

## Power Pentode

### NOVAR TYPE

For Output Stages of High Fidelity  
Audio-Amplifiers and Radio Receivers

### ELECTRICAL

Heater Characteristics and Ratings:

Voltage (AC or DC) . . . . .	6.3 ± 0.6	volts
Current at heater volts = 6.3 . . . . .	0.800	amp
Maximum Heater-Cathode Voltage:		
Heater negative with respect to cathode.	200	volts
Heater positive with respect to cathode		
Peak . . . . .	200	volts
DC component . . . . .	100	volts

Direct Interelectrode Capacitances (Approx.):<sup>a</sup>

Grid No.1 to plate . . . . .	0.15	pf
Input: G1 to (K + G3, G2, H) . . . . .	11.0	pf
Output: P to (K + G3, G2, H) . . . . .	4.4	pf

### MECHANICAL

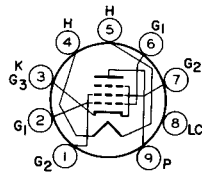
Operating Position . . . . .	Any
Type of Cathode . . . . .	Coated Unipotential
Maximum Overall Length . . . . .	3.110 in
Maximum Seated Length . . . . .	2.730 in
Diameter . . . . .	1.062 to 1.188 in
Bulb . . . . .	T9
Dimensional Outline . . . . .	See <i>General Section</i>

Bases (Alternates):

- Small-Button Novar 9-Pin . . . . . (JEDEC No.E9-75)
- Small-Button Novar 9-Pin with Exhaust Tip . . . . . (JEDEC No.E9-89)

### BASING DESIGNATION (Bottom View)

- Pin 1-Grid No.2
- Pin 2-Grid No.1
- Pin 3-Cathode, Grid No.3
- Pin 4-Heater
- Pin 5-Heater
- Pin 6-Grid No.1
- Pin 7-Grid No.2
- Pin 8-LC - See *Note*
- Pin 9-Plate



9RW

**Note:** May be used as tie point for components operating at or near the DC voltage of either the grid No.2 or plate, or between these voltages. Otherwise, do not use.

### AF POWER AMPLIFIER — Class A1

Maximum Ratings, *Design-Maximum Values:*

Plate Voltage . . . . .	550	volts
Grid-No.2 (Screen-Grid) Voltage . . . . .	440	volts
Cathode Current . . . . .	90	ma
Grid-No.2 Input . . . . .	3.3 <sup>b</sup>	watts
Plate Dissipation . . . . .	19	watts
Bulb Temperature (At hottest point on bulb surface). . . . .	240	°C

← Indicates a change.



## Power Pentode

## NOVAR TYPE

For High-Fidelity Audio-Amplifier Applications

## GENERAL DATA

## Electrical:

Heater, for Unipotential Cathode:

Voltage (AC or DC) . . . . .	6.3 $\pm$ 10%	volts
Current at 6.3 volts . . . . .	0.8	amp

Direct Interelectrode Capacitances

(Approx.):<sup>a</sup>

Grid No.1 to plate . . . . .	0.15	$\mu\mu\text{f}$
Grid No.1 to cathode & grid No.3, grid No.2, and heater . . . . .	11	$\mu\mu\text{f}$
Plate to cathode & grid No.3, grid No.2, and heater . . . . .	4.4	$\mu\mu\text{f}$

## Mechanical:

Operating Position . . . . .	Any
Maximum Overall Length . . . . .	3.24"
Maximum Seated Length . . . . .	2.86"
Length, Base Seat to Bulb Top (Excluding tip) . . . . .	2.30" $\pm$ 0.09"
Diameter . . . . .	1.062" to 1.188"
Bulb . . . . .	T9
Socket . . . . .	Cinch Mfg. Corp. No.149 19 00 24, or equivalent
Base . . . . .	Small-Button Novar 9-Pin (JEDEC No.E9-75)
Basing Designation for BOTTOM VIEW . . . . .	9NZ

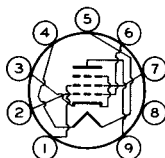
Pin 1 - Grid No.2

Pin 2 - Grid No.1

Pin 3 - Cathode,  
Grid No.3

Pin 4 - Heater

Pin 5 - Heater



Pin 6 - Grid No.1

Pin 7 - Grid No.2

Pin 8 - Internal Con-  
nection—  
Do Not Use

Pin 9 - Plate

AF POWER AMPLIFIER — Class A<sub>1</sub>

Maximum Ratings, Design-Maximum Values:

PLATE VOLTAGE . . . . .	550	max.	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE . . . . .	440	max.	volts
CATHODE CURRENT . . . . .	90	max.	ma
GRID-NO.2 INPUT . . . . .	3.3 <sup>b</sup>	max.	watts
PLATE DISSIPATION . . . . .	19	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode . . . . .	200	max.	volts
Heater positive with respect to cathode . . . . .	200 <sup>c</sup>	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface) . . . . .			
	240	max.	°C

## Typical Operation and Characteristics:

Plate Voltage . . . . .	300	volts
Grid-No.2 Voltage . . . . .	300	volts



Grid-No.1 (Control-Grid) Voltage . . . . .	-10	volts
Peak AF Grid-No.1 Voltage . . . . .	10	volts
Zero-Signal Plate Current . . . . .	60	ma
Max.-Signal Plate Current . . . . .	75	ma
Zero-Signal Grid-No.2 Current . . . . .	8	ma
Max.-Signal Grid-No.2 Current . . . . .	15	ma
Plate Resistance (Approx.) . . . . .	29000	ohms
Transconductance . . . . .	10200	μmhos
Effective Load Resistance . . . . .	3000	ohms
Total Harmonic Distortion . . . . .	13	%
Max.-Signal Power Output . . . . .	11	watts

### Maximum-Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation . . . . .	0.3	max. megohm
For cathode-bias operation . . . . .	1	max. megohm

### PUSH-PULL AF POWER AMPLIFIER — Class AB<sub>1</sub>

#### Maximum Ratings, Design-Maximum Values:

PLATE VOLTAGE . . . . .	550	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE . . . . .	440	max.	volts
CATHODE CURRENT . . . . .	90	max.	ma
GRID-No.2 INPUT . . . . .	3.3 <sup>b</sup>	max.	watts
PLATE DISSIPATION . . . . .	19	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode . . . . .	200	max.	volts
Heater positive with respect to cathode . . . . .	200 <sup>c</sup>	max.	volts
BULB TEMPERATURE (At hottest point on bulb surface) . . . . .			
	240	max.	°C

#### Typical Operation:

Values are for 2 tubes

	Fixed Bias					Cathode Bias	
	300	350	400	450	450	450	
Plate Supply Voltage . . . . .	300	350	400	450	450	450	volts
Grid-No.2 Supply Voltage . . . . .	300	350	350	350	400	400	volts
Grid-No.1 Voltage . . . . .	-12.5	-15.5	-16	-16.5	-21	-	volts
Cathode Resistor (Common to both cathodes) . . . . .	-	-	-	-	-	170	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage . . . . .	25	31	32	33	42	31	volts
Zero-Signal Plate Current . . . . .	74	72	64	60	40	86	ma
Max.-Signal Plate Current . . . . .	116	130	135	142	145	94	ma
Zero-Signal Grid-No.2 Current . . . . .	10	9.5	8	7.2	5	10	ma
Max.-Signal Grid-No.2 Current . . . . .	28	32	28	26	30	20	ma



Effective Load Resistance (Plate to plate) . . . . .	6600	6600	6600	6600	6600	10000	ohms
Total Harmonic Distortion . . . . .	5	2.5	2	2.5	5	2	%
Max.-Signal Power Output . . . . .	24	30	34	38	44	28	watts

**Maximum Circuit Values:**

Grid-No.1-Circuit Resistance:		
For fixed-bias operation. . . . .	0.3 max.	megohm
For cathode-bias operation. . . . .	1 max.	megohm

**PUSH-PULL AF POWER AMPLIFIER — Class AB<sub>1</sub>**

*Grid No.2 of each tube connected to tap on plate winding of output transformer*

**Maximum Ratings, Design-Maximum Values:**

PLATE AND GRID-No.2 (SCREEN-GRID)		
SUPPLY VOLTAGE. . . . .	440 max.	volts
DC CATHODE CURRENT. . . . .	90 max.	ma
GRID-No.2 INPUT . . . . .	3.3 <sup>b</sup> max.	watts
PLATE DISSIPATION . . . . .	19 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	200 max.	volts
Heater positive with respect to cathode .	200 <sup>c</sup> max.	volts
BULB TEMPERATURE (At hottest point on bulb surface). . . . .	240 max.	°C

**Typical Operation:**

*Values are for 2 tubes*

	<i>Fixed Bias</i>	<i>Cathode Bias</i>	
Plate Supply Voltage. . . . .	400	425	volts
Grid-No.2 Supply Voltage. . . . .	d	d	volts
Grid-No.1 Voltage . . . . .	-20.5	-	volts
Cathode Resistor (Common to both cathodes) . . . . .	-	185	ohms
Peak AF Grid-No.1-to-			
Grid-No.1 Voltage . . . . .	41	42	volts
Zero-Signal Plate Current . . . . .	60	88	ma
Max.-Signal Plate Current . . . . .	115	100	ma
Zero-Signal Grid-No.2 Current . . . . .	8	12	ma
Max.-Signal Grid-No.2 Current . . . . .	18	16	ma
Effective Load Resistance (Plate to plate). . . . .	6600	6600	ohms
Total Harmonic Distortion . . . . .	2.5	3.5	%
Max.-Signal Power Output. . . . .	23	21	watts

**Maximum Circuit Values:**

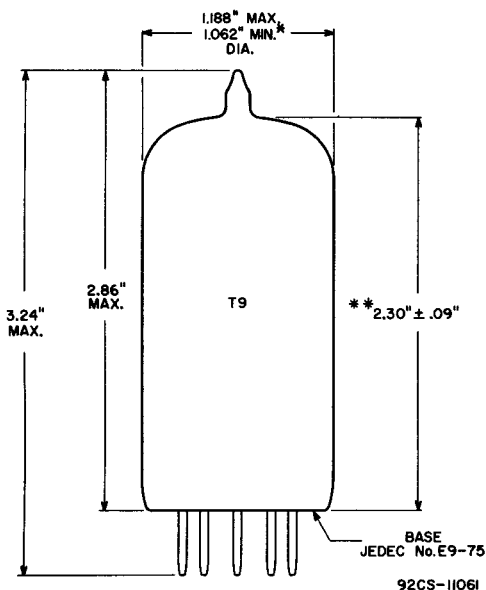
Grid-No.1-Circuit Resistance:		
For fixed-bias operation. . . . .	0.3 max.	megohm
For cathode-bias operation. . . . .	1 max.	megohm



- a Without external shield.
- b Grid-No.2 input may reach 6 watts during peak levels of speech and music signals.
- c The dc component must not exceed 100 volts.
- d Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center-tap (B+) so as to supply 50 per cent of the plate signal voltage to the grid No.2 of each output tube.

## OPERATING CONSIDERATIONS

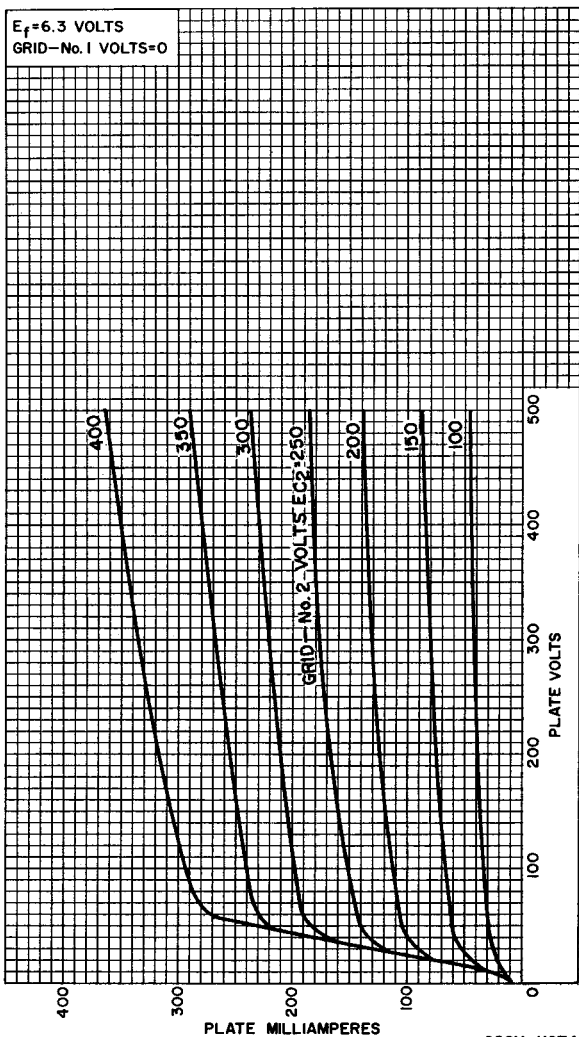
The *bulb* becomes hot during operation. To insure adequate cooling, it is essential that free circulation of air be provided.



\* APPLIES IN ZONE STARTING 0.375" FROM BASE SEAT.

\*\* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF 0.600" INSIDE DIAMETER.

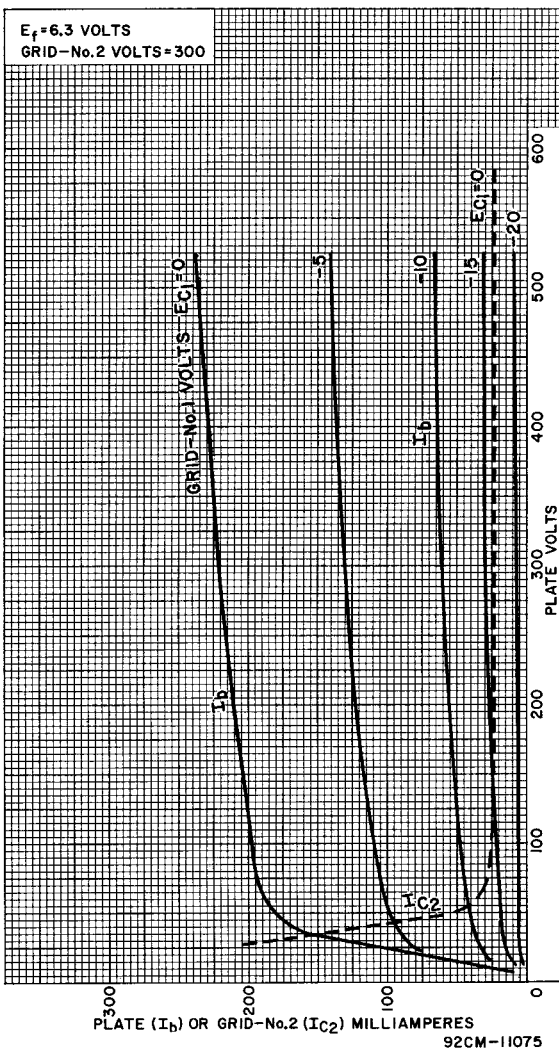
## AVERAGE PLATE CHARACTERISTICS



92CM-11074



## AVERAGE CHARACTERISTICS



## OPERATION CHARACTERISTICS

### Push-Pull Class AB<sub>1</sub>

