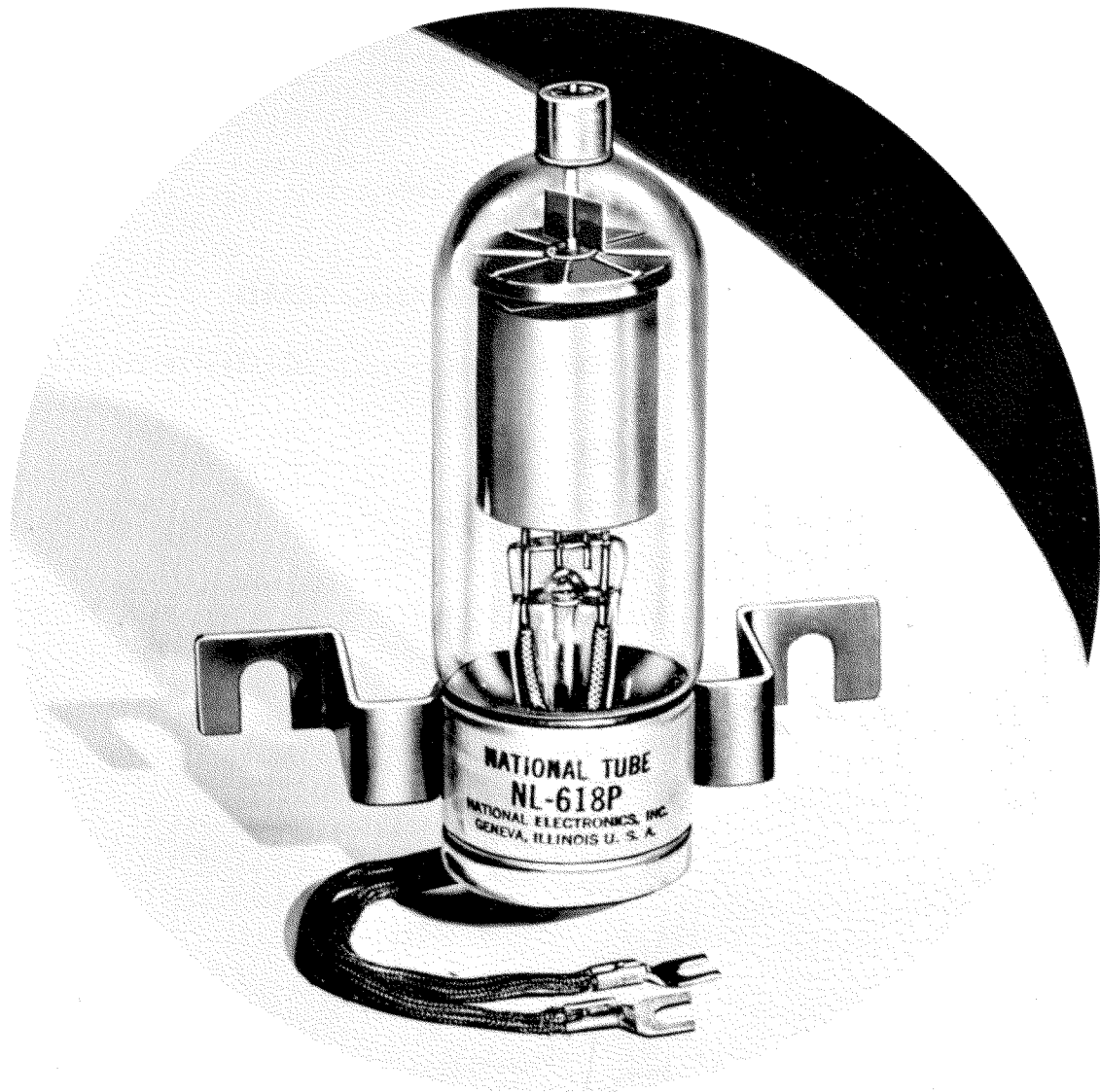
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-618

INERT-GAS-FILLED RECTIFIER TUBE

6.4 Amperes dc



NATIONAL POWER TUBE NL-618 is a sturdy rectifier tube designed especially for industrial power rectifier and control applications. It is xenon-filled for efficiency, compactness, and the ability to operate within very wide temperature limits. NL-618 utilizes a No. 412 Industrial 4-pin base. It is available with a bracket base for panel mounting under the type number NL-618P, also with the new NATIONAL-designed lug type base under type number NL-618L.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-618 RECTIFIER TUBE

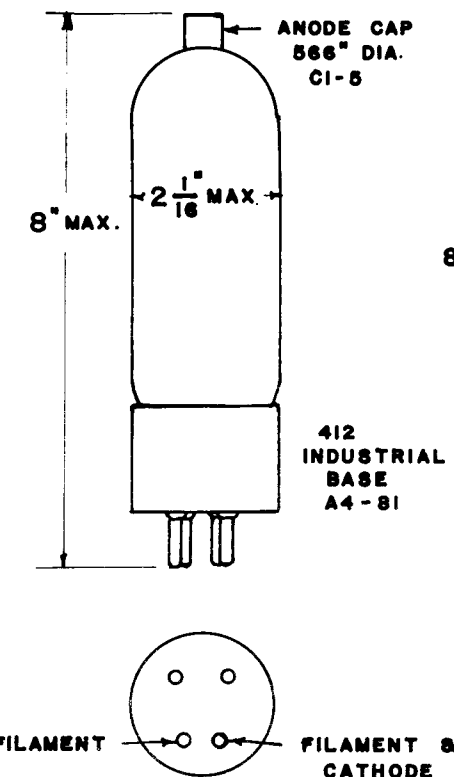
TECHNICAL INFORMATION

dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	40
Maximum time of averaging anode current (seconds)	20
Maximum peak inverse volts	900
Max. commutation factor (V/u sec. x A/u sec.)	0.66
Filament volts	2.5
Filament amperes	18 ± 2
Filament heating time (seconds)	60
Typical arc drop at 20 amperes peak (volts)	9
Typical Anode starting voltage (volts)	20
Maximum ac short circuit current (amperes)	770
Ambient temperature limits (°C)	- 55 to + 75
Mounting position	Any
Net Weight (ounces)	6
Approx. shipping weight (lbs.)	4

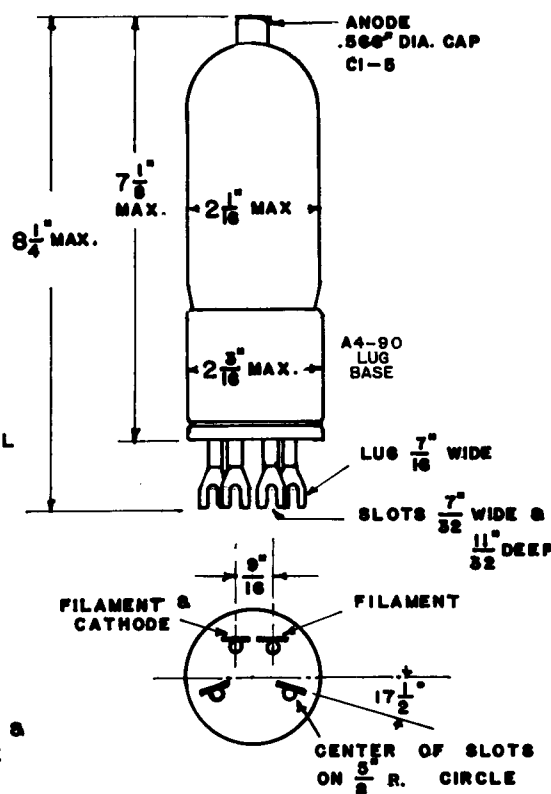
Note: Max. base shell to lead voltage, 1500 Vrms.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP
LIGHT FILAMENT BEFORE APPLYING LOAD

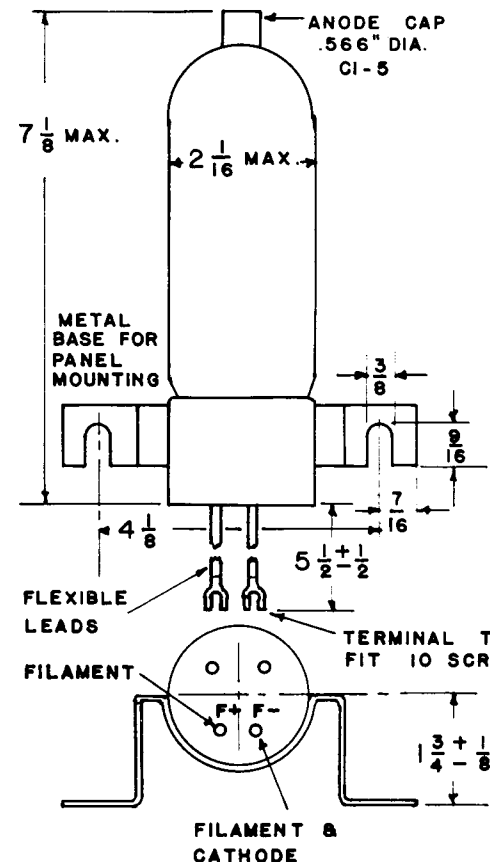
OUTLINE DRAWING
NL-618



OUTLINE DRAWING
NL-618L



OUTLINE DRAWING
NL-618P



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NATIONAL ELECTRONICS, INC.

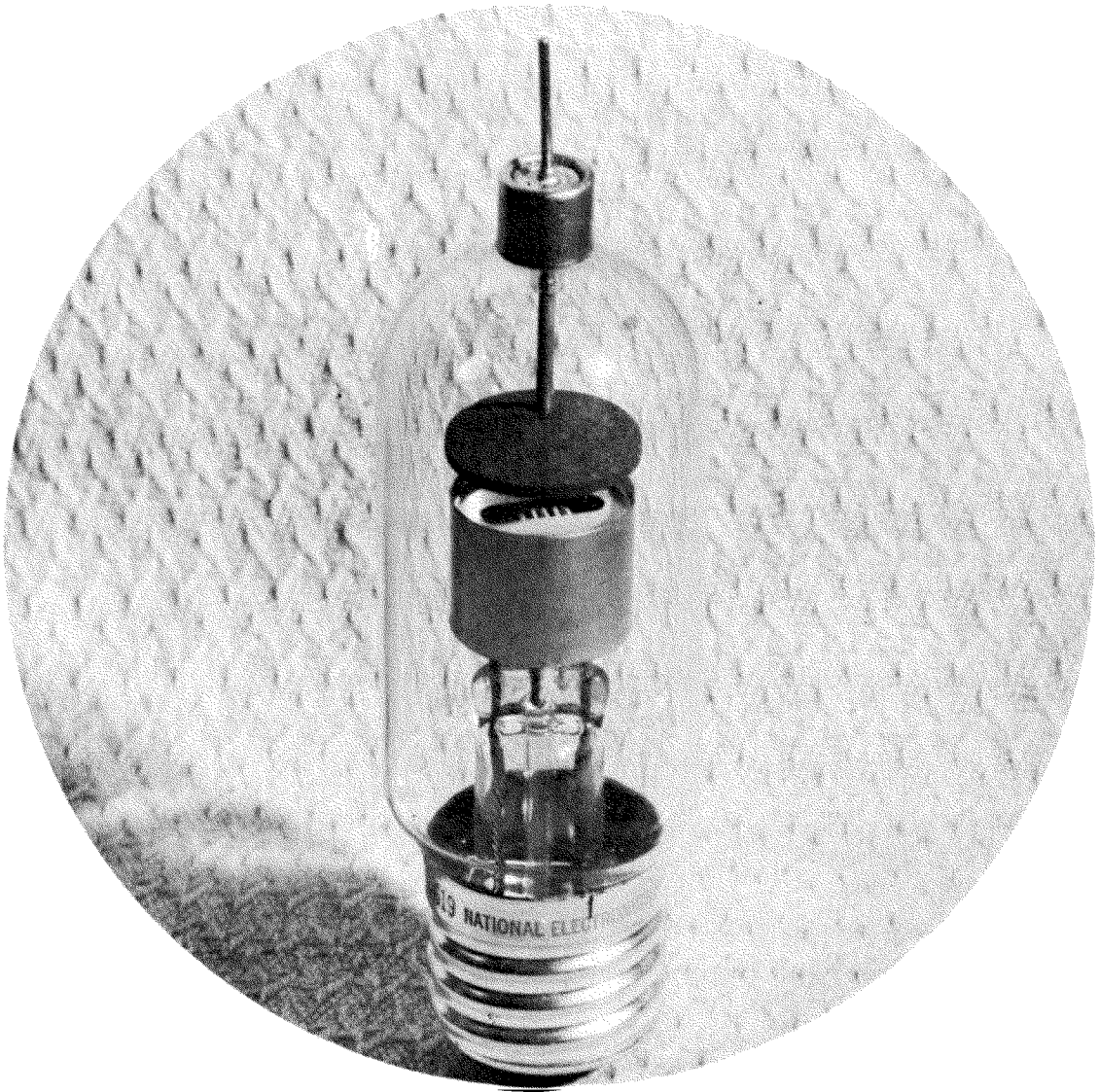
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-619

RECTIFIER TUBE

6 Amperes dc



NATIONAL POWER TUBE NL-619 is a sturdy mercury vapor rectifier tube with Mogul screw base. It is designed especially for industrial rectifier applications at 90 volts dc. The tube is mercury vapor filled to obtain long life and high efficiency in operation.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

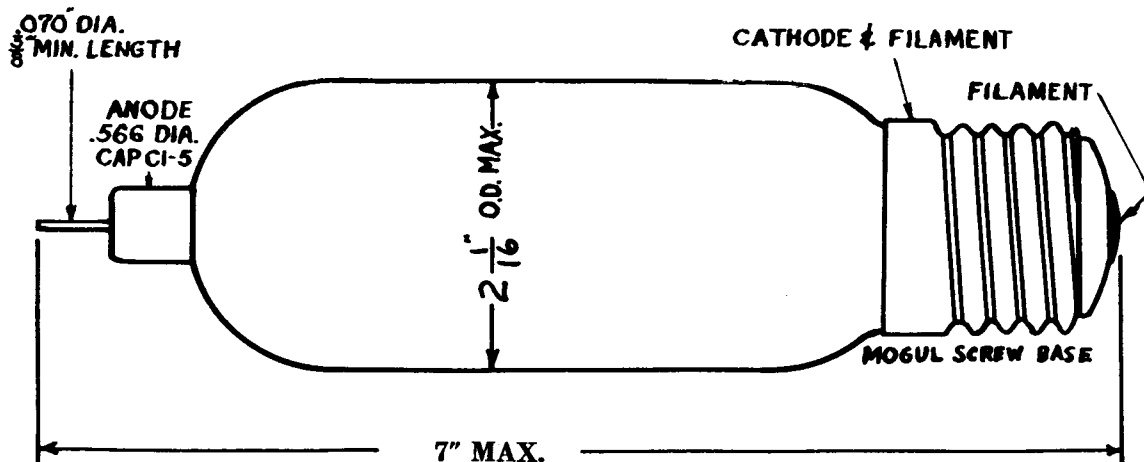
NL-619 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	6
Instantaneous Amperes output (maximum)	20
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	300
Filament volts	2.0
Filament amperes	10 to 13
Filament heating time (seconds)	60
Typical arc drop at 15 amperes peak, 70°C (volts)	10
Typical Anode starting voltage (volts)	9
Maximum ac short circuit current (amperes)	250
Condensed mercury temperature limits (°C)	+35 to +115
Approx. temp. rise, cond. merc. above ambient, no load (°C)	25
Approx. temp. rise, cond. merc. above ambient, full load (°C)	60
Mounting position	vertical, base down
Net weight (ounces)	6
Approx. shipping weight (lbs.)	4

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



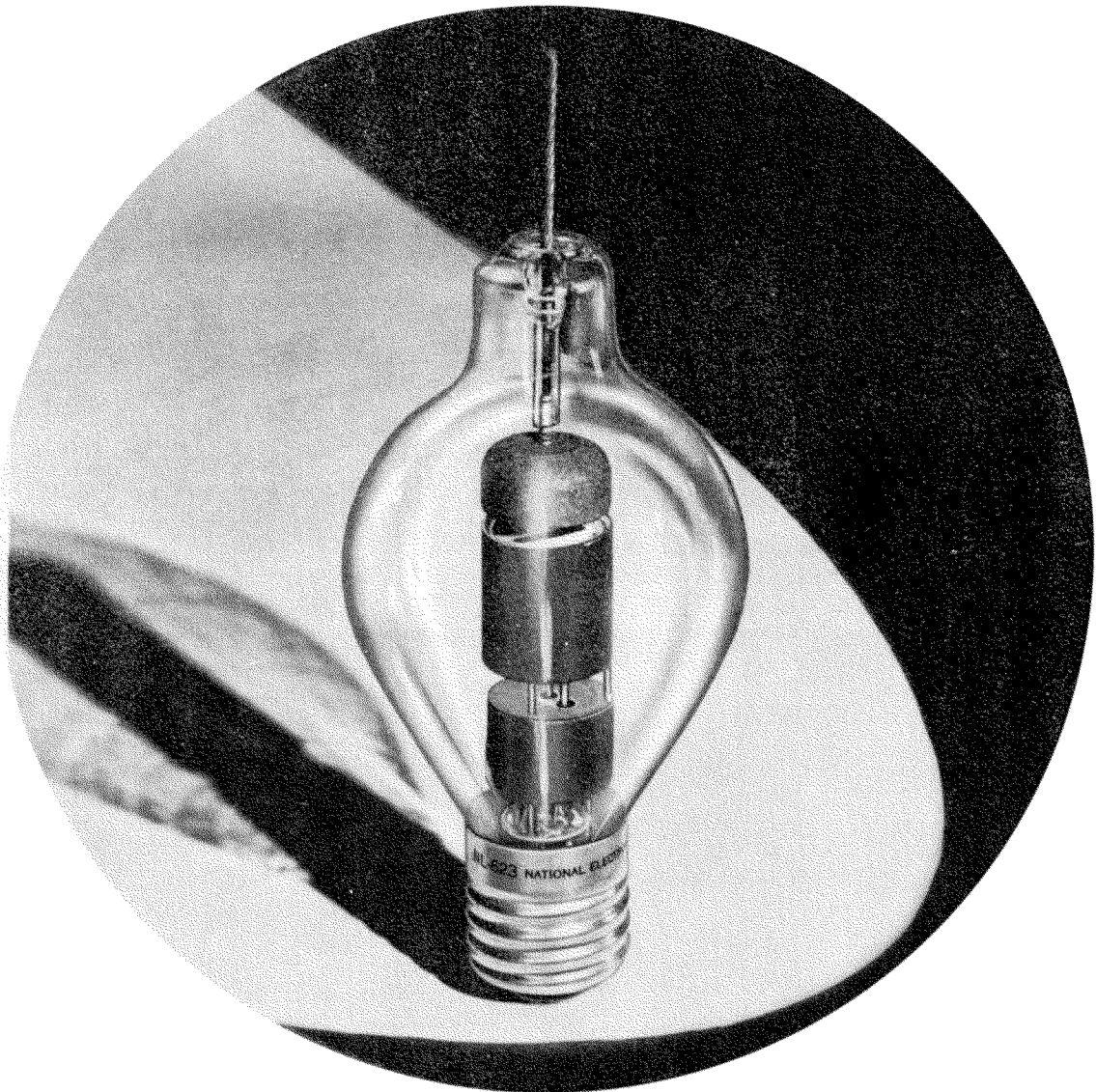
Printed in USA 5-56 GR

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-623
RECTIFIER TUBE
15 Amperes dc



NATIONAL POWER TUBE NL-623 is a sturdy rectifier tube designed especially for Industrial power rectifier applications up to 150 volts dc. It is mercury filled for efficiency, long life, and the ability to withstand high inverse voltage.

NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

NL-623 RECTIFIER TUBE

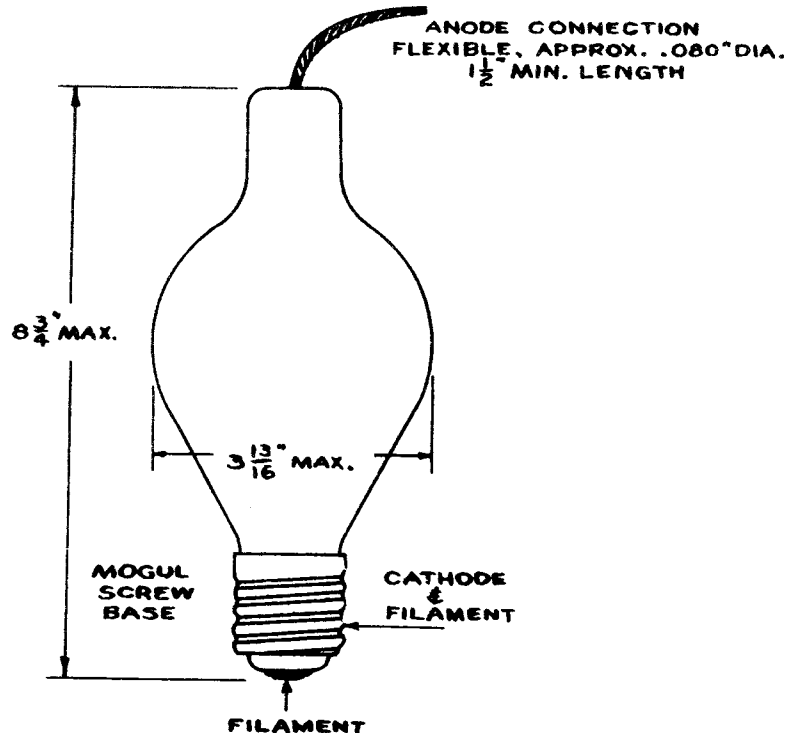
TECHNICAL INFORMATION

dc Amperes output (maximum)	15
Instantaneous Amperes output (maximum)	45
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	500
Filament volts	2.5
Filament amperes	20 ± 2
Filament heating time (seconds)	120
Typical arc drop at 45 amperes peak (volts)	10
Typical Anode starting voltage (volts)	13
Maximum ac short circuit current (amperes)	750
Condensed mercury temperature limits (°C)	+ 35 to + 100
Approximate temperature rise, cond. mercury above ambient , no load (°C)	40
Approximate temperature rise, cond. mercury above ambient, full load (°C)	60
Mounting position	vertical, base down
Net weight (ounces)	6
Approx. shipping weight (lbs.)	5

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



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NATIONAL ELECTRONICS, INC.

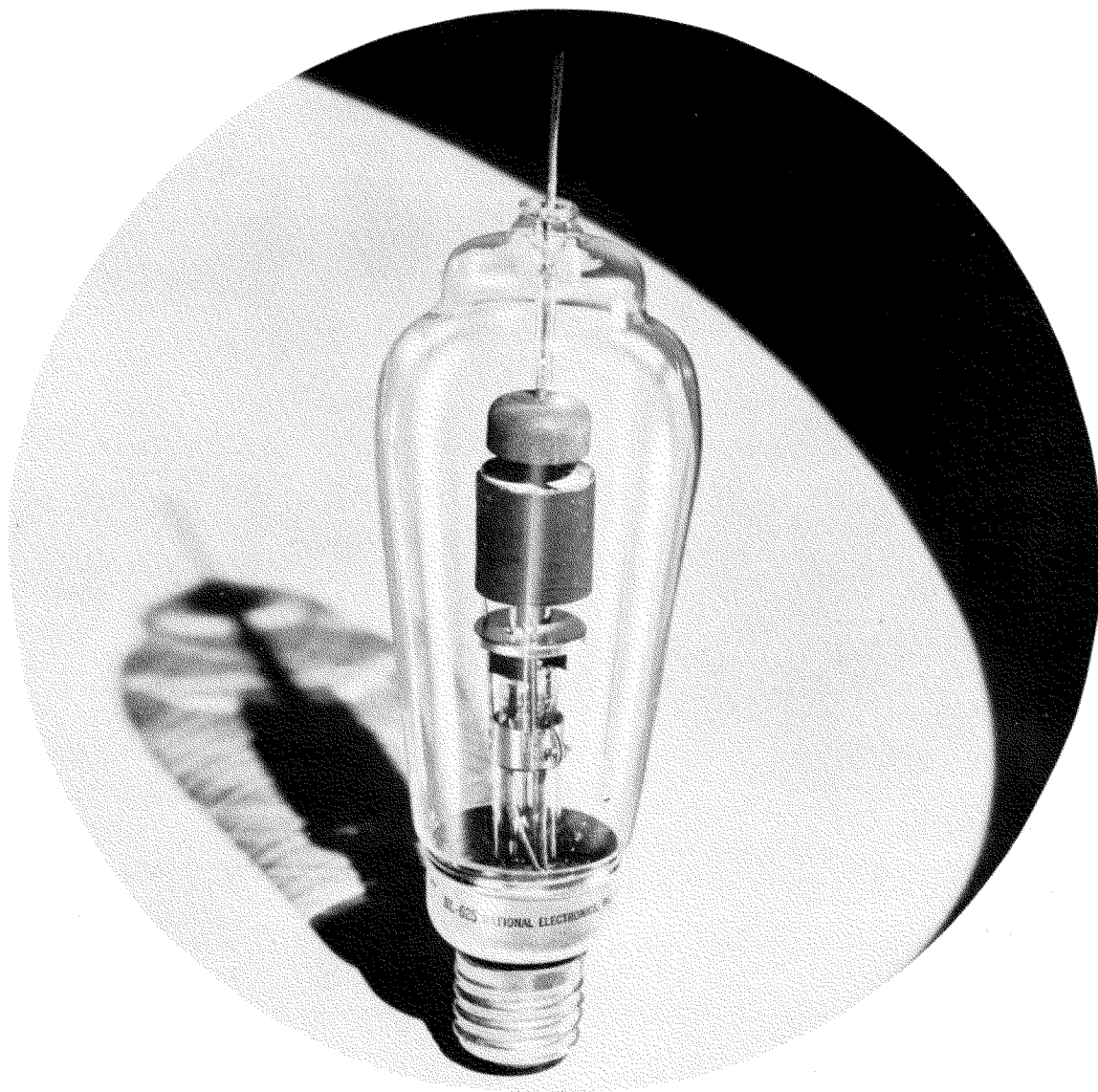
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-625

RECTIFIER TUBE

15 Amperes dc



NATIONAL POWER TUBE NL-625 is a sturdy rectifier tube designed especially for industrial power rectifier applications up to 250 volts dc. It is mercury filled for efficiency, long life, and the ability to stand high inverse voltage.

NATIONAL ELECTRONICS, INC.

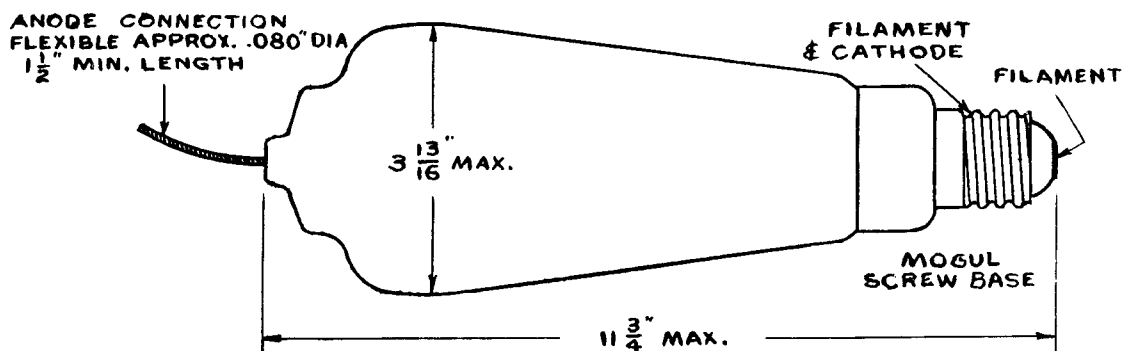
GENEVA, ILLINOIS, U. S. A.

NL-625 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	15
Instantaneous Amperes output (maximum)	45
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	20 + 2
Filament heating time (seconds)	120
Typical arc drop at 45 amperes peak (volts)	10
Typical Anode starting voltage (volts)	13
Maximum ac short circuit current (amperes)	750
Condensed mercury temperature limits (°C)	+ 35 to + 80
Approx. temp. rise, cond. merc. above ambient, no load (°C)	25
Approx. temp. rise, cond. merc. above ambient, full load (°C)	40
Mounting position	vertical, base down
Net weight (ounces)	12
Approx. shipping weight (lbs.)	7

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP
LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



Printed in USA 5-56 GR

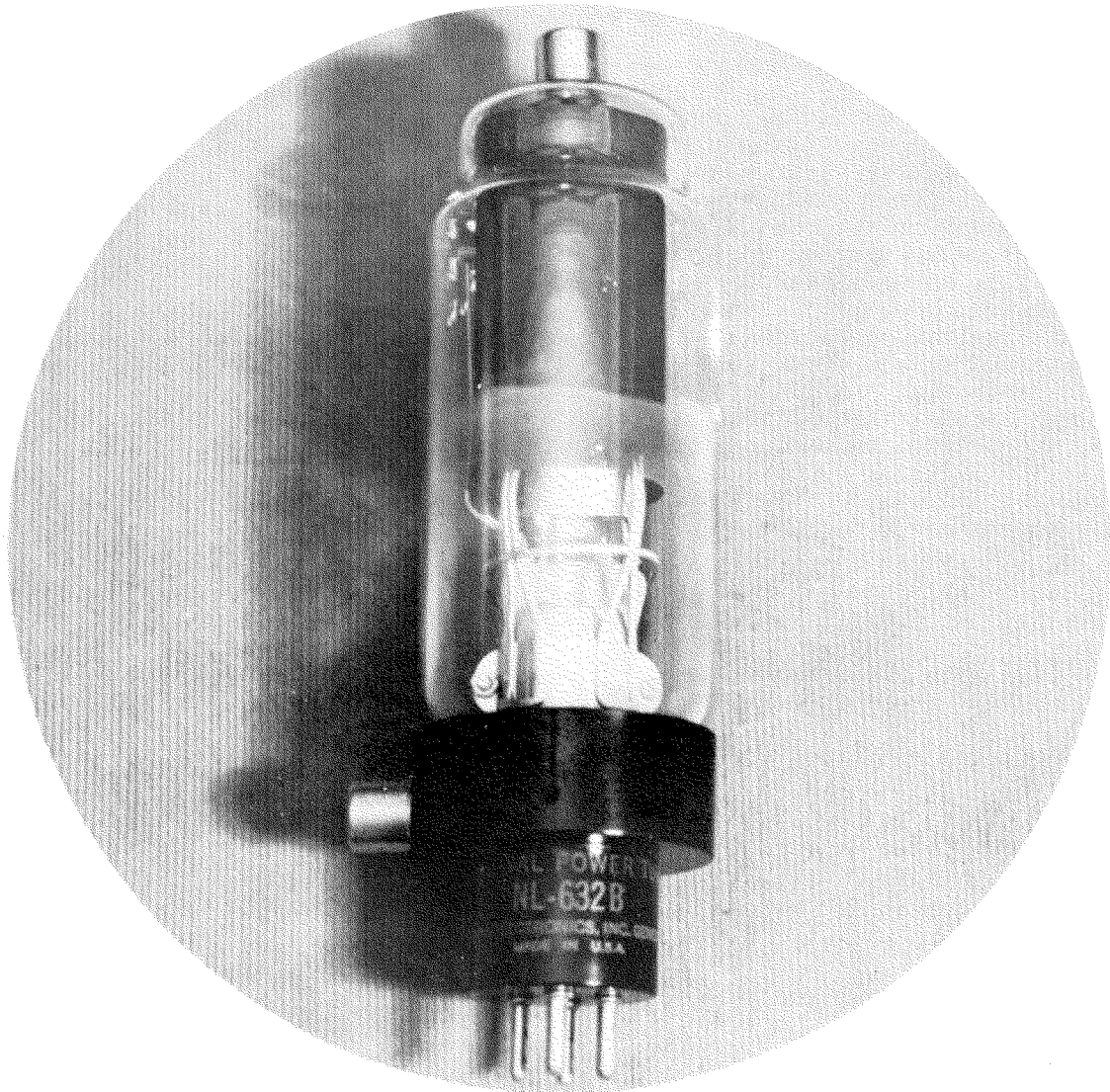
NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBES

NL-632B

THYRATRON TUBE

2.5 Amperes dc -- 30 Amperes Peak



NATIONAL POWER TUBE NL-632B is an indirectly heated cathode thyatron designed especially for control, timing, and ignitor firing applications. The shield grid construction and mercury vapor filling give stable operation even with high impedance grid supplies.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-632B THYRATRON TUBE

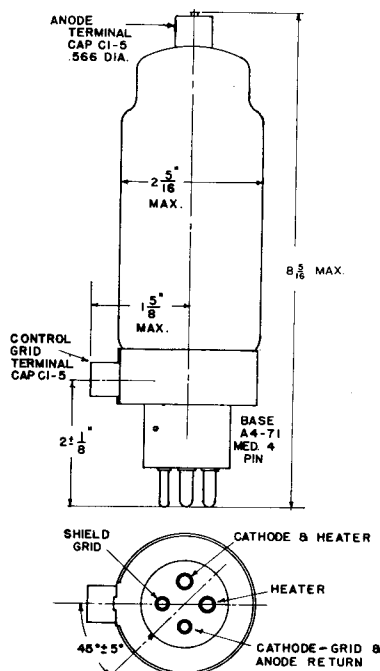
TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	30
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	1500
Maximum peak forward volts	1500
Filament volts	5.0 ± .25
Filament amperes	4.7 ± .6
Heating time (seconds)	300
Typical arc drop at 10 amperes peak (volts)	12
Grid control characteristic	see curve
Maximum negative control grid voltage before conduction (volts)	1000
Maximum negative control grid voltage during conduction (volts)	10
Maximum negative shield grid voltage before conduction (volts)	300
Maximum negative shield grid voltage during conduction (volts)	5
Maximum control grid current (average amperes)	.25
Maximum control grid current (peak amperes)	1.0
Maximum shield grid current (average amperes)	.25
Maximum shield grid current (peak amperes)	1.0
Maximum critical control grid current (microamperes)	2.0
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to control grid capacitance (uuf)	0.04
Cathode to control grid capacitance (uuf)	4.4
Maximum ac short circuit current (amperes)	150
Condensed mercury temperature limits (°C)	+40 to +80
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	8
Approx. shipping weight (lbs.)	4

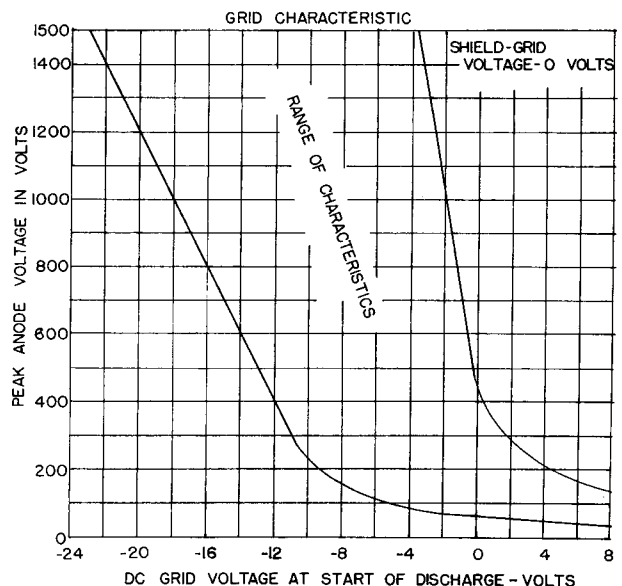
ALL DATA ARE BASED ON RETURNS TO CATHODE

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC

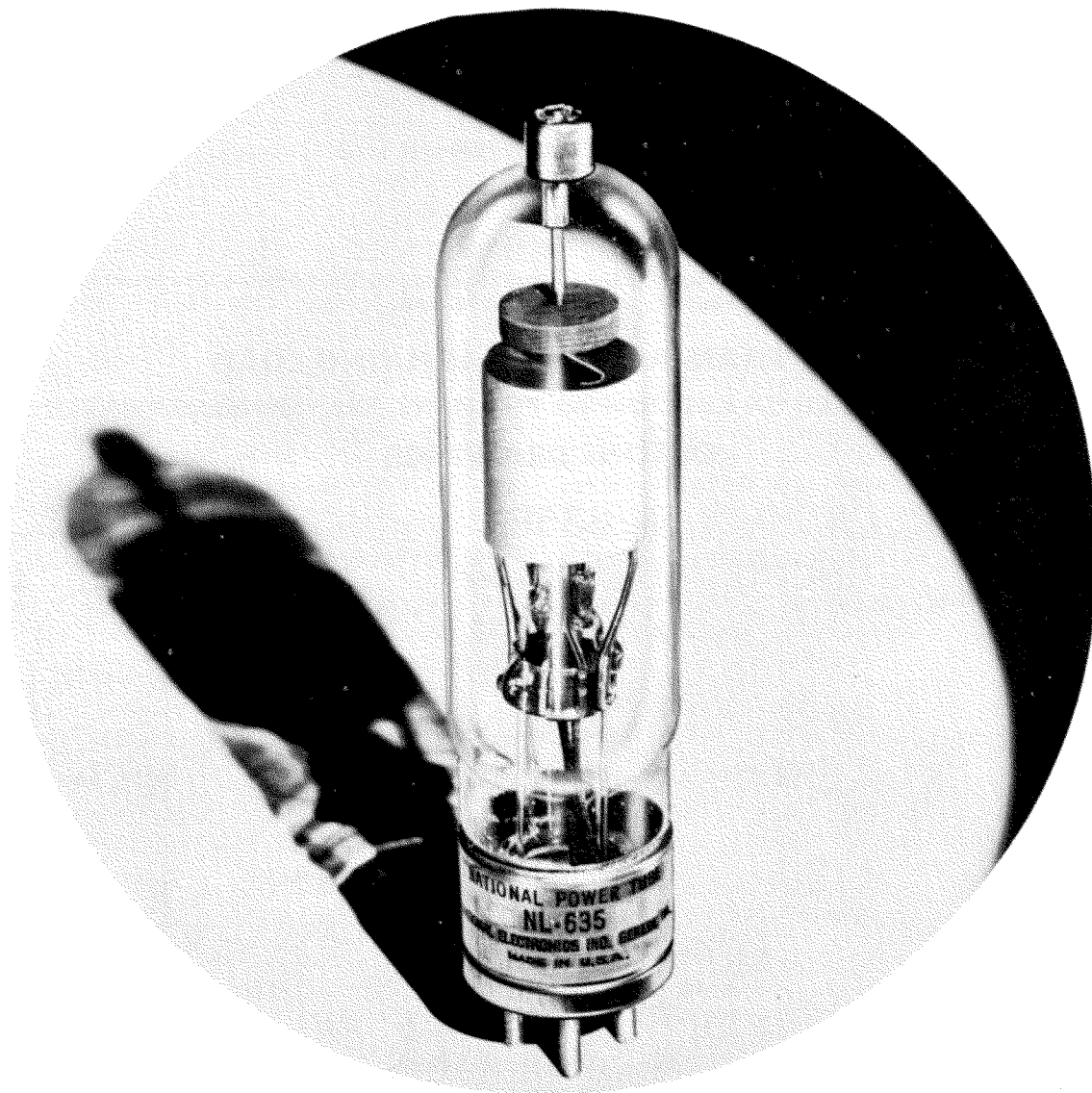


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NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-635
RECTIFIER TUBE
6.4 Amperes dc



NATIONAL POWER TUBE NL-635 is a sturdy rectifier tube designed especially for industrial power rectifier applications up to 250 volts dc. It is mercury and gas filled for efficiency, long life, and the ability to withstand high inverse voltages. NL-635 utilizes a No. 412 industrial 4-pin base. It is available with a bracket base for panel mounting under the type number NL-635P and the new National lug type base under the number NL-635L.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-635 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	6.4
Instantaneous Amperes output (maximum)	77
Maximum time of averaging anode current (seconds)	20
Maximum peak inverse volts	1000
Filament volts	2.5
Filament amperes	18 ± 2
Filament heating time (seconds)	60
Typical arc drop at 20 amperes peak (volts)	9
Typical Anode starting voltage (volts)	20
Maximum ac short circuit current (amperes)	770
Condensed mercury temperature limits (°C)*	-40 to +100
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	6
Approx. shipping weight (lbs.)	4

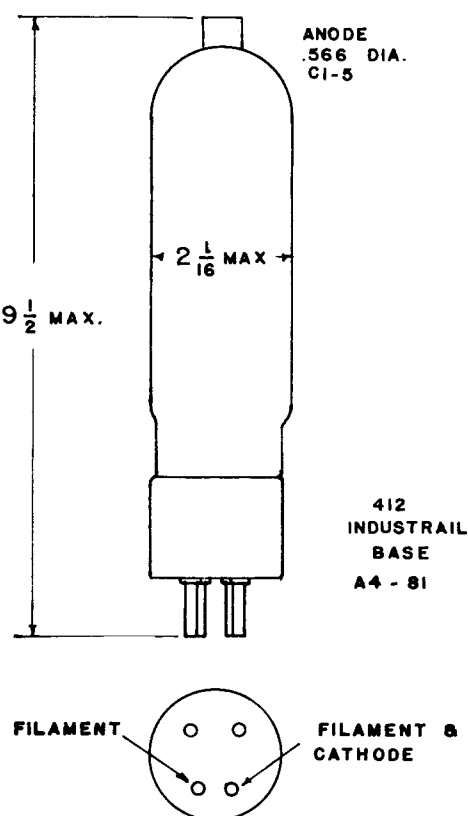
*Satisfactory operation will be obtained between -40 to +100°C. For long life the tube should be operated between +40 to +100°C condensed mercury, or approximately +10 to +70°C ambient.

LIGHT FILAMENT BEFORE APPLYING LOAD

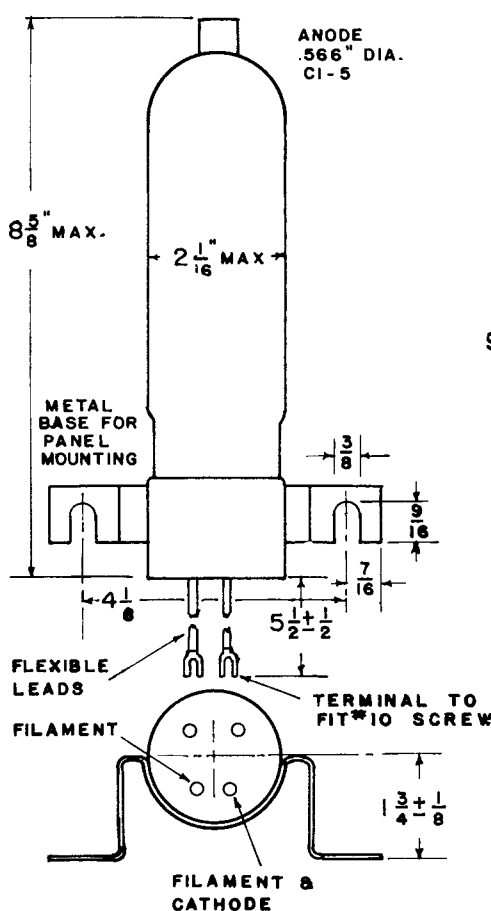
ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

OUTLINE DRAWINGS

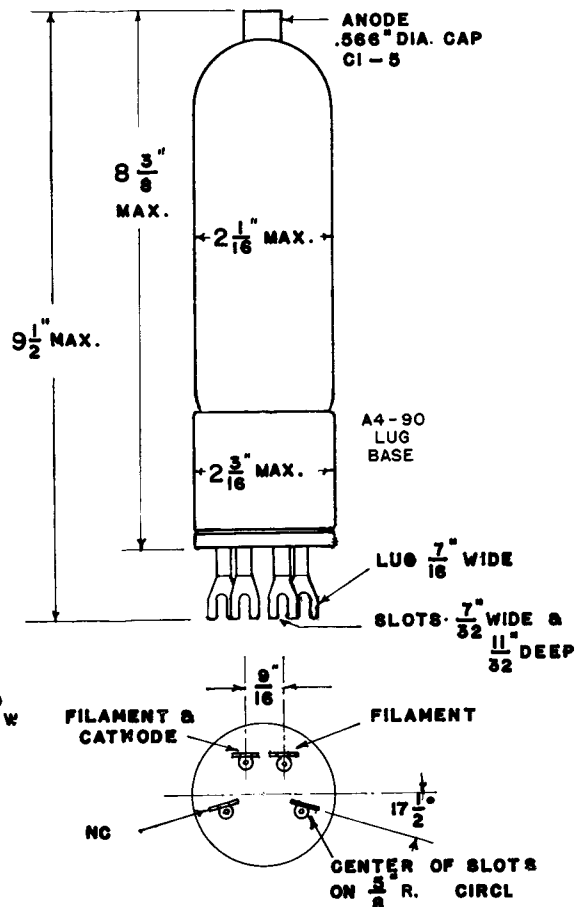
NL-635



NL-635P



NL-635L



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NATIONAL ELECTRONICS, INC.

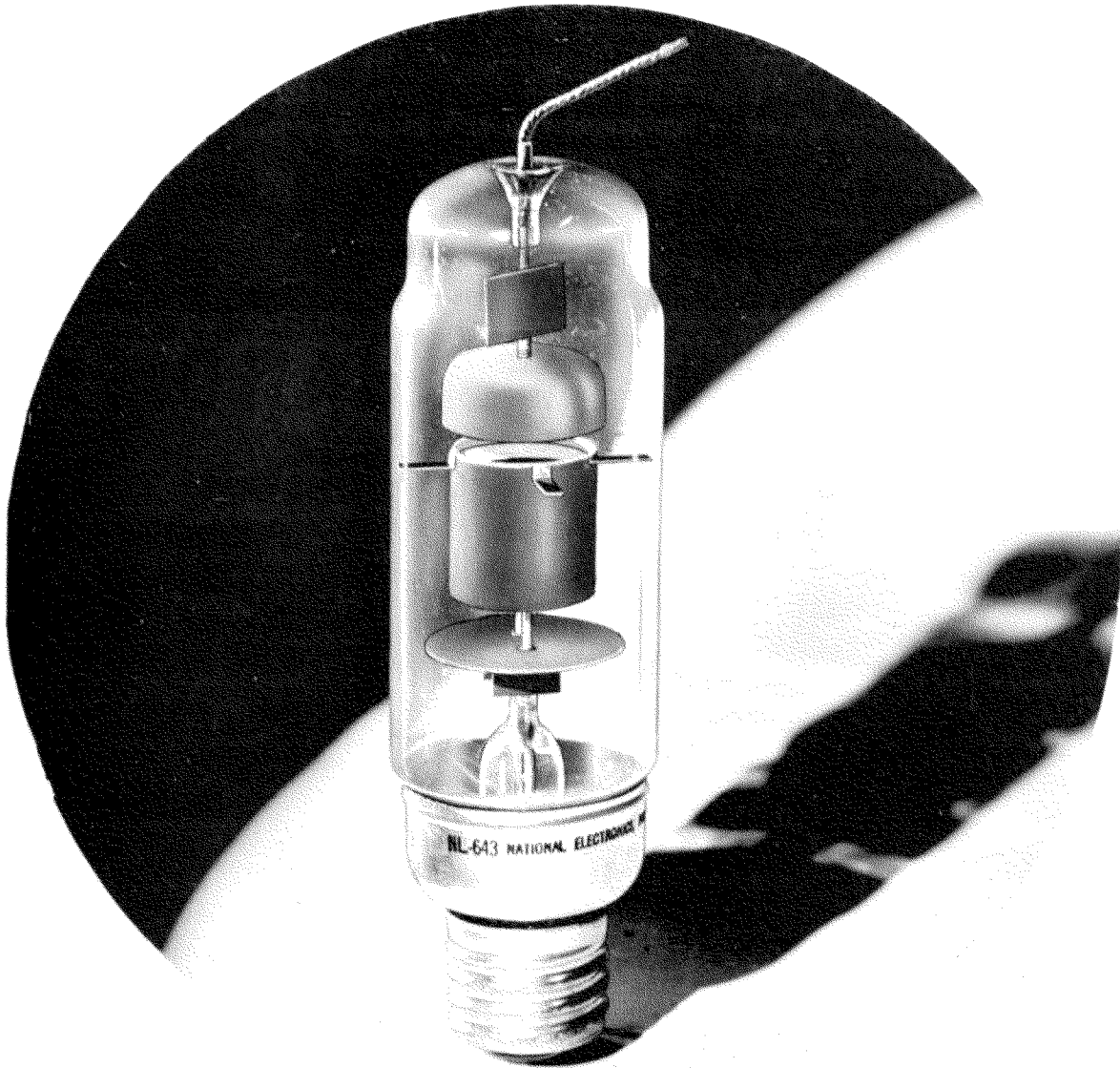
GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-643

RECTIFIER TUBE

15 Amperes dc



NATIONAL POWER TUBE NL-643 is a sturdy rectifier tube designed especially for industrial power rectifier applications up to 200 volts dc. It is mercury filled for efficiency and the ability to withstand high inverse voltage. NL-643 is designed to give exceptionally long life when used within its ratings.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

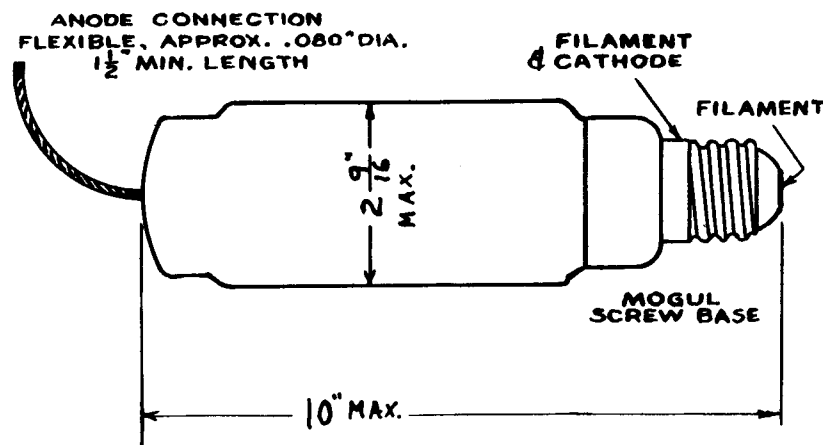
NL-643 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	15
Instantaneous Amperes output (maximum)	90
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	700
Filament volts	2.5
Filament amperes	23 ± 2
Filament heating time (seconds)	120
Typical arc drop at 45 amperes peak (volts)	10
Typical Anode starting voltage (volts)	13
Maximum ac short circuit current (amperes)	750
Condensed mercury temperature limits (°C) (700 volts peak inverse)	+ 35 to + 90
Condensed mercury temperature limits (°C) (500 volts peak inverse)	+ 35 to + 100
Approximate temperature rise, cond. mercury above ambient, no load (°C)	35
Approximate temperature rise, cond. mercury above ambient, full load (°C)	50
Mounting position	vertical, base down
Net weight (ounces)	9
Approx. shipping weight (lbs.)	5

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-649

RECTIFIER TUBE

2 Amperes dc



NATIONAL POWER TUBE NL-649 is a sturdy, single-ended, rectifier tube designed especially for industrial power rectifier applications and for "back-rectifier" applications in conjunction with a thyatron tube. It is mercury filled for efficiency, long life, and the ability to stand high inverse voltage.

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

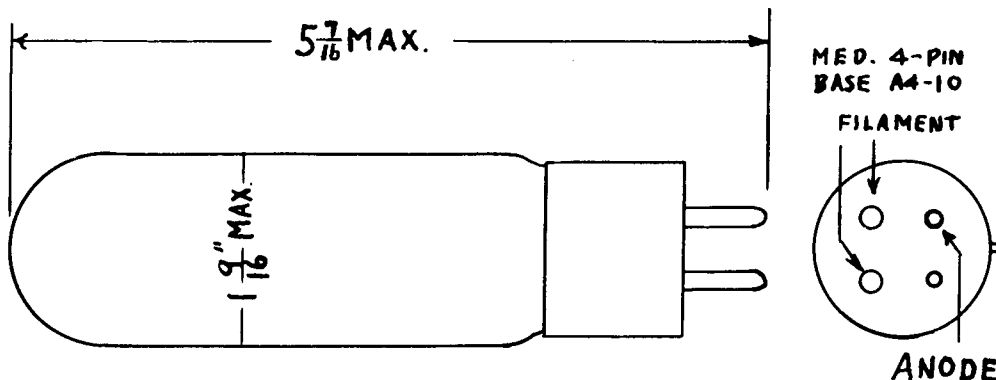
NL-649 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	2
Instantaneous Amperes output (maximum)	10
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	7 ± 1
Filament heating time (seconds)	20
Typical arc drop at 6 amperes peak (volts)	9
Typical Anode starting voltage (volts)	16
Maximum ac short circuit current (amperes)	125
Condensed mercury temperature limits (°C)	+ 35 to + 85
Approximate temperature rise, cond. mercury above ambient (°C)	25
Mounting position	vertical, base down
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



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NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

RECTIFIER TUBE

NL-653

RECTIFIER TUBE

3 Amperes dc



NATIONAL POWER TUBE NL-653 is a sturdy, single-ended, rectifier tube designed especially for industrial power rectifier applications and for "back-rectifier" applications in conjunction with a thyatron tube. It is mercury filled for efficiency, long life, and the ability to stand high inverse voltage.

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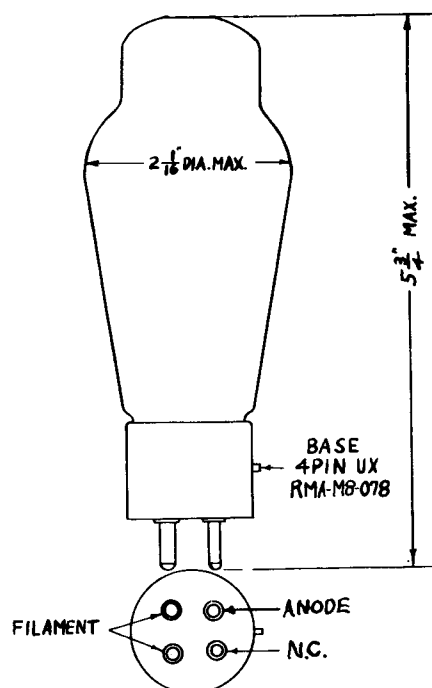
NL-653 RECTIFIER TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	3
Instantaneous Amperes output (maximum)	12
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	900
Filament volts	2.5
Filament amperes	$9\frac{1}{2} \pm 1\frac{1}{2}$
Filament heating time (seconds)	40
Typical arc drop at 12 amperes peak (volts)	11
Typical Anode starting voltage (volts)	16
Maximum ac short circuit current (amperes)	200
Condensed mercury temperature limits (°C)	+ 35 to + 85
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	4
Approx. shipping weight (lbs.)	3

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP

LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING

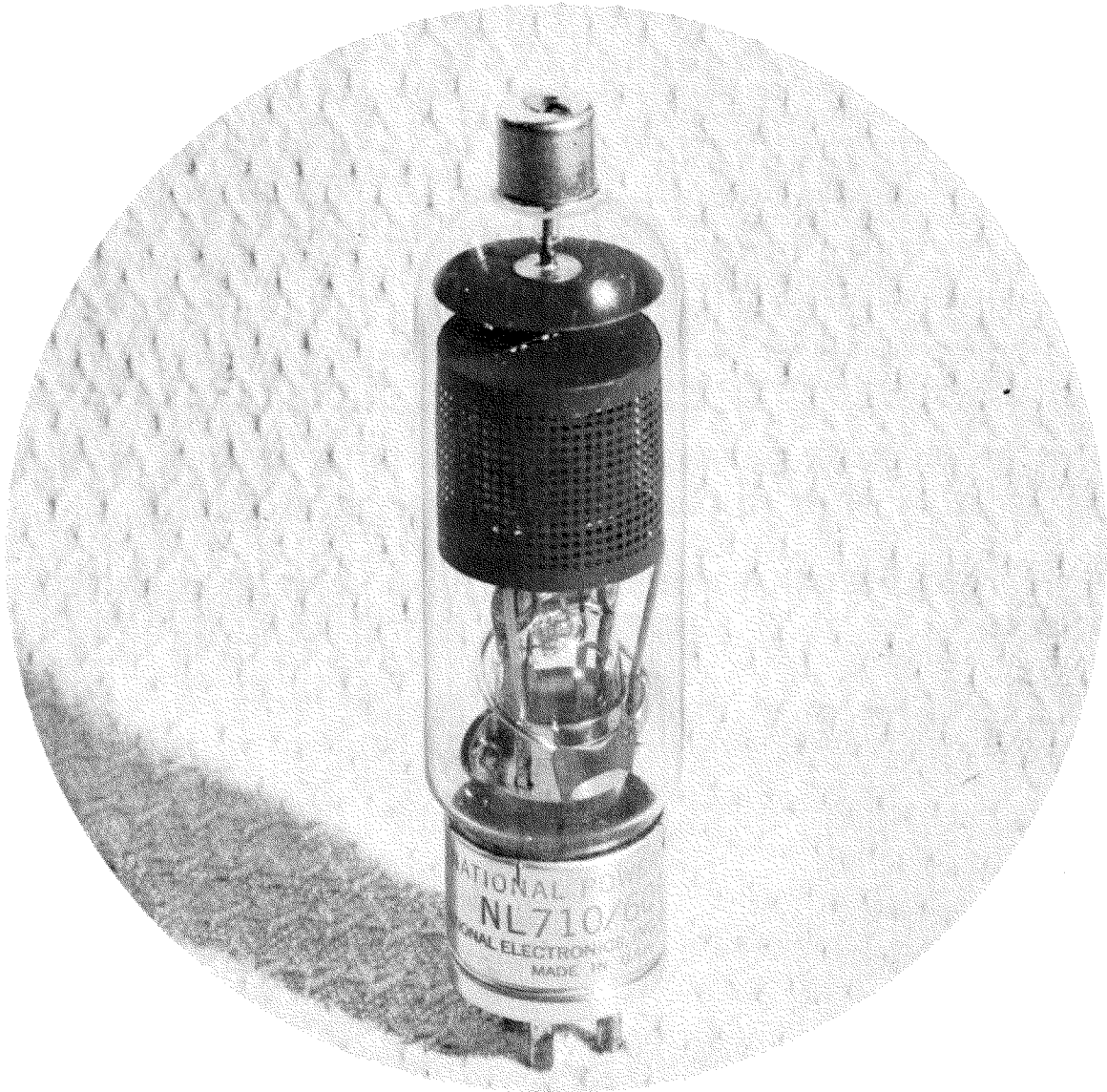


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NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBE

NL-710/6011 & NL-710L
2.5 Amperes dc -- 30 Amperes Peak



NATIONAL POWER TUBE NL-710/6011 is a quick heating thyatron designed especially for ignitor firing and regulated rectifier applications. It is gas and mercury filled for quick starting and constancy of characteristics within wide temperature limits. The NL-710/6011 with the lug type base is designated as the NL-710L.

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GENEVA, ILLINOIS, U. S. A.

NL-710/6011 & NL-710L

THYRATRON TUBE

TECHNICAL INFORMATION

dc Amperes output (maximum)	2.5
Instantaneous Amperes output (maximum)	30
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	1500
Maximum peak forward volts	1500
Filament volts	2.5
Filament amperes	9 ± 2
Filament heating time (seconds)	20
Typical arc drop at 8 amperes peak (volts)	10
Grid control characteristic	see curve
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	2
Grid to filament capacitance (uuf)	12
Maximum ac short circuit current (amperes)	250
Condensed mercury temperature limits (°C) *	- 40 to + 80
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	4
Approx. shipping weight (lbs.)	3

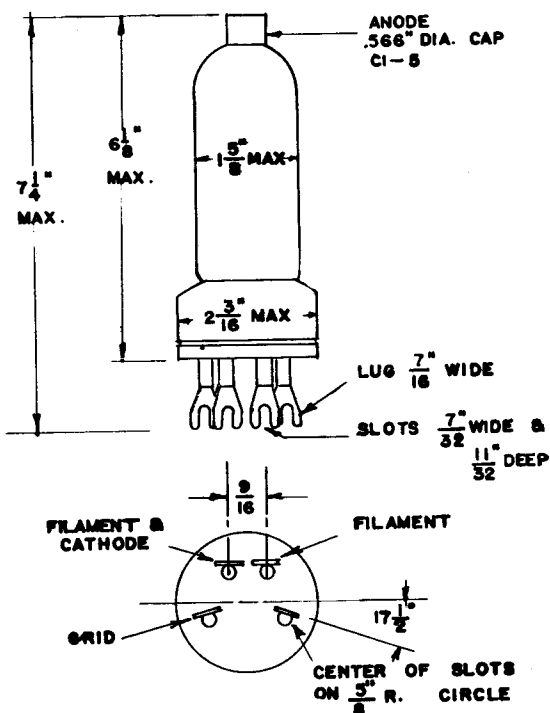
*The tube may be started and satisfactory operation will result between -40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +10 to +50°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

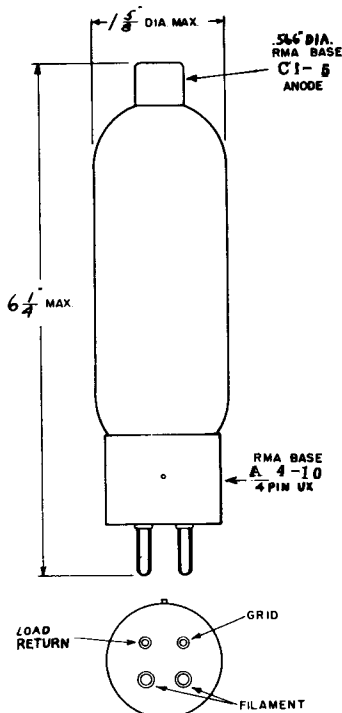
LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWINGS

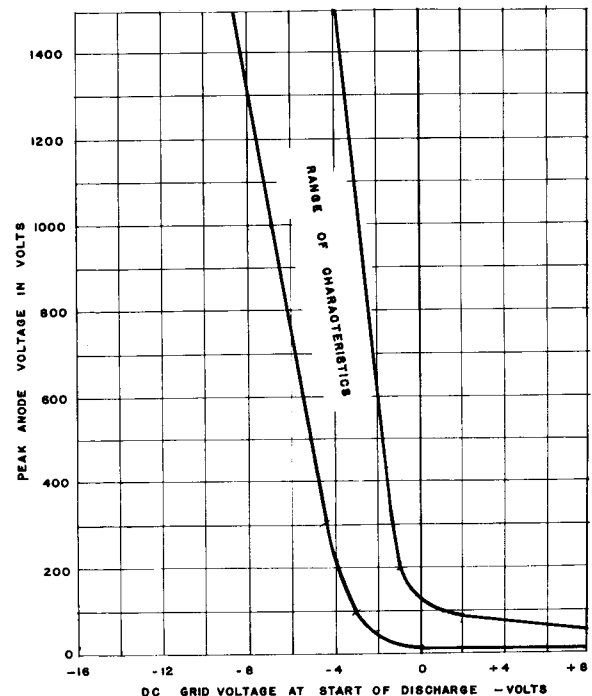
NL-710L



NL-710/6011



GRID CHARACTERISTIC



Printed in USA 6/58

NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBES

NL-714 & NL-5557/715
THYRATRON TUBES
1 Ampere dc — 3 Amperes Peak



NATIONAL POWER TUBE NL-714 is a quick heating industrial thyatron designed especially for timing control and regulated rectifier applications. It is gas and mercury filled for quick starting and constancy of characteristics within wide temperature limits.

NL-5557/715 has the same general characteristics, within its narrower temperature limits, but is filled with mercury only to permit use of the tube at higher voltages such as are found in the amateur radio transmitter application.

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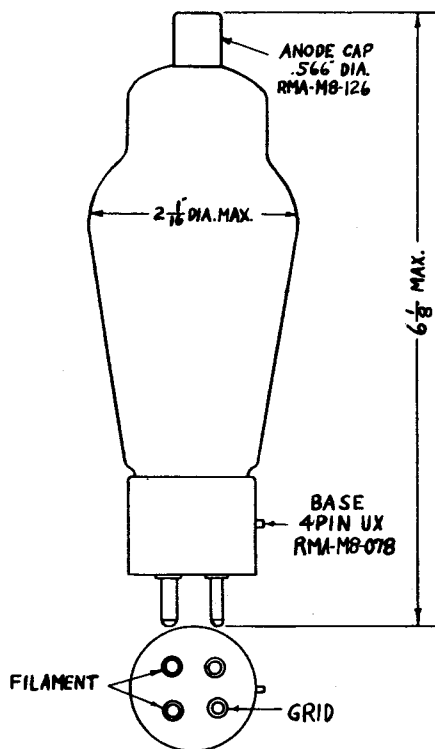
NL-714 & NL-5557/715 THYRATRON TUBES

TECHNICAL INFORMATION

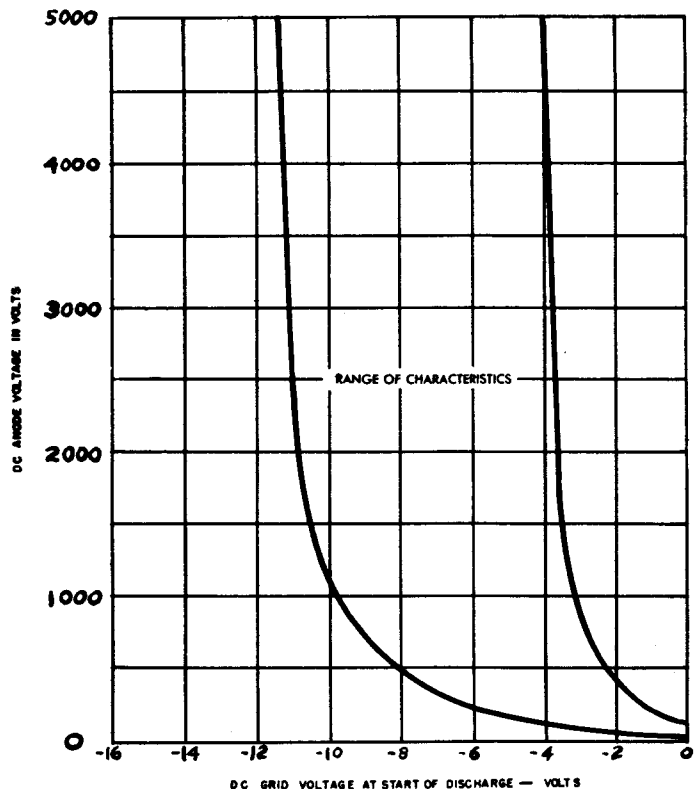
	NL-714	← NL-5557 / 715 →		
dc Amperes output (maximum)	1.0	.25	.5	1.0
Instantaneous Amperes output (maximum)	3	1	2	3
Maximum time of averaging anode current (seconds)	5	5	5	5
Maximum peak inverse volts	1250	10,000	5,000	1250
Maximum peak forward volts	1250	5,000	2,500	1250
Condensed mercury temperature limits (°C)	-40--+80	+40--+60	+40--+80	+40--+90
Filament volts	2.5			2.5
Filament amperes	5 ± .5			5 ± .5
Heating time (seconds)	5			5
Typical arc drop at 3 amperes peak (volts)	15			15
Grid control characteristic	See Curve			
Maximum negative grid voltage before conduction (volts)	500			500
Maximum negative grid voltage during conduction (volts)	10			10
Maximum critical grid current (microamps)	5			5
Ionization time (approx., microseconds)	10			10
Deionization time (approx., microseconds)	1000			1000
Anode to grid capacitance (uuf)	2			2
Maximum ac short circuit current (amperes)	50			50
Approx. temp. rise, cond. mercury above ambient (°C)	15			15
Mounting position	Vertical, base down			
Net weight (ounces)	3			3
Approx. shipping weight (lbs.)	3			3

ALL DATA ARE BASED ON RETURNS TO FILAMENT CENTER TAP
LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC



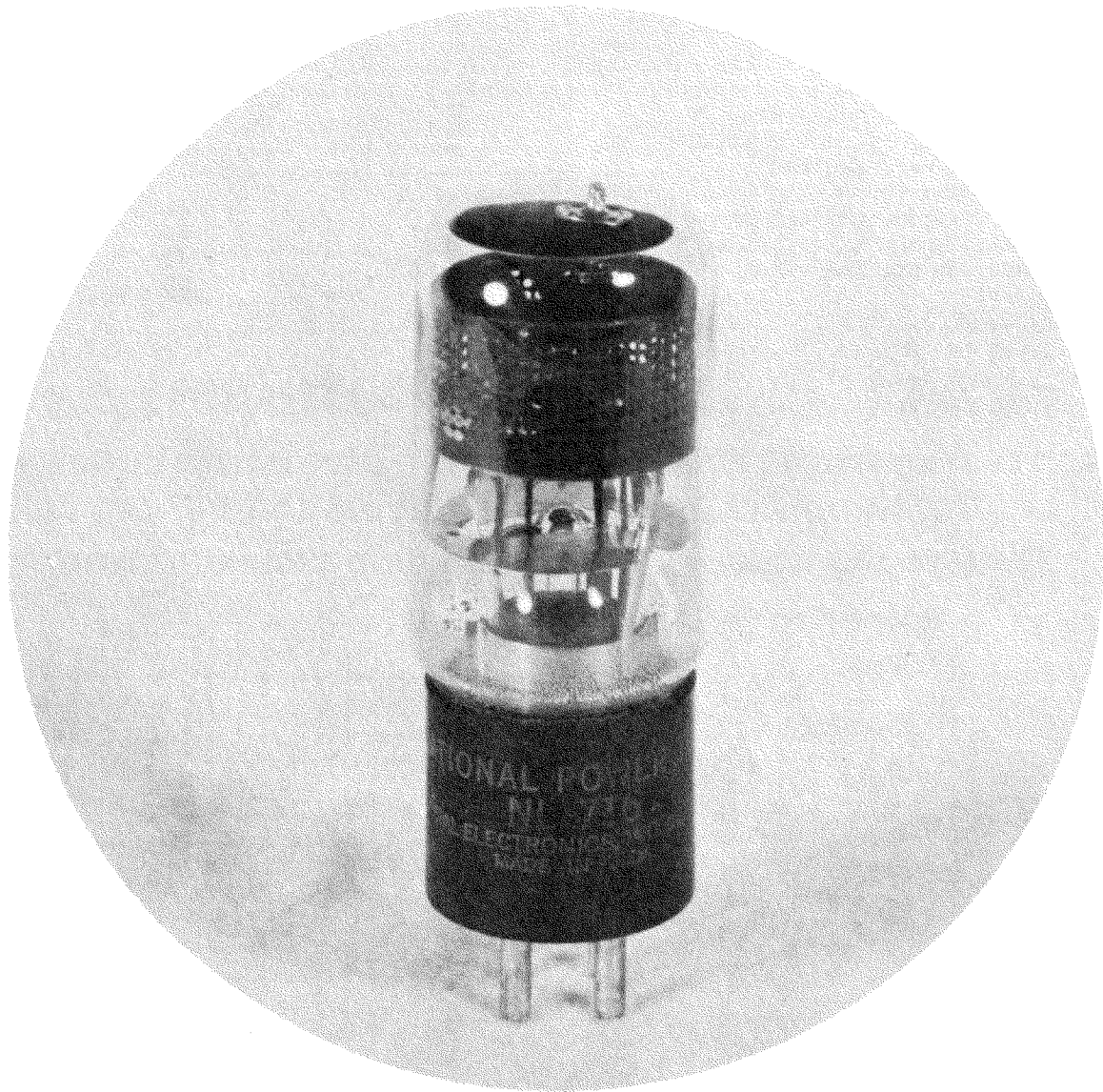
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GENEVA, ILLINOIS, U. S. A.

THYRATRON TUBE

NL-716
THYRATRON TUBE
1.0 Ampere dc -- 8.0 Amperes Peak



NATIONAL POWER TUBE NL-716 is a compact, quick heating thyatron designed for timing and control applications. It is gas and mercury filled for quick starting and wide temperature limits. NL-716 gives long life without circuit cushioning.

NATIONAL ELECTRONICS, Inc.

GENEVA, ILLINOIS, U. S. A.

NL-716 THYRATRON TUBE

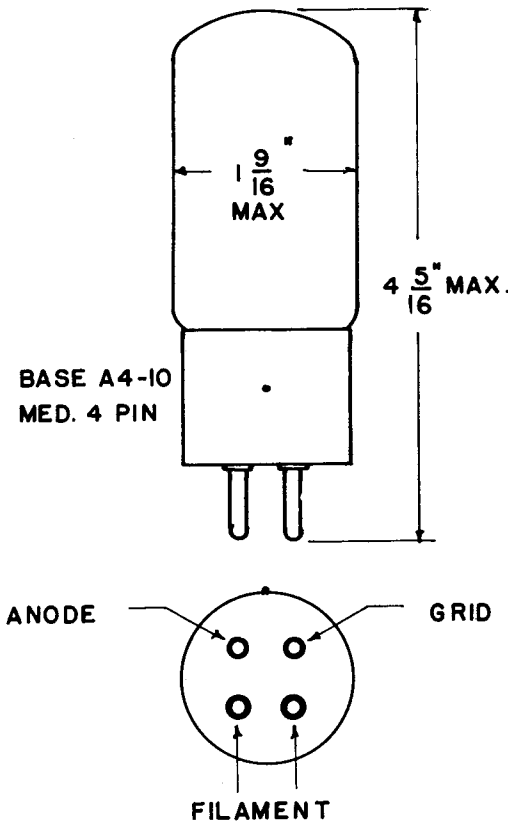
TECHNICAL INFORMATION

dc Amperes output (maximum)	1.0
Instantaneous Amperes output (maximum)	8.0
Maximum time of averaging anode current (seconds)	5
Maximum peak inverse volts	1250
Maximum peak forward volts	1250
Filament volts	2.5
Filament amperes	6.3 $\pm$ 0.8
Filament heating time (seconds)	15
Typical arc drop at 5 amperes peak (volts)	8
Grid control characteristic	see curve
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	3
Maximum critical grid current (microamperes)	10
Maximum ac short circuit current (amperes)	80
Condensed mercury temperature limits (°C) *	-40 to +80
Approximate temperature rise, cond. mercury above ambient (°C)	30
Mounting position	vertical, base down
Net weight (ounces)	3
Approx. shipping weight (lbs.)	3

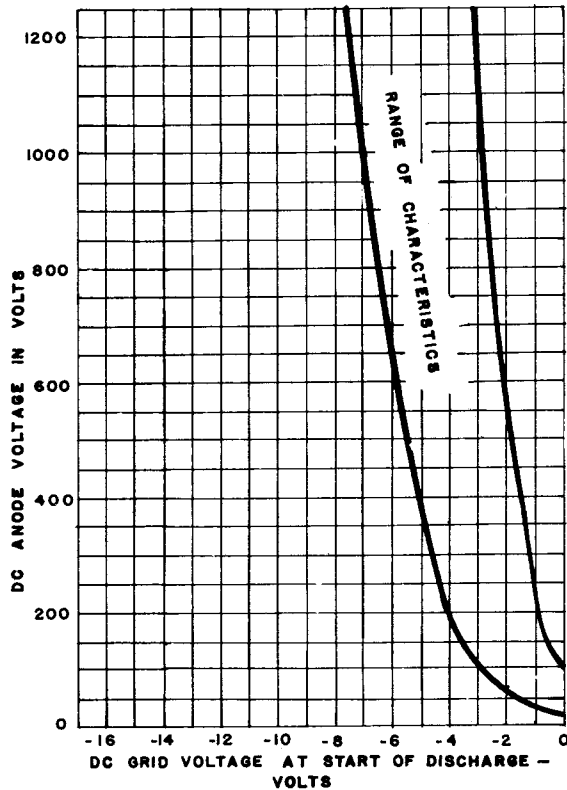
*The tube may be started and satisfactory operation will result between -40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +10 and +50°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP
LIGHT FILAMENT BEFORE APPLYING LOAD

OUTLINE DRAWING



GRID CHARACTERISTIC

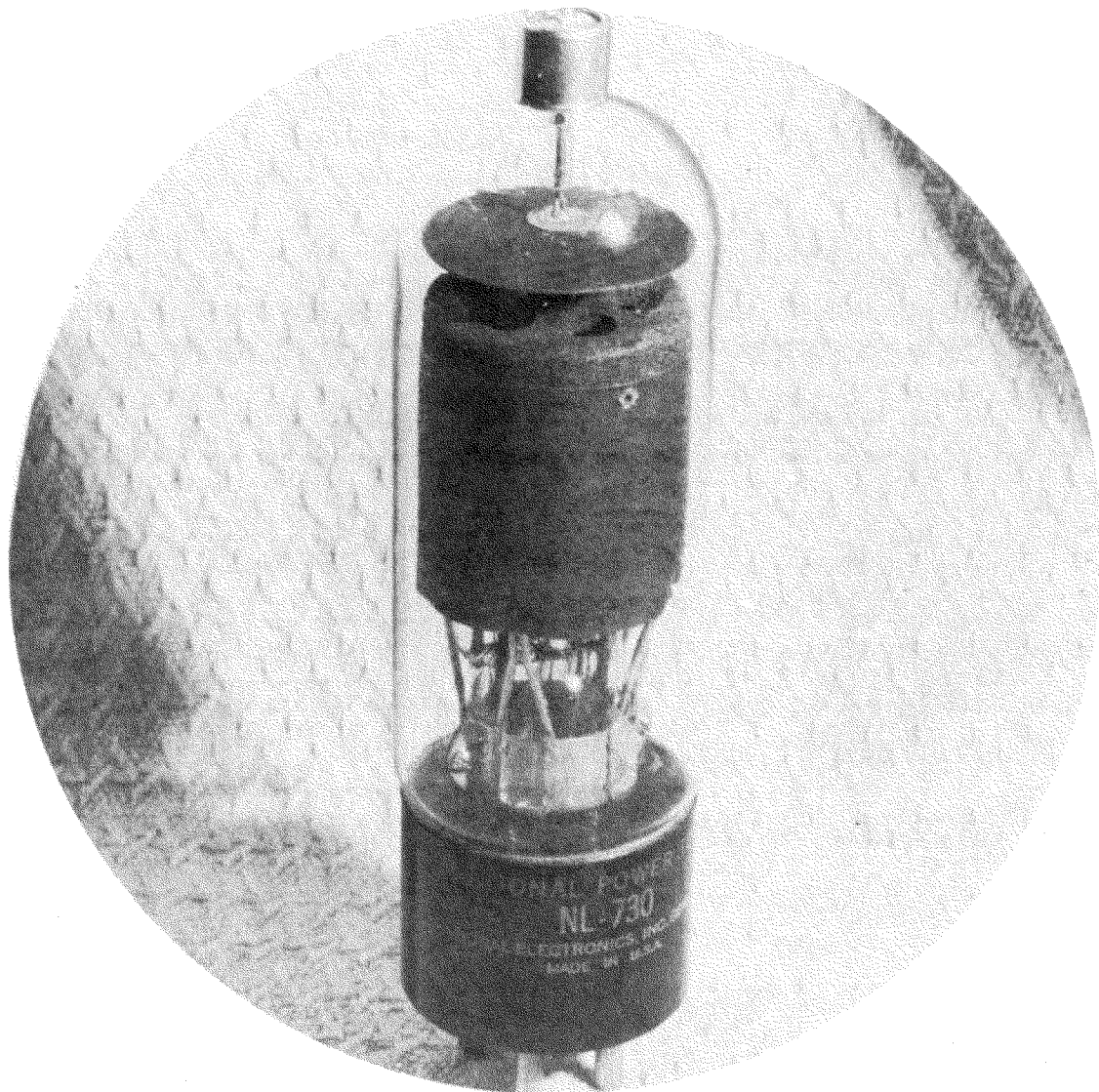


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THYRATRON TUBES

NL-730

3.2 Amperes dc — 40 Amperes Peak



NATIONAL POWER TUBE NL-730 is a quick heating thyatron especially designed for motor speed control and regulated rectifier applications. It is gas and mercury filled to give quick starting, long life, and wide temperature limits.

NATIONAL ELECTRONICS, INC.

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NL-730 THYRATRON TUBE TECHNICAL INFORMATION

dc Amperes output (maximum)	3.2
Instantaneous Amperes output (maximum)	40
Maximum time of averaging anode current (seconds)	15
Maximum peak inverse volts	1500
Maximum peak forward volts	1500
Condensed mercury temperature limits (°C)* —40 to +80	
Filament volts	2.5
Filament amperes	12 ± 1.5
Filament heating time (seconds)	30
Typical arc drop at 12 amperes peak (volts)	12
Grid control characteristic	See Curve

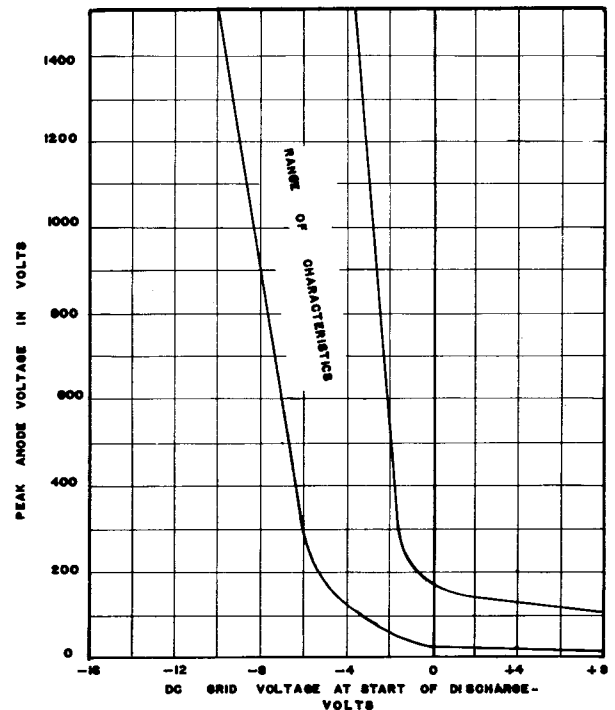
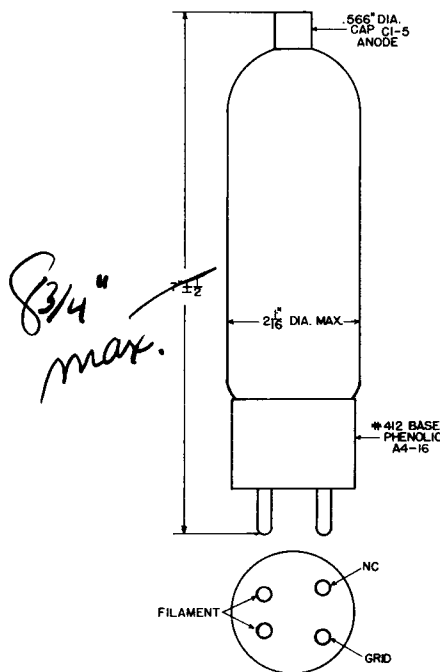
Maximum negative grid voltage before conduction (volts)	500
Maximum negative grid voltage during conduction (volts)	10
Maximum critical grid current (microamps)	10
Ionization time (approx., microseconds)	10
Deionization time (approx., microseconds)	1000
Anode to grid capacitance (uuf)	4
Maximum ac short circuit current (amperes)	560
Approx. temp. rise, cond. mercury above ambient (°C) <i>23</i>	20
Mounting position	Vertical, base down
Net weight (ounces)	7
Approx. shipping weight (lbs.)	4

*The tube may be started and satisfactory operation will result between —40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +10 to +50°C ambient.

ALL DATA ARE BASED ON RETURNS TO FILAMENT TRANSFORMER CENTER TAP

OUTLINE DRAWING

GRID CHARACTERISTIC



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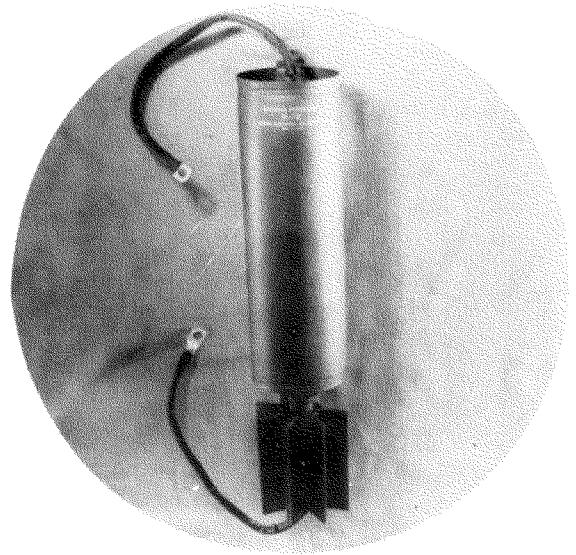
NATIONAL ELECTRONICS, INC.

GENEVA, ILLINOIS, U. S. A.

NL-732 THYRATRON TUBE

**30 Amperes dc — 225 Ampere peak
1500 Volts peak**

NATIONAL POWER TUBE NL-732 is a metal envelope thyatron designed especially for resistance welding and AC control applications. It is gas and mercury filled for quick starting and long life without circuit cushioning.



TECHNICAL INFORMATION

dc Amperes output (Maximum)	30	25
Instantaneous amperes output (Maximum)	160	225
Maximum time of averaging anode current (seconds)		30
Maximum peak inverse volts		1500
Maximum peak forward volts		1500
★Condensed mercury temperature limits (°C)	—40 to +80	
Filament volts		2.5
Filament amperes		55 ± 5
Filament heating time (seconds)		180
Typical arc drop at 100 amperes peak (volts)		12
Grid control characteristics	See Curve	
Maximum negative grid voltage before conduction (volts)		500
Maximum negative grid voltage during conduction (volts)		10
Maximum critical grid current (microamps)		10
Maximum dc grid current (amperes)		1
Ionization time (approx., microseconds)		10
Deionization time (approx., microseconds)		1000
Anode to grid capacitance (uuf) (approx.)		4
Maximum ac short circuit current (amperes)		2500
Approx. temp. rise, cond. mercury above ambient (°C)		30
Mounting position	Vertical, fin down	
Net weight (pounds)		7
Approx. shipping weight (lbs.)		15

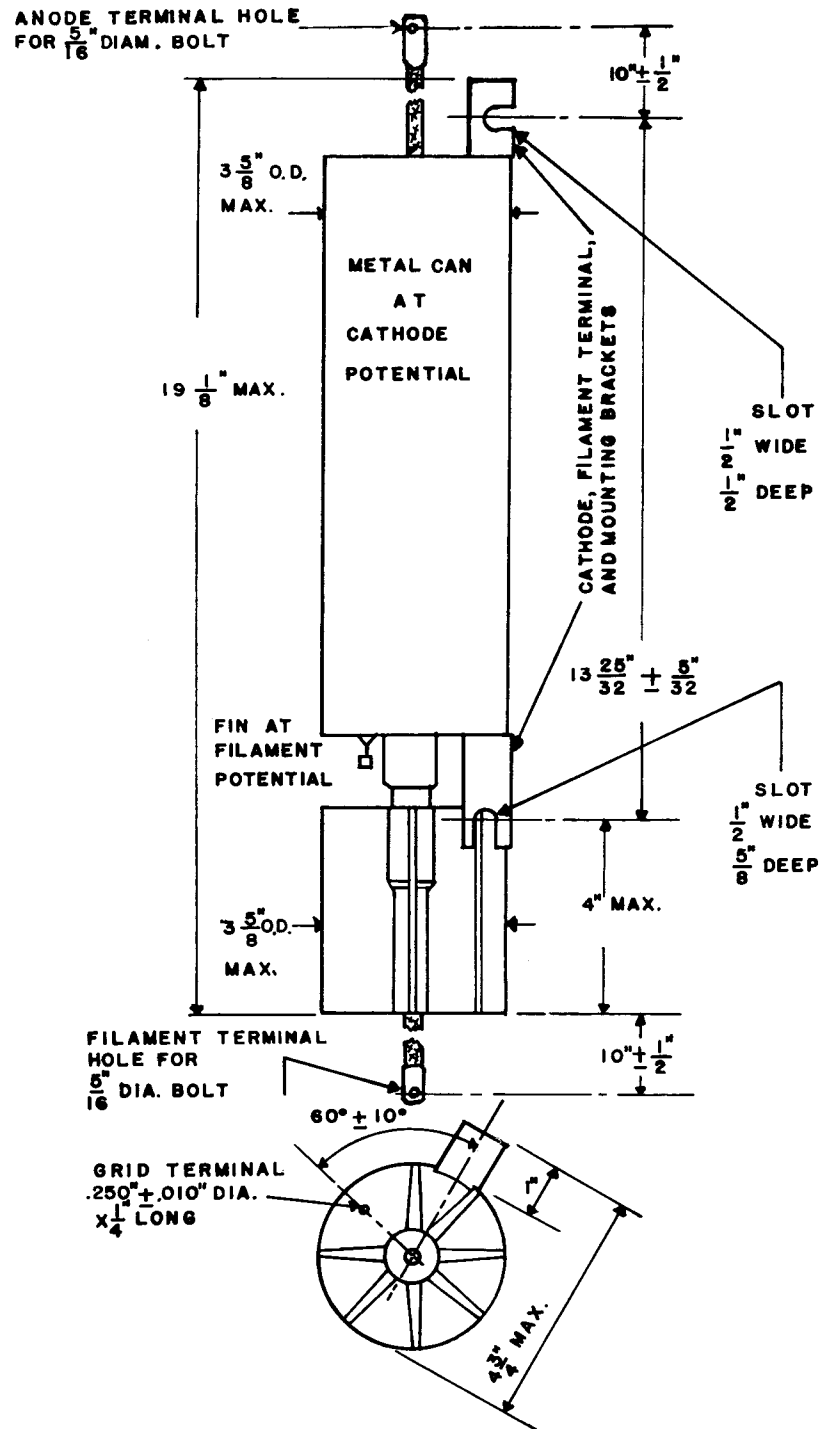
★The tube may be started and satisfactory operation will result between —40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +10 and +50°C ambient.

All data are based on returns to filament center tap or to tube bracket and with filament voltage phasing such that the lower filament terminal (lead) is positive when the anode is positive.

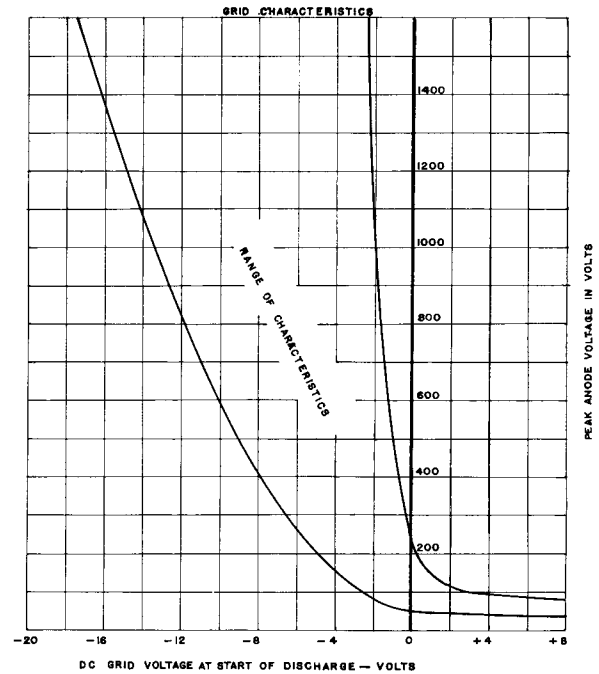
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GENEVA, ILLINOIS, U. S. A.

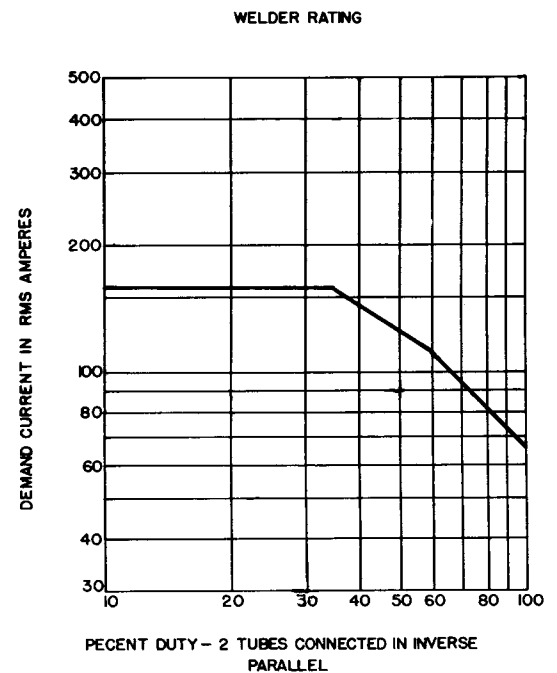
NL-732 THYRATRON TUBE



NL-732 OUTLINE



NL 732 GRID CHARACTERISTIC CAN RETURN FILAMENT PHASING AS NOTED IN DATA



NATIONAL ELECTRONICS, INC.
GENEVA, ILLINOIS, U. S. A.

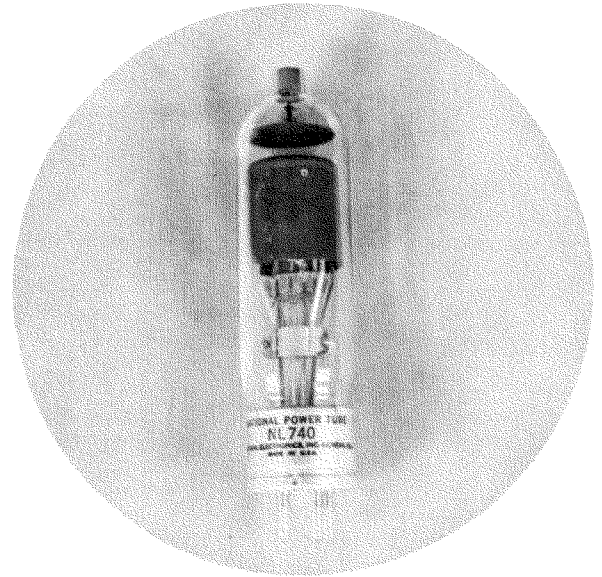
NL-740 & NL-741 THYRATRON TUBES

4 Amperes dc — 50 Amperes Peak

National Power Tube NL-740 is a quick starting Industrial thyatron designed especially for heavy duty ignitor firing applications and for use in motor speed control and regulated rectifier equipments. It is gas and mercury filled for quick starting and constancy of characteristics within wide temperature limits.

NL-741 has the same general characteristics, within its narrower temperature limits, but is filled with mercury only to permit use of the tube at higher voltages.

Both types are available with bracket type bases for panel mounting under type numbers NL-740P and NL-741P and with the new NATIONAL-designed lug type bases under type numbers NL-740L and NL-741L.



TECHNICAL INFORMATION

NL-740

dc Amperes output (maximum)	4.0	2.5
Instantaneous Amperes output (maximum)	30	50
Maximum time of averaging anode current (sec.)..	5	5
Maximum peak inverse volts	1500	1500
Maximum peak forward volts	1500	1500
Condensed mercury temperature limits (°C)	—40 to +80*—40 to +80*	
Filament volts	2.5	
Filament amperes	16 ± 2	
Filament heating time (seconds)	30	
Typical arc drop at 12 amperes peak (volts)	12	
Grid control characteristic	See Curve	
Maximum negative grid voltage before conduction (volts)	500	
Maximum negative grid voltage during conduction (volts)	10	
Maximum critical grid current (microamps)	10	
Ionization time (approx., microseconds)	10	
Deionization time (approx., microseconds)	1000	
Anode to grid capacitance (uuf)	3	
Maximum ac short circuit current (amperes)	400	
Approx. temperature rise, cond. mercury above ambient (°C)	25	
Mounting position	Vertical, base down	
Net weight (ounces)	7	
Approx. shipping weight (lbs.)	4	

NL-741

4.0	2.5	2.5
30	50	15
5	5	5
1500	1500	5000
1500	1500	2500
+40 to +90	+40 to +90	+40 to +65

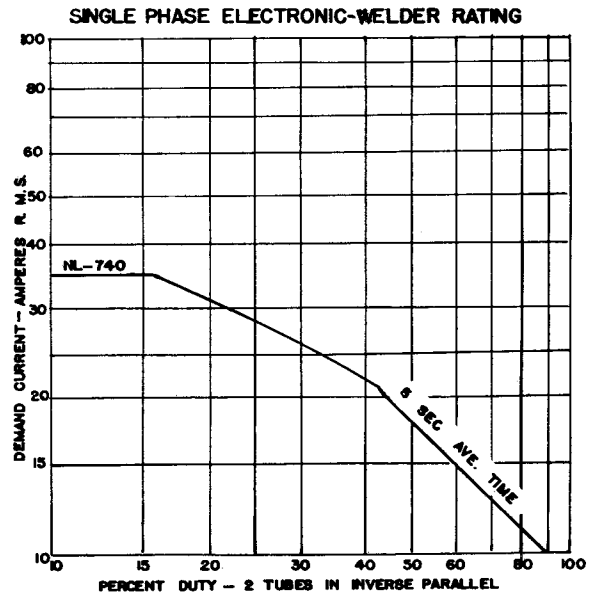
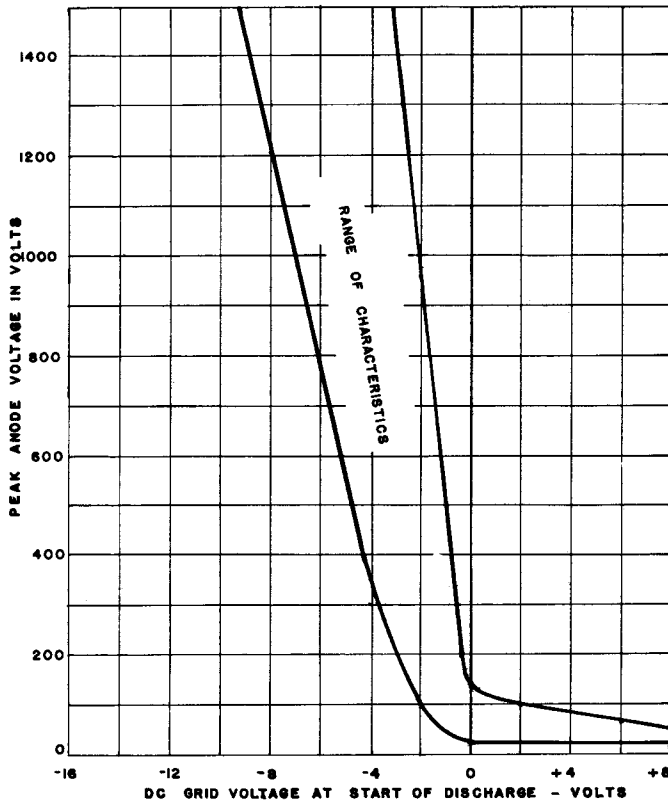
*The tube may be started and satisfactory operation will result between —40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +15 to +55°C ambient temperature.

Note: Max. base shell to lead voltage, 1500 v rms.

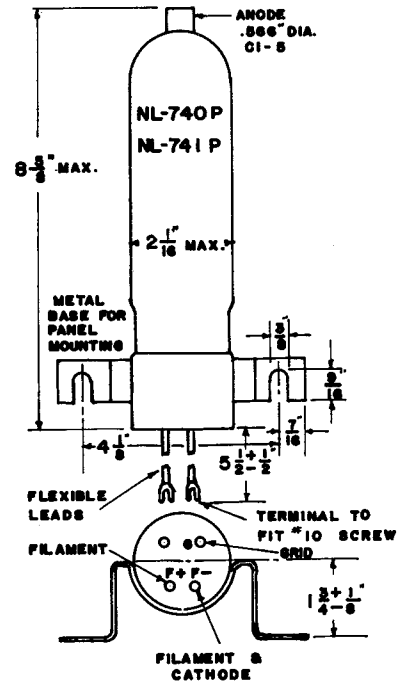
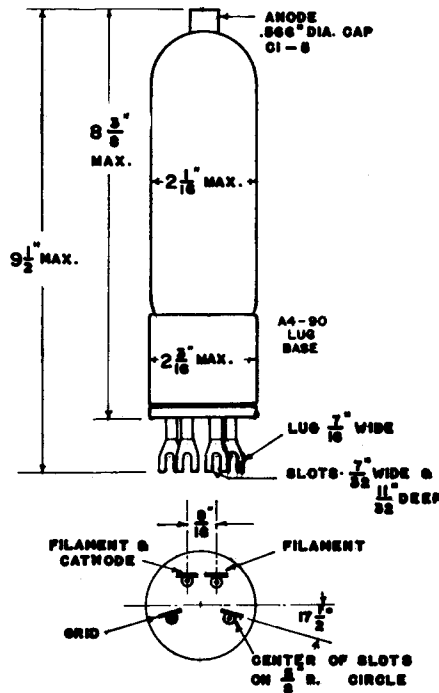
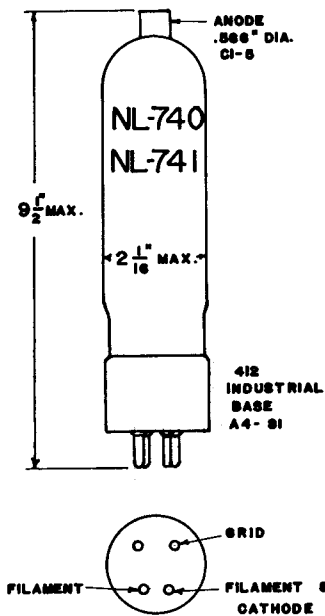
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NL-740 & NL-741 THYRATRON TUBES



NL-740L



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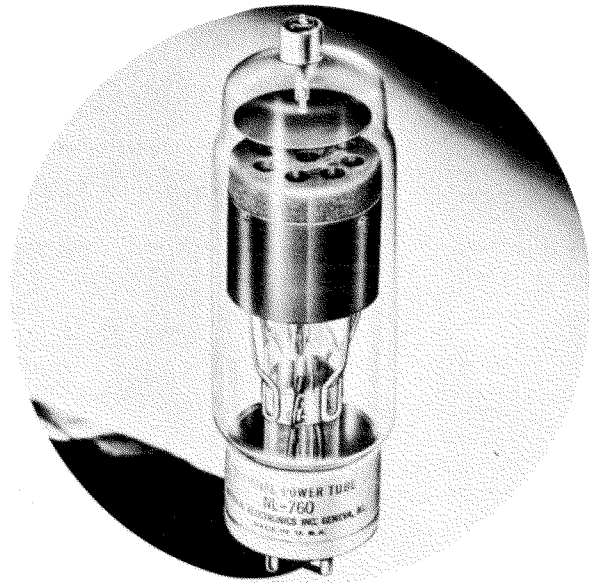
NL-760 & NL-761 THYRATRON TUBES

6.4 Amperes dc — 77 Amperes Peak

National Power Tube NL-760 is a quick heating industrial thyatron designed especially for welding control, motor speed control, and regulated rectifier applications. It is gas and mercury filled for quick starting, constancy of characteristics within wide temperature limits, and long life.

NL-761 has the same general characteristics, within its narrower temperature limits, but is filled with mercury only to permit use of the tube at higher voltages.

Both types are available with bracket type bases for panel mounting under type numbers NL-760P and NL-761P, and with the new National-designed lug type bases under type numbers NL-760L and NL-761L.



TECHNICAL INFORMATION

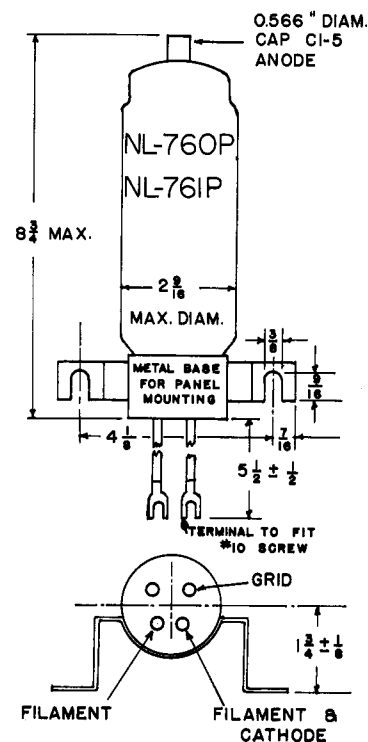
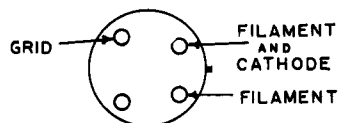
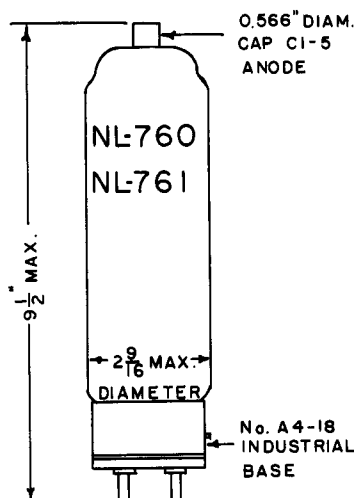
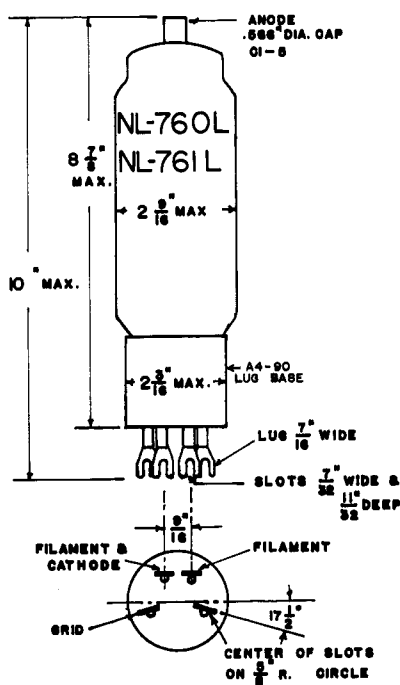
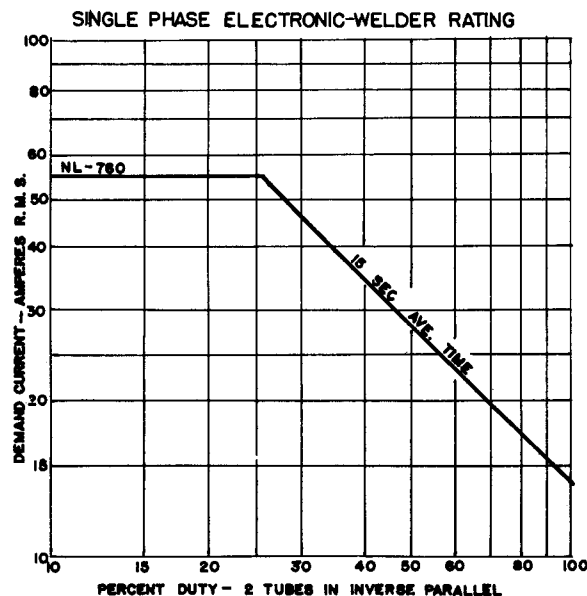
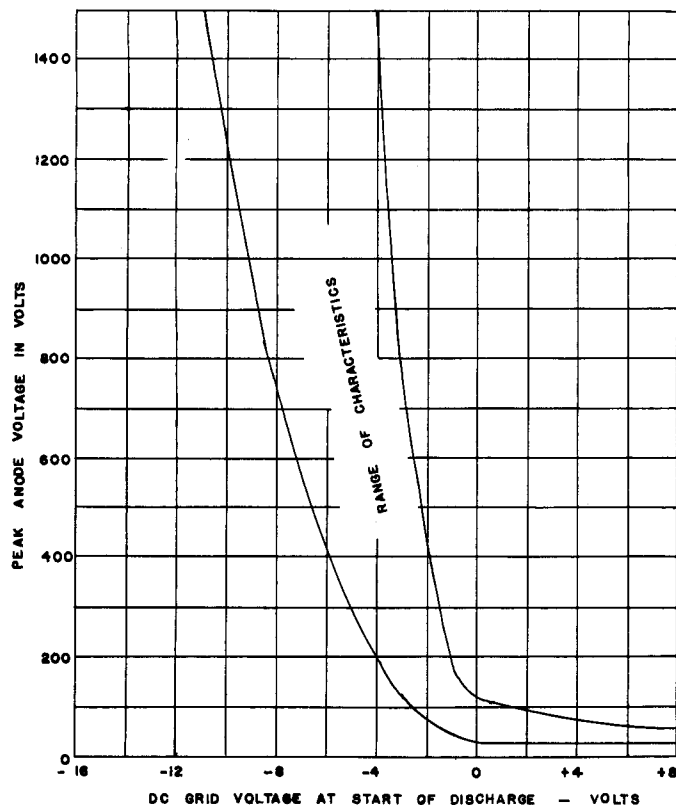
	NL-760	NL-761
dc Amperes output (Maximum)	6.4	6.4
Instantaneous Amperes Output (Maximum)	77	77
Maximum time of averaging anode current (seconds)	15	15
Maximum peak inverse volts	1500	1500
Maximum peak forward volts	1500	5000
Condensed mercury temperature limits (°C)	—40 to +80*	1500
Filament volts	2.5	+40 to +90
Filament amperes	21 ± 2	+40 to +65
Filament heating time (seconds)	60	
Typical arc drop at 20 amperes peak (volts)	12	
Grid control characteristic	See Curve	
Maximum negative grid voltage before conduction (volts)	500	
Maximum negative grid voltage during conduction (volts)	10	
Maximum critical grid current (microamps)	10	
Ionization time (approx., microseconds)	10	
Deionization time (approx., microseconds)	1000	
Anode to grid capacitance (uuf)	4	
Maximum ac short circuit current (amperes)	770	
Approx. temp. rise, cond. mercury above ambient (°C)	30	
Mounting position	Vertical, base down	
Net weight (ounces)	9	
Approximate shipping weight (lbs.)	5	

*The tube may be started and satisfactory operation will result between —40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +10 to +50°C ambient.

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NL-760 & NL-761 THYRATRON TUBES



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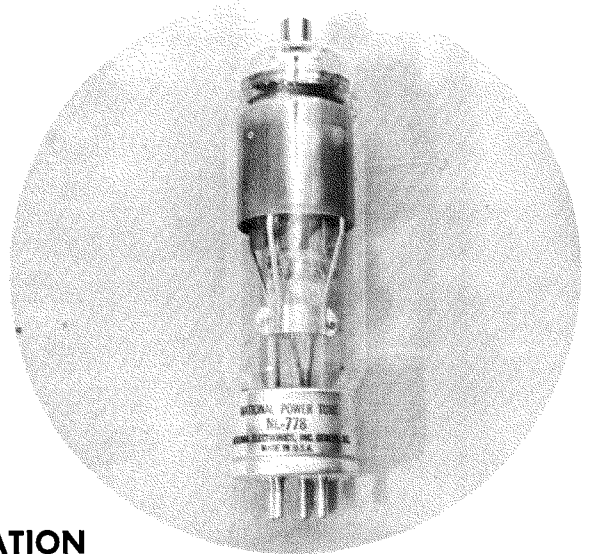
NL-778 THYRATRON TUBE

3.0 Amperes dc - 110 Amperes Peak

6.4 Amperes dc - 50 Amperes Peak

National Power Tube NL-778 is a quick heating industrial thyatron designed especially for welding control applications. It is gas and mercury filled for quick starting, constancy of characteristics within wide temperature limits, and long life.

It is available with bracket type base for panel mounting under type number NL-778P, and with the new National-designed lug type base under type Number NL-778L.



TECHNICAL INFORMATION

NL-778

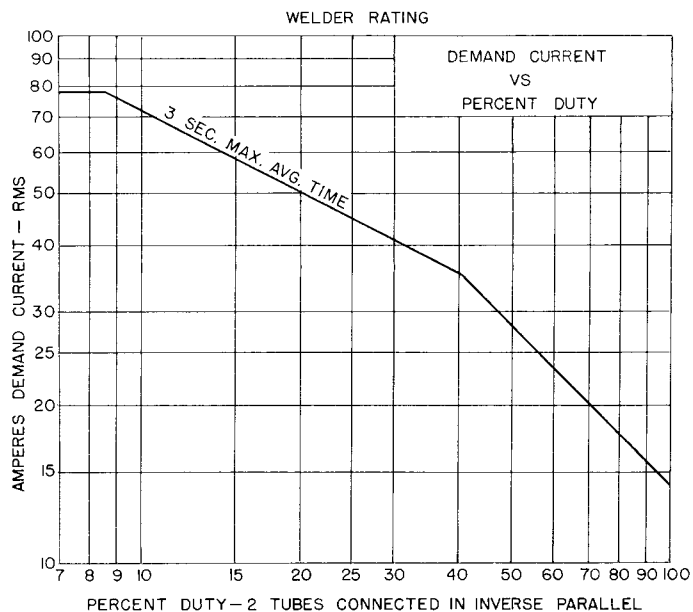
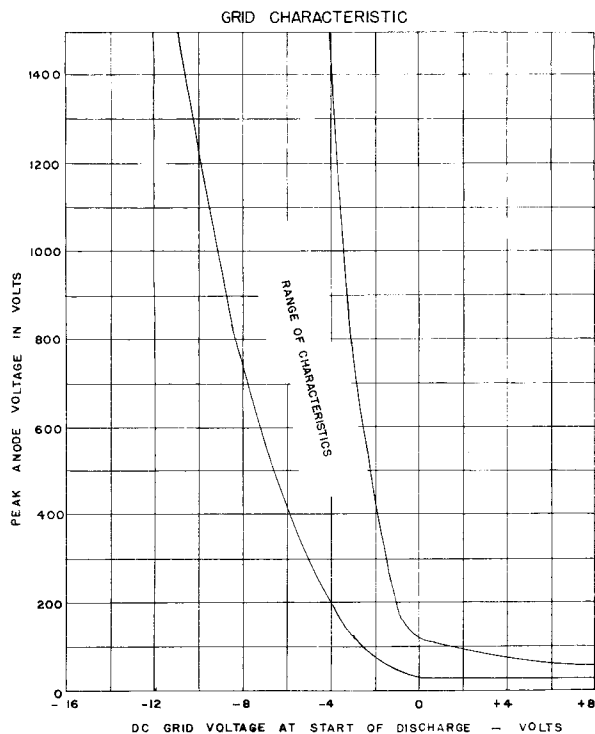
dc Amperes output (Maximum)	6.4	3.0
Instantaneous Amperes Output (Maximum)	50	110
Maximum time of averaging anode current (seconds)		3
Maximum peak inverse volts		1500
Maximum peak forward volts		1500
Condensed mercury temperature limits (°C)	-40 to +80*	
Filament volts	2.5	
Filament amperes	21 ± 2	
Filament heating time (seconds)	60	
Typical arc drop at 20 amperes peak (volts)	12	
Grid control characteristic	See Curve	
Maximum negative grid voltage before conduction (volts)	500	
Maximum negative grid voltage during conduction (volts)	10	
Maximum critical grid current (microamps)	10	
Ionization time (approx., microseconds)	10	
Deionization time (approx., microseconds)	1000	
Anode to grid capacitance (uuf)	4	
Maximum ac short circuit current (amperes)	770	
Approx. temp. rise, cond. mercury above ambient (°C)	30	
Mounting position	Vertical, base down	
Net weight (ounces)	9	
Approximate shipping weight (lbs.)	5	

*The tube may be started and satisfactory operation will result between -40 and +80°C. For maximum life the condensed mercury temperature after warm-up should run between +40 and +80°C which corresponds to approximately +10 to +50°C ambient.

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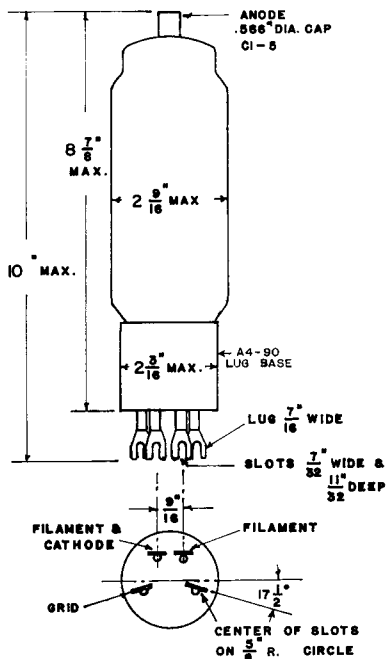
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NL-778 THYRATRON TUBE

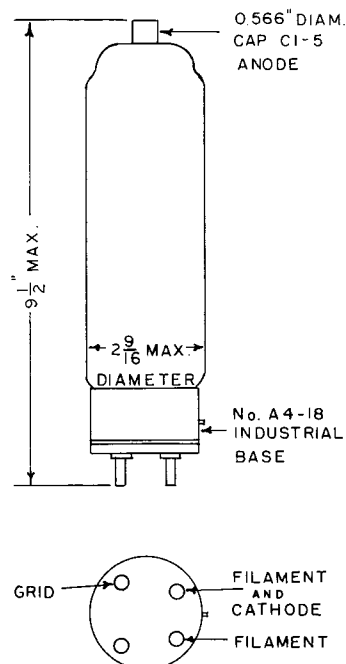


OUTLINES

NL-778L



NL-778



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