

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.):^a

Grid No.1 to plate.	0.15	μ f
Grid No.1 to cathode & grid No.3, grid No.2, and heater	11	μ f
Plate to cathode & grid No.3, grid No.2, and heater	4.4	μ 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

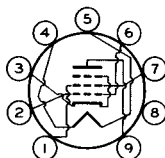
Pin 1 - Grid No.2

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 A₁

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 ^b	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 ^c	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	μ mhos
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 AB₁

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 ^b	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 ^c	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 AB₁

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 ^b 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 ^c 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:

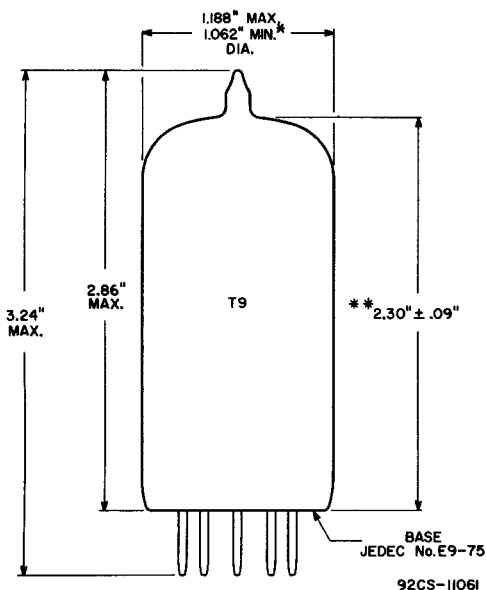
For fixed-bias operation.	0.3 max.	megohm
For cathode-bias operation.	1 max.	megohm



- 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

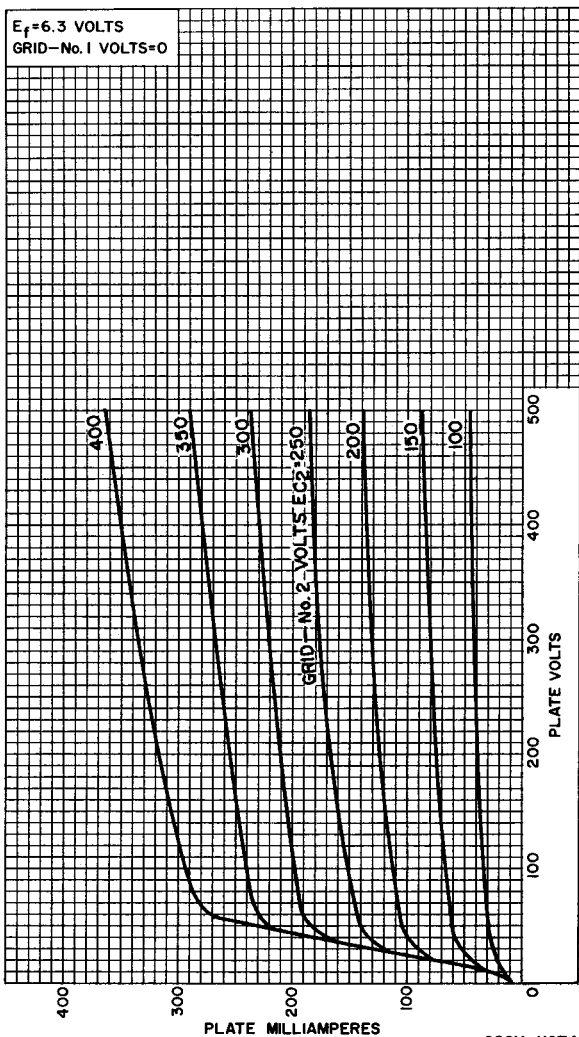
The *bulb* becomes hot during operation. To insure adequate cooling, it is essential that free circulation of air be provided.



* 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.

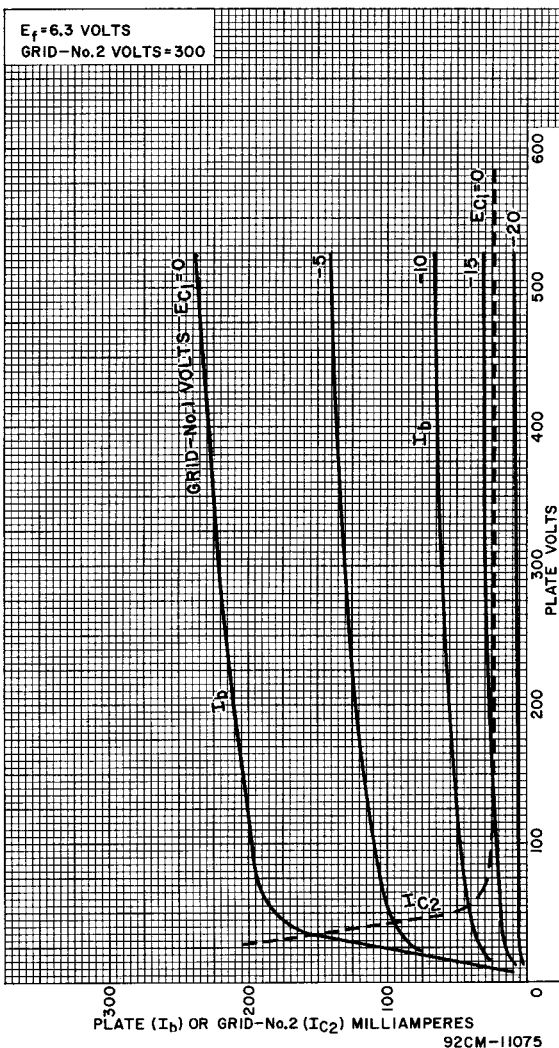
AVERAGE PLATE CHARACTERISTICS



92CM-11074

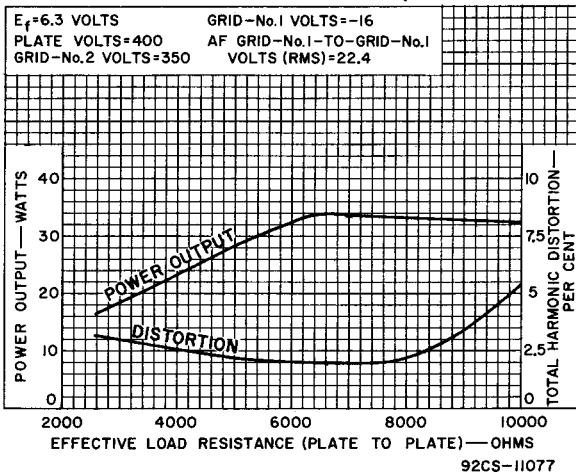


AVERAGE CHARACTERISTICS



OPERATION CHARACTERISTICS

Push-Pull Class AB₁



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.):^a

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

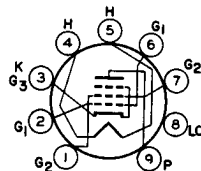
Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	3.110 in
Maximum Seated Length	2.730 in
Diameter	1.062 to 1.188 in
Bulb	T9
Dimensional Outline	See <i>General Section</i>

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 ^b	watts
Plate Dissipation	19	watts
Bulb Temperature (At hottest point on bulb surface).	240	°C

← Indicates a change.



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	megohm
For cathode-bias operation	1	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB₁

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 ^b	watts
Plate Dissipation.	19	watts
Bulb Temperature (At hottest point on bulb surface)	240	°C

Typical Operation:

Values are for 2 tubes

	Fixed Bias					Cathode	
						Bias	
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	c	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



	Fixed Bias					Cathode	ohms
						Bias	
Effective Load Resistance (Plate to plate)	6600	6600	6600	6600	6600	10000	
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	megohm
For cathode-bias operation	1	megohm

PUSH-PULL AF POWER AMPLIFIER — Class AB₁

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	volts
DC Cathode Current	90	ma
Grid-No.2 Input	3.3 ^b	watts
Plate Dissipation	19	watts
Bulb Temperature (At hottest point on bulb surface).	240	°C

Typical Operation:

Values are for 2 tubes

	Fixed Bias	Cathode Bias	
Plate Supply Voltage	400	425	volts
Grid-No.2 Supply Voltage	d	d	volts
Grid-No.1 Voltage	-20.5	c	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
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Max.-Signal Power Output	23	21	watts

Maximum Circuit Values:

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



- ^a Without external shield.
^b Grid-No. 2 input may reach 6 watts during peak levels of speech and music signals.
^c Connected to negative end of cathode resistor.
^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.

Operation Characteristics

Push-Pull Class AB₁

